TRADE, INVESTMENT AND COMPETITIVENESS

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EQUITABLE GROWTH, FINANCE & INSTITUTIONS INSIGHT

Unfair Advantage:
Distortive Subsidies and Their Effects on Global Trade

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Acknowledgments

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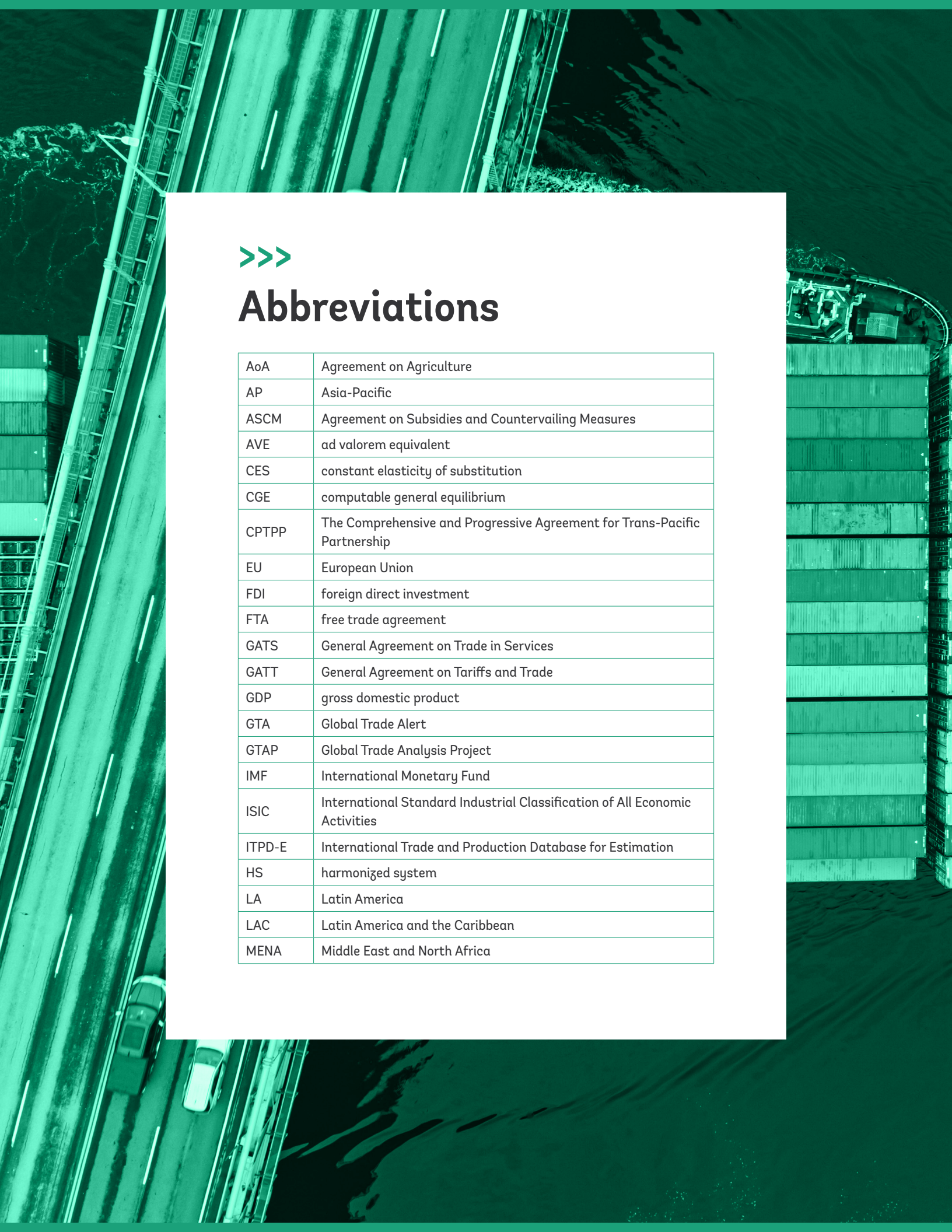
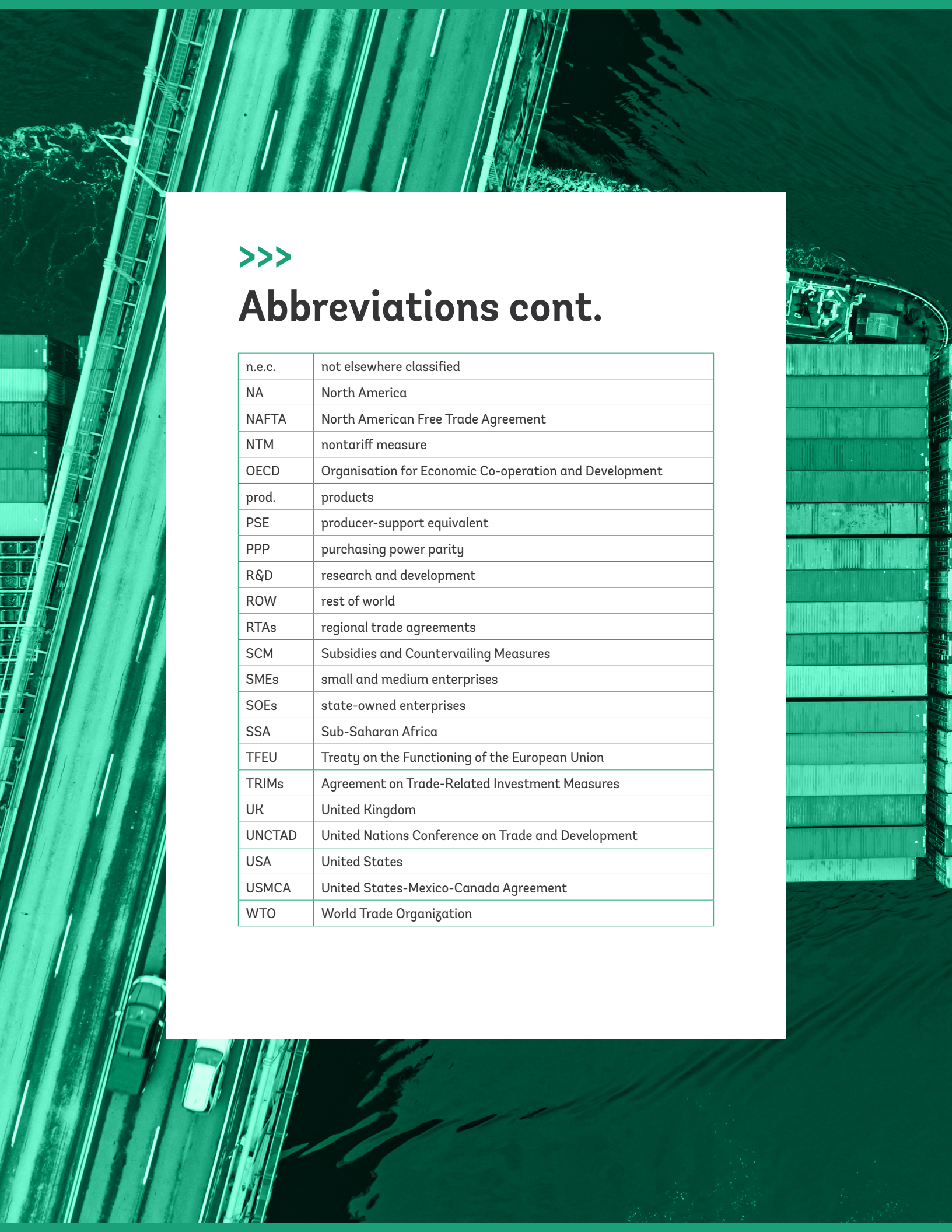


Abbreviations

AoA	Agreement on Agriculture
AP	Asia-Pacific
ASCM	Agreement on Subsidies and Countervailing Measures
AVE	ad valorem equivalent
CES	constant elasticity of substitution
CGE	computable general equilibrium
CPTPP	The Comprehensive and Progressive Agreement for Trans-Pacific Partnership
EU	European Union
FDI	foreign direct investment
FTA	free trade agreement
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GDP	gross domestic product
GTA	Global Trade Alert
GTAP	Global Trade Analysis Project
IMF	International Monetary Fund
ISIC	International Standard Industrial Classification of All Economic Activities
ITPD-E	International Trade and Production Database for Estimation
HS	harmonized system
LA	Latin America
LAC	Latin America and the Caribbean
MENA	Middle East and North Africa



Abbreviations cont.

n.e.c.	not elsewhere classified
NA	North America
NAFTA	North American Free Trade Agreement
NTM	nontariff measure
OECD	Organisation for Economic Co-operation and Development
prod.	products
PSE	producer-support equivalent
PPP	purchasing power parity
R&D	research and development
ROW	rest of world
RTAs	regional trade agreements
SCM	Subsidies and Countervailing Measures
SMEs	small and medium enterprises
SOEs	state-owned enterprises
SSA	Sub-Saharan Africa
TFEU	Treaty on the Functioning of the European Union
TRIMs	Agreement on Trade-Related Investment Measures
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
USA	United States
USMCA	United States-Mexico-Canada Agreement
WTO	World Trade Organization

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Executive Summary

Government subsidies have emerged as a flashpoint in the geopolitical tensions that threaten to undermine the global rules-based trading system. Subsidies are among the tools deployed by the world's major economies to tackle climate change, gain an edge in frontier technologies, and revamp supply chains disrupted by the COVID-19 pandemic and the war in Ukraine. Yet, even when deployed in pursuit of legitimate goals, subsidies can harm trading partners, fuel tensions, and provoke countermeasures. They can nullify the benefits of global trade and investment by distorting international prices and limiting market access, as in the case of local content requirements, and they can create inefficiencies in global value chains. Because the international trading system is ill-equipped to discipline the use of subsidies, governments increasingly are responding with countervailing tariffs or subsidies of their own when they can afford it.

Subsidy programs—which have been rising since the 2008 global financial crisis—can create substantial distortions to trade:

- Subsidies are concentrated among the world's biggest trading economies, including China, the European Union (EU), and the United States;
- Manufacturing has emerged as the principal beneficiary, surpassing agriculture, in terms of number of measures;
- Subsidies can be more distortive to trade than tariffs—ad valorem equivalents of export support average 15 percent for agriculture and 8 percent for manufacturing. This is double and quadruple average tariffs (at 8 percent and 2 percent), respectively.

These developments risk triggering a tit-for-tat cycle of rising barriers and trade-distorting subsidies that pose a threat to global economic prosperity. The economic toll has yet to be assessed, but preliminary data on global trade and investment flows suggest that induced efficiency costs could be significant. Trade has been a critical channel for the diffusion of technology, which in turn drives productivity and economic growth. Higher barriers to trade mean less competition and therefore lower efficiency and slower growth. More rigid and localized supply chains would be more vulnerable to shocks, potentially creating shortages and fueling inflation. Geopolitical tensions could lead to restrictions on flows of credit and investment, creating financial stability risks.

1. See, for example, Irwin (2019).

Developing countries are most at risk from a loss of confidence in global trade rules. To attract much-needed investment and establish or strengthen links with global value chains, developing countries need the certainty provided by a credible and coherent system of global trade rules. They need international trade to drive growth, reduce poverty, diversify their economies, and respond to rising challenges such as climate change. Perhaps most importantly, they need to be able to compete at fair terms, a capacity that trade-distortive subsidies and protectionist policies will hurt. With limited fiscal and institutional capacity, they often cannot respond with their own subsidies or trade defense actions.

Information on the extent and economic effects of subsidies is hard to come by, making it difficult to regulate their use under international trade rules. Governments lack the information they need to have informed discussions and decision making on subsidies that may distort trade. Because subsidies serve various objectives and take many forms—including direct financial grants, tax breaks, and in-kind contributions—it may not be easy to identify which ones need to be addressed. The amount of support and the conditions under which a subsidy is granted—for example, whether it is linked to production levels—can be important determinants of their effects across borders. Furthermore, due to the paucity of subsidy data, the magnitude of their trade effects remains understudied.

Subsidies have proliferated

Since the global financial crisis of 2008, subsidies have far surpassed tariffs and nontariff measures as the most frequent form of policy intervention in trade. The rising number of measures has coincided with a marked slowdown of global trade from its pre-crisis pace. Countries principally involved in subsidy interventions include large economies in the Group of 20, which have the fiscal and administrative capacity to increase the use of subsidies. The magnitudes are significant. For instance, the support provided to agriculture by governments across a wide range of countries exceeded US$600 billion per year from 2016 to 2018.

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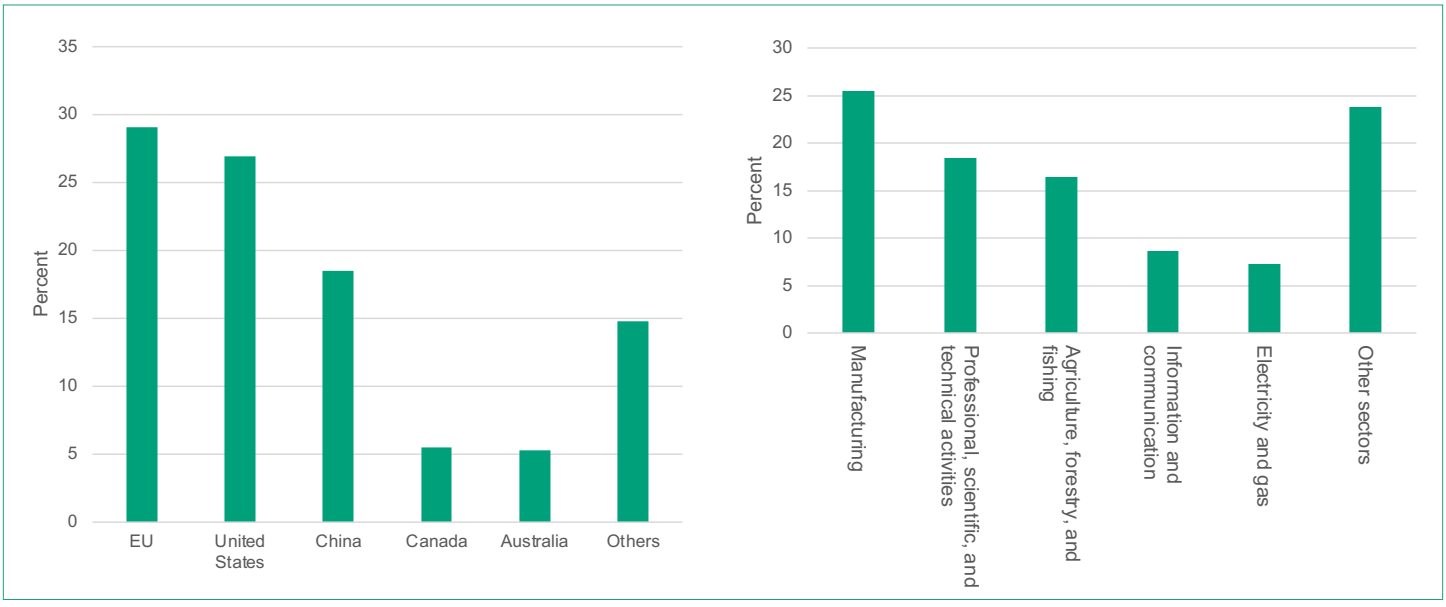
Figure ES.1. Subsidies are concentrated in the top trading blocs and predominate for manufacturing in terms of number of measures
(Distribution by number of measures, 2018)



Source: Compilation of subsidy measures.
Note: EU = European Union (EU28); "Others" combines other 20 major trading economies.

This analysis builds a framework to identify trade-distorting subsidies, monitor them, and offer potential solutions. It develops a working definition and classification of subsidy measures and builds a global database covering more than 2,000 programs in 50 countries accounting for more than 70 percent of global trade. This database provides a picture of subsidies as of 2018 in terms of intended policy objectives, types of measures, and regional and sectoral patterns. The analysis breaks new ground by quantifying the trade-distortive effects of subsidies.

These new data show that subsidies are not a single-country or single-region problem. China, the EU, and the United States—big economies with the potential to influence global markets—account for about 75 percent of programs of the documented number of measures. Australia and Canada are also among the world's top subsidizers. Most government programs are implemented at the sub-national level. In China and the United States, sub-national subsidies account for 90 percent and 82 percent of programs, respectively. Thus, all levels of government need to be aware of and subscribe to established disciplines on subsidy provisions and acknowledge the need for full transparency.

Subsidies predominate in manufacturing. They are also common in certain services and in agriculture. Subsidies benefiting manufacturing account for about 25 percent of programs. They are prevalent in industries such as electronics, vehicles, machinery, ships, chemicals, food and beverages, and metals and metal products. The second largest category encompasses services related to professional, scientific, and technical activities (primarily R&D), followed by agriculture and fishing in third place. Together, those three top sectors account for about 60 percent of subsidies. Other sectors, with less concentrated programs, include electricity and gas, mining and quarrying, and various services such as information and communication, construction, and financial and insurance activities.

Measures vary considerably by type and stated objective. In the EU, about six in 10 take the form of financial grants. In the United States, tax incentives predominate. In both economies, about 20 percent of measures are loans, guarantees, or capital injections. In China, most programs provide grants. More than 20 percent of subsidy programs appear to be aimed at supporting the competitiveness of a particular sector. A second major category consists of incentives to help generate or transfer technology, such as capital and rewards for innovation; knowledge-sharing and technology-transfer platforms; financial and business support for start-ups; and capacity building. Subsidies with an environmental goal are less common. They often include rewards for conserving energy and reducing pollution by the use of coal filters, for example, or by substituting natural gas for coal. Nevertheless, fossil fuel subsidies still outnumber those for clean energy. Certain interventions have emerged recently with stated climate objective that remains to be assessed as they unfold, but that have already raised concerns for their possible trade effects. These include large subsidies to promote clean energy in the United States and the EU, under the Inflation Reduction Act and the Green Deal Industrial Plan, respectively.

Subsidies can distort trade

Subsidies create trade-distorting effects for both agriculture and manufacturing exports. The sectoral inventory of measures developed here provides useful information on sectors countries consider strategic. Based on their stated objectives, these interventions are often put in place with the likely intention of benefiting sectoral competitiveness, and less clearly with the goal of addressing a market failure or a legitimate social concern. This is an important distinction, not only because of the uneven playing field that certain subsidies can generate but also because of their often-large opportunity costs. New empirical estimates—derived from a structural, general equilibrium gravity model—show that subsidies can skew trade and production significantly for both agriculture and manufacturing. In particular, the introduction of a subsidy program can boost exports by, on average, between 3 and 4 percent.

Subsidies can be more distortive to trade flow than existing tariffs barriers. The distortionary effect of subsidies on trade, expressed in ad valorem equivalents, is estimated at 15 percent for agriculture and 8 percent for manufacturing. These estimates suggest that subsidies, while not necessarily

intended to influence trade, can have more pronounced effects on trade flows than border measures applied directly to trade flows, such as tariffs barriers. On average, subsidies in agriculture can be almost twice as distortive to trade as agricultural tariffs. For manufacturing, the distortions in comparison to tariff barriers are even larger. Furthermore, these effects differ by region. The biggest distortions in agriculture originate in the advanced economies of the EU and North America. Subsides in Asia disproportionately affect trade in manufactures.

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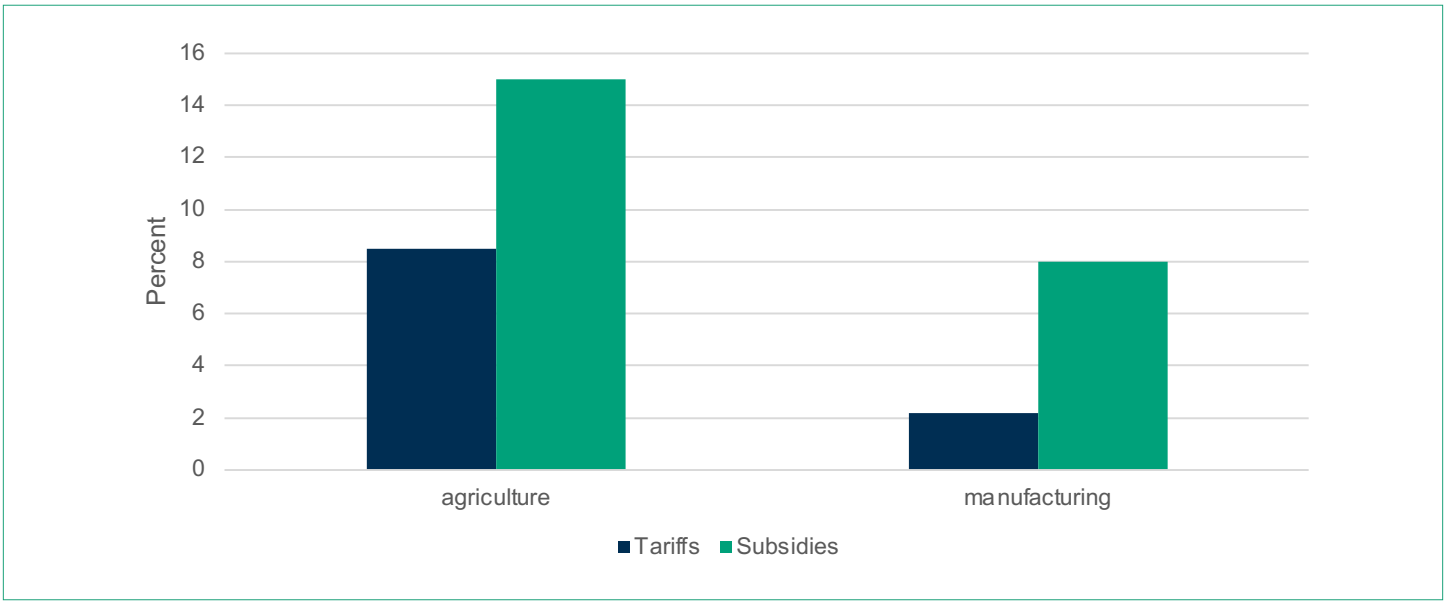
Figure ES.2. Subsidies can distort trade more than tariff barriers
(Estimated ad valorem equivalents for tariffs and subsidies)

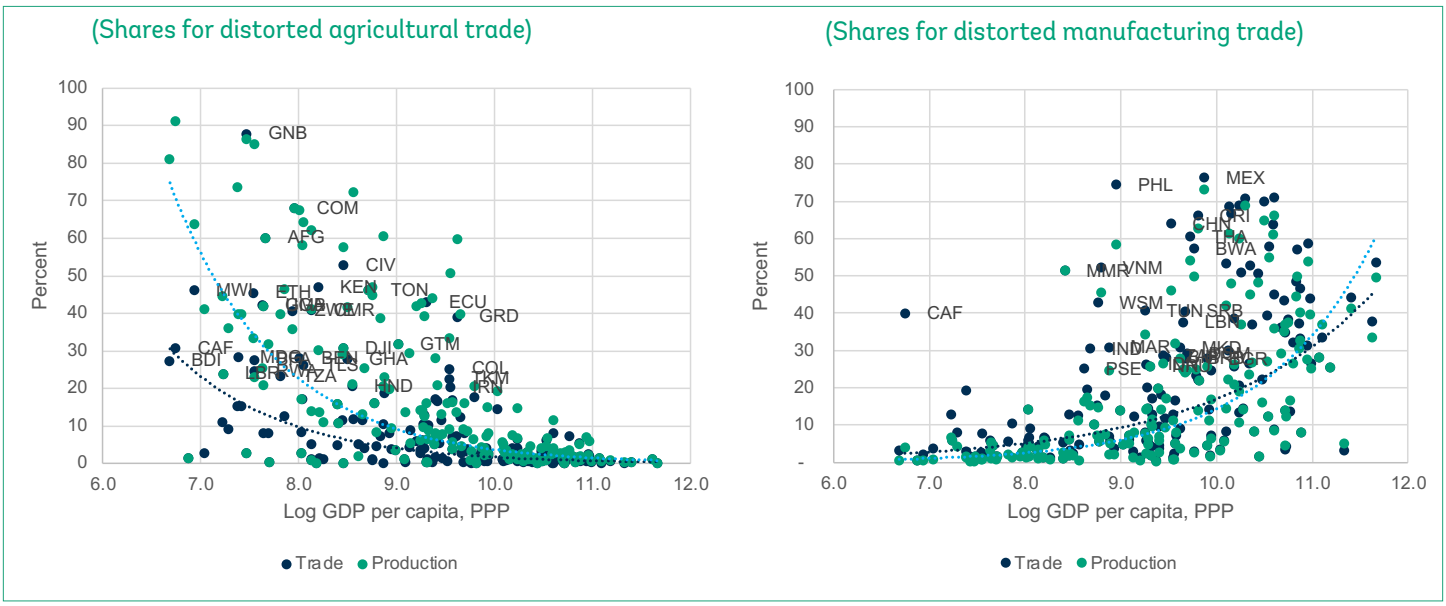


Source: UNCTAD TRAINS Database and original estimates of the trade effects of subsidies.

