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The Global Landscape of Agricultural Trade, 1995-2014

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Abstract

Global agricultural trade, about $1 trillion in 2014, has been rising about 3.6 percent per year for the last two decades, facilitated by technological change and productivity gains, as well as trade liberalization. In addition, trade patterns have shifted and trade policy has evolved. The largest importers and exporters of agricultural products are largely unchanged over the last 20 years, but five countries—Brazil, Russia, India, Indonesia, and China—account for much of the increase in trade. The landscape of policies affecting trade is increasingly complex, and agricultural trade is facing obstacles that may restrict future growth. Despite trade rules such as in the World Trade Organization, countries impose trade barriers. High tariffs are permitted for many products in many countries. Rising domestic support in some countries could undermine a level playing field for agricultural trade. Moreover, sanitary and phytosanitary barriers and other technical barriers to trade are growing, with disagreements about the scientific basis for rejecting products becoming particularly contentious. This report surveys 20 years (1995-2014) of trends in world agricultural trade (1995-2016 for some measures of U.S. agricultural trade) and summarizes key policy issues that will confront decision makers and shape agricultural trade in the coming years.

Keywords: agriculture, trade, WTO, preferential trade agreements, BRIICs, tariffs, import interventions, export restrictions, domestic support, farm subsidies, export competition, nontariff measures, SPS measures, TBT measures.

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What Is the Issue?

The Uruguay Round Agreement on Agriculture (URAA) of 1994 imposed new disciplines on market access barriers, domestic support, and export subsidies, and set up rules for nontariff measures as well. In the two decades since the URAA, government interventions in agricultural trade have evolved, agricultural trade has expanded, and BRIIC countries (Brazil, Russia, India, Indonesia, and China) and other emerging economies have become significant agricultural traders. Although clear progress has been made in many areas—e.g., tariff reductions and elimination of export subsidies—there is room for further disciplines on tariffs, nontariff measures, and domestic policy. This report explores the evolution of agricultural trade patterns since the URAA (from 1995 to 2014) and examines the array of government interventions currently affecting agricultural trade.

What Did the Study Find?

Global agricultural trade volume increased steadily and quickly, averaging over 3.5 percent per year. Growth occurred across all major categories, with trade in oilseeds/oilseed products growing fastest; however, growth in trade across countries and regions was uneven. Agricultural exports by the five BRIIC countries grew much faster than the global average. Agricultural imports of emerging economies grew quickly, dominated by growth in China's imports; while Europe's agricultural imports grew much more slowly.

Across the largest economies and trading countries, applied agricultural import tariffs averaged 15-22 percent and bound tariffs (maximum tariff rates established in the World Trade Organization (WTO)) 46 percent. A country's tariffs tend to be higher for imports that compete with domestic products, and additional duties can be applied for limited periods and in certain circumstances. Tariffs at these levels can significantly restrict agricultural trade. ***Regional and bilateral trade agreements*** give preferential tariff treatment to certain agricultural products traded among the members of these agreements. Trade volumes can be limited by government administration of ***tariff-rate quotas (TRQs)***, government licensing of the right to import, and special privileges given to ***state-trading enterprises*** active in agricultural markets. While export subsidies are scheduled to be eliminated in a series of steps beginning in 2017, export restrictions—such as taxes and licensing—have proliferated.

Domestic farm support has evolved since the URAA due to income growth, commodity price changes, political factors, and WTO commitments. Some developed economies initially moved to a system of direct, decoupled payments, more recently emphasizing countercyclical support for producers, which is more substantive when yields or returns are low. The amount of agricultural support has remained about the same (or fallen) since the URAA for developed countries. Major emerging economies, however, have increased the support they provide to farmers, sometimes using methods like price support or input subsidies that are more likely to distort trade. In some of these countries, the recent emphasis on support for agriculture is a sharp departure from earlier policies that implicitly taxed agriculture.