Trade-distorting subsidies can displace trade and production in other trading partners, with important repercussions for developing countries. Beyond possibly being distortive and inefficient for domestic objectives, subsidies can have negative spillovers across borders. The uneven playing field they create can affect the commercial interests of countries that compete with subsidized products in foreign markets. This does not need to be only in direct competition in the same market, as a disproportionally large number of subsidy programs are implemented by large trading countries with the potential to influence world prices. Subsidies by other countries may also affect domestic sales in industries that cannot compete on fair terms with such subsidized imports. These channels of uneven competition can be significant for developing countries.

Developing countries are especially vulnerable to the trade-distortive effects of subsidies. Their production and trade tend to be concentrated in agriculture, where distortions caused by subsidies are greatest. In much of Sub-Saharan Africa, products for which subsidies are found to be particularly trade distortive—such as fresh fruits and vegetables, pulses and legumes, nuts, cotton, and meat—represent more than 20 percent of goods exports. In manufacturing, subsidies cover a wide range of products and significantly affect a large share of international trade, with particularly pronounced effects in certain types of machinery and equipment, parts and components, and miscellaneous manufactures. These distortive subsidies affect middle-income countries—including Costa Rica, Mexico, and the Philippines—involved in manufacturing value chains.

Figure ES.3. Low- and middle-income countries are particularly exposed to distorted agriculture and manufacturing trade



Source: Original calculations for this study.
Note: GDP = gross domestic product; PPP = purchasing power parity.

Eliminating trade-distorting subsidies in agriculture could enhance agricultural output in most parts of the world. In the short and medium term, agricultural output would increase in all regions, except for North America and the EU, between 1 and 3 percent. Global agricultural supply would fall by just 0.1 percent. Similarly, agricultural exports also would increase in all regions except for North America and the EU. The largest expansions would be for the Asia Pacific region followed by Sub-Saharan Africa, where agricultural exports would increase by 8 and 4 percent, respectively. For manufacturing, eliminating subsidies would reduce production and exports in Asia. Production would increase in Sub-Saharan Africa (3 percent), Middle East and North Africa (2 percent), and Latin America and the Caribbean (1 percent) to partially cover the lower manufacturing trade. Given the initial levels, the largest expansion in dollar terms would be in Latin America and the Caribbean.

Global rules are ill-equipped to deal with subsidies

Existing subsidy disciplines have not kept pace with the rising challenges of global economic governance. At the multilateral level, a multiplicity of interests, deep differences of views among countries, and the broader gridlock in the World Trade Organization (WTO) negotiating mechanism have barred any meaningful changes to WTO rules. As a result, the governance system for subsidies is a patchwork of overlapping instruments, with the most far-reaching reform efforts taking place at plurilateral or bilateral levels, particularly in the context of free-trade agreements.

One glaring gap in the existing subsidies rules is the virtual absence of services—the fastest-growing portion of trade. Investment-distorting subsidies, which could lead to trade distortions, are also not covered. Moreover, WTO rules do not explicitly apply to enterprises owned or controlled by the state, which are important economic actors in many countries. The rules are deemed to cover economic transfers by government entities that are vested with authority to exercise governmental functions. They are also deemed to cover private bodies that have been entrusted or directed by a government to make a financial contribution. Demonstrating such direction by the state, however, may be particularly challenging, especially where measures are either unwritten or not formally communicated.

The paucity of information on subsidies is another impediment to action. While governments are required to notify the WTO of subsidy programs, notifications are often late, incomplete, or missing entirely. State and provincial governments, which account for most subsidies in many countries, are often poorly informed about or unaware of global trade rules. Where data are available, they are often not comparable—a shortcoming that this study helps to address.

Moreover, the WTO dispute settlement system has limitations in effectively addressing challenges to subsidies. Outright prohibitions apply only to subsidies contingent on the volume of exports or the use of local content. Other types of subsidies can be challenged, but this rarely happens. A member must wait for the harm, possibly irreparable, to materialize before bringing a challenge. In addition, there may be scant incentive to do so. Gathering and analyzing evidence to prove adverse effects is difficult and costly, and remedies do not reverse the subsidy measure or offer monetary compensation for damage inflicted.

There are ways to strengthen the dispute settlement system. For example, deadlines could be shortened or strictly enforced, and remedies could be strengthened to include the recovery of subsidies or even monetary compensation. However, the dispute settlement system is under severe pressure, given the paralysis of the Appellate Body, and consensus even on broad reform directions is lacking. A shift to more prescriptive rules, based on prohibitions or rebuttable presumptions for certain types of subsidies, would appear to be a more viable alternative.

Strengthening transparency and analysis on subsidies extended by major global trade players will be critical. More data and analysis will be needed to understand the trade-distorting effects of subsidies and to inform the debate on reforms. Understanding which subsidy measures are inefficient or ineffective in achieving their intended goals and their potential effects on other countries will require more detailed information on the design, implementation, and beneficiaries of such interventions. This may require enhanced cooperation in fulfilling notification requirements, as well as other actions by country peers. International organizations can play a facilitating role and provide guidance as to how best to consolidate this information and monitor subsidies within and across countries.

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Introduction

The expansion in trade and global value chains (GVCs) over the past 30 years contributed to higher growth and an unprecedented reduction in poverty.[1] From 1989 to 2018, GDP growth in low- and middle-income countries averaged 4.4 percent a year; their trade as a share of GDP increased from less than 30 percent in 1987 to between 50 and 60 percent in the early 2000s. Meanwhile, the proportion of people in extreme poverty ($2.15 a day, PPP terms) declined from 43.6 percent in 1981 to 8.4 percent in 2019

The benefits of trade operate through various channels. Trade integration can boost productivity by shifting production toward sectors and firms with greater comparative advantage and higher efficiency, expanding markets and creating opportunities for overall output and employment. Increased trade also makes available a wider range of intermediate inputs, lowering costs and increasing firm competitiveness, and enhancing investment, technological spillovers, innovation, and other dynamic effects that can cumulate over time. On the consumer side, greater trade integration can also lead to lower prices and a wider and increasing variety of goods and services, benefiting consumers through higher real incomes and a greater choice of consumption goods and services.

Despite these gains, long simmering skepticism about the benefits of free trade is intensifying. Critics blame trade and GVCs for the loss of manufacturing jobs in advanced economies, environmental degradation, and disruptions to supplies of vital goods like vaccines. These concerns, combined with geopolitical tensions, are prompting major players to raise barriers to trade and investment and to subsidize the domestic production of goods deemed essential and strategic. With shades of economic nationalism, this setback to multilateral integration could become a source of unwarranted inefficiencies and a drag on the global economy.

Developing countries have the most to lose from these increased trade tensions and protectionist policies. To attract investment, they critically need the certainty provided by a credible and coherent system of global trade rules. Smaller developing economies cannot be

1. See, for example, Irwin (2019).

self-sufficient and need to export to import. They critically need to be able to compete at fair terms, a capacity that trade distortive subsidies and protectionist policies will hurt. Furthermore, many developing countries lack the fiscal resources to counter steps taken by advanced countries to subsidize domestic production.

While recent subsidy programs by major economies have exacerbated international trade frictions, government subsidies often have legitimate economic and social goals. They can be used to reduce market failures. If properly designed and implemented, subsidies may lead to favorable outcomes, such as creating employment in marginalized areas, ensuring adequate food or medical supplies in a crisis, or achieving environmental targets. More broadly, they can be used to align market equilibriums with appropriate social goals. Thus subsidies, like taxes, can be an important policy tool for governments and should not be banned ex ante.

Yet even when put in place on the most solid socioeconomic or environmental grounds, subsidies can still harm trading partners. They can nullify the benefits of global trade and investment by distorting international prices and limiting market access, as in the case of local content requirements, and they can create inefficiencies in global value chains. In many cases, it is difficult to categorize ex ante a subsidy measure as trade distortive. In some cases, however, subsidies can be intended explicitly to skew competitive opportunities in favor of certain groups of economic operators to the detriment of others. These measures are of particular concern because of their potential beggar-thy-neighbor effects. Ultimately it is an empirical question whether the receipt of subsidies has a statistically and economically significant trade-distorting effect. And this is a key question addressed in the current report.

Subsidies have proliferated as a key policy lever over the past decade, as the growth of global trade has slowed down. Data on government interventions starting in the 2008 global financial crisis show that subsidies have been principal interventions during the period. The stock of subsidy measures in effect per year has been increasing continuously since the collapse of world trade in 2008. This coincides with the period over which global trade has slowed down, especially relative to the rapid trade expansion prior to the global financial crisis (figure 1.1). Furthermore, these subsidies, while documented in a wide range of countries, are implemented for the most part by large economies. The G20 countries, for example, consistently represent about 90 percent of all global subsidies by count (figure 1.2).

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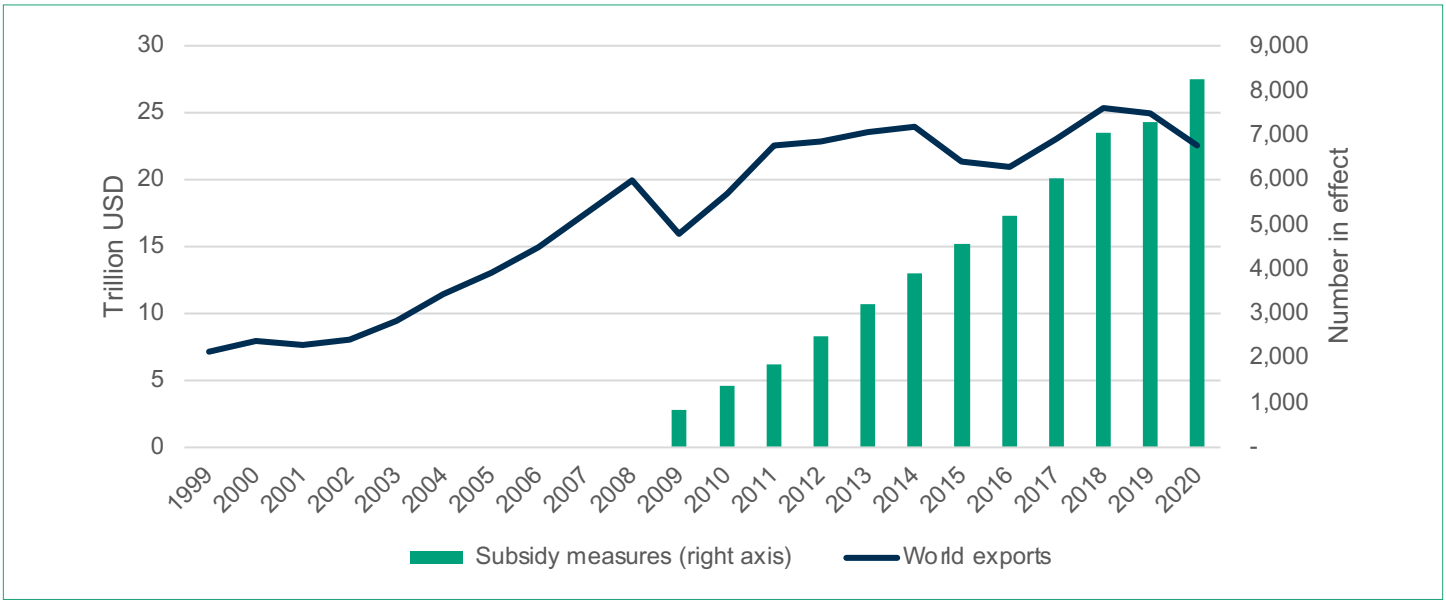
Figure 1.1 Subsidies have been escalating as global trade has slowed down over the last decade



Source: World Bank World Development Indicators and Global Trade Alert, World Bank staff calculations.
Note: Collection of subsidy interventions starts in 2009.

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Figure 1.2 Most subsidies are implemented by large economies

Source: Global Trade Alert, World Bank staff calculations.

Subsidies and their likely trade-distorting effects are an area of growing multilateral friction, which has been exacerbated by major programs introduced by large, advanced economies. Indeed, subsidies are the largest category of intervention, far exceeding tariff and trade remedy measures.[2] Moreover, countries are increasingly resorting to unilateral trade remedies in reaction to subsidies put in place by others. Updated data on trade defense barriers show that interventions in the form of antidumping and countervailing actions have grown significantly over the years.[3] These duties, while highly concentrated by sector, are being applied more often and by a larger number of countries, affecting a growing share of global trade.

Developing countries are most vulnerable to the trade-distorting effects of subsidies and other forms of intervention in the exchange of goods and services across borders. Developing countries rely on trade to drive economic growth, reduce poverty, diversify their economies, and respond to rising challenges such as digitalization and climate change. And any fracturing of the global, rules-based trading system would be especially harmful to developing countries, which rely on the certainty that the system provides to attract investment.

Rising tensions and counteractions point to the need to address subsidies at the multilateral level. For the global trade community to come together, it is crucial to find a way forward on addressing subsidies in goods as well as in services, and in related policy areas such as competition policy. The potential for subsidies to distort the level playing field and to heighten the perceived inadequacy of existing systems that govern these interventions add pressure to the current global trading system, with potentially dire consequences for prosperity, especially in the developing world.

Yet subsidies remain a difficult issue in the multilateral arena. They can take many forms and serve various objectives, so it may not be easy to identify which ones need to be addressed. They can include grants or in-kind contributions, tax or tariff incentives, preferential financing, provision of services at lower rates, bailouts, or support prices. How they take place depends in part on country-specific fiscal or administrative capacities. It is therefore important to establish definitions (or categories) for various types of subsidies for purposes of identification, monitoring, impact evaluation, and negotiation.

2. Global Trade Alert database. See figure 3.1 for the relative frequency of subsidies versus other documented government interventions during the period.
3. See World Bank, "Temporary Trade Barriers Database," https://www.worldbank.org/en/data/interactive/2021/03/02/temporary-trade-barriers-database, for a data visualization of these temporary trade barriers across countries and over time.

A subsidy, in a broad economic sense, is an action taken by a government to make a particular good or service more abundant at a lower price or raise the income of a producer. However, governments deploy a variety of policy instruments to implement subsidies, and each of these has different direct and indirect effects. Because markets are interconnected, the same policy objective may be achieved by paying consumers or producers and may be implemented using various instruments at different points in the supply chain (IMF, OECD, World Bank, and WTO 2022).

Beyond definitions, lack of transparency on the extent of government subsidies poses a major hurdle in moving ahead with negotiations. Because there is lack of clarity as to what may constitute subsidy measures by a government, there is also a general lack of transparency about their occurrence. Data on subsidies are scarce and much more incomplete than information on other policy instruments such as tariffs and certain nontariff measures. Filling these data gaps needs to be a priority for the international community. Better data on subsidies would support analysis and inform the discussion on the international spillovers of subsidies and the need or desire to design new rules. Furthermore, a lack of transparency significantly hinders parties from establishing a negotiating baseline.

This study aims to lay the groundwork and make significant progress in describing different interventions that can be considered as subsidies and analyzing their trade-distorting effects. Subsidies are a matter of concern in the multilateral system, with two-way accusations and diverging views and goals as to how to discipline them. Transparency issues on the use of subsidies still predominate, thus little is known about their effects on global trade and the economy.

Using both quantitative and qualitative analyses, this study aims to expand the evidence base and point to potential policy recommendations. Several insights that emerge are highlighted in box 1.1. Among the study's goals are:

- *To develop a broader working definition and classification or categorization of various subsidy measures* and to make this nomenclature publicly available to researchers and data suppliers;
- *To build a new database on subsidies across many countries* collected in a uniform way;
- *To describe the global landscape of identified measures* in terms of utilization by countries, sectors, and types of subsidy measures and their intended goals to provide a broad picture of what it is known and still unknown on the subject matter;
- *To develop a new analytical framework*, building on the new data, to estimate the trade-distortive effects of subsidies across countries and sectors using a structural, general equilibrium gravity model; and
- *To assess the international regulatory environment* on the use of subsidies interfering with trade, identifying important gaps.

BOX 1.1. SEVERAL MAIN INSIGHTS FROM THIS WORK

Whereas distinctions and differences exist on what should be counted as a subsidy measure or disciplined under existing or new rules, some observed patterns can be helpful in discussions of subsidies at the multilateral level.

- Transparency on subsidies remains an issue around the world, with significant data gaps on the provision of this support. For example, interventions provided by nongovernmental entities, such as state-owned enterprises (SOEs), can be important and generally difficult to identify. Furthermore, information on the beneficiaries of subsidies and on the depth of these interventions is often unclear or unavailable.
- Newly collected data suggest that the incidence of subsidies is highly concentrated in a relatively small number of countries or trading blocs. The European Union (EU), the United States, and China together account for three out of every four measures globally. Given their disproportionally large share of global trade, subsidies by these top trading partners can possibly have significant cross-border effects.
- Subsidies are applied very broadly. They go beyond agriculture, where their use poses a clear problem, to include manufacturing and services. Manufacturing is the sector in which the most measures are applied. But support in agriculture is prevalent, and subsidies to innovation services are also common.
- Most subsidies are implemented by subcentral government entities, such as states and provinces. It highlights not only the importance of enhancing transparency in government support measures at subnational levels, but also the importance of ensuring that the applications of these adhere to prevailing international rules.
- Subsidies in in most cases are used as an industrial policy tool to support potentially strategic sectors. Many of these subsidy programs are intended to provide financial support for the acquisition of capital goods and materials and for business operations. Subsidies with an environmental objective are relatively less common, and many are oriented toward “cleaner” fossil fuels, such as natural gas.
- New estimates in this study show that subsidies can disproportionately affect international trade. Subsidies for both agriculture and manufacturing can displace trade and production in developing countries and limit their participation in global value chains. The largest trade-distorting effects are in agriculture, with an estimated ad valorem equivalent of about 15 percent. Subsidies for agriculture distort the playing field particularly against low-income countries. The advanced economies of the EU and North America account for the largest distortive effects in agriculture.
- Subsidies to manufacturing are also distortive to trade, with an estimated ad valorem equivalent of 8 percent. Asia is the largest source of trade-distorting subsidies for manufacturing.
- The prevalence of subsidies and their significant trade effects contrast with deficiencies in the multilateral framework governing them. The current arrangement to apply trade defense ex post, after harmful effects are done and determined, seems inadequate to solve the root causes, because it does not remove the distortions in global markets. Many importers, such as most countries in Sub-Saharan Africa, do not have the legal or institutional infrastructure to respond with trade remedies.
- Many actions related to subsidies are also not covered, or clearly covered, by prevailing rules. Disciplines on subsidies related to cross-border services and foreign direct investment (FDI) are virtually nonexistent. And subsidies to and from nongovernmental entities, including SOEs, also fall outside most international regulations.
- Increased transparency and international cooperation will become even more important and should be strengthened. This is especially the case after disruptions to supply chains caused by the COVID-19 pandemic put pressure on governments to support certain critical industries.

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Scope and Defining Characteristics of Subsidies

Understanding what may constitute a subsidy, or at least recognizing that different definitions apply in different circumstances, is a precondition to analyzing data on subsidies. Similarly, a definition and classification of the types of government interventions that may act as a subsidy to trade and investment are needed to determine how those measures are regulated by international trade rules. For example, the definition of a subsidy under the World Trade Organization (WTO) Agreement on Subsidies and Countervailing Measures (ASCM or SCM Agreement) does not capture several government interventions, such as those that are not specific, that can be considered subsidies in economic terms.[4]

One important objective of this study is to offer a working definition and classification of subsidy actions for the purpose of tracking them and building a database. Meant to provide the conceptual basis for the collection and classification of subsidies and subsidy-like measures that have the potential to distort trade and investment, the definition is broad and based on the nature and function of the policy intervention rather than its legal or economic form. In deciding on the limits of this definition a number of existing and proposed frameworks on subsidies were examined.[5]

4. Article 1.1 of the WTO ASCM defines subsidies as government measures containing three basic elements: (a) a financial contribution (b) by a government or any public body within the territory of a Member (c) which confers a benefit; in addition, the measures must be "specific" to an enterprise or industry to be covered by the agreement. The agreement does not apply to measures affecting trade in services or incentives to foreign direct investment (FDI), which are covered under other WTO agreements (notably, the General Agreement on Trade in Services, GATS), under different concepts and rules.
5. Consulted disciplines include but are not limited to: the ASCM and the General Agreement on Trade in Services (GATS), which form part of the agreements covered bythe WTO; the state aid system established under the relevant agreements of the European Union; and select regional trade agreements such as the United States-Mexico-Canada Agreement and the Canada-EU Comprehensive Economic and Trade Agreement.

At the most basic level, subsidies share certain core features:

1. They must be directed at or affect economic actors, such as producers of goods or suppliers of services, and have the potential to distort cross-border trade or investment.
2. They must entail the transfer of economic value or nonfinancial assets.
3. They must be provided by a granting authority, which is a public authority or entity acting on behalf of or at the behest of a public authority.
4. They must confer a benefit or advantage on the recipient, in the sense that they are provided so conditions are more favorable than those prevailing in the marketplace.
5. They must be limited, whether explicitly or implicitly, to a subset of all possible recipients on the market. A detailed discussion of elements is included in appendix B.

While no definition effort is infallible, wholly exhaustive, or completely neutral, the defined scope aims to abstract from actions that are of potentially less analytical interest, such as the provision of social services, or measures, such as a currency devaluation, that are horizontal in nature. In that way, feature 1 is meant to focus on measures applied to, or directed at, actors or activities of an economic, productive, or commercial nature (collectively referred to as "economic undertakings"), because it is more likely that this type of public spending affects cross-border activity and potentially distorts competition. Similarly, feature 5 is meant to identify measures that benefit specific actors, enterprise activities, sectors, or regions, whether de jure or de facto limited to a subset of economic undertakings.

The transfer of economic value can involve different modalities beyond the transfer of government money to a private entity (for example, a negative tax). Subsides in feature 2 include direct transfers of funds, such as grants, loans, equity infusions, and debt-to-equity swaps. Guarantees, insurance, or lines of credit may also be offered to satisfy future financial claims or be contingent on the occurrence of a certain event. Other types of subsidies may involve forgoing government revenue, as in a wide range of tax or duty breaks (such as exemptions, deductions, remissions, and so forth), which are not costless to the government. Finally, subsidies may involve furnishing or buying goods, services, real property, natural resources, or intellectual property—assets that may not be immediately convertible into monetary terms but have economic value.

The transfer of value in a subsidy may emanate from a public authority, whether at the central or subcentral level, but potentially it could also involve actions by enterprises owned or controlled by the state. In the latter case it may not be easy to ascertain whether an entity can be identified as a granting authority (feature 3). On the one hand, state ownership or control does not necessarily mean that these entities are not commercial. Left to their own devices, they could be profit-maximizing companies driven by the market. On the other hand, when the state can control the behavior of such entities, the potential exists that they may behave in a noncommercial manner to advance public-policy objectives. Such entities include state-owned and state-invested enterprises and chartered or concessionaire companies tasked with providing public goods or services (for example, municipal transport companies).