Changing trade patterns have exposed other domestic policies that act as barriers to agricultural trade. Although often essential to protecting the health and safety of consumers and the value of the agricultural sector, nontariff measures like sanitary/phytosanitary standards have been used to protect favored producers from competition. The number and stringency of regulations and standards affecting agricultural trade have increased dramatically since the Uruguay Round. Whether they are mandatory government policies or requirements of private firms, these sanitary measures often dictate market access more than tariffs and other traditional trade policies.

How Was the Study Conducted?

The 2001 ERS report *The Road Ahead: Agricultural Policy Reform in the WTO* provided an impetus and guide for the current study. To understand the evolution and current status of world agricultural trade, a database of total agricultural imports and exports for each of 180 countries was constructed. Primary data sources include the World Bank and the Food and Agriculture Organization of the United Nations. To examine the trends and key issues in policies affecting trade, the study uses a broad range of data and indicators from numerous sources. Tariff data were gathered from the WTO and other country sources. U.S. trade data came from the USDA. Domestic support data came from the WTO and the Organisation for Economic Co-operation and Development. This report also uses the results of papers commissioned by the International Agricultural Trade Research Consortium and relies heavily on material published by the WTO—including articles on its website, trade policy reviews, notifications made by members, and the annual *World Trade Reports*.

Introduction

Agricultural trade encompasses a diverse and changing array of products originating in animal or crop agriculture. The resource base required to efficiently produce this great variety of food and fiber products is not distributed evenly around the globe, nor does it correspond to the locations where demand is greatest. This creates significant welfare gains from trade. While natural growing advantages largely determine agricultural trade patterns, a wide array of government policies influence the extent to which producers compete on a level playing field for access to foreign markets.

Technological change in production, communication, transportation, and logistics management—along with trade and investment liberalization—has facilitated a dramatic increase in trade over the past 20 years. Rising incomes and productivity growth in countries that are not traditional agricultural importers and exporters have boosted demand for (and supply of) food and agricultural products. Brazil, Russia, India, Indonesia, and China—henceforth the BRIICs—have exhibited growth in agricultural trade that has outpaced world growth generally.

Because of their large populations and generally rapid income growth, the BRIICs are poised to remain among the world's largest agricultural importers. Likewise, the five countries' large share of the world's arable land, vast labor forces, and rising productivity suggest they will be increasingly important agricultural exporters. The BRIICs' growing value as agricultural markets and competitiveness in agricultural trade makes familiarity with their trade policies essential.

Although the increasing participation of newly emergent trade giants implies for long-dominant agricultural traders a diminishing trade share, those countries still maintain a large presence in international agricultural trade. The European Union and the United States, the largest traders in 1995, remain the largest traders.

The multilateral framework of agricultural trade rules established by the Uruguay Round Agreement on Agriculture (URAA) in 1995 with the founding of the World Trade Organization (WTO) remains the point of departure for most agricultural trade analyses. Trade policies have evolved in response to these and other commitments under the WTO and other trade agreements, as well as to broader changes in technology and the global economy. However, high tariffs, product-specific tariffs, and tariff-rate quotas (TRQs) continue to protect many products, particularly those that are politically sensitive or deemed crucial to domestic welfare.

Domestic farm support has become so pervasive or entrenched in some countries that critics question whether WTO disciplines have been compromised. Several emerging economies, including the BRIICs, have greatly increased domestic support to farmers, sometimes tipping the agricultural sector from net taxation to net subsidization and thereby distorting trade (Anderson, 2010; Krueger et al., 1988).

These changes to trade policy and support levels require a reassessment of the impact of domestic support on world agricultural trade. A quantitative assessment is complex because many countries have failed to fully notify the WTO of their domestic support policies, as stipulated under the URAA. Furthermore, farm policy reforms in many countries include policies that fall outside the formula-based commitments used in previous WTO negotiations.

The landscape of agricultural trade policy is further complicated by other critical policy issues that affect agricultural trade but do not adhere to the URAA framework or its metrics. For example, domestic animal/plant health and food safety regulations, while essential to maintaining a safe food supply, increasingly manifest as nontariff measures (NTMs) affecting trade. Technical standards, mandated by governments as well as private firms, can help consumers identify the product characteristics they desire and help firms ensure quality along the supply chain via tracking and labeling. However, product standards and phytosanitary regulations have been used as barriers to market access and can limit the choices of consumers and firms. And technical requirements, if complex or costly, can disqualify some potential suppliers along the supply chain.