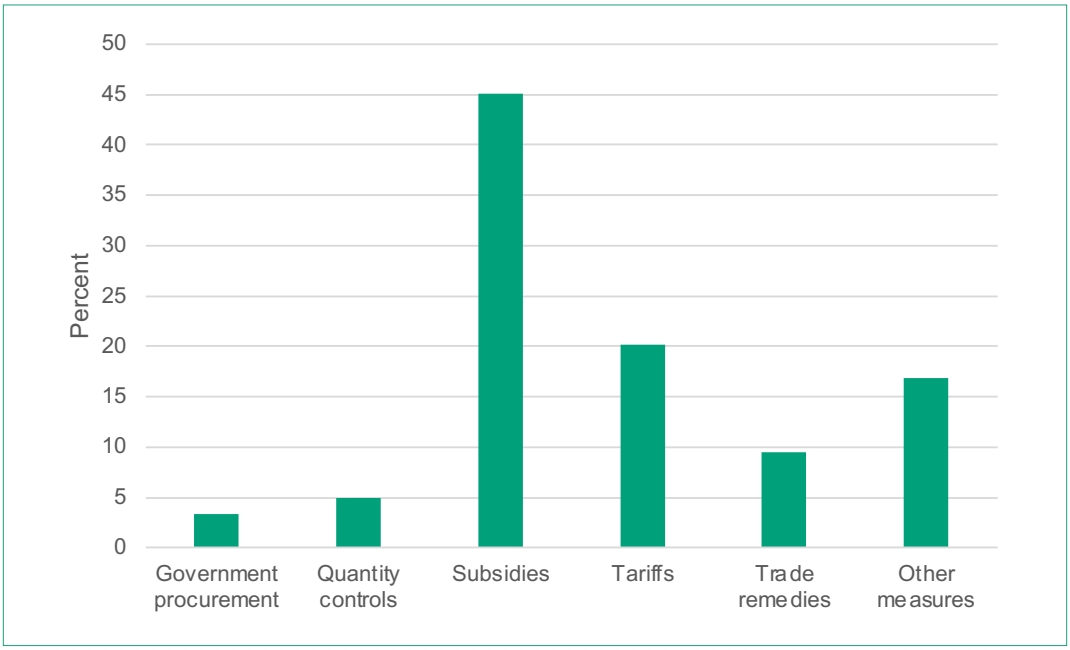
To qualify as a subsidy, a government action must offer terms that cannot be obtained in the open market. For example, financing by a state bank may not meet the definition of a subsidy if the terms are no better than those offered by private banks (feature 4). Similarly, the government purchase of goods or services is not per se a form of subsidy, but it can become one when the transaction is part of a price-support program. The transfer of value at a zero price, such as the grant of a financial asset or intangible asset such intellectual property rights, is clearly a subsidy. For other types of value transfer, however, determining whether it confers a benefit requires a careful examination of the terms and conditions of the transaction and comparing them to those available in the market.[6]

6. A hypothetical benchmark may be needed for purposes of comparison if no market for the asset exists or if the market is significantly distorted, for example, by the government's presence.

The Extent of Subsidy Measures

Subsidy measures have proliferated in recent years. Data collected after the global financial crisis of 2008 show that subsidies have been the principal interventions during the period, surpassing tariffs and other nontariff measures. Subsidies account for close to 45 percent of the interventions documented by the Global Trade Alert project (figure 3.1), followed by tariffs at about 20 percent and trade remedies at about 10 percent. It is not always clear what counts as a subsidy. Local content requirements, the most common form of government procurement measure in the period, can be seen as subsidy-like measures.

Figure 3.1. Subsidies have been the most frequent form of intervention
(Shares of documented measures, 2009–20)



Source: Global Trade Alert, World Bank staff calculations.
Note: Shares refer to counts of government interventions in the GTA; bars sum to 100 percent.

7. Global Trade Alert (GTA) has been tracking potential trade-distorting and trade-liberalizing measures of countries in the G-20 and around the world since the end of 2008. The data from GTA correspond to the full download of the database accessed in October 2021.

Unilateral actions are the dominant response to contentious subsidies. Under WTO rules, countries can initiate consultations on subsidy issues as part of the dispute settlement mechanism, but this happens rarely. For example, in 2018, just six requests for formal consultations involved subsidies. Of those, four were more about the application of unilateral remedy actions by another WTO member. Subsidies that are specific, per the WTO ASCM, can be addressed through the dispute settlement or by unilateral actions if they cause injury. Countervailing subsidies unilaterally via tariffs is the dominant course of action.[8]

Countries are increasingly resorting to countervailing duties and other trade remedy measures. According to the World Bank Temporary Trade Barriers Database, the average number of countervailing procedures more than doubled from 19 new cases per year in 2007–09 to 43 in 2017–19 (figure 3.2).[9] Because these measures remain in place for several years, the stock of existing global measures almost quadrupled from 2007 to 2019.

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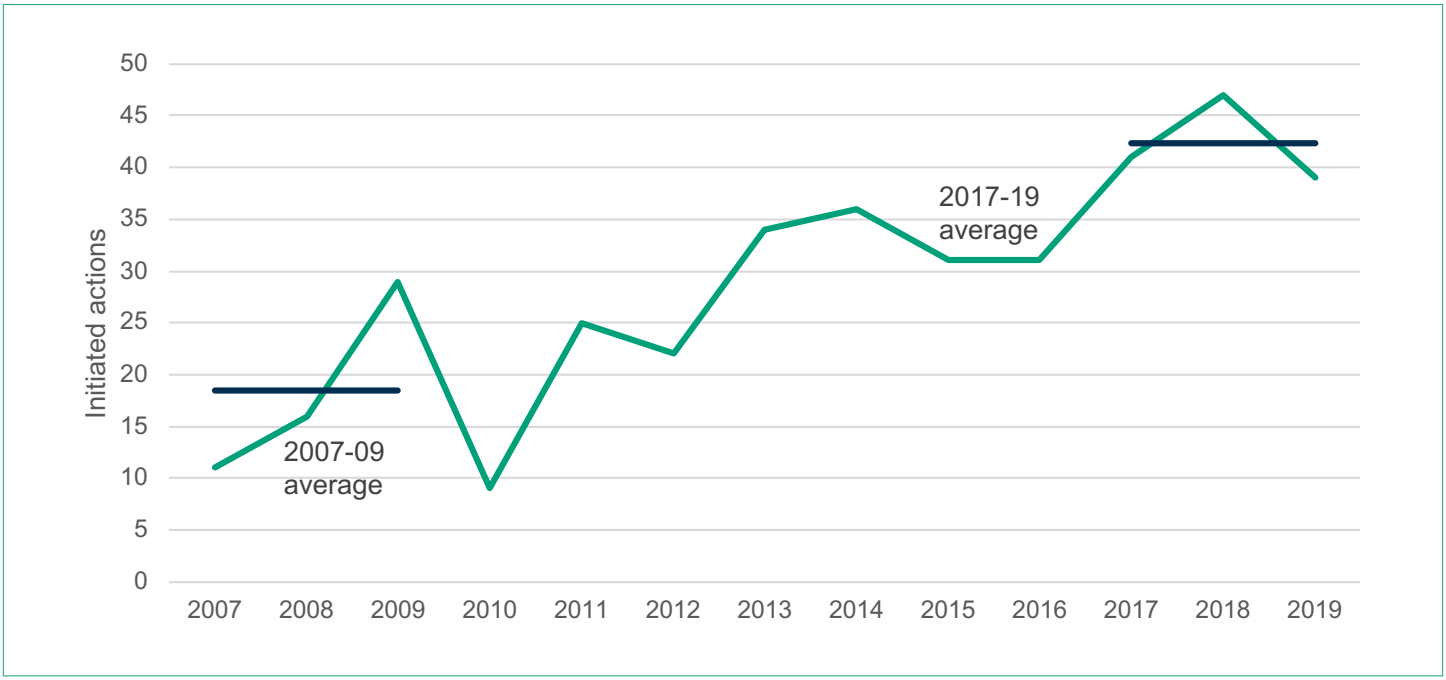
Figure 3.2. New unilateral barriers to subsidized imports have accelerated
(Initiated countervailing actions per year)



Source: World Bank Temporary Trade Barriers Database.

Global measures against subsidies are highly concentrated. The United States, Canada, and the EU are the top three users, accounting for more than 80 percent of global countervailing measures. The United States alone accounts for more than half. Countervailing actions are also concentrated by the target country. Since 2010, China has been by far the largest target of such actions (figure 3.3). Prior to that, India was the principal target and is now the second largest. The rapid increase in actions against China in part reflects that, before 2007, countervailing actions were not taken against China, as a nonmarket economy, under US trade remedy procedures. However, the continued increase in actions against China over the following decade suggests a sustained concern about domestic injury caused by subsidized imports from China. Other key targets include Türkiye, Republic of Korea, and Vietnam, but at significantly lower levels.

8. Most unilateral countervailing actions on subsidies involve imposing tariffs, meant to counter any advantage, on the imports of goods that a country deems to be subsidized and harmful to its domestic industries.
9. Chad P. Bown, Milla Cieszkowsky, Aksel Erbahar, and Jose Signoret. "Temporary Trade Barriers Database," World Bank, 2020, www.worldbank.org/en/data/interactive/2021/03/02/temporary-trade-barriers-database.

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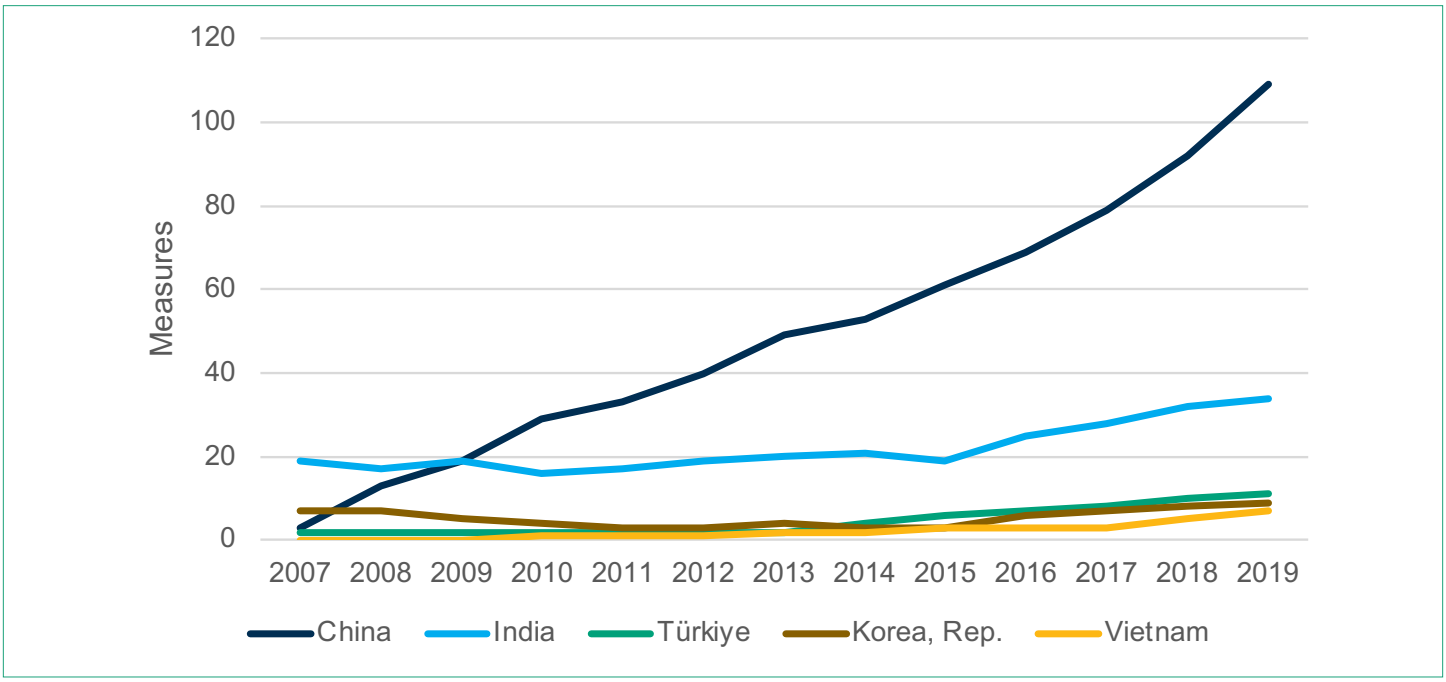
Figure 3.3. China has emerged as the principal target of countervailing measures



Source: World Bank Temporary Trade Barriers Database.

Similarly, the product mix of unilateral actions against subsidies is highly skewed toward some sectors. Since 2007, by far the largest number of countervailing actions are found in the iron and steel sector, which includes products in the harmonized system (HS) chapter 72 (table 3.1). Downstream iron and steel products, contained in HS chapter 73, account for the second-largest number of measures, with the share increasing as iron and steel from China were targeted. Together iron and steel and their products and paper and paperboard have accounted for the overwhelming majority of global countervailing measures. Measures have diminished in sectors such as electronics, edible fats, and sugar, while they have risen in sectors such as aluminum and plastics and rubber and their products.

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Table 3.1. The scope of products subject to countervailing measures is diversifying
(Top sectors targeted by countervailing actions)

	2007				2019		
	Chapter	Measures	%		Chapter	Measures	%
Iron and steel	72	257	80.802	Iron and steel	72	630	59.66
Iron/steel products	73	10	3.14	Iron/steel products	73	127	12.03
Paper and paperboard	48	6	1.89	Paper and paperboard	48	39	3.69
Electronics and parts	85	6	1.89	Aluminum and products	76	36	3.41
Edible fats	15	5	1.57	Plastics and products	39	25	2.37
Sugar/sugar products	17	4	1.26	Rubber and products	40	23	2.18

Source: World Bank Temporary Trade Barriers Database.
Note: The count reflects the number of source countries and HS 6-digit products affected.

Antidumping measures are used jointly with countervailing actions. While practically all countervailing cases are also brought up as antidumping cases, the reverse is not the case. The data on antidumping measures suggest that some countries may be using them to defend against less-than-normal-value imports in general.[10] Antidumping measures have been increasing continuously over time, over a wider range of countries, and in sectors similar to those targeted by countervailing measures. This description of the antidumping data is in appendix A.

Trade remedies are likely skewed toward sectors where industry interests are relatively better organized. To implement countervailing actions, countries must determine that the subject imports are subsidized or sold for less than the normal value and that these imports have caused (or threaten to cause) material injury to a domestic industry. This process can involve significant time and effort. Yet in some countries and sectors, there may not be an import-competing industry, or the import-competing industry is too dispersed to seek protection. Some countries lack the legal and institutional capacity to undertake these trade-defense actions (as in most of Sub-Saharan Africa, for example). Thus, while the information on trade remedies is indicative of certain sectors where there may be high levels of tension, it provides a narrow picture of the extent of subsidies.

3.1. A New Compilation of Subsidy Measures

This study collects data on subsidies in a wide range of countries from available trade-policy documents. These include notifications by governments on subsidy programs implemented in their countries; assessments of the trade system as documented by the Trade Policy Review process; and concerns raised by trading partners as reflected in documents such as the US National Trade Estimate Report and the EU Market Access database. A similar compilation for nontariff measures (NTMs) is the CoRe NTM database (Martinez, Mora, and Signoret 2009). These sources can be used to identify the products or sectors that are more frequently targeted by subsidies as well as the types of subsidies, and to benchmark the prevalence of subsidies by country.

These data supplement available information on subsidies that are fragmented. Information on subsidies is very incomplete and not always collected consistently across sectors, nor does it follow similar definitions or methodologies, as reviewed by a recent study by the IMF, OECD, World Bank, and WTO (2022). Some data are narrowly focused on specific sectors or industries, such as energy, while other data may focus on specific types of measures, such as tax incentives.[11] A source of data that aims to be broad in sectoral scope is the Global Trade Alert, which collects information on government interventions since 2009. This source is based on announcements of new interventions, so that it captures the flow of measures, but it could miss the totality of applied measures (the stock).

A multidimensional categorization is used to record these actions and characterize the nature and extent of identified subsides. This includes the following principal fields:

- How the subsidy is applied (for example, a law or a directive)
- The stated objective
- Whether it is applied to a good or a service
- The type of subsidy (for example, grant, loan, and so forth)
- The granting authority (for example, central or subcentral level)
- The recipient and/or beneficiary
- Selection criteria (for example, firms or activities)

Subcategories to these headings provide a detailed list of features to describe the data (appendix B).[12]

To focus efforts, data were limited to major exporters likely to affect global markets. The data on subsidies cover 31 jurisdictions that account for over 70 percent of global goods trade. These include G-20 countries plus other major trading countries, ranked by their export values. Supranational measures implemented at the EU28 level (i.e., including at the time the United Kingdom) are recorded and denoted as EU subsidies. Subsidies by six principal traders in the EU (Belgium, France, Germany, Italy, the Netherlands, and the United Kingdom) were also categorized by country (table 3.2). In the interest of covering more countries outside of the EU, national subsidies in the EU-wide region were not fully recorded.[13]

10. Technically a foreign firm could be dumping its products in some other country to the extent that it can price-discriminate across destination markets.
11. See, for example, OECD (2018) and OECD and IEA (2021) for support measures for fossil fuel. See Redonda, von Haldenwang, and Aliu (2021) for a cross-country database on tax expenditures.
12. This expands in various ways other current nomenclatures, such as the latest classification of nontariff measures by the United Nations Conference on Trade and Development (UNCTAD).
13. For purpose of a simple count, all subsidy programs reported by the EU-28 members can be calculated, as in figure 3.4. But the data of EU members not explicitly targeted for the database are not further categorized, for example, in terms of sectors, type of subsidy used, or intended purpose.

Table 3.2. Economies Selected for the Database

Argentina[a]	Indonesia[a]	Saudi Arabia[a]
Australia[a]	Israel	Singapore
Belgium[b]	Italy[ab]	South Africa[a]
Brazil[a]	Japan[a]	Switzerland
Canada[a]	Korea, Rep.[a]	Türkiye[a]
Chile	Malaysia	United Arab Emirates
China[a]	Mexico[a]	United Kingdoma[b]
European Union[a]	Netherlands[b]	United States[a]
France[ab]	Norway	Vietnam
Germany[ab]	Philippines	
India[a]	Russian Federation[a]	

Notes: For completeness, all EU-28 countries' counts of subsidies are included in the data; but the dataset does not include all variables for the European Union countries not listed.
a. G-20 member.
b. European Union (EU28) member.

The data provide a cross section of over 2,000 subsidy programs in a broad range of sectors. This count reflects programs that were in effect through all or part of the period 2017–18. Countries' notifications to the WTO, the most granular source of information, include much of the information needed to populate most dimensions of the database. However, assigning sectors was not always straightforward when assigning an industrial classification such as ISIC to a vague textual description (such as "children's goods").[14] Information on a specific recipient or beneficiary was generally omitted to preserve confidentiality. Subsidy amounts (while not broken down by individual recipient) were sometimes available at the program level, but values were missing for a large number of programs. The missing information sometimes depends on the form of subsidy (for example, tax breaks where estimates of the revenue forgone were not available in some countries) or on the level of the implementing jurisdiction (for example, subnational programs for which the monetary values of the measures are not documented). Fields in the database were populated as completely as possible from the original source with some follow-up research to supplement the data source.

3.2. Global Landscape of Measures

This new database is used to assess global subsidies in terms of their intended policy objectives, types of measures, and regional and sectoral patterns. The database offers a snapshot of the global economy, covering over 2,000 programs among the nations that are likely to shape trade trends in significant ways through their disproportional effect on global markets. The data represent a cross-sectional inventory of subsidies in 2018,[15] including legacy measures enacted prior to that year. Using 2018 as a baseline avoids atypical years when data can be distorted by extraordinary shocks such as the global financial crisis or the COVID-19 pandemic.[16]

14. ISIC stands for International Standard Industrial Classification of All Economic Activities. ISIC Revision 4 was used to classify the subsidy programs per affected economic sector.
15. The data track subsidy programs in place in a notional year of 2018, for which most intended targeted countries were available. For only a small number of countries this may refer to 2017 or earlier.
16. Recent events such as the COVID-19 pandemic, the Ukraine-Russia war, and disruptions in global supply chains are adding demand for subsidies. One consideration is whether in mitigating these shocks the trends and patterns described in this study are likely to continue going forward. That subsidies are more prevalent in major trading partners is a trend that seems robust over time (in crisis and noncrisis times).

REGIONAL PATTERNS

The EU, the United States, China, Canada, and Australia are top global subsidizers by number of programs. The top two alone—the EU (inclusive of measures in EU28 member countries) and the United States—account for over half of measures and, combined with China, the three account for about 75 percent of measures included in the database (figure 3.4) and are the top global traders. These figures are consistent with other broad databases on subsidies. For example, the OECD found that these three economies are the main subsidizers in terms of budgetary support to agriculture (OECD 2021). Similarly, a database on the flow of measures in the last decade or so provides evidence that most new interventions refer to the EU, the United States, and China.[17]

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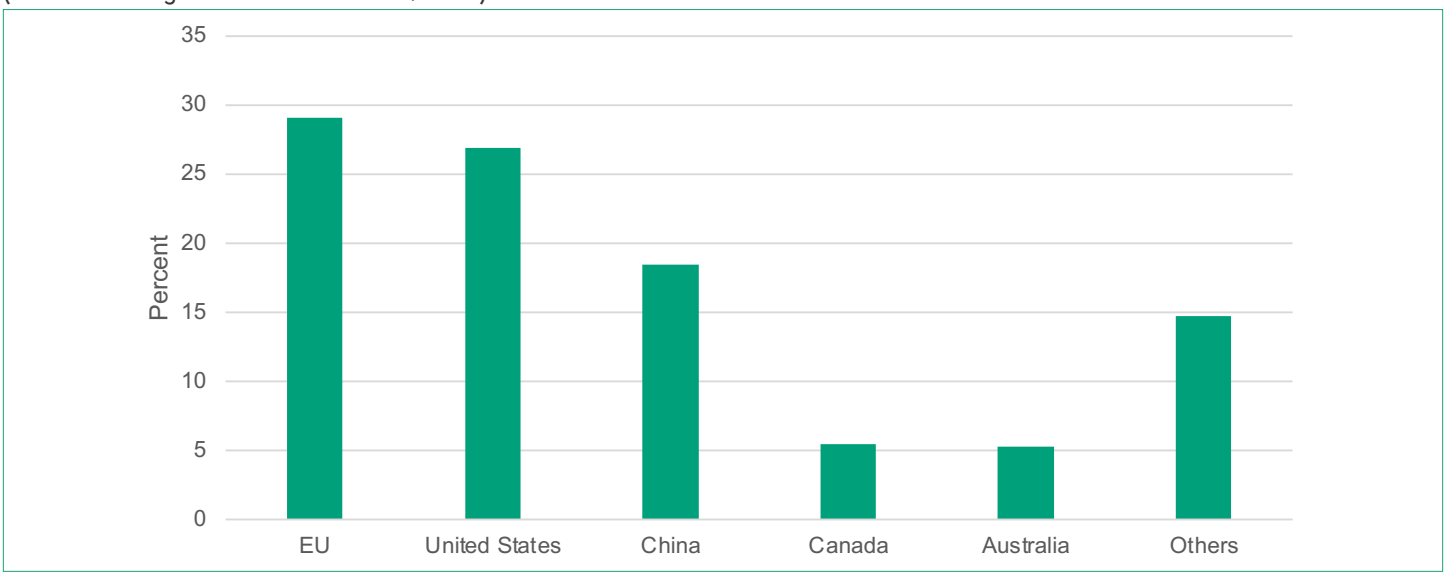
Figure 3.4. The top three trading blocs account for most subsidies
(Distribution by number of measures, 2018)



Source: Compilation of subsidy measures.