Access to global supply chains is de facto market access for an increasing number of products. The same factors that have contributed to the overall rise in trade have also facilitated the fragmentation of production across countries and the growth of global value chains (GVCs). As in manufacturing and services, final products in food and agriculture are increasingly comprised of inputs sourced around the globe (Greenville et al., 2017, Baldwin and Lopez-Gonzalez 2015). Greenville and colleagues (2017) find that the same trade and domestic policies that tend to distort and restrict international agricultural trade also reduce the likelihood of a country's producers participating in a GVC.

Trade reform over the past 20 years has not adhered to the negotiated multilateral process envisioned under the Uruguay and Doha Rounds (2001). Still, trade liberalization has occurred. Accession agreements for new WTO members, including Russia and China, expanded access to valuable markets and committed more countries to WTO rules. WTO members agreed to completely eliminate the use of export subsidies at the 10th WTO Ministerial Meeting in 2015. And under the Trade Facilitation Agreement (TFA), in effect as of early 2017, countries agreed to implement a set of best practices to facilitate products crossing borders.

Trade liberalization has also occurred on a preferential basis. Since 1995, 242 new preferential trade agreements (PTAs) have been notified to the WTO. Agricultural trade within the largest regional agreements—the European Union and the NAFTA—has expanded significantly. However, the preferential trading alliances and concessions that arise from these agreements further complicate the landscape of trade policy.

Background on the Multilateral Framework of Agricultural Trade Rules

Global trade in agricultural products was partially liberalized over 1995-2004 by reciprocal disciplines on trade policy and domestic policies affecting trade, negotiated under the Uruguay Round of multilateral trade negotiations under the General Agreement on Tariffs and Trade (GATT). The Uruguay Round produced several agreements pertinent to agricultural trade and established the WTO to oversee compliance. Under the URAA, countries agreed to reduce government interventions affecting international trade through disciplines on domestic farm support, export competition, and barriers to market access, known collectively as the "three pillars" (Burfisher et al., 2001).

The URAA allowed most countries to avoid sharp reductions in support to farmers while providing new but limited access to their markets. Countries were able to maintain substantial import barriers for products that had historically been highly protected such as rice, sugar, and dairy products. Nevertheless, the Uruguay Round agreements are a first step toward liberalizing agricultural trade by establishing a set of consensus rules that increase transparency and discipline future policy

(Hathaway and Ingco, 1996). The URAA and its accompanying schedules were fully implemented by 2004. Additional agricultural trade liberalization continued after 1995 through the WTO accession process, which brought China, Russia, and other significant traders into the organization. Today, the vast bulk of global agricultural trade takes place among WTO members.

The WTO has continued to facilitate openness in the international trading system and serve as a negotiating platform for multilateral trade agreements. New agricultural negotiations were launched in 2000, as mandated in the URAA. One year later, the agricultural negotiations were folded into a new comprehensive set of negotiations, the Doha Round, which encompassed 20 subject areas, including agriculture. Among the Doha Round's goals was to define a set of trade rules that would facilitate developing countries' access to trade as a platform for economic development (WTO, 2016i).

Compared to the Uruguay Round, the dynamic of WTO negotiations has changed significantly. Several developing countries, including some of the BRIICs, have taken a more high-profile role, although many have been unwilling to make more than marginal commitments themselves in agriculture.[1] Many of these countries were disappointed with the outcome of the Uruguay Round and have insisted that a new agreement include special and differential treatment (S&DT) aimed at enhancing gains for developing countries (Matthews, 2013). At the same time, critics of the Uruguay Round pointed to the weak disciplines on developing countries' policies and the increased importance of those countries as potential agricultural markets. However, the fundamental nature of S&DT is contentious, with some countries looking unfavorably on exceptions from negotiated reforms. Some exceptions, it is feared, would be on products in which benefactor countries are least competitive, substantially reducing gains from trade through new market access for more seasoned producers and lessening welfare gains to consumers (Martin and Anderson, 2006).