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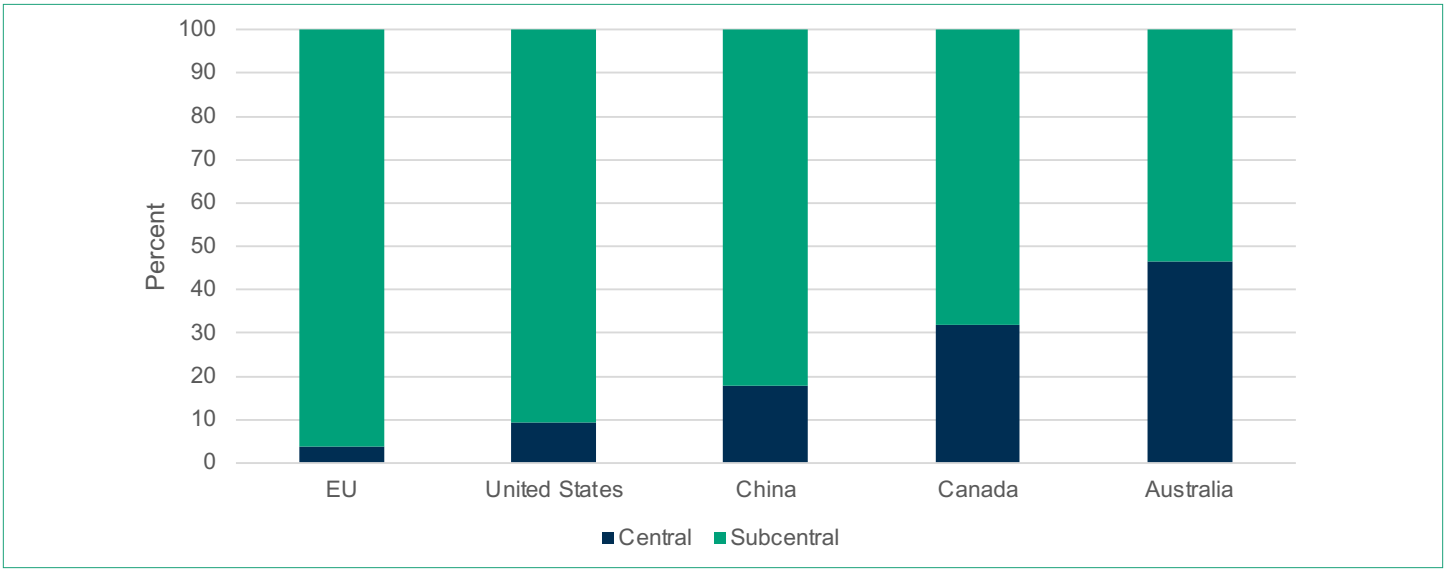
Figure 3.5. Subcentral government subsidies account for the largest share of measures
(Distribution by number of measures in each region, 2018)



Source: Compilation of subsidy measures.
Note: EU = European Union.

17. IMF, OECD, World Bank, and WTO (2022) calculation based on GTA data.

Most subsidy programs are implemented by government entities at the subcentral level (figure 3.5). For the EU, treated as a single market, subcentral measures include those taken by EU member states at the national and subnational levels. For all top users of subsidies (counting the EU as a region or bloc), the vast majority of government subsidies relate to support measures at this subregional level. In the United States and China, subcentral subsidies account for 90 percent and 82 percent of programs, respectively.[18] These findings highlight the importance of ensuring that all levels of government are aware of and subscribe to established disciplines on subsidy provisions and acknowledge the need for full transparency.

SECTORAL PATTERNS

Scientific research and development (R&D), several manufacturing industries, agriculture, and energy are the principal recipient sectors for subsidies. The database uses international industry classification codes to categorize subsidy programs.[19] Depending on the program, the sectoral association can be made at the two-, three-, or four-digit industry code level. About 8 percent of cases are categorized as "horizontal" either because measures seemed applicable to any sector, or because the textual description was too vague or broad to allow for a sectoral classification. The broader categorization at the two-digit level shows that the recorded subsidies benefit upward of 80 industries or sectors. However, about half of the observations by program and sector fall among the top 15 sectors.

A wide range of manufacturing activities are supported by subsidies. The largest share of programs is directed broadly to manufacturers. Programs are prevalent in the electronics, vehicles, machinery, ships, chemicals, food and beverages, and metals and metal products industries, among others. About 25 percent of programs by broad sectors in the database affect manufacturing industries (figure 3.6). The second broad category refers to professional, scientific, and technical activities (primarily R&D), followed by agriculture and fishing. Together, those three top broad sectors account for about 60 percent of subsidies at that level of industrial or sectoral aggregation. Other service sectors can be important beneficiaries of subsidies; for example, information and communications and construction, but their shares of subsidy measures are relatively low.

Primary sectoral targets of subsidies vary by country and region. Table 3.3 shows the share of subsidy interventions by the number of measures in the top implementing economies. For the EU, the largest share of subsidies goes to crop and animal production (ISIC 01), accounting for about 9 percent of the total, followed by food products and scientific R&D (ISIC 10 and 72), each accounting for about 5 percent. For the United States, the three most frequently subsidized sectors are machinery and equipment; computer, electrics, and optical products; and chemicals (ISIC 28, 26, and 20). For China, the largest shares are for sectors related to scientific R&D, motor vehicles, and fisheries (ISIC 72, 29, and 03).

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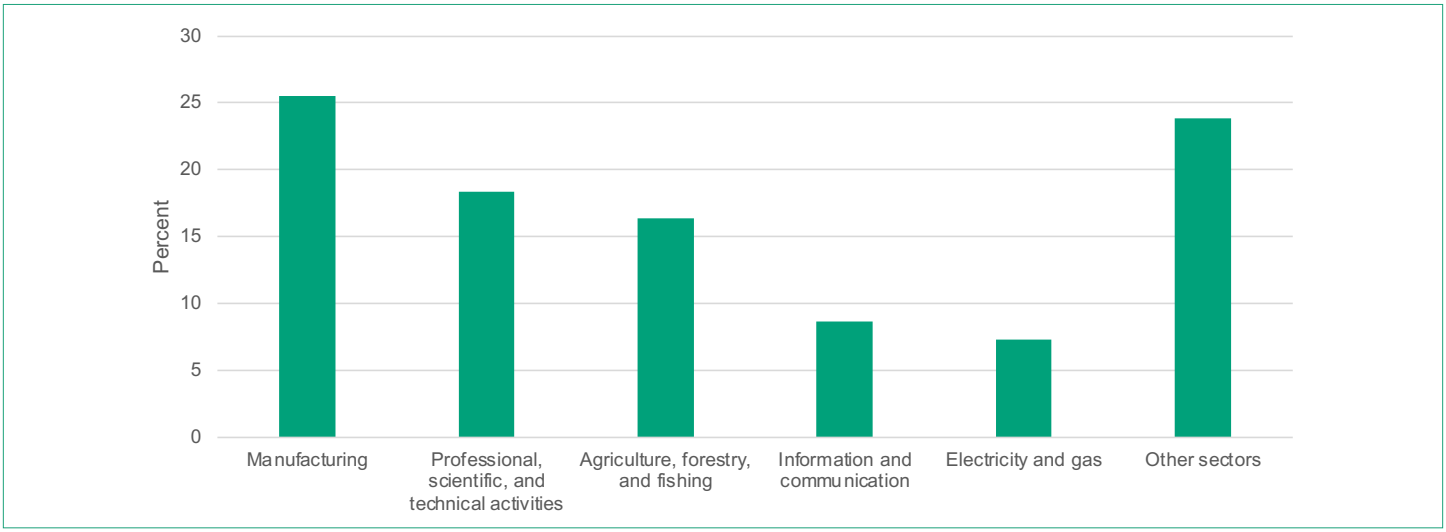
Figure 3.6. Support to manufacturing predominates
(Top broad sectors by number of measures)



Source: Compilation of subsidy measures.
Note: Breakdown by 1-digit (section) code of International Standard Industrial Classification of All Economic Activities (ISIC), rev. 4.

18. Some evidence in the academic literature shows subsidy competition among US states. Ossa (2015), using a quantitative economic geography model calibrated to US states, finds that states have strong incentives to engage in subsidies to outcompete other states in attracting economic activity, with potentially large costs from an escalation of subsidy competition.
19. In particular, this database uses the International Standard Industrial Classification of All Economic Activities (ISIC), Revision 4.

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Table 3.3. Top affected sectors tend to vary for each main user

(Percentage of the count of programs for top sectors, by top regions, 2018)

	EU		USA		China
Crop/animal prod	8.9	Machinery/equip.	4.4	Scientific R&D	16.3
Food products	5.2	Computer/elect./optical	4.3	Motor vehicles	6.1
Scientific R&D	5.2	Chemicals	4.1	Fishing and aquaculture	5.4
Electricity, gas	3.5	Scientific R&D	4.0	Computer/elect./optical	4.5
Business services	3.5	Transport equipment	3.8	Computer programming	3.1
Land transport	3.1	Electricity, gas	3.6	Transport equipment	2.9
Pharmaceuticals	2.9	Food products	3.3	Civil engineering	2.9
Transport equip.	2.9	Motor vehicles	3.2	Crop/animal prod	2.7
Civil engineering	2.9	Basic metals	3.1	Basic metals	2.7
Beverages	2.3	Electrical equip.	3.1	Electrical equip.	2.5

Source: Compilation of subsidy measures.
Note: Sectors designated by 2-digit (division) code of International Standard Industrial Classification of All Economic Activities (ISIC), rev. 4. Elect = electrical; equip. = equipment; EU = European Union; prod = products; R&D = research and development; USA = United States.

While subsidy measures are generally uniform through sectors in the United States, they are more skewed toward agriculture in the EU and technology in China. For example, the top and fifth sectors for the United States (machinery and transport equipment, respectively) both account for about 4 percent of US programs. Meanwhile, in the EU, the top sector (crop and animal production) accounts for more than double the number of subsidy programs as the fifth sector (business services). The difference is even more pronounced in China, where the top sector (scientific R&D) receives more than five times the number of programs than the fifth sector (computer programming).

TYPE OF MEASURES AND OBJECTIVES

Financial grants account for slightly over half of subsidy measures in the database, followed by tax breaks such as rebates, base or rate reductions, and exemptions. Other interventions take the form of soft loans, loan guarantees, and financial interventions such as capital injections and purchases of equity stakes. Again, this characterization is based on a count of programs because information on their value is often missing.

However, the types of subsidy measures can vary significantly by implementing region (figure 3.7). For the EU, for example, about six in 10 programs take the form of financial grants. This is consistent with subsidies provided by the EU in agriculture, where support to producers takes the form of direct payments. For the United States, on the other hand, a similar proportion of measures takes the form of tax incentives. For both the EU and the United States, about 20 percent of measures refer to financial instruments such as loans, guarantees, or capital injections. For China, most programs refer to grants, while financial interventions are apparently rare. This is at odds with some accounts of subsidies to industrial sectors in China in the form of below-market financing; for example, in cases where aluminum products from China benefit from loans granted on a preferential, noncommercial basis.[20] Yet these are provided through state-owned or state-directed banks that are inherently difficult to identify.

20. See, for example, the 2017 dispute at the WTO by the United States on primary aluminum from China, in consultations; US countervailing duties on aluminum foil from China of 2021.

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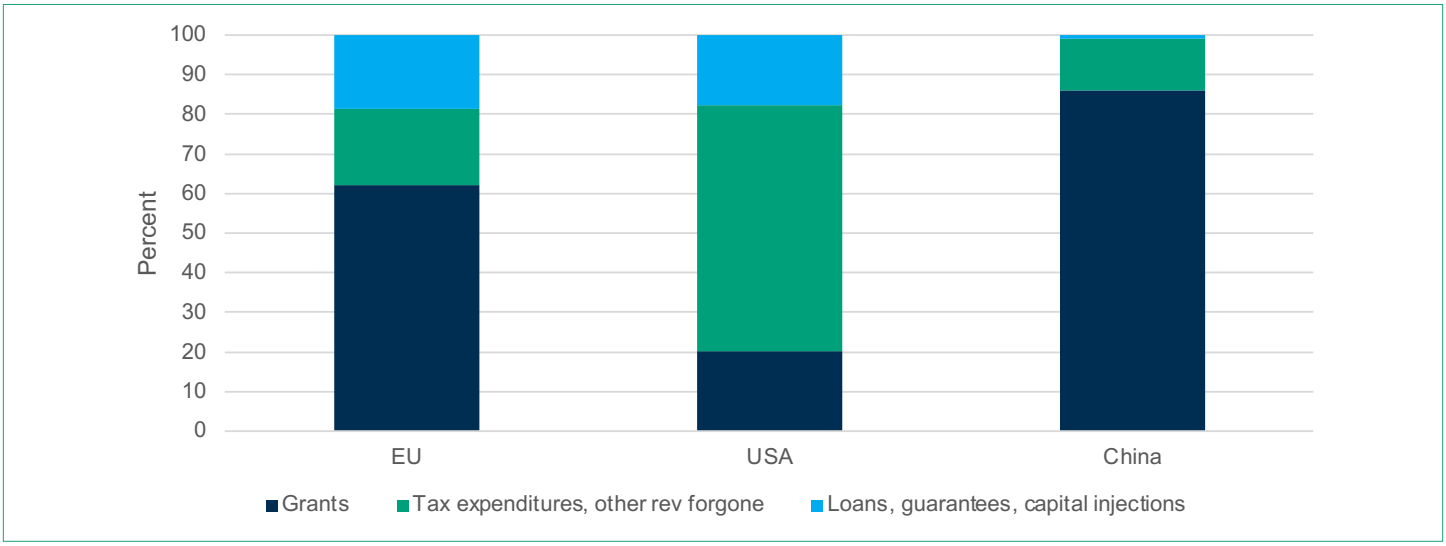
Figure 3.7. Subsidies take various forms depending on the economy

(Count shares of subsidy forms by top users, 2018)



Source: Compilation of subsidy measures.
Note: rev = revenue.

Identified subsidies can be classified as aiming to achieve a wide variety of stated objectives. Deciphering the intent of subsidy measures is not straightforward. Nevertheless, subsidies could be classified based on the objectives or goals of the programs described in the source measures. Based on this information, programs were catalogued in 30 broad areas (see appendix C), of which the top 15 are listed in figure 3.8.[21] Primary areas are intended to support strategic sectors and the acquisition of knowledge; other goals include the environment, support to fuel and energy production, infrastructure development, and social objectives.

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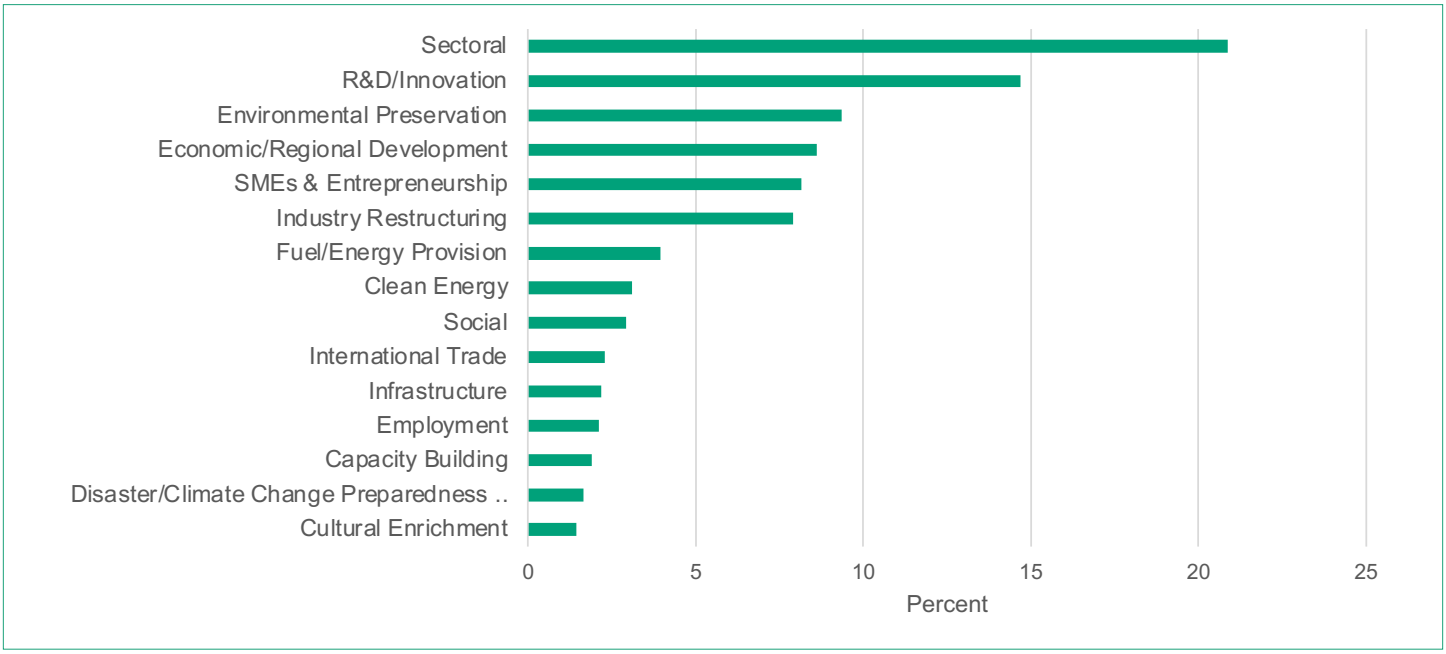
Figure 3.8. Support to improve sectoral competitiveness is a principal objective

(Top stated objectives of programs, 2018)



Source: Compilation of subsidy measures.
Note: rev = revenue.

21. Cognizant that a particular measure may serve more than one objective, two variables were allowed per measure to record those multiple concerns and are counted separately using those. For example, measures intended to improve the competitiveness of a particular sector, as a primary objective, and also to advance issues of regional development, if noted as such, are included with both goals in the calculation. These characterizations, of course, are limited by the relative richness of the program descriptions. Also, as an overarching caveat, intended goals per the descriptions may not necessarily reflect the real political economy objectives pursued by these interventions.

Most recorded measures appear related to a sectoral objective. This covers general sectoral financial support for the acquisition of capital goods, materials, and business operations. This form of sectoral objective includes slightly more than 20 percent of cases, suggesting that subsidies are used in pursuit of industrial policy. A second large category consists of incentives to help generate or transfer technology, such as capital and rewards for innovation, knowledge-sharing and technology-transfer platforms, financial and business support for start-ups, and capacity building.

Support of trade competitiveness is a common goal. Although relatively fewer subsidy measures are directly described as a way to advance trade (10th in the objectives category in figure 3.8), many nevertheless represent industrial policy efforts to increase competitiveness, as in the sectoral category, which is the most common. Box 3.1 further illustrates the stated subsidy rationales and their ex ante possibly distortive effects to identify which should be subject to particular scrutiny.

Environmental subsidies are less common. These, in principle, include measures to preserve certain species or ecosystems; reduce earth, air, or water pollution; and conserve natural resources through tax credits or other incentives for the adoption of more environmentally friendly or sustainable production, processes, transportation, and so forth. These include rewards for conservating energy and reducing pollution through the use of coal filters, for example, or by substituting natural gas for coal. Subsidies for clean energy, categorized separately, are even further down the list and below subsidies for other fuels and energy, showing how fossil fuels continue to receive more support than renewables.

BOX 3.1. SUBSIDY RATIONALES AND THEIR POSSIBLY DISTORTIVE EFFECTS

It is difficult to categorize a particular subsidy measure as trade distortive ex ante, because it often depends on how it was designed and how it is implemented. In principle, subsidies can be the first-best policies in the presence of market failures, where they can be seen as corrective interventions, for example, to capture positive externalities. For instance, economists generally recognize that private agents may underinvest in research and development because their rate of return in such innovation investments is less than the social return. Subsidies can also be often justified in the pursuit of social objectives or in the context of an economic, health, or environmental crisis.

However, from mere descriptions of a subsidy's intentions, it is often difficult to identify which market failure, if any, particular subsidies are trying to address. And depending on the industry benefiting, often a tax, rather than a subsidy, may be a more economically justified action. One example of this is the still significant levels of subsidies directed to fossil fuels that are an important area of debate (IMF, OECD, World Bank, and WTO 2022). Even in more ambiguous cases, an important consideration should be whether the intended objective can be achieved with fewer subsidies or with subsidy actions that could have a less trade-distorting effect. These are important considerations, not only because of the uneven playing field that certain subsidies can generate but also because of the opportunity cost of subsidies. In the context of limited resources, the presence of subsidies means that some other goods or services are underproduced.

A good number of subsidies could be reviewed for their distortive effects. In view of their intended objectives, where available (in about two-thirds of collected subsidy information), subsidies could be classified on the basis of whether the goal suggests a higher potential for being distortive in favor of the beneficiaries or whether the subsidy could be seen as having either a more ambiguous or lesser/more indirect effect on distorting trade and competition. Objectives are divided along these lines in table B3.1.1. Roughly a third of programs in the database fall within each category, with 35 percent of subsidies intending to support sectoral goals, industry restructuring, state-owned enterprises, and so on. In terms of reforming subsidies, initial scrutiny could focus on the interventions with the potential of being more distortive.

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Table B3.1.1. Possible Distortive Effect by Objective

Possibly distortive	Possibly ambiguous	Possibly less distortive
Sectoral	Economic/regional development	R&D/innovation
Industry restructuring	SMEs and entrepreneurship	Public services
SOEs	Transportation	Infrastructure
Fuel/energy provision	Clean energy	Disaster/climate change readiness/ response
International trade	Financial markets participation	Public health/safety
FDI	Business services	Social
PPPs	Capacity building	Employment
	Regulatory compliance, certification	Environmental preservation
		National traditions/heritage
		Support for ethnic minorities
		Support for people with disabilities
		Gender-related support
		Cultural enrichment
		Children/adult education
		Water conservancy/treatment

Source: Original figure for this publication.
Note: FDI = foreign direct investment; R&D = research and development; PPP = public-private partnership; SMEs = small and medium enterprises; SOE = state-owned enterprise.

3.3 Effects of Subsidies on Trade

Subsidies can have cross-border spillovers for other trading partners. A disproportionally large number of programs are implemented by major trading countries that have the economic heft to distort global markets for goods and services. This section assesses the potentially distortive effects of subsidies on global trade, a primary goal of this inquiry.

The literature on the effects of subsidies on trade is sparse, mainly because of the paucity of data. Some available estimates of the value of subsidies, such as those for the energy sector, primarily depend on estimates of differences between the observed, subsidized price of fuel and an undistorted reference price. While this approach is useful, it is insufficient for an understanding of the trade-distorting effects of subsidies for at least three reasons. First, prices can partly reflect qualitative characteristics of goods, so it is difficult to distinguish between the relative impact on prices of quality differences (for example, based on the source of the good) and the presence of a subsidy. Second, in the absence of frictions to trade, a divergence in the prices of identical goods on international markets should be eliminated by arbitrage. Thus, part of the observed price gap depends on a range of trade costs (for example, distance, the presence of borders, and so forth) that need to be controlled for as best as possible, especially if the measure of the subsidy is a residual term. Third, even if the extent or value of subsidies can be measured with reasonable confidence, the question of how trade is distorted remains unanswered.

Government support measures in agriculture are among the best documented. That is the result of over 30 years of analysis at the Organisation for Economic Co-operation and Development (OECD) on support for producers and consumers of agricultural products. For example, the producer-support equivalent (PSE) captures the production support in dollar terms or as a percentage of gross farm receipts. This includes estimates for 54 countries. The largest producer support numbers by far refer to the EU, followed by China. The United

States, in third place for agricultural subsidies, provides much of this assistance through consumer support; the same is true for India (OECD 2021). Outside of these four economies, agricultural subsidies on a value basis are relatively small. As a percentage of gross farm receipts, agricultural subsidies average around 12 percent for all countries and 17 percent for OECD countries.

By contrast, estimates of the monetary value of subsidies in industrial sectors are generally lacking. There is the sense that subsidies are common in a wide range of industries such as electronics, vehicles, other transport equipment (for example, aircraft, ships, rail), pharmaceuticals, other chemicals, and machinery. There is also the sense that they are more prominent in the larger economies of China, the EU, and the United States, as described in Section 3.2.[22] But how distortive these programs may be and how consequential they may be for the commercial interests of other trading partners is not well understood. Similar observations can be made for subsidies related to services, which are also common.

Even for agricultural subsidies, it is difficult to ascertain trade-distorting effects. Subsidies can be implemented in ways that can have more or less distortionary effects. For example, some measures may be "coupled" to the recipient's level of output, while others may be decoupled (such as direct payment to farmers), which may be less distortionary. In any case, it is necessary to take the estimated support equivalents to some type of model to translate the effect of the subsidy (or its removal) on trade. For agriculture this type of analysis has been done in the context of computable general equilibrium (CGE) model simulations (see, Anderson, Valenzuela, and van der Mensbrugghe 2010). Such modeling builds on added information in the Global Trade Analysis Project (GTAP) database over the years on agricultural support equivalent (Dimaranan and McDougall 2005; Anderson and Valenzuela 2008). However, this limited information on agricultural subsidies exaggerates the relative level of subsidization in agriculture and precludes a comprehensive analysis on subsidy reform (i.e., both agricultural and non-agricultural).

ECONOMETRIC ESTIMATES

The methodological approach followed here estimates the effect of subsidies on trade. It builds a multicountry and multisector general equilibrium framework that captures the impact of subsidies on production and trade. Using this model, a set of theory-based estimating equations can be derived to obtain a structural gravity equation. Augmented with tariff and subsidy information, the model makes it possible to estimate the direct effects of subsidies on trade and their ad valorem equivalents.[23]

This empirical approach explicitly incorporates subsidies in various sectors and countries. It takes advantage of the inventory of subsidy programs described in this study and enters it directly as an explanatory variable in the estimating equation, building on its variation for sectoral identification. In these data, only a small fraction of identified programs are horizontal. While many subsidy programs with identified sectors fall within manufacturing, scientific R&D, and agriculture, there are nuances by countries in terms of industries. For example, within transport equipment, some countries' programs may be directed to aircraft, others to motor vehicles or railways.

The analysis exploits the available signal in terms of sectors of interest targeted for support. While the inventory of measures is not exhaustive, it is nevertheless likely to provide useful information as to strategic sectors by country by combining available information on the incidence of subsidy measures with statistical inference from econometrics. The approach followed in the main set of results refers to using not only the presence of subsidies in a country-sector, but also the intensive margin from the multiplicity of subsidies provided to sectors (such as in receiving a variety of subsidies). To estimate this impact of subsidies on trade, the information on subsidy programs is mapped to 170 sectors for which trade and production data across countries are brought into the analysis,[24] along with other country and sectoral covariates of trade, such as those used in the empirical gravity literature. However, the data analysis is conducted separately for

22. Evenett and Fritz (2021) also consider China, the EU, and the United States major players in the subsidy field and focus attention on subsidies in these economies. The authors build an inventory of subsidy interventions in China, the EU, and the United States since 2008. As in the GTA database, this information is collected from government information made available online on subsidies granted, complemented by information on subsidies receipts by publicly listed Chinese companies (from the Win.d database). The information on subsidy receipts to Chinese companies shows that not only the number of subsidies has increased over time, but also the annual amounts received, which have been growing at a fast pace during the period (at an annual growth rate of 14.6 percent). No monetary values of subsidy receipts are reported for the EU or the United States.
23. Appendix E presents some basic assumptions, the structure, and the estimating approach of the structural model. Additional technical details can be found in Larch et al. (2021). In general, the assumptions employed are relatively mild and common to the many structural gravity frameworks.
24. These data are from the recent International Trade and Production Database for Estimation (ITPD-E) database (Borchert et al., 2021), using the average of the last three years in that database to smooth for across years.

agriculture and manufacturing industries, excluding the relatively less tradable sectors of mining and services.[25] Several subgroups within both agriculture and manufacturing are formed to estimate the effect of subsidies on trade in other sectoral subgroups of interest, as described further below.

The estimated trade equation shows plausible estimates and some comparable effects to the empirical gravity literature. The estimated coefficients for all terms show the expected signs and are in general statistically significant (table 3.4). Distance lowers trade, with a slightly larger coefficient for agricultural goods. Other gravity measures such as contiguous borders, common language, and an indicator variable for colonial relationship tend to increase bilateral trade flows. Policy variables include indicator variables for membership in regional trade agreements (RTAs) and the EU single market, both of which show significant positive effects on bilateral trade flows (for example, RTAs can increase trade by 16 percent for manufactured goods and by up to 43 percent for agriculture). On the opposite side, the coefficient for an indicator variable for trade sanctions shows large negative effects on trade. The variable for domestic market, an indicator variable for trade that refers to domestic sales, aims to capture the extent of home bias; while the interaction with gross domestic product (GDP) per capita allows for this to vary by the level of development of the producing country. The term for tariffs captures the variable cost of tariff barriers on bilateral trade.[26] Its estimated coefficient is used to recover the trade elasticity and is estimated at around 3 percent for agriculture and 8 percent for manufacturing, which are plausible magnitudes given other estimates in the literature.[27] This trade elasticity, in turn, is used, together with the estimated coefficient for the term for subsidies, to calculate the ad valorem equivalent (AVE) of subsidy measures.

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Table 3.4. Econometric estimates of bilateral trade and the effects of subsidies by broad sectors

	(1) Agriculture	(2) Manufacturing
Log (distance)	−0.891 (0.103)**	−0.741 (0.034)**
Contiguous	0.651 (0.136)**	0.354 (0.048)**
Colony	0.294 (0.202)	0.366 (0.077)**
RTA	0.676 (0.269)*	0.150 (0.066)*
EU	1.271 (0.281)**	0.191 (0.096)*
Sanctions	−1.747 (0.410)**	−1.776 (0.325)**
Domestic	10.968 (1.650)**	6.889 (0.704)**
Log (GDP per capita) *Domestic	−0.683 (0.163)**	−0.405 (0.068)**
Subsidy measures	0.025 (0.008)**	0.037 (0.013)**
Tariff	−3.428 (1.172)**	−8.467 (0.924)**

25. The agricultural sector is defined as the first 26 industries in ITPD-E data; while manufacturing covers over 100 sectors from industry 34 to 153.
26. The information on tariffs at the product level is from the International Trade Center's Market Access Map database (MacMap) and reflects preferential rates in effect among trading partners.
27. For example, Fontagné, Guimbard, and Orefice (2022) estimate trade elasticities for all possible HS six-digit codes and find that the estimated parameter has a median of −5.6

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Table 3.4. Econometric estimates of bilateral trade and the effects of subsidies by broad sectors

Constant	11.733 (0.912)**	12.462 (0.319)**
N	46228	479227
R^2	0.982	0.972
Subsidy AVE	14.529 (6.743)*	8.443 (2.843)**

Note: Standard errors in parentheses. Contiguous = contiguous borders; language = a common language; colony = a colonial relationship; RTA = membership in regional trade agreements; EU = membership in the EU single market; domestic = domestic sales; GDP per capita allows for this to vary by the level of development of the producing country; tariff = the variable cost of tariff barriers on bilateral trade. AVE = ad valorem equivalent. Regressions include exporter and importer fixed effects.
+p < 0.10, *p < .05, **p < .01

Subsidies promote a country's exports disproportionately. This impact is estimated by the effect of the subsidy variable in the trade equation that captures the effects of subsidies above and beyond their effects on the domestic economy. As the subsidy variable is the count of subsidies for the sector, the estimated coefficients for agriculture and for manufacturing suggest that the introduction of a subsidy program increases exports by about 3 to 4 percent, relative to domestic sales. Given the recovered trade elasticities for the tariff term, the effects of the subsidies on trade can be restated in ad valorem equivalents of about 15 percent for agriculture and 8 percent for manufacturing.[28] These are new empirical estimates that show statistically significant, trade-distorting effects of subsidies for both agriculture and manufacturing exports.

The effects of subsidies on trade also differ by region, with subsidies favoring manufacturing exports being statistically significant for Asia-Pacific. Estimating the econometric model and allowing for interaction effects with country regions shows this differentiated effect. Estimated coefficients for most model variables are comparable to those presented in table 3.4, and the comparable table is included in appendix E. Figure 3.9 shows the resulting ad valorem equivalents of subsidy measures by region (as estimated at one standard deviation) for those estimates for which the ad valorem equivalents are statistically significant in favor of exports.[29] Only the ad valorem estimate for manufacturing in the Asia-Pacific shows a positive (and statistically significant) value.[30]

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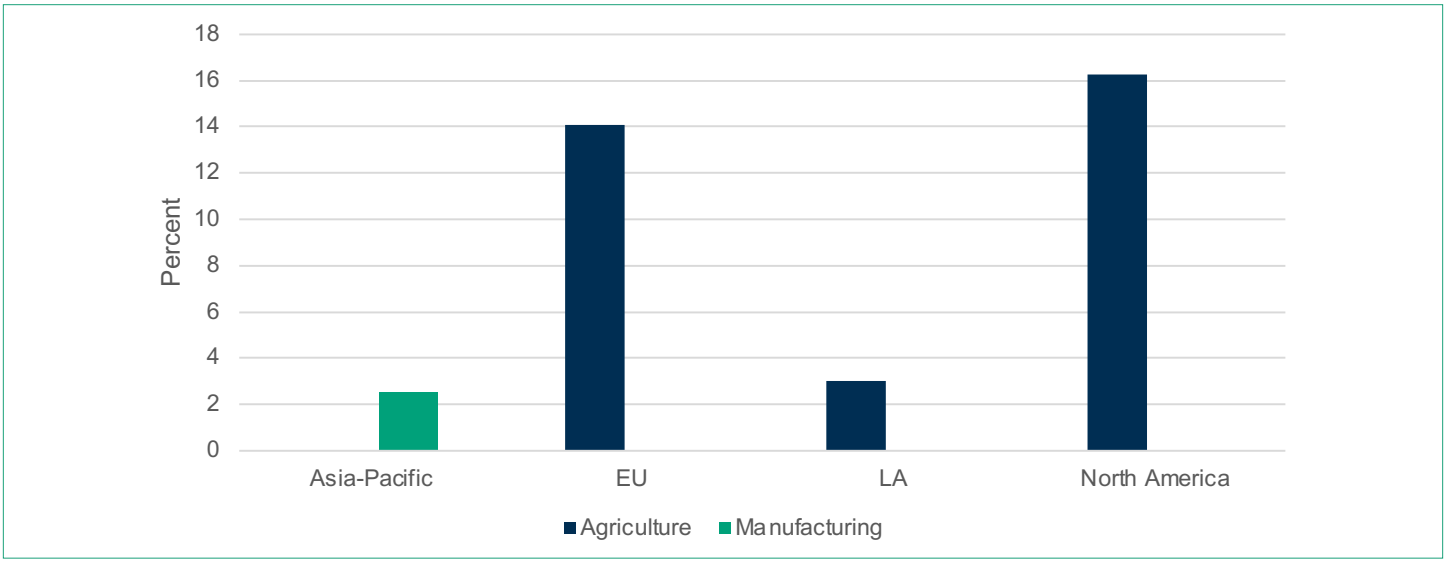
Figure 3.9. Trade effects of subsidies are particularly significant for agriculture
(Estimated export-support equivalents, ad valorem, by sector and region)



Source: Original calculations for this publication based on estimates from a gravity estimation.
Note: Ad valorem estimates of subsidies that statistically favor exports. EU = European Union; LA = Latin America.

28. These AVEs are a nonlinear function of the coefficients for subsidies and tariffs, the latter being the trade elasticity. The point estimate for the AVEs is calculated as follows: [exp(S*α/β) -1]*100, where α is the estimated coefficient for the subsidy term and β is the estimated elasticity. The subsidy variable S is evaluated at one standard deviation.
29. With a significance level of at least 10 percent.
30. The Asia-Pacific region includes the following countries in the subsidy database: Australia, China, India, Indonesia, Japan, Republic of Korea, Malaysia, the Philippines, and Vietnam.

Subsidies in the advanced economies of the EU and North America disproportionally affect their agricultural exports. The estimated ad valorem equivalent for both regions is in the range of 14 to 16 percent (with overlapping confidence intervals).[31] Agricultural subsidies in the EU and the United States are known to be large (OECD 2021), which may be consistent with these results. But according to the same source, agricultural supports in China and India are also estimated to be large, although this econometric analysis does not suggest disproportional trade effects in agriculture in those regions.[32] Conversely, agricultural subsidies in certain Latin American countries are found to disproportionally affect trade.[33] This effect in Latin America, however, is significantly lower, at about 3 percent. Egas Yerovi and de Salvo (2018) review agricultural support policies in Latin America and find that countries had extended agricultural supports during the period 2009–16 that amounted to 3.29 percent of gross agricultural receipts on average. This estimate, in turn, would be higher at 6.29 if Argentina (which during that period taxed the agricultural sector) were excluded. This same study estimated agricultural support across the Latin American and the Caribbean region at 10 percent of agricultural GDP.[34]

At a more disaggregated level, subsidies for agricultural products, including meat and several horticultural products, are found to be particularly trade-distorting. Beyond estimating the trade effects of subsidies in the broad agriculture and manufacturing categories, additional estimates by subsectors aim to highlight groups of products for the distorting effect of subsidies on trade that can be established with statistical significance. With this in mind, all goods sectors (the more than 100 sectors with trade and production data) are pooled into 22 product groups. For agriculture, this includes six subgroups.[35] Of these, particularly distortive effects are found for the sector that contains meats, livestock products, and live animals; as well as for the sector that includes fresh fruits and vegetables, pulses and legumes, nuts, cotton, tobacco leaf, and spices, among other agricultural products not elsewhere classified (n.e.c.). For these subgroups, the estimated effect of an additional subsidy measure is to promote exports by 3 to 4 percent. An estimated ad valorem equivalent of subsidies for plant products would be about 13 percent.[36]

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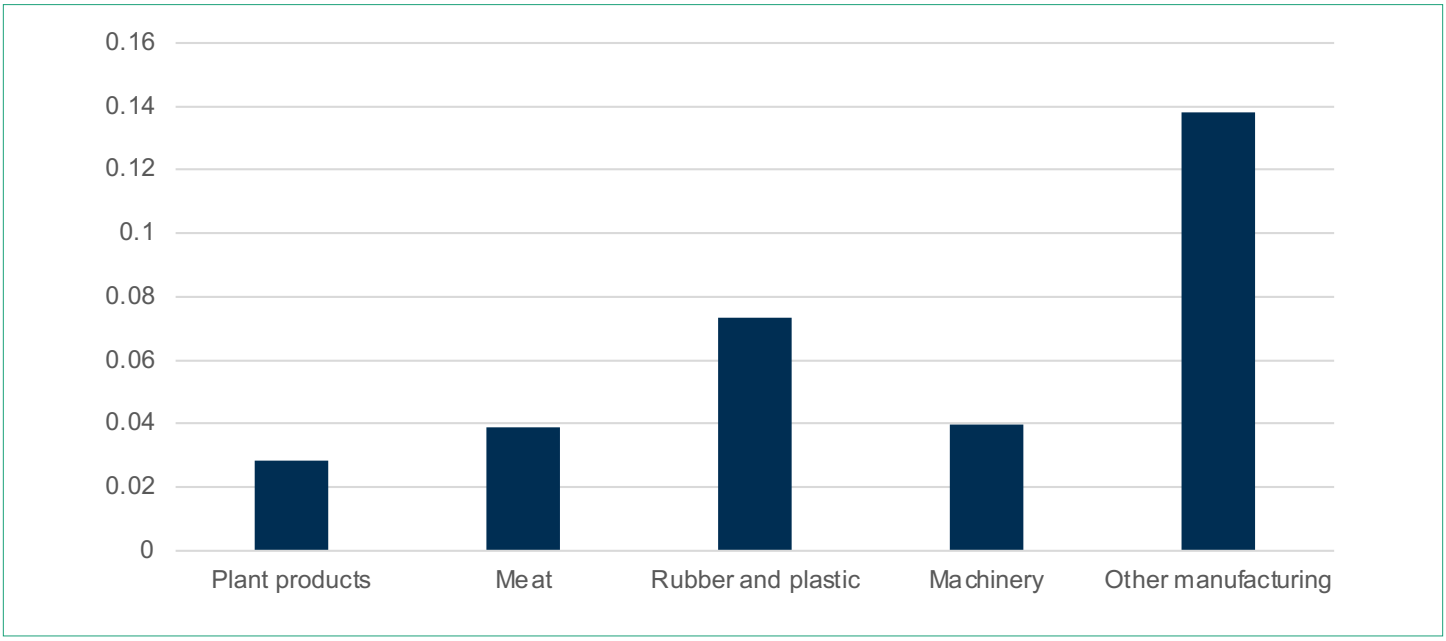
Figure 3.10. Certain agricultural and manufacturing sectors exhibit significant trade effects
(Estimated marginal effects of subsidy measures, by sector)



Source: Original calculations for this publication based on estimates from a gravity estimation.
Note: Estimated coefficients of subsidy variable that statistically favor exports.

31. The region of North America includes Canada and the United States.
32. Specifically, the estimated point estimate for the agricultural ad valorem equivalent in Asia-Pacific is 5.4 percent, with a 90 percent confidence interval that covers the values from zero up to about 11 percent.
33. The Latin America grouping refers to the following countries included in the subsidy database: Argentina, Brazil, Chile, and Mexico.
34. Subsidized inputs, for example with respect to energy and fertilizers, are important in Brazil, Chile, and Mexico (Egas Yerovi and de Salvo, 2018).
35. For agriculture, these groups are cereals; oilseeds; sugars; plant products; meat; and animal products. These descriptions are broad, and each covers one or more of the 26 agricultural categories in the ITPD-E data, which in turn group a number of agricultural products per the FAOSTAT Commodity List.
36. Figure 3.10 focuses on the estimated coefficient of the subsidy measures for product subgroups for which the parameter is at a significance level of at least 10 percent. Because the estimated trade elasticities on these more granular regressions are not always significant, ad valorem equivalents are generally not reported.

Similarly, for manufacturing, trade-distorting effects of subsidies are found for a wide range of capital, intermediate, and consumer goods. For manufacturing, estimation is done separately for 16 subgroups.[37] Among these groups, subsidies have particularly distortive effects for rubber and plastics products, for which each subsidy measure expands exports by about 7 percent. Another subgroup for which subsidies promote exports includes a wide range of products such as machinery; electrical equipment (electric motors, generators, batteries, and so forth); electronic components and boards; communications equipment; consumer electronics; medical and optical instruments; and motor vehicles and parts. Lastly, an industry group with significant subsidy effects includes miscellaneous manufactures such as furniture, jewelry, musical instruments, sports goods, games and toys, and other manufacturing n.e.c.

IMPLICATIONS FOR DEVELOPING COUNTRIES

Trade-distorting subsidies can displace trade and production in other trading partners, with important repercussions for developing countries. Domestic subsidies, beyond possibly being distortive and inefficient for domestic objectives, can have negative spillovers across borders. The uneven playing field created by subsidies can affect the commercial interests of countries that compete with subsidized products in foreign markets. This does not need to be only in direct competition in the same market, as a disproportionally large number of subsidy programs are implemented by large trading countries with the potential to affect world prices. Furthermore, subsidies by other countries may also affect domestic sales in import-competing industries that cannot compete on fair terms with such subsidized products. Both of these channels, displacing exports and displacing domestic sales, can be important for developing countries.

Subsidies for both agriculture and manufacturing can be important for different reasons. For agriculture, the empirical evidence presented suggests that the trade-distortive effects of subsidies are likely higher. For example, the ad valorem equivalents of subsidies by advanced economies are in the double digits (on average 15 percent), helping their producers undercut developing-country competitors that might otherwise be competitive in such products.

For many developing and especially low-income countries, a significant share of trade and production is concentrated in agricultural activities subject to trade-distorting subsidies. Figure 3.11 shows the percentage of goods trade and production in each country where trade-distorting subsidies are found per figure 3.10. On a value basis, exports of those agricultural goods represent less than 5 percent of global trade.[38] However, for poor countries, these agricultural activities are significant, representing over 20 percent of goods exports for countries such as Afghanistan, Burkina Faso, Burundi, Central African Republic, Ethiopia, The Gambia, Guinea-Bissau, Liberia, Madagascar, Malawi, Rwanda, and Uganda. Indeed, there is a strong negative correlation between the relative importance of these agricultural exports and income levels, as suggested by the fitted line in figure 3.11 for both exports and production, so that employment and livelihood are more dependent on these activities among the poorest countries. To a lesser extent, these sectors also represent significant export activities in middle-income countries such as Colombia, Ecuador, Grenada, Guatemala, and Turkmenistan.

37. For manufacturing products, these groups are manufactured food; drinks and tobacco; textiles; apparel; wood; pulp and paper; publishing and printing; petroleum and fuel; chemical products; rubber and plastic; minerals; steel; metal products; machinery; other transportation; and other manufacturing.
38. Note that in the industry classification used here, manufacture of food products is under the broad manufacturing sector. If the HS classification were used, global exports under chapters 1 through 24, which also include prepared foodstuffs, beverages, spirits, and tobacco products, account for less than 9 percent of merchandised trade.

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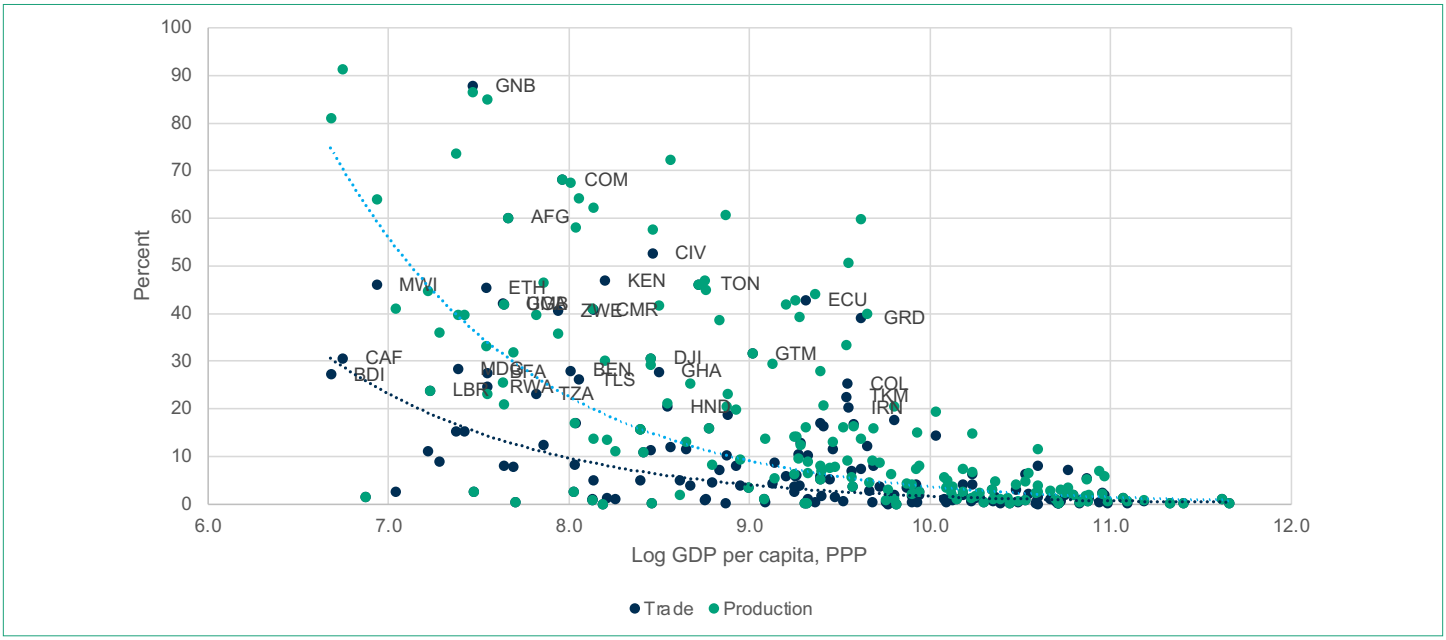
Figure 3.11. Low-income countries are particularly exposed to distorted agricultural trade

(Share of trade and production for distorted agricultural trade)



Source: Original calculations for this publication.
Note: GDP = gross domestic product; PPP = purchasing power parity.

Manufactured goods represent the vast majority of global trade, so that subsidies in industrial goods can be widespread.[39] Focusing only on those manufacturing activities with trade-distorting subsidies per figure 3.10 involves slightly less than half of global exports. Thus, together with the percentage of trade where there are trade-distorting subsidies in agriculture, as discussed above, about half of global trade is affected—either favored by or competing with distortive subsidies.

Manufacturing exports that are subject to trade-distorting subsidies can be a stepping-stone to higher value-added trade. Manufacturing exports are more prevalent in high-income countries, such as the Czech Republic, Hungary, Malaysia, and the Slovak Republic, where they can account for as much as 70 percent of goods exports. Indeed, there is a large positive correlation between the share of those products in total merchandise exports and income levels (figure 3.12). At the same time, these manufacturing exports are significant for a notable number of middle-income countries, including China, Costa Rica, Mexico, the Philippines, Thailand, Tunisia, and Vietnam. These are countries that have integrated into manufacturing value chains. Low-income countries, on the other hand, are not significant exporters of these manufacturing products.[40] A possible factor could be that subsidized exports of industrial goods, including parts and components, prevent developing countries from entering manufacturing value chains; this may especially be the case as they lack the resources to counter the effects of other countries' subsidies. This in turn can limit the growth potential that trade offers low- and middle-income countries, as participation in manufacturing value chains is typically associated with higher investment and technological spillovers.