Doha Round negotiations have thus far failed to deliver a wide-ranging, multilateral liberalization that would compare in scope to the Uruguay Round agreements. The initial timetable for the Doha Round negotiations anticipated an end date of 2005. Several interim deadlines have also long since passed. However, progress has occurred even without a comprehensive Doha Round agreement. The Bali Ministerial (in 2013) devised the Trade Facilitation Agreement (TFA), a multilateral framework under which countries agree to take specific steps to reduce transport costs across borders. The TFA came into effect in early 2017.

At the Bali Ministerial, WTO members also agreed on new rules to encourage tariff-rate quotas (TRQs)—instruments that offer lower tariffs on a limited amount of imports—to be fully utilized. In another example of Doha progress, the Ministerial Decision at the Nairobi Ministerial Meeting (2015) eliminated export subsidies and addressed public stockholding for food security and a special safeguard for developing countries (WTO, 2016k). Despite this progress toward multilateral reform, the ministerial meeting in Nairobi failed to reaffirm the Doha negotiating mandate for the first time since it was declared. Thus, further liberalization through negotiated reforms to trade rules under WTO auspices is uncertain.

[1]In the Uruguay Round, countries were allowed to designate themselves as developing. Additional provisions applied to the countries designated as least-developed countries (LDCs) by the United Nations (UN).

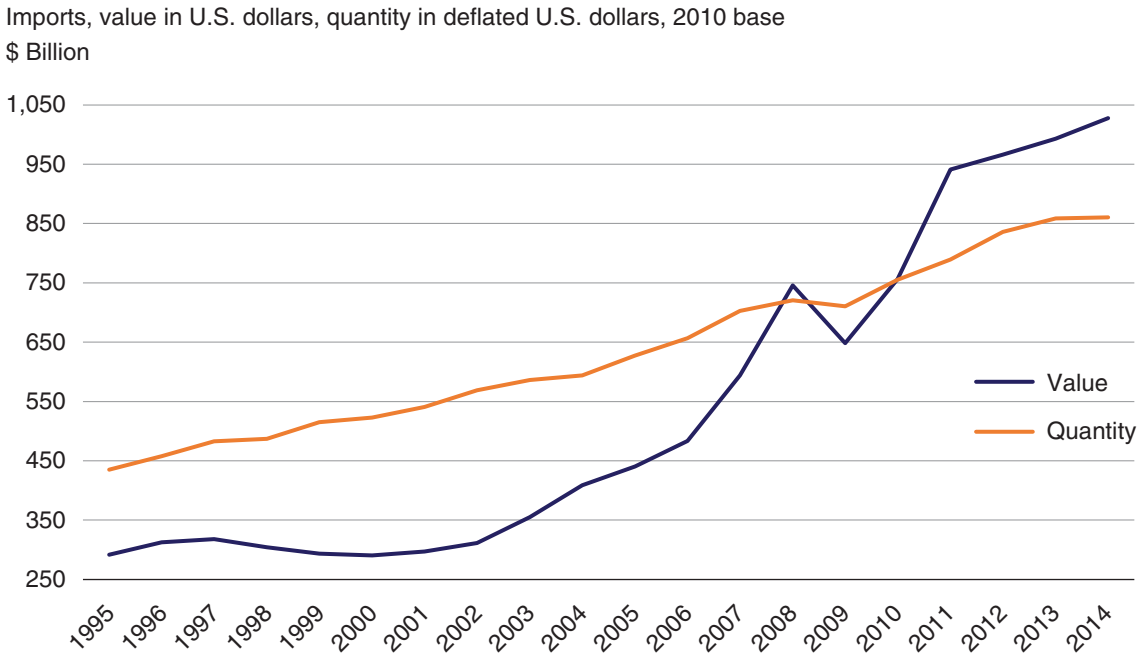
The Evolution of Agricultural Trade Since 1995

The value of agricultural goods traded has more than tripled since 1995 and the estimated inflation-adjusted value has roughly doubled (fig. 1) (see box, "Measuring Agricultural Trade Flows"). Trade has grown partly to accommodate an increase of over 25 percent in the global population and a 75-percent hike in global real gross domestic product (GDP). Falling trade barriers as well as advances in transportation, information, and communication technology have facilitated this growth.

The long, steady rise in world agricultural trade since 1995 was disrupted in 2007-09 by volatility in agricultural and other global markets. However, trade quickly recovered, exceeding 2008 levels by 2010 and returning to annual growth rates above 5 percent the next 2 years. Agricultural trade, as with total merchandise trade, once again slowed during 2012-14 as aggregate demand weakened amid the economic crises in many high-income countries. Trade growth is expected to resume once these economies recover. However, the responsiveness of trade to GDP growth has been significantly weaker in recent years compared with 1986-2000, when this relationship was robust by historical standards. This weakening association has been primarily attributed to the maturing of global value chains, particularly in the United States and China, but increased protectionism may also be a factor (Constantinescu et al., 2015).

U.S. agricultural trade has grown along with global trade. The real dollar value of U.S. agricultural exports grew at an average annual rate of 1.4 percent over the last two decades, from an average of $85 billion during 1995-99 to $105 billion during 2011-15. Over the same period, the United States imported a wide variety of consumer-oriented agricultural products. Import growth outpaced exports, rising at an average annual rate of 4.3 percent from a real value of $51 billion in 1995-99 to $96 billion in 2011-15.

Figure 1
Quantity and value of global agricultural trade, 1995-2014



Note: Quantity is value deflated using the Food and Agriculture Organization (2017) agricultural import unit-price indices.
Source: Authors' calculations using data from United Nations, 2016.

Box 1

Measuring Agricultural Trade Flows

This report uses the WTO definition of agricultural trade when using trade data from the WTO and UN agencies, and the USDA definition when using U.S. trade data. These two definitions largely overlap. The chief difference is that the WTO definition includes manufactured tobacco, ethanol, and distilled spirits, whereas the USDA definition does not include them (see Appendix 1). Import and export data for all countries for 1995-2014 are from the United Nations Comtrade Database, accessed through the World Integrated Trade Solution (WITS) of the World Bank. Where data were not reported, partner-country trade data were used. Thus, missing import data for a country were extrapolated using the value of all other countries' *exports to* that country, and missing export data were filled in using the value of all other countries' *imports from* that country. Data were collected for 180 countries. The EU was treated as one country, using EU-28 extra-trade data as provided directly in WITS from 2000 to 2014, and constructing extra-trade data for earlier years for the EU-28 country set.

Most analysis in this report is based on the value of agricultural trade measured in U.S. dollars. However, agricultural prices fluctuate widely, and general inflation is the norm. When examining the evolution of trade (as in figures 1 and 9), it is useful to know how underlying physical quantities of agricultural imports and exports have changed. We estimate agricultural import quantity by deflating the dollar value with the country-specific import unit/value indices for agricultural products published by the UN Food and Agriculture Organization (FAO). Where the FAO indices are not available, we deflate import values using the country's consumer price index (CPI) (IFS, 2016). To estimate U.S. agricultural export quantity in 2014 and 2015 (figure 9), we extend the FAO agricultural products export index for the United States using the growth rate in the agriculture/forestry/fishing/hunting import price index, computed by the U.S. Bureau of Labor Statistics (BLS).