39. About 80 percent of global trade is contained in HS chapters 28 and above, which cover merchandised trade excluding food and agriculture, minerals, and fuels.
40. The Central African Republic is an outlier, where the high percentage of manufacturing exports reflects exports from sawmilling and planing of wood, and to a lesser extent vehicle parts.

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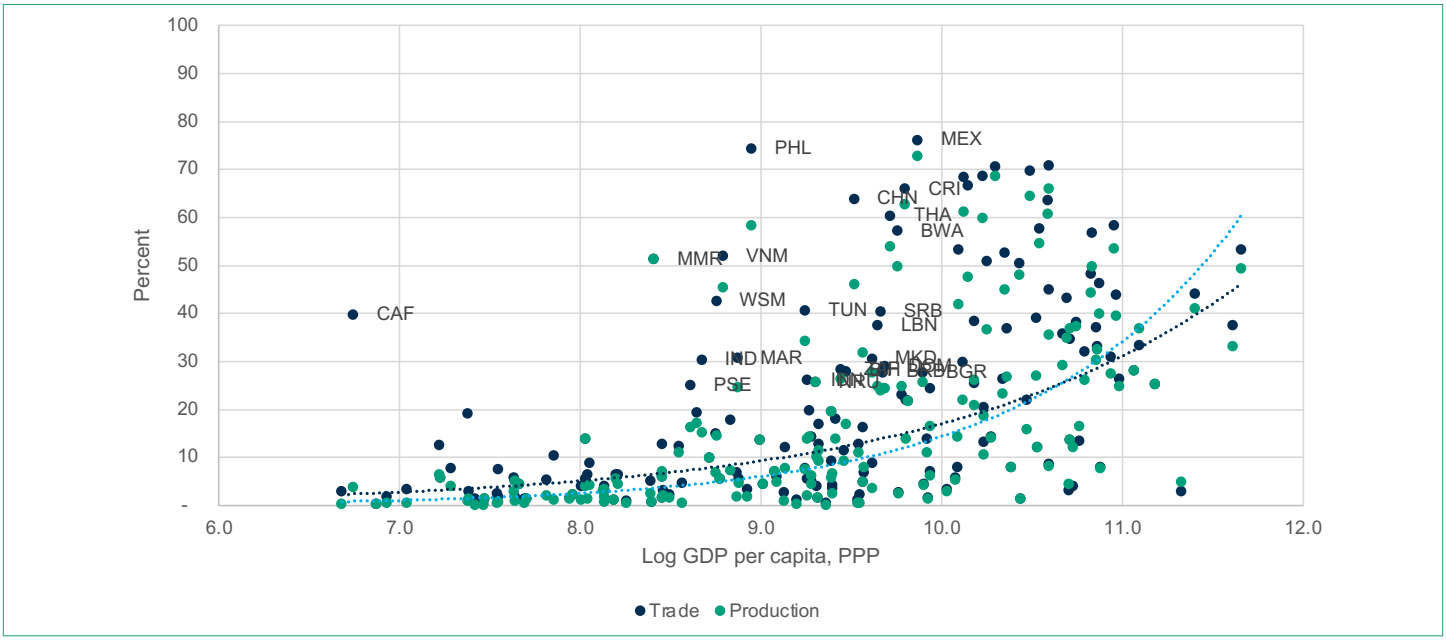
Figure 3.12. Middle-income countries are particularly exposed to distorted manufacturing trade

(Share of trade and production for distorted manufacturing trade)



Source: Original calculations for this publication.
Note: GDP = gross domestic product; PPP = purchasing power parity.

Reforming subsidies in agriculture and manufacturing can affect regional trade and production patterns and economic welfare. These economic effects can be analyzed, based on economic modeling, under the scenarios where all trade-distorting subsidies on agriculture and manufacturing are eliminated.[41] These indicative simulations show that both exports and production would partially shift from regions with more subsidies to others with less. For example, conservatively in the medium term, export of agricultural products can expand in Sub-Saharan Africa by close to 5 percent. Under this scenario, agricultural output would fall in North America and the European Union (by about 4 percent combined), while it would increase in all other regions by between 1 and 3 percent (by about 2 percent combined), as (more) subsidized agricultural products are substituted by their own products. Global agriculture supply, after removing trade-distorting subsidies, would remain largely unchanged (0.1 percent lower). Similarly, regional production patterns would shift in the case of removing trade-distorting manufacturing subsidies, decreasing in Asia and increasing in the rest of the world combined, with the global supply of manufactures largely unchanged (less than 0.1 percent lower). Furthermore, as subsidies can cause global production and trade to deviate from their otherwise optimal levels, they can create misallocations or allocative inefficiencies that result in deadweight losses to the global economy.

41. These scenarios are simulated separately for agriculture and manufacturing. Analysis details are in Appendix F.

>>> International Disciplines and Gaps on Subsidies

Disciplines on subsidies exist in a wide range of international instruments comprising multilateral, regional/plurilateral, and bilateral treaties and arrangements.[42] These disciplines vary widely in approach and scope. They may be subsidy-specific or may regulate subsidies within the context of a broader economic or noneconomic governance system. Moreover, they may take the form of treaty law or nontreaty commitments. The enforcement and implementation of such disciplines may rely on a dispute-settlement mechanism or a nonbinding mechanism that relies on peer pressure.

The current governance system for subsidies is a patchy framework with few binding, substantial rules, limited sectoral coverage, and weak institutional settings. While recent international agreements, particularly free trade agreements (FTAs), introduce small innovations focused on expanding the system, current international disciplines remain subject to major gaps that undermine their effectiveness.

At the global level, the virtual absence of rules on subsidies for cross-border services and foreign investment limits the governance framework for subsidies. WTO Subsidies and Countervailing Measures (SCM) rules apply only to goods, and GATS rules provide little guidance on services. Rules related to trade in goods are further hampered by a narrow definition of granting authorities, which limits the potential to address subsidies offered by SOEs and other nongovernment entities. Broad and unclear language on the regulation, particularly regarding the "specificity" or "selectivity" of the measures to be captured as subsidies, also reduces the effectiveness of the framework.

Substantive rules on subsidies in goods trade are more comprehensive but remain hampered by strict requirements on how to apply them. In particular, the SCM requirement that actionable subsidies effectively must have an "adverse effect" on other members severely limits the scope of the regime. Free-trade agreements have expanded the list of subsidies that

42. This section draws on the work of Kreier, Remy, and Kyriakou (2022).

need not demonstrate adverse effects (that is, "prohibited" subsidies), but the SCM rules limit that framework to export subsidies.

The multilateral institutional setting of the WTO SCM, focused on increasing transparency and providing ex post remedies, offers only superficial rules and weak incentives for compliance. Rules on the notification of state aid measures are marred by shortcomings that hinder their intended transparency benefits. The WTO offers a strong rule-based dispute settlement mechanism, but disputes on the use of subsidies fit poorly in its procedural rules and, importantly, provide prospective-only remedies.

4.1 Existing Rules

There are three major sources of international disciplines on subsidies: (a) the rules contained in the "covered agreements" of the WTO, which are nearly universal in geographical scope; (b) the state aid system of the EU; and (c) subsidy-related provisions in FTAs among some of the world's major trading powers, including the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), the United States-Mexico-Canada Agreement (USMCA), and EU-led agreements. The WTO offers the only global framework and remains a benchmark for disciplines on subsidies, especially those related to trade in goods; the EU and, to a smaller degree, FTAs, have elaborated on those rules, offering relevant guidance on ways to improve the multilateral framework.

WORLD TRADE ORGANIZATION

The WTO Agreement on Subsidies and Countervailing Measures features the most comprehensive global rules on subsidies, but they focus only on goods trade. Narrower disciplines are contained in the General Agreement on Tariffs and Trade (GATT) 1994, the General Agreement on Trade in Services (GATS), the Agreement on Agriculture (AoA), the Agreement on Trade-Related Investment Measures (TRIMs), and several WTO Accession Protocols. This analysis focuses predominantly on the rules of the SCM Agreement.

Only economic transfers by certain "granting authorities" to beneficiaries in a WTO member country fall under the SCM agreement. Granting authorities may be central governments and all subnational government authorities, "public bodies" vested with elements of "governmental authority," and private entities "entrusted" or "directed" by a government to make a financial contribution. Under these rules and existing WTO jurisprudence, state ownership and control of entities such as SOEs are not sufficient to classify those entities as "public bodies."[43]

The SCM Agreement focuses on manufacturing.[44] Agricultural subsidies that conform to specific requirements under the WTO AoA may be protected under the SCM Agreement. Also, subsidies that benefit the service sector are excluded from the scope of the SCM agreement and are, instead, to be further negotiated under Article XV of GATS, which has thus far failed to yield services-specific disciplines.

WTO rules apply to a specific set of "financial contributions" that confer a "benefit." Economic transfers covered by the SCM Agreement are enumerated as direct transfers of funds; potential direct transfers of funds or liabilities; the forgoing of revenue that is otherwise due; the provision of goods and services other than general infrastructure; the purchase of goods (although not of services); and price or income support. Notably, the SCM Agreement does not cover regulatory actions that do not involve a listed financial contribution, including export restrictions that can provide an implicit subsidy to downstream activities. Importantly, these measures must confer a "benefit" to its recipient to constitute a subsidy, understood as a financial contribution being made.

Finally, financial contributions must be "specific" to an enterprise or industry to fall under SCM rules. A subsidy is de jure specific to an enterprise or industry when there is an express regulatory limitation on access. It may also be de facto specific, depending on whether it is predominantly or disproportionately used by certain enterprises, and on how much discretion the granting authority exercised in deciding to grant the subsidy. A subsidy is also considered specific when limited to a certain region in a designated geographical area. Finally, subsidies that are contingent on export or the use of domestic content (that is, prohibited subsidies under

43. See WTO Appellate Body Report, DS379: *United States—Definitive Anti-Dumping and Countervailing Duties on Certain Products from China*, 2012, paras. 318 and 353. This ruling regarding the meaning of a "public body" has provoked substantial legal and policy debate.
44. Investment and services subsidies are indirectly governed by the nondiscrimination provisions of GATS and TRIMs.

WTO rules) are deemed to be specific. On the other hand, subsidies based on "objective criteria," such as the number of employees or the size of the enterprise, are not considered "specific" and hence fall out of the SCM coverage.

Subsidies may be "prohibited" or "actionable." The SCM Agreement contains two principal sets of rules: prohibitions for a limited set of subsidies that are considered most likely to distort trade, and a cause of action for all other specific subsidies that can be demonstrated to have "adverse effects" on the interests of another member. Subsidies contingent on export or local content—either de jure or de facto—are prohibited outright. Actionable subsidies—subsidies that are not local content- or export-contingent but cause adverse effects (that is, serious prejudice, material injury, or nullification and impairment)—can be challenged through WTO dispute settlement with a view to seeking their withdrawal.

All specific subsidies, whether prohibited or actionable, may be subject to countervailing duties. To impose countervailing duties, the importing member must show that the subsidized imports are causing or threatening to cause injury to its domestic industry, or that they retard the establishment of such an industry. Subsidies are also subject to transparency and notification requirements.

EU STATE AID LAW

The EU state aid framework is arguably the broadest and most developed international framework for subsidies. This framework is laid out in Articles 107 and 108 of the Treaty on the Functioning of the European Union (TFEU) and its subsequent regulations.

The EU state aid framework applies to all economic sectors and to the central and subnational governments of any EU member state, as well as other public bodies and SOEs to the extent that the economic transfer involves the use of "state resources" and may be attributed to the state. The framework requires that the state aid, which can take any form, including direct grants, loans, direct investment in corporate capital, in-kind benefits, guarantees, and revenue foregone, entail a direct or indirect "advantage" to the recipient. Article 107(1) of the TFEU also includes a "material selectivity" or a "regional selectivity" threshold for the state aid to be subject to its disciplines—an element that connects with the "specificity" requirement in WTO rules.

The EU state aid framework contains horizontal and sectoral disciplines. At the horizontal level the Council of the European Union and the European Commission have devised special rules applicable to regional aid, R&D, environmental aid, and other forms of non-sector-specific aid. At the sectoral level, separate EU regulations govern areas such as finance, transport, and fisheries.

State aid under EU rules must first be notified and approved, with fines imposed for noncompliance. The European Commission plays an active role in the EU state aid rules, examining notifications and granting approval, as well as imposing fines and defending its decisions before the Court of Justice of the European Union. The remedy for unlawful state aid is recovery from the beneficiary.

SELECT FREE TRADE AGREEMENTS

Traditionally, subsidy-related disciplines contained in FTAs simply reaffirmed member states' obligations under the SCM Agreement. Recently, certain WTO members have included special subsidy rules in their FTAs, whether as part of subsidy-specific chapters or under chapters dedicated to the regulation of SOEs. The CPTPP, the USMCA, and a range of FTAs concluded by the EU are notable examples of an emerging trend to develop specific disciplines on subsidies and SOEs in FTAs. In many cases, these new provisions reflect a determination to plug perceived gaps in WTO subsidy disciplines.

THE COMPREHENSIVE AND PROGRESSIVE AGREEMENT FOR TRANS-PACIFIC PARTNERSHIP

The CPTPP's most significant innovations in subsidies relate to noncommercial assistance provided both by and to SOEs. The CPTPP is intended to regulate SOEs, both as potential subsidizers and as recipients of subsidies.

While the concept of noncommercial assistance is built on the types of financial contributions provided for under the SCM Agreement,[45] CPTPP covers SOEs operating in both the goods and service sectors. Importantly, an enterprise is an SOE under the CPTPP if the government has majority ownership, controls a majority of voting shares, or has the power to appoint a majority of the management board.

The main provision mandates that no party cause adverse effects or injury to the interests of another party by using noncommercial assistance provided to or by SOEs. Notably, these disciplines apply where a party is subsidizing the activities of its SOEs abroad (transnational subsidies), arguably reaching beyond WTO rules. In addition to establishing a state-to-state dispute settlement mechanism, the CPTPP creates new transparency requirements on the operation of SOEs and the provision of noncommercial assistance.

Besides SOE-related rules, the CPTPP contains provisions addressing subsidies in specific sectors. For example, Article 20.16.5 prohibits subsidies that negatively affect fish stocks in areas that are overfished, as well as subsidies to any fishing vessel engaged in illegal, unreported, and unregulated fishing.

UNITED STATES-MEXICO-CANADA AGREEMENT

The United States-Mexico-Canada Agreement (USMCA) includes some of the most far-reaching disciplines on state aid featured in a free trade agreement. While most of the USMCA framework mirrors the scope, content, and governance features of the subsidy-related disciplines set out in the CPTPP, its definition of SOEs extends even beyond the definition given under the CPTPP, encapsulating situations where the government has the power to control an enterprise through an indirect or minority interest.

The USMCA prohibits three categories of noncommercial assistance provided to or by SOEs of a party. These are applicable to goods, without the need to demonstrate adverse effects and injury.

- Loans or loan guarantees provided by an SOE to an uncreditworthy SOE;
- Noncommercial assistance provided by a party or SOE to an SOE, in circumstances where the recipient is insolvent or on the brink of insolvency, without a credible restructuring plan to return the SOE within a reasonable period to long-term viability; and
- Conversion by a party or SOE of the outstanding debt of an SOE to equity, in circumstances where this would be inconsistent with the usual investment practice of a private investor.

EUROPEAN UNION FREE TRADE AGREEMENTS

The EU has developed a significant body of subsidy rules under its FTAs. Several contain specific chapters on subsidies, in addition to chapters regulating SOEs, while others do not contain specific chapters but still prescribe rules that impose meaningful constraints on subsidies. The EU-South Korea FTA, for instance, covers subsidies in its competition chapter which, like the USMCA, prohibits unlimited guarantees to cover a company's debts or liabilities and subsidies for ailing companies without a credible restructuring plan, insofar as they adversely affect international trade (that is, domestic or export markets). FTAs such as those with Replubic of Korea and Singapore include subsidies to services sectors.

The EU-Japan FTA further includes an obligation to ensure that enterprises use subsidies only for the specific purpose for which they are granted. The EU-Japan FTA permits the parties to rely on Article XX of GATT 1994 to justify subsidies granted in pursuit of a closed list of legitimate policy objectives.

OTHER AGREEMENTS

Energy and environment-related agreements or arrangements may include disciplines that limit the use of subsidies in areas that may have a negative impact on the environment. The Paris Agreement on climate change does not contain rules specific to subsidies but requires the parties to commit to the decarbonization of the global economy. This implies in practice an overhaul of the energy subsidy framework, as made explicit through the goal to make "finance flows consistent with a pathway

45. Although it notably excludes revenue forgone (presumably because SOEs lack taxing powers) and the purchase of goods.

towards low greenhouse gas emissions and climate-resilient development" (Article 2.1(c)). The G-20 Fossil Fuel Subsidies Agreement established an overall goal to eliminate "inefficient" fossil-fuel subsidies and create a mechanism for country peer reviews of fossil-fuel subsidies.

4.2 Gaps and Limitations in the Current Subsidy Governance Framework

It is widely accepted that existing subsidy disciplines have not fully kept pace with the recent developments and rising challenges of global economic governance. This holds particularly true at the multilateral level, where the multiplicity of the interests at stake, deep differences of views among countries, and the broader gridlock in the WTO negotiating mechanism have barred any meaningful amendment to the rules. As a result, the governance systems for dealing with subsidies are a patchwork of overlapping instruments, with the most far-reaching reform efforts taking place at plurilateral or bilateral levels, particularly in the context of FTAs.

LIMITATIONS RELATED TO THE SCOPE OF THE CURRENT DISCIPLINES

SECTORAL COVERAGE

The main gap in subsidies rules is the virtual absence of the services sector from its coverage. As the SCM covers the goods sector exclusively, the main substantial GATS rules on subsidies in the services sector are its nondiscrimination obligations. There may be several factors playing into this gap, including the difficulty of collecting data; the profound sensitivity of some critical services sectors including health, education, transportation, and banking; and the complex interaction of commercial and noncommercial activity in these services areas. Even so, this lack of disciplines on services subsidies can be perceived as a major weakness, especially considering the rapidly rising share of services in global trade. Meaningful outcomes in this sector would likely need to be negotiated through treaty amendments in the WTO, which appears unlikely to happen in the short term.[46]

GRANTING AUTHORITIES

Under which circumstances the actions of nongovernmental entities should be attributable to the state has become particularly contentious in the context of subsidies granted to and by SOEs. Under WTO rules, the term "public body" in the SCM Agreement has been construed to mean that relevant entities must be "vested with governmental authority" to be subject to the agreement's disciplines. As a result, the ability of a government to control an entity is not sufficient to establish attribution, meaning that even subsidies provided by SOEs that are wholly- or majority-owned by the state may not be subject to WTO rules. Given that SOEs in many countries are important economic actors, particularly as suppliers of inputs and financial services, this may be seen as a major loophole. Moreover, demonstrating "entrustment" or "direction" of private bodies by the state may be particularly challenging, especially where measures are either unwritten or not formally communicated.

TYPES OF ECONOMIC TRANSFERS

While the SCM Agreement contains a list of covered "financial contributions," certain categories of economic transfers, particularly those related to regulations, may not fit within the list. For example, export restrictions and differential export taxation on inputs, which may confer an advantage to downstream user industries, are not included under the area of "financial contribution" (Hoekman and Nelson 2020). While there are widely varying views about whether these types of government behavior should be addressed as subsidies, through other disciplines, or not at all, it may be useful to evaluate whether and in what circumstances the current range of financial contributions could be adjusted.

TYPES OF ECONOMIC ADVANTAGES

In WTO rules, "benefit" is established in relation to the market, which is likely to require a complex, case-specific analysis to identify an appropriate benchmark. The situation becomes particularly difficult where no market exists because the government or public body fully occupies the area of economic activity, or where the heavy presence of state

46. Potential reforms include adopting a scheduling approach to disciplines, enabling members to select those sectors where they have more flexibility to accept disciplines; blocking exemptions for particularly sensitive sectors or types of subsidies; and grandfathering (through scheduling) existing support systems in specific sectors.

actors distorts the market. While WTO law recognizes that in certain circumstances a resort to proxies may be required, the circumstances in which this is allowed, and the way such proxies are constructed, remain unclear. Given that this is a highly technical issue it could be addressed through technical discussion in an expert group to develop recommendations. Examples of these include the groups used by the Tokyo Round Antidumping and SCM Committees, or by the WTO SCM Committee.

SPECIFICITY AND SELECTIVITY

The current rules do not provide concrete guidance on how targeted (that is, specific or selective) a subsidy must be to be subject to discipline. For example, it is unclear whether subsidies to the entirety of a country's agriculture sector can be deemed specific. Also, the application of the specificity test may exclude from discipline certain subsidies with substantial trade-distorting effects, such as the low-cost provision of energy or other inputs economy-wide. This area too could benefit from convening a group of experts to consider whether the existing rules regarding specificity would benefit from clarification and, more generally, whether such rules are useful and appropriate in all circumstances.

TRANSNATIONAL SUBSIDIZATION

Issues related to subsidies provided by one member that affect economic activity in another member have become more common in recent years. This is the case both in the context of countervailing duty investigations involving imports from a third country, and in situations where a member argues that subsidies provided by an external party to entities within its territory are distorting internal competition (European Commission 2020). There is legal uncertainty as to the extent to which such subsidies are, or should be, within the scope of the SCM Agreement.[47] Clarity regarding these issues would be desirable before any comprehensive treatment of transnational subsidies is entertained.

LIMITATIONS RELATED TO CURRENT SUBSTANTIVE RULES

"PROHIBITED" SUBSIDIES

While current SCM Agreement rules are designed to address trade-distorting subsidies, the list of subsidies that are deemed to distort trade and are thus a priori prohibited is very short. In effect, only subsidies that are contingent upon exportation (export subsidies) or upon the use of domestic over imported goods (local content subsidies) are prohibited. Some WTO members argue that the SCM Agreement would be more effective if it prohibited other categories of subsidies that, while not conditioned upon the achievement of trade objectives, are the most likely to distort trade because of their magnitude, their role in creating economic actors or productive capacity (or maintaining such actors' capacity when not economically viable), or their involvement in granting access to inputs on a discriminatory basis.[48]

DEMONSTRATION OF EX POST ADVERSE TRADE EFFECTS

As discussed earlier, subsidies that do not fall under the "prohibited" category are only covered under the SCM Agreement when they cause "adverse effects" to the interests of another member. As a result, members must wait until they have suffered (possibly irreversible) economic harm before they can challenge the measure in WTO dispute settlement. This is particularly problematic when coupled with the prospective nature of WTO remedies, which can neither undo the harm suffered nor offer monetary compensation. There is thus little incentive for members to avoid causing adverse effects through their subsidy measures. Significant evidentiary challenges make it difficult to demonstrate adverse effects.

Strengthening the dispute-settlement system could in principle address the weakness in WTO subsidy disciplines. Deadlines could be shortened or strictly enforced, and remedies could be strengthened to include recouping subsidies or even monetary compensation. However, the dispute settlement system is currently under severe pressure, considering the inoperability of the Appellate Body, and

47. Crochet and Hegde (2020), for instance, conclude that transnational subsidies can be covered under Article 3, which does not contain the limitation of "within the jurisdiction" stipulated under Article 2.1.
48. See, for example, the approach under the USMCA and a number of EU FTAs.

consensus even on broad reform areas or directions is lacking. A shift to more prescriptive rules, based on prohibitions or rebuttable presumptions for certain subsidies, would therefore appear to be a more viable alternative.

DISTORTIONS IN INVESTMENT FLOWS

Investment distortions can harm the economic welfare of affected businesses and workers just as much as trade distortions.[49] Furthermore, investment distortions may be seen as precursors to trade distortions, as shifts in the distribution of production may ultimately affect trade flows. While multilateral rules on investment have proved highly controversial in the past, possible disciplines related to investment-distorting subsidies could strengthen the ability to mitigate the adverse effects of mobile capital of multinational corporations. Any new rules would require changes to the SCM Agreement.