Regional Evolution of Trade Patterns

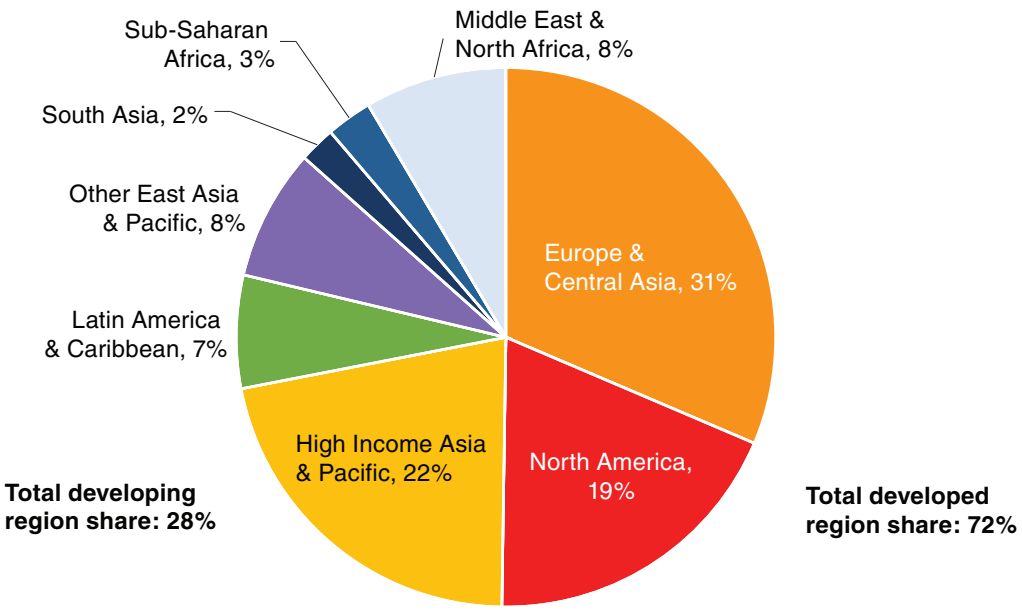
Developing countries are participating more in global agricultural trade—particularly imports—over the past 20 years. The share of import value accounted for by developing countries in the world's regions rose from 28 percent in 1995-99 to 42 percent in 2010-14 (fig. 2).[2] Their share of agricultural exports rose from 37 percent to 46 percent over the same period (fig. 3).

[2]The regions defined in figures 2-3 primarily reflect geography. They do not divide the world neatly by income group. Nevertheless, some regions are composed primarily of countries classified as low- and middle-income economies by the World Bank, referred to here as developing countries. Other regions are dominated by countries classified as high-income economies by the World Bank, referred to here as developed countries. Regions dominated by developing countries, are Latin America and the Caribbean, China, Southeast Asia, South Asia, Sub-Saharan Africa, and Middle East/North Africa. Developed regions are Europe/Central Asia, High-Income Asia/Pacific, and North America. (The North America region includes Mexico, which is typically classified as a developing country.) The High-Income Asia/Pacific region includes countries that are members of the Organisation for Economic Co-operation and Development (OECD) or classified as high income by the World Bank: Australia, Hong Kong, Japan, South Korea, Macao, New Zealand, Singapore, and Taiwan.

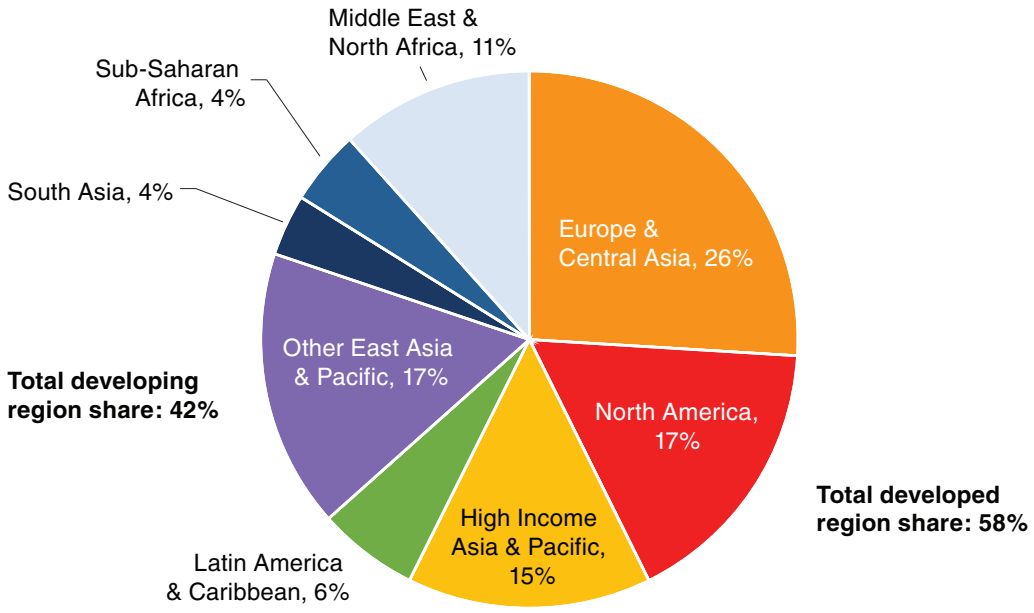
Figure 2

Average share of global agricultural import value, 1995-99 and 2010-14

Average 1995-99



Average 2010-14



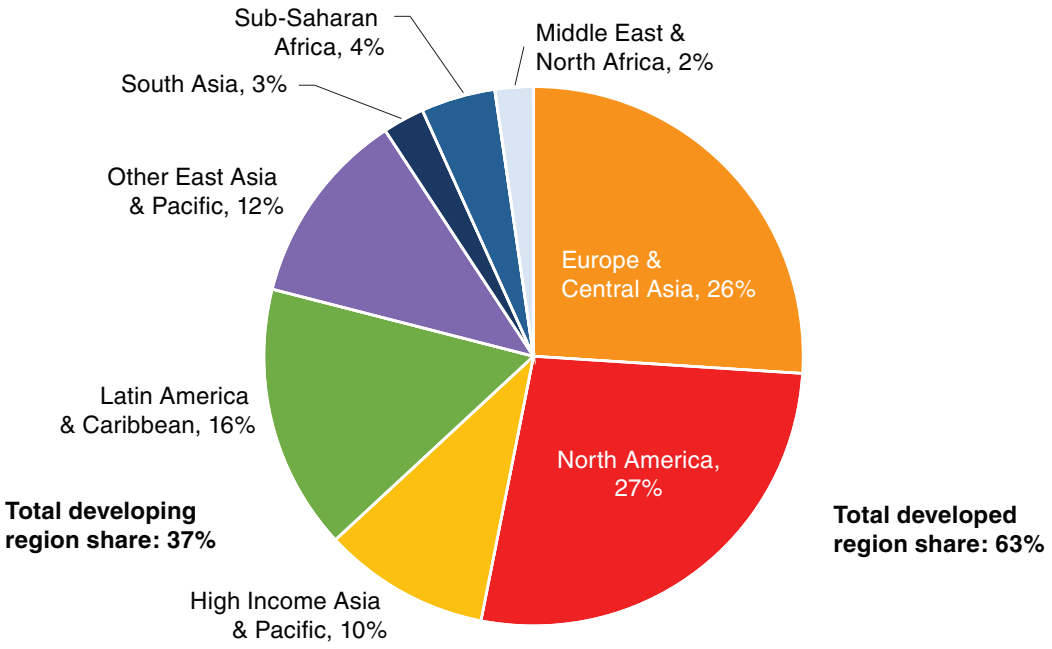
Note: Shares are based on the nominal value of agricultural trade.

Source: USDA, Economic Research Service. Authors' calculations using data from United Nations, 2016.