NONTRADE EFFECTS OF CERTAIN SUBSIDIES

A comprehensive reform of the international governance system for subsidies should aim to address the nontrade effects. The current multilateral framework of the WTO neither protects subsidies that seek to advance or protect legitimate policy objectives (for example, the environment, R&D, health, and welfare) from challenge nor seeks to balance the trade-distorting effects of a subsidy against the impact of achieving the policy objectives. Potential ways to address this include the resurrection of a nonactionable category of subsidies, the creation of a set of general exceptions analogous to GATT Article XX, or the development of a facilitated mechanism to review and approve waivers from subsidy disciplines in appropriate circumstances.

LIMITATIONS RELATED TO GOVERNANCE AND OTHER SYSTEMIC CONCERNS

TRANSPARENCY AND NOTIFICATION

The current WTO SCM framework relies on notification requirements to increase transparency on the use of subsidies, but these are often late and incomplete. WTO rules provide for the ex post notification of subsidies on a two-year cycle. In practice, this means that even timely notifications of subsidies may be two or three years old before they are subject to review. Moreover, since notifications rely on self-identification, WTO members often fail to send notifications of subsidies entirely. This may happen out of a lack of understanding on whether a measure is covered by the SCM agreement, or often, to avoid "self-incrimination," especially regarding the subsidies that are the most likely to be challenged: those most trade distortive. Lack of notification is particularly common for subsidies adopted at the subnational level, largely due to low awareness of WTO disciplines.

DISPUTE SETTLEMENT AND REMEDIES

Subsidy-related disputes have proven particularly challenging. First, subsidy-related disputes are heavily evidence-based. Second, since the principal subsidy disciplines are effects-based, the process of gathering evidence and conducting intensive economic analysis[50] is difficult and extremely time-consuming for WTO dispute settlement. Critically, economic analytical exercises rely on part-time, ad hoc panels that lack the subpoena and other investigative powers of national judicial systems. Third, WTO dispute settlement is inherently prospective in nature. While a prospective remedy may be reasonably effective in addressing recurring subsidies, it is notably ineffective in dealing with large, one-off subsidies that create or maintain economic activity (for example, the creation of new production capacity) and whose effects may continue for decades. Under WTO law there are no obvious ways to remove the adverse effects of subsidies, which is aggravated by the fact that in certain cases the complainant must wait until negative effects emerge before being able to bring the claim.

DATA COLLECTION

One of the main challenges for the international governance of subsidies is the poor quality of comparable statistical data. e of the most frequently expressed concerns relates to the limitations of data collection on the extent of subsidization provided by governments around the world (See Hoekman 2015; Horlick and Clarke 2017). Currently, there is no global information hub, and importantly, there is no agreed-upon common methodology for the collection of data on subsidies.

49. Johnson and Toledano (2013).
50. Some observers also believe that the WTO dispute settlement has been reluctant to fully embrace economic analysis. See Mavroidis and Neven (2017).

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Moving Ahead on Subsidies and Trade

Closing data and analytical gaps should remain a priority area in the discussion of subsidies. Subsidies remain a delicate and poorly documented matter in global trade policy. Understanding which subsidy measures are inefficient or ineffective in achieving their intended goals and their potential effects on other countries by distorting trade would require detailed information on the design, implementation, and beneficiaries of such interventions. This may require enhanced cooperation in fulfilling notification requirements, as well as other actions by peers (see a short discussion below on some possible mechanisms). International organizations can play a facilitating role and provide guidance as to how best to consolidate this information and monitor subsidies (within and across countries).[51]

More knowledge is needed on subsidies and their international implications. There is room for greater collaboration to improve the collection, vetting, and dissemination of data on subsidies. Enhanced information on subsidies, including indirect subsidies by nongovernmental entities such as SOEs, could naturally feed into a research workstream to better assess the role of subsidies on trade. This work could be done in collaboration with international agencies with global coverage such as the World Bank, the International Monetary Fund (IMF), WTO, UNCTAD, and the OECD, as well as external experts on subsidies. Technical experts and government entities could be encouraged to participate in collecting and vetting data.[52] This effort could initially focus on a limited set of countries that, as shown in the current analysis, disproportionally employ subsidy measures. Nonbinding policy guidelines issued by an independent body could have a high impact, given the prevalence of subsidy interventions and the need to inform multilateral reform discussions.

Limited transparency should not preclude (or be used to preclude) progress on reforms where agreement can form. Shortfalls of information about the source, scale, and extent of subsidies can deter reform as much as political gridlock. This is particularly true in contexts where it is virtually impossible to know how governments are assisting the private sector.

51. IMF, OECD, World Bank, and WTO (2022).
52. To ensure success and broad-based participation, such an exercise needs to be (a) delinked from any ongoing efforts in rulemaking; (b) conducted without prejudice to any consequences under existing binding or nonbinding regimes; and (c) able to manage confidential data.

A comprehensive global framework for subsidies is ideal but unlikely. Any sensible proposal for governance reform must distinguish between the desirable and the feasible. At the multilateral level, the current gridlock in broader WTO reforms limits any undertaking from being adopted. The sensitivity of subsidies governance adds another layer of caution. While most countries would agree that better coordination in formulating subsidy rules may be necessary, there is no consensus on the design of these rules or what role the WTO—or other bodies—should have in developing or enforcing them, much less on which substantive areas should be prioritized. Thus, it is unlikely to expect any major multilateral effort toward reform of subsidy rules in the foreseeable future. More likely is a continuation of the divergent approaches to, and levels of ambition in, subsidy rules, as reflected in recent bilateral and plurilateral FTAs. Sectoral disciplines under nontrade instruments may also attract more regulatory activity.

The nature of subsidies requires the agreement of all major trading partners. Unlike tariffs and other market access deals, whose benefits can be limited to participating parties in regional trade agreements, subsidy disciplines are unlikely to succeed unless all the major subsidizers come to an agreement, mainly due to challenges surrounding the free-rider problem. This means that solutions ultimately must be negotiated multilaterally, especially in the WTO or in other forums that include all the major economies.

In this context, some priority steps include the following:

- **The need for subsidy disciplines in cross-border services and investment.** While reform on this area may be beyond the current appetite, the importance of the issue requires keeping it on the table. Increased transparency on the use of subsidies in the services sector, including on investment in services, could be negotiated as "additional commitments" to the GATS.
- **Support multilateral rules with bilateral interpretations**. Even where disciplines exist under the SCM Agreement, there is a need to adapt its rules to reflect current jurisprudence and realities. For instance, interpreting the meaning of a "public body" could be guided by definitions used in FTAs, and the types of government action subject to subsidy rules could be expanded to include transnational subsidies as well as export duties and taxes.
- **Increase transparency through peers' actions**. Shortcomings in the notification process could be addressed through (a) peer pressure in the SCM Committee; (b) the involvement of successive SCM Committee chairs; (c) the publication of "status of notification" documents; (d) the use of counternotifications; (e) technical cooperation by the Secretariat; and (f) the work of the WTO's Trade Policy Review Body. Moreover, institutional or legal consequences could be attached to non-notification, and transparency could be improved by creating domestic bodies with the mandate and legal authority to collect information from national and subnational government agencies and report to the WTO.
- **Use soft law options to fill loopholes.** Instead of improving subsidy rules through treaty amendments (which in the current climate may be unfeasible), the suggested recommendations could be implemented through alternative means such as authoritative interpretations, waivers, or expert group recommendations for more technical issues (including the calculation of benefit or the determination of "specificity").

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Appendix A: Antidumping Measures

The application of antidumping measures has been increasing continuously, albeit at a slower pace than countervailing measures. Antidumping measures around the world increased by 46 percent from 2007 to 2019, with growth averaging 3.2 percent per year (figure A.1).[53] In 2019, about 2,000 antidumping measures were in place, or about 10 times more than countervailing measures. That compares with 2007, when antidumping measures were more than 20 times as numerous as countervailing duties, and 2013, when antidumping measures were 15 times more common than countervailing measures.

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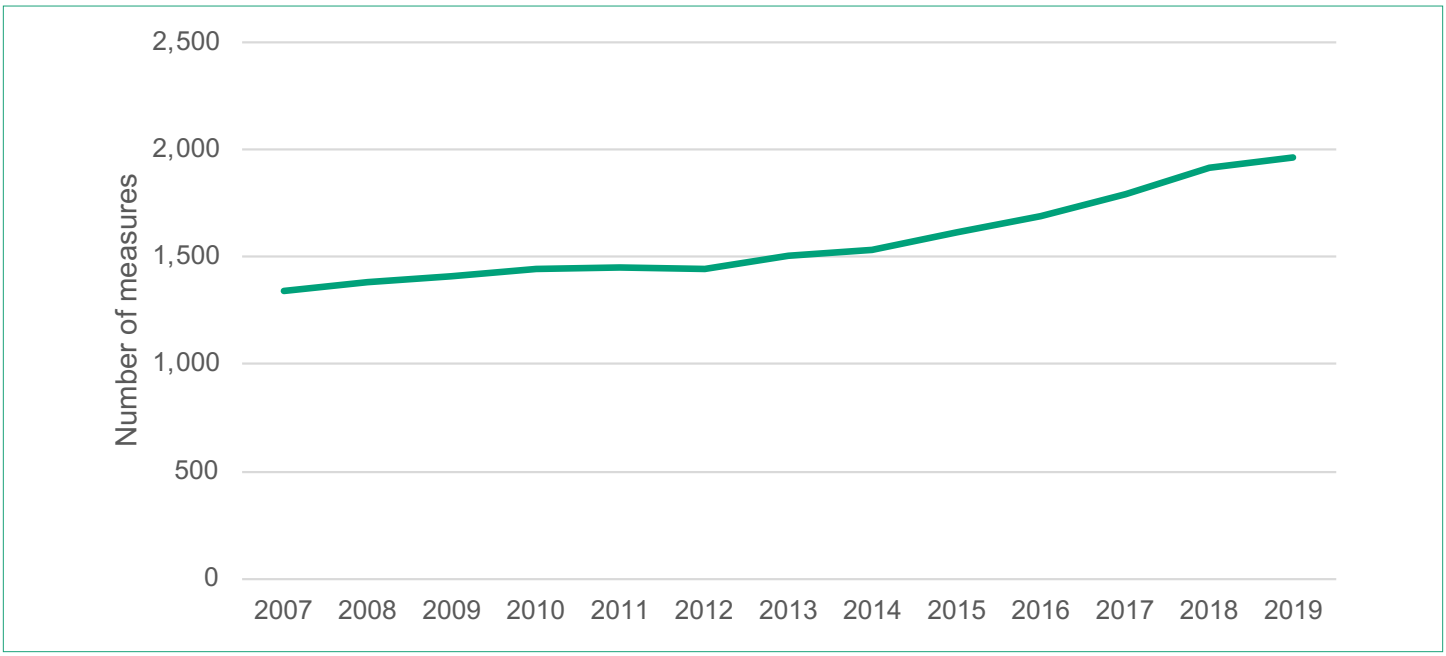
Figure A.1. Applied Antidumping Measures Per Year, 2007–2019



Source: World Bank Temporary Trade Barriers Database.

A diverse group of rapidly emerging economies has become top users of antidumping measures. Starting from essentially zero, India rapidly started implementing antidumping duties at the end of the 1990s. In 2003 it passed the EU as the second-largest user of global antidumping measures after the United States. Brazil and Türkiye have also increased their use of antidumping measures very rapidly, Türkiye in the early 2000s and Brazil after 2012. Together, the United States, India, Brazil, and Türkiye account for slightly over half of the global total (figure A.2).

China is by far the largest target of antidumping measures, accounting for slightly more than one third of the global total. China is the principal target for all top 10 users of antidumping measures, as shown in figure A.2 (excluding China itself). Meanwhile, most of China's antidumping measures are aimed at the United States, Japan, the EU, and Republic of Korea (figure A.3).

53. This is based on the World Bank Temporary Trade Barriers Database. Chad P. Bown, Milla Cieszkowsky, Aksel Erbahar, and Jose Signoret. 2020. Temporary Trade Barriers Database. Washington, DC: World Bank. www.worldbank.org/en/data/interactive/2021/03/02/temporary-trade-barriers-database.

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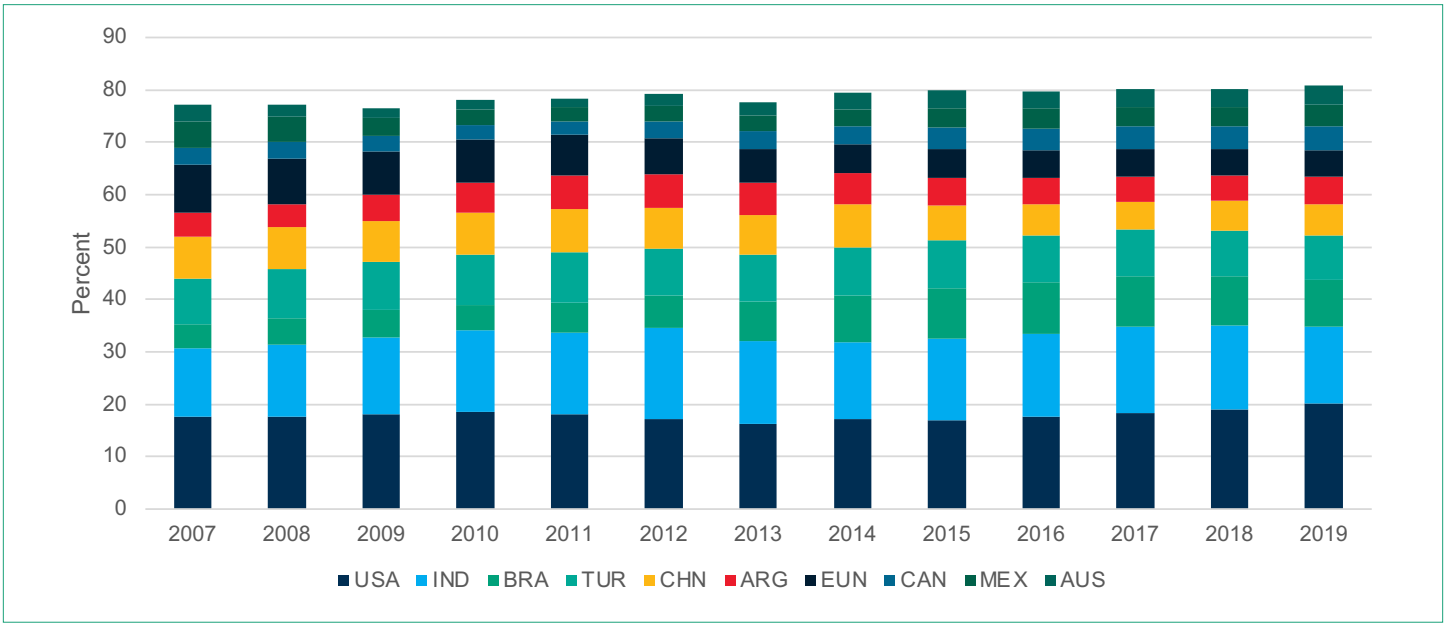
Figure A.2. Share of Global Antidumping Measures by Top Users, 2007–2019



Source: World Bank Temporary Trade Barriers Database.
Note: ARG = Argentina; AUS = Australia; BRA = Brazil; CAN = Canada; CHN = China; EUN = European Union; IND = India; MEX = Mexico; TUR = Türkiye; USA = United States.

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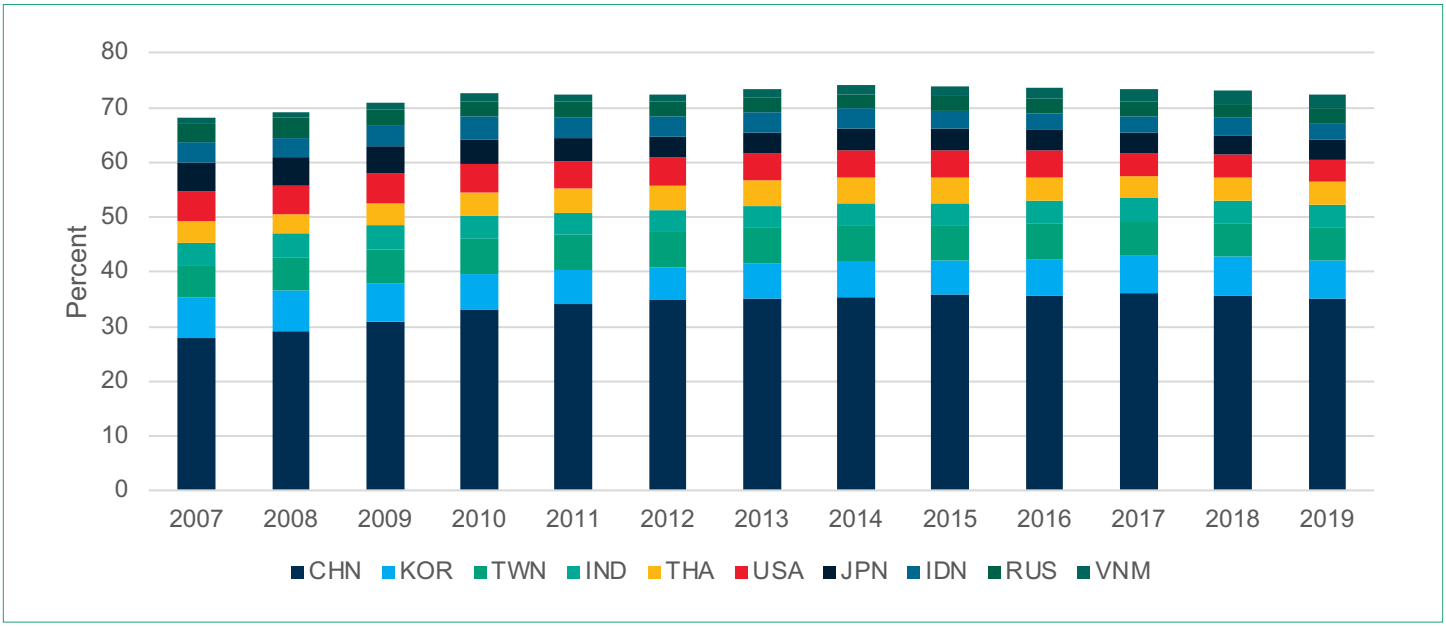
Figure A.3. Share of Applied Antidumping Measures by Target Economies, 2007–2019



Source: World Bank Temporary Trade Barriers Database.
Note: CHN = China; IDN = Indonesia; IND = India; JPN= Japan; KOR= Korea, Rep.; RUS= Russian Federation; THA = Thailand; TWN = Taiwan, China; USA= United States; VNM = Vietnam.

Antidumping measures are highly concentrated in the same sectors as countervailing actions (figure A.4). Iron and steel together with iron and steel products (under HS chapters 72 and 73 respectively) accounted for about 6 of every 10 targets of antidumping duties in 2019. Similarly, plastics and plastic products and paper and paperboard are commonly targeted by trade remedy actions. Meanwhile, chemicals and synthetic textiles are common in antidumping cases but not in countervailing cases. This in part reflects the application of antidumping measures in these sectors in countries such as India, Mexico, and Türkiye, which rarely apply countervailing duties.

Appendix B: Subsidy Measures Classification

The following provides a schematic guide to the type of information to be collected and classified for an analytical database on subsidy measures.[54]

1. **Type of measure through which subsidy is provided***
   - Law/legislation/regulation
   - Administrative practice/direction
   - Omission
   - Other (state)

2. **Objectives or objectives of measure (Use direct language where explicitly stated.)**
   - Research, innovation, technology
   - Environment, social impact
   - Financial bail-out/relief
   - Disaster relief
   - Other (please state)

3. **Good/service/sector in which economic activity takes place***
   - **Goods**
     - Manufacturing (specify)
     - Agriculture (specify)
     - Fishing (specify)
   - **Services**
     - Business (including professional and computer services)
     - Communication (including postal, telecoms, and courier)
     - Construction and related
     - Distribution
     - Educational
     - Environmental
     - Financial
     - Health and social
     - Tourism and travel
     - Recreational, cultural, and sporting
     - Transport
     - Other

(The Harmonized System can be consulted to categorize good at the chapter, heading, or subheading level as possible. For services see WTO Services Sectoral Classification List: MTN.GNS/W/120. A sectoral classification following the ISIC nomenclature is also recommended.)

54. An asterisk (*) in the headings below designates mutually exclusive criteria. Provided options under heading are for initial guidance and can be regrouped as necessary. General considerations include: i) a single measure may include different subsidies; each subsidy must be separately assessed; ii) the form of a measure is not necessarily dispositive of its ultimate categorization and classification: A complete review of the measure's design, structure, and operation is needed; iii) it is preferable to err on the side of being overly inclusive; iv) where a single measure can fall into different categories, a determination should be made as to the most appropriate category, and if not possible, both categorizations could be included, with relevant indications to avoid double counting; v) and references/citations should be provided as possible to ensure the work is easily verifiable.

4. **Category of transfer of economic value or (nonfinancial) assets***
   - Direct transfers of funds
     - Grant
     - Grant
     - Loan
     - Equity infusion
     - Joint venture
     - Debt forgiveness
     - Transfer of liability
     - Transfer of shareholding
     - Other
   - **Potential direct transfers of funds or liabilities**
     - Guarantee
     - Insurance
     - Issuance of line of credit
     - Other
   - **Foregoing of government revenue otherwise due**
     - Indicate the type of revenue forgone:
       - Income-related taxes (e.g., on wages, profits, interest, rents, royalties, and other income)
       - Product-related internal taxes (such as sales, excise, turnover, and value-added taxes)
       - Real property taxes
       - Import and export charges (such as tariffs and duties on imports and exports)
       - Social welfare charges
       - Other
     - Indicate the manner in which revenue forgone is forgone
       - Exemption
       - Remission
       - Deferral
       - Other
   - **Provision of goods, services, real property, or other nonfinancial assets:**
     - Provision of goods/services
     - Provision of real property right/intellectual property right
     - Other
   - **Purchase of goods, services, real property, or other nonfinancial assets:**
     - Purchase of goods/services
     - Purchase of real property/intellectual property right
     - Other
   - **Other**

5. **Granting authority (indicate, where possible, the nationality and name of the granting authority)**
   - National governments
   - Subnational authorities
   - Inter-, supra- and transnational institutions
   - Parastatal entities (specify how control is exercised (e.g., through ownership/specific transactions)
   - Private actors/ bodies acting under the instruction of a public authority (specify the public authority)

6. **Recipient and/or beneficiary of transfer**
   - Recipient of economic/asset transfer (specify whether first, second, third, and so forth)
   - Ultimate beneficiary of subsidy (if applicable, indicate how is different from prior recipients)
   - Identify market (if one does not exist, indicate and describe the constructed market)
   - Amount/value of benefit

7. **Selectivity criteria (Indicate basis for selectivity and whether de jure or de facto)***
   - Enterprise
   - Sectoral
   - Territorial
   - Trade-related: export or domestic content contingent

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Appendix C: Subsidy Objectives (Broad Categorization)

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Table C.1. Subsidy Objectives

	Objectives	Scope
1	Sectoral	General sectoral financial support; for the acquisition of capital goods, materials, business operations or not earmarked
2	Industry restructuring	Reorganization, upgrades, technical transformation, and other measures to enhance competitiveness
2.1	Overcapacity reduction	
3	Research and development/ innovation	Financial support for research and development of new technologies and innovations in various fields/sectors
4	Social	Income supplement for struggling firms or individuals; measures of social inclusion/ integration such as leisure and social activities
5	Employment	Measures related to expanding employment options and/or opportunities for individuals
6	Small and medium enterprises and entrepreneurship	Financial support for the creation or growth of small and medium enterprises, seed capital, venture capital, and so forth
7	Capacity building	Training and instructional sessions (or the financing of such programs) geared at increasing the knowledge of businesses, employees, municipalities, and so forth, on topics such as environmental protection, business management, entrepreneurship, industry-related workshops, and so forth
8	Business support/services	The provision of business-related services or the financing thereof; for example, marketing, accounting, management, and taxation
9	Economic/regional development	Measures geared at facilitating the creation or attraction of new businesses, economic diversification, and job creation in a given region
10	Cultural enrichment	Measures aimed at the creation or enjoyment of works in the arts, film, music, and literature industries, among others
11	National traditions/heritage	Financial support to maintain and/or pass on national traditions to a new generation, such as specific hunting/fishing techniques, arts and crafts skills and styles, as well as the maintenance of historical, geographic, natural, or artificial landmarks or monuments
12	Support for ethnic minorities	Support for ethnic minorities through income supplement, business support, capacity building, employment, and so forth
13	Support for people with disabilities	Support for people with disabilities through income supplement, business support, capacity building, employment, and so forth
14	Gender-related support	Support for gender minorities through income supplement, business support, capacity building, employment, and so forth

	Objectives	Scope
15	Environmental preservation	Efforts to preserve certain species or ecosystems, reduce earth/air/water pollution and conserve resources through tax credits or other measures to incentivize the adoption of more environmentally friendly and/or sustainable production, processes, transportation, and so forth—except clean energy
16	Clean energy	Measures aimed at increasing the production or substitution of renewable, more environmentally friendly energy for traditional ones. Note: Hydroelectric power, for the purpose of this classification, though cleaner than the energy produced with fossil fuels, is not listed as clean energy due to the severe environmental disruption it causes.
17	Fuel/energy provision	Measures to encourage the prospecting, exploration, or management of fossil fuel sources and hydroelectric power. This classification also includes measures to offset taxes on or fuel prices (regardless of their source) as well as tax credits and other financial rewards for energy/fuel conservation.
18	Infrastructure	Construction or installation of networks necessary to improve transportation, communication, the provision of certain public services, and so forth
19	Public services	Financial support for government agencies, municipalities and/or private firms performing public services such as sewage treatment and trash collection and disposal, among others (except construction of infrastructure and provision of transportation)
20	Transportation	Financial aid to facilitate the management, modernization, and/or repairs of public transport vehicles, as well as the provision of transportation services for passengers and businesses
21	Disaster/climate change preparedness and response	Financial support for regions/industries that are susceptible to or affected by disasters and other harmful events (whether natural or artificial) that cause capital losses (such as agricultural pests, droughts, wildfires, and meteorological disasters)
22	Public health/safety	Prevention/reduction of accidents and disease; medical services, incentives for a healthier lifestyle
23	Financial markets participation	Subsidy to increase/incentivize initial public offerings (IPOs) and other participation in financial markets
24	International trade	Subsidies to finance or encourage imports/exports
25	FDI	Foreign direct investment
26	Water conservation/treatment	
27	Children/adult education	Grade-school and above education
28	Regulatory compliance, certification acquisition	Financial aid for the payment of governmental or professional certification fees and inspections, for the maintenance or improvement of conditions to maintain or obtain such certifications, or to meet regulatory or industry standards
29	State-owned enterprises	Financial aid to government-owned (or partially owned) firms and farms
30	PPPs	Public-private partnerships

Source: Authors

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Appendix D: Summary Description of Subsidy Values

For slightly over half of collected subsidy programs in the database, subsidy values were reported and entered. While the missing information precludes a robust treatment of this information, a brief description of some patterns is provided here, subject to the data caveat that this information can be missing in important ways both across countries and for certain types of programs within a country.

The largest providers of subsidies across economies are the EU, China, and the United States, with the largest value for the EU in the range of US$250 billion. The fact that these are the largest values in part reflects that these are the largest economies. In fact, there is a positive correlation between (log) GDP and total subsidies, either in absolute value or as percent of GDP. Among the largest subsidy programs are payments to farmers in the United States (of over US$64 billion) and in the EU (under the First Pillar of the EU Common Agricultural Policy with close to US$63 billion). Also substantial is the European Regional Development Fund, with a budget of about US$52 billion. Other large programs are China's Fund for Development of Agriculture (with US$30 billion) and Türkiye's Eximbank Export Credits for the manufacturing industry, with close to US$40 billion.

Table D.1 shows at a high level, which sectors may be the primary beneficiaries by country.

>>>

Table D.1. Primary Sectors Receiving Subsidy Resources by Economy

Country		Sector		Country		Sector
Belgium	→	R&D		Norway	→	Agriculture
France	→	R&D		Mexico	→	Agriculture
Israel	→	R&D		Indonesia	→	Agriculture
Türkiye	→	Manufacturing		Chile	→	Agriculture
India	→	Manufacturing		Argentina	→	Agriculture
European Union	→	Agriculture		Russia	→	Transport equipment
China	→	Agriculture		Canada	→	Renewable energy
United States	→	Agriculture		Netherlands	→	Renewable energy
Japan	→	Agriculture		Italy	→	Multiple sectors
Switzerland	→	Agriculture		United Kingdom	→	Multiple sectors
Brazil	→	Agriculture		Germany	→	Multiple sectors
Korea, Rep.	→	Agriculture		Australia	→	Multiple Sectors

Note: R&D = research and development.

55. Several countries do not reflect subsidy values at all. For the United States, subsidy amounts for subfederal programs are not reported. For China, subsidy expenditures for tax incentives are generally missing.

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Appendix E: Additional Information on Econometric Analysis

This Appendix describes in brief form the basis of the modeling frameworks developed to introduce the role of subsidies, including their assumptions and derived equations for estimation, in the principal estimations.[56]

The model starts from the basic premise that economic agents in each country produce and consume and, across countries, engage in trade. This basic idea leads to some principal equations, following economic theory, for the structures on preferences, technology, and trade interactions.

In this framework, the value of production is assumed to follow a standard Cobb-Douglas function, while consumer preferences are described by a constant elasticity of substitution (CES) utility function, nested within the Cobb-Douglas utility function across sectors. Each consumable consists of a variety differentiated by its place of origin (as in Armington, 1969). Meanwhile, trade is assumed to be subject to iceberg costs. In addition to being increased by trade frictions of this nature, delivered prices can be influenced by policies in the destination markets as well as by subsidies by the country of origin.

The model can be solved in two stages: First, the solution of the upper level determines the aggregate variables in the model—for example, sectoral output and expenditure. Then, the solution to the lower level gives the bilateral trade flows. The solved model arrives at a structural system of subsidies, production, and trade as described in the following system of equations:

$$
\begin{aligned}
X_{ij}^{l} &= \frac{Y_i^l E_j^l}{Y^l}\left(\frac{t_{ij}^l(1+\tau_{ij}^l)(1-z_i^l)(1-(1-\phi_i^l)s_i^l)}{\Pi_i^l P_j^l}\right)^{1-\sigma^l}, \\
\left(\Pi_i^l\right)^{1-\sigma^l} &= \sum_j (1+\tau_{ij}^l)^{\sigma^l}\left(\frac{t_{ij}^l(1-z_i^l)(1-(1-\phi_i^l)s_i^l)}{P_j^l}\right)^{1-\sigma^l}\frac{E_j^l}{Y^l}, \\
\left(P_j^l\right)^{1-\sigma^l} &= \sum_i \left(\frac{t_{ij}^l(1+\tau_{ij}^l)(1-z_i^l)(1-(1-\phi_i^l)s_i^l)}{\Pi_{i,t}^l}\right)^{1-\sigma^l}\frac{Y_i^l}{Y^l}, \\
Y_i^l &= \left(\beta_i^l\right)^{-\frac{1}{\sigma^l}}\left(A_i^l\right)^{\frac{1}{\sigma^l}}\left(L_i^l\right)^{\frac{1-\gamma}{\sigma^l}}\left(K_i^l\right)^{\frac{\gamma}{\sigma^l}}\left(Y^l\right)^{\frac{\sigma^l-1}{\sigma^l}}\left(\Pi_i^l\right)^{-\frac{1}{\sigma^l}}\left(1+\phi_i^l s_i^l\right)^{\frac{1}{\sigma^l}}.
\end{aligned}
$$

In a nutshell, these equations describe the economic equilibrium conditions for exports (X) of industry I from country i to j as in the first equation, which will be a principal objective for the current estimation. The other three equations describe the outward multilateral resistance (Π), consumer prices (P), and the exporter's level of production (Y). Other variables and parameters in this system include expenditures (E), iceberg transport cost (t), ad valorem tariffs (τ), export and production subsidies (z and s, with the possibility that only a fraction φ of the latter influences exports), and the elasticity of substitution σ. Additionally, an equilibrium output includes the CES preference parameter β, as well as A, L, K, and γ corresponding to production technology, labor, capital, and output elasticity with respect to capital, respectively.

56. See Larch, Signoret, Shikher, and Yotov (2021) for more details on the model and estimation robustness checks.

This theoretical model is translated into an empirical framework that allows us to identify the direct impact of subsidies on production and trade. With this framework, the first equation on the determinants of bilateral trade between trading partners *ij* is estimated, with the inclusion of country subsidies in *i*, which are assumed to be applied irrespective of the partner country *j*. Given that the subsidy data are for a single period of time, the econometric model to be estimated is set in a cross-section. The trade function is specified as a gravity equation as follows:

$$X_{ij}^{l} = \exp[\pi_{i}^{l} + \chi_{j}^{l} + GRAV_{ij}\beta^{l} + INTRA_{ii}\gamma^{l} + \alpha_{1}Z_{ij}^{l} + \alpha_{2}S_{ij}^{l}] \times \epsilon_{ij}^{l},$$

where the dependent variable denotes nominal trade flows in industry *l* from source *i* to destination market *j*. The estimation of the gravity equation takes advantage of production data by sector to include internal trade flows (that is, domestic sales) when *i* = *j*. The first two terms in the exponential function refer to exporter-sector and importer-sector fixed effects that control for the structural multilateral resistances as in Anderson and van Wincoop (2003). These fixed effects also aim to control for other exporter-sector and importer-sector unobserved factors. The vector GRAV includes a number of standard gravity variables that proxy for trade cost. These include natural frictions such as distance, as well as policy instruments such as regional trade agreements. Meanwhile, the vector *INTRA* includes additional factors for domestic trade costs, including an indicator variable for home bias.

The last two terms, *Z* and *S*, refer to two possible types of subsidies in the i country—the first one to capture subsidies specifically targeted to export activities (that is, trade subsidies) and the second to capture subsidies that are not specific to trade but which could have, nonetheless, effects on trade flows (production supports). As the vast majority of collected subsidy measures are not specific to exports, the current estimations do not make this distinction, so that only one coefficient is estimated. It should be noted that the effect of subsidies on bilateral trade is measured from the perspective of exports, while it could also be looked at from the import side. In that respect, the average effect of subsidies on exports controls for subsidies in the importing country (via the importer-sector fixed effect) but separating this effect would not be possible with cross-sectional data.

The gravity equation, in log-linearized form, is estimated via a Poisson Pseudo Maximum Likelihood estimator (Santos Silva and Tenreyro, 2006, 2011). This provides for consistent estimates and takes advantage of the information contained in the zero trade flows.

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Table E.1. Estimates of Trade and Subsidies Varying by Country Regions

	(1) Agriculture	(2) Manufacturing
Log (distance)	−0.882 (0.105)**	−0.757 (0.034)**
Contiguous	0.592 (0.123)**	0.336 (0.046)**
Language	0.424 (0.177)*	0.438 (0.075)**
Colony	0.631 (0.271)*	0.463 (0.087)**
RTA	0.385 (0.161)*	0.140 (0.067)*
EU	1.377 (0.273)**	0.178 (0.098)+
Sanctions	−1.730 (0.413)**	−1.815 (0.328)**

Domestic	10.674 (1.625)**	7.799 (0.766)**
Log (GDP per capita)*Domestic	−0.613 (0.159)**	−0.513 (0.075)**
Subsidies AP	0.038 (0.020)+	0.040 (0.013)**
Subsidies EU	0.222 (0.063)**	−0.095 (0.028)**
Subsidies LA	0.267 (0.076)**	−0.490 (0.199)*
Subsidies NA	0.029 (0.007)**	−0.171 (0.045)**
Tariff	−3.460 (1.223)**	−7.805 (0.913)**
Constant	11.331 (0.919)**	13.527 (0.355)**
N	46228	479227
Subsidy AVE AP	5.442 (3.320)	2.503 (0.820)**
Subsidy AVE EU	14.096 (6.725)*	−2.479 (0.817)**
Subsidy AVE LA	3.030 (1.442)*	−2.399 (1.075)*
Subsidy AVE NA	16.284 (7.485)*	−32.959 (8.488)**

Note: Standard errors in parentheses. Contiguous means contiguous borders; language = a common language; colony = a colonial relationship; RTA = membership in regional trade agreements; EU = membership in the EU single market; domestic = domestic sales; GDP per capita allows for this to vary by the level of development of the producing country; tariff = the variable cost of tariff barriers on bilateral trade. AP = Asia-Pacific; AVE = ad valorem equivalent; LA = Latin America; NA = North America. Regressions include exporter and importer fixed effects.
+ $p < 0.10$, * $p < .05$, ** $p < .01$

Appendix F: Effects of Reforming Trade-Distorting Subsidies

The trade effects of subsidies, as estimated by the gravity approach in this study, are further utilized to simulate the economic impact of reforming trade-distorting subsidies.[57] In these simulations the impacts of export subsidies are translated into impacts on sectoral trade, production, and other economic variables (for example, consumption, prices, income, and so forth). The computable general equilibrium (CGE) framework employed is a multiregion, multisector model that quantifies the medium-run effects in a comparative static specification. Economic sectors include those highlighted in the econometric analysis and in particular three agricultural aggregates (referred to as certain plant products, livestock products, and rest of agriculture) and four manufacturing aggregates (rubber/plastic, machinery, other manufacturing, and rest of manufacturing) in addition to other sectors of the economy. Regional aggregates correspond to one North America region, one region for the European Union, two groupings for Latin America and the Caribbean (subsidizing and the rest of Latin America and the Caribbean), a regional aggregate for Sub-Saharan Africa, one region for the Middle East and North Africa (MENA), two regions for Asia and the Pacific (subsidizing and the rest of Asia-Pacific), and a rest of the world.

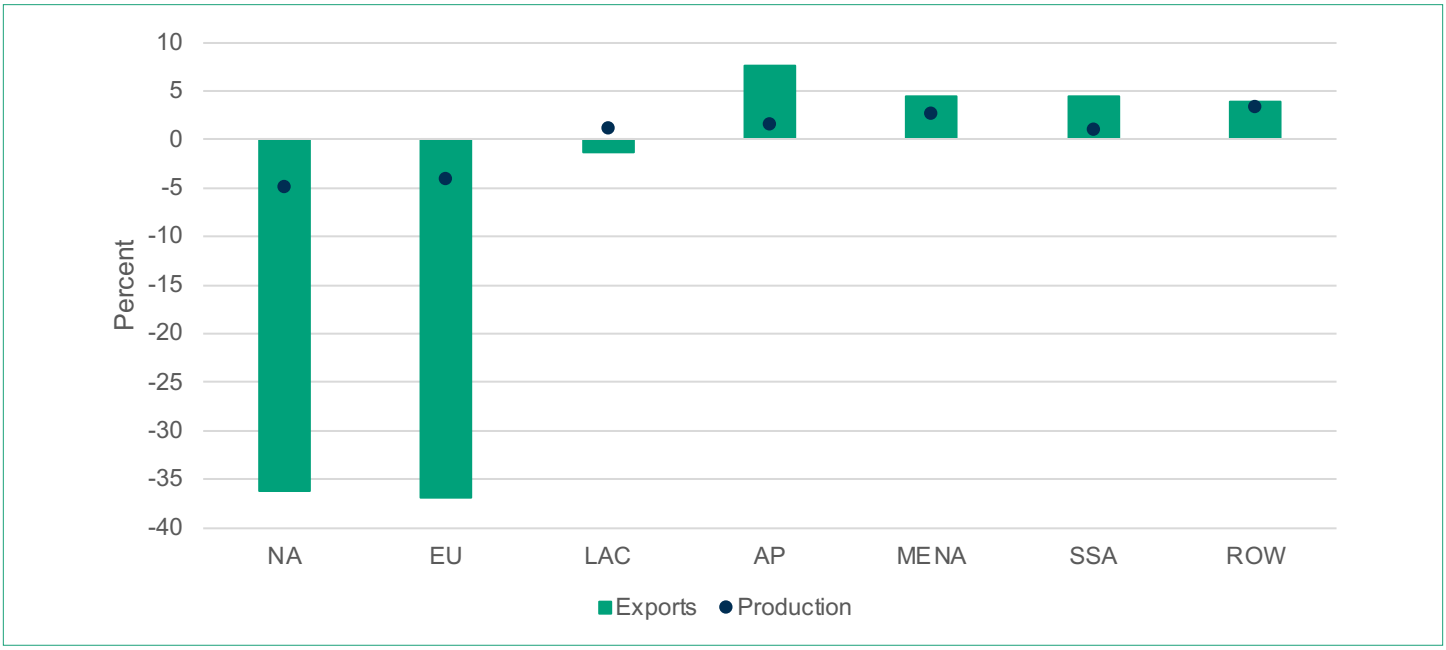
Two hypothetical scenarios are simulated to describe the elimination of all trade-distorting subsidies on agriculture and manufacturing, separately. To focus attention, the own sectoral displacement effects are examined first (for example, how agricultural subsidies affect agricultural trade and production across borders), and additional effects are reported in this appendix. To develop a baseline, an initial equilibrium is solved for the base year 2017 with subsidy information in the Global Trade Analysis Project (GTAP) database updated along the lines of the estimated ad valorem equivalent (AVE) of subsidies. Agricultural subsidies, for example, are introduced in North America and the European Union at AVEs of 15 percent, of 3 percent for Latin America and the Caribbean countries in the subsidy database, and of a nominal 1 percent for all other regions. Subsidies on manufacturing goods are introduced in a similar stylized form, based on the econometric estimates.

The economic simulations show that eliminating the trade distortions of agricultural subsidies would shift agricultural trade flows by reducing exports from North America and the European Union by about 36 and 37 percent, respectively, and in Latin America and the Caribbean by about 1 percent (figure F.1). However, exports from all other regions would be higher. They would increase by about 8 percent in Asia-Pacific and by about 4 percent in MENA, Sub-Saharan Africa, and the rest of the world. These higher exports would amount to about US$27 billion in Asia-Pacific, about US$2 billion in MENA and in Sub-Saharan Africa, and about US$3 billion in the rest of the world. Agricultural production would fall in North America and the European Union (by about 4 percent combined), while it would increase in all other regions by between 1 and 3 percent (by about 2 percent combined), as (more) subsidized agricultural products are substituted by their own products. In this scenario, agricultural output would increase by US$91 billion in Asia-Pacific, US$14 billion in Latin America and the Caribbean, US$12 billion in Middle East and North Africa, and US$7 billion in Sub-Saharan Africa. Agricultural output worldwide, after removing trade-distorting subsidies, would be just slightly lower than without the removal of the subsidies (0.1 percent lower).

57. The general equilibrium effects discussed are based on the Global Trade Analysis Project (GTAP) computable general equilibrium (CGE) model of international trade (Hertel 1997; Corong et al. 2017). A CGE model uses economic statistics and estimated economic parameters to simulate how markets in the global economy might react to trade policies. The model builds on the GTAP database (version 11).

>>>

Figure F.1. Effects on Agriculture of Eliminating Agricultural Subsidie



Source: Original calculations for this publication.
Note: Exports for the EU refer to extra-EU exports. AP = Asia-Pacific; EU = European Union; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; NA = North America; ROW = rest of world; SSA = Sub-Saharan Africa.

The effect of removing trade-distorting subsidies in manufacturing would reduce manufacturing trade beyond Asia-Pacific, where the large subsidy AVEs are (figure F.2). Exports from Asia-Pacific would drop by about 6 percent, while exports from North America and the European Union would also be lower by between 6 and 8 percent. This would correspond to lower manufacturing exports by US$338 billion in Asia-Pacific and by about US$110 billion and US$111 billion in North America and the European Union, respectively. Manufacturing goods from Asia-Pacific fuel manufacturing exports from North America and the European Union, so that in the medium term the reduction of subsidies in Asia-Pacific also translate into lower exports from these regions. Similarly, manufacturing exports from Latin America and the Caribbean would also fall, while more modestly by about US$7 billion (1 percent). Manufacturing production across regions, on the other hand, would not fall except for in Asia-Pacific. In regions such as Latin America and the Caribbean, Middle East and North Africa, and Sub-Saharan Africa manufacturing production would increase to partially cover the lower manufacturing trade. Production would increase by US$15 billion in Sub-Saharan Africa (about 3 percent), US$26 billion in Latin America and the Caribbean (1 percent), and US$29 billion in Middle East and North Africa and in the rest of the world (2 percent).

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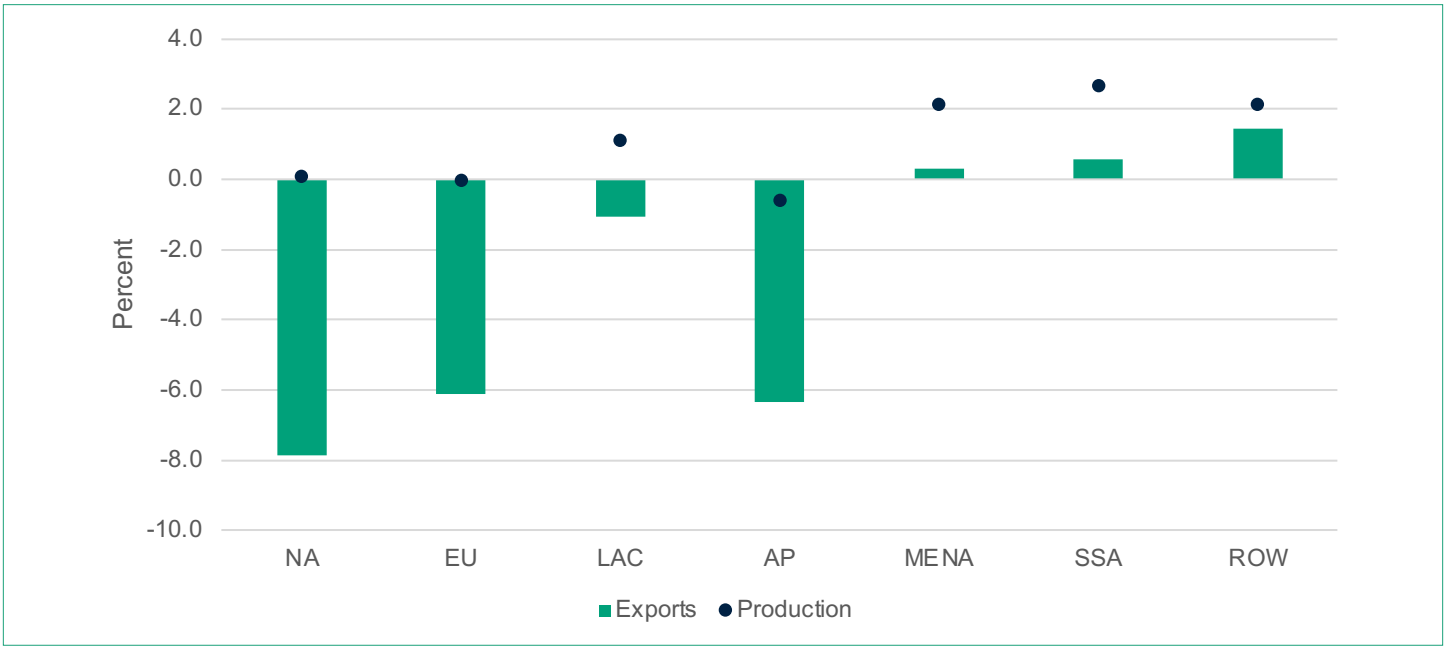
Figure F.2. Effects on Manufacturing of Eliminating Manufacturing Subsidies



Source: Original calculations for this publication.
Note: Exports for the EU refer to extra-EU exports. AP = Asia-Pacific; EU = European Union; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; NA = North America; ROW = rest of world; SSA = Sub-Saharan Africa.

In both simulated scenarios global production and trade deviate from their otherwise optimal levels. These distortions expand production of subsidized goods at the expense of other goods and services in the economy, creating misallocations or allocative inefficiencies. These inefficient quantities generate deadweight losses to the global economy. From the model, one could calculate those allocative efficiency effects that reflect the removal of the export subsidies, thus ignoring the effect of all other existing distortions which may remain in place (that is, as if there were no other distortions). These effects are in general positive for all regions and would sum to an annual waste of about US$65 billion, with the majority (US$52 billion) related to manufacturing subsidies.

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