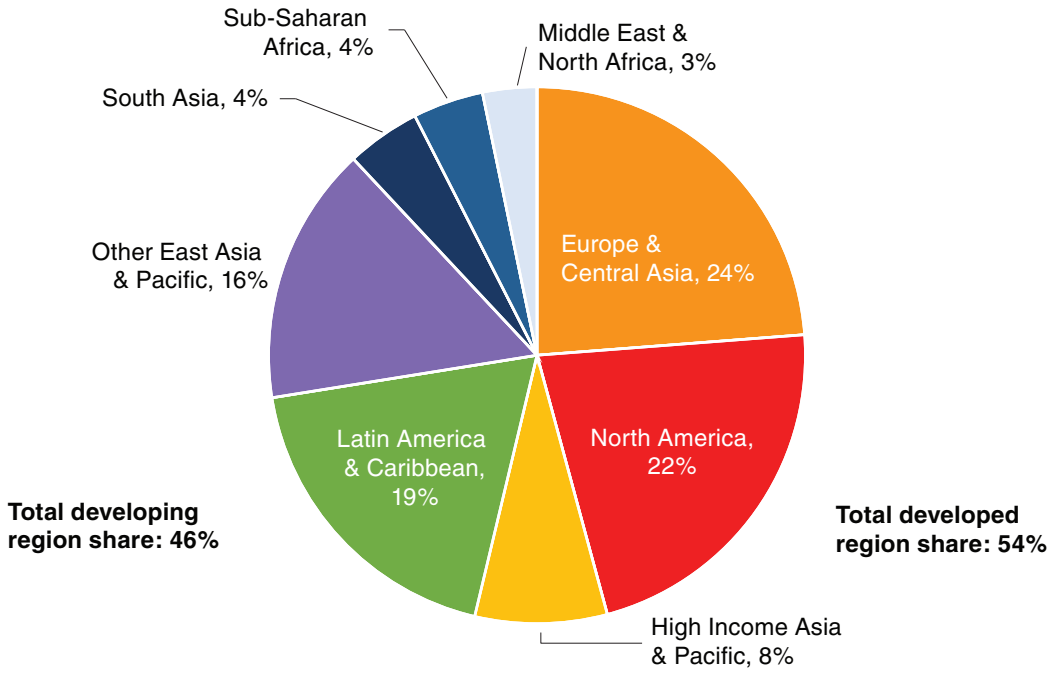
Figure 3

Average share of global agricultural export value, 1995-99 and 2010-14

Average 1995-99



Average 2010-14



Note: Shares are based on the nominal value of agricultural trade.

Source: USDA, Economic Research Service. Authors' calculations using data from United Nations, 2016.

Despite this shift in agricultural import/export share, the top five agricultural importers and exporters, by value, in 2012-14 remain nearly the same as in 1995, with China (including Hong Kong) surpassing Japan as the world's second leading agricultural importer (tables 1 and 2). Nevertheless, the sources and destinations of agricultural trade have become more diversified over the past 20 years. The top five countries accounted for 63 percent of total agricultural imports in 1995, but 48 percent, on average, in 2012-14. The share of the top five exporters fell from 85 percent in 1995 to 75 percent in 2012-14.[3]

The top 20 importers have also changed significantly. Vietnam, India, and the United Arab Emirates (UAE) became much more substantial importers over the last two decades, with Saudi Arabia and Iran also moving up. Although Sub-Saharan Africa's share of global agricultural imports increased, even the region's largest economies—such as South Africa and Nigeria—do not rank among the top 20 importing countries.

Table 1
Top 20 agricultural importers during 2012-14 and their rank in 1995

			Import value, $ billion (U.S.)	
Rank	Country	Rank in 1995	2012-14	1995
1	European Union	1	133.9	69.13
2	China/Hong Kong	4	132.1	20.05
3	United States	3	110.6	33.63
4	Japan	2	57.9	38.77
5	Russia	5	38.8	10.23
6	Canada	7	34.4	9.06
7	Mexico	10	26.1	5.21
8	Korea	6	24.7	9.19
9	Saudi Arabia	13	20	4.31
10	India	20	19.7	2.06
11	Indonesia	11	18.2	4.62
12	Malaysia	14	16	3.67
13	United Arab Emirates	23	13.8	1.87
14	Egypt	16	13.6	3.34
15	Turkey	15	13.3	3.48
16	Iran	21	13.1	2.06
17	Switzerland	9	12.2	5.58
18	Singapore	12	12.1	4.57
19	Australia	19	11.9	2.63
20	Vietnam	37	11.9	0.54

Note: Dollar values are not adjusted to account for inflation.
Source: USDA, Economic Research Service. Authors' calculations using data from United Nations, 2016.

[3]Trade among the countries with above-average growth of imports and/or exports was often with other countries that gained trade share (so-called South-South trade).

The composition of the top 20 agricultural exporters has changed less (table 2). As in 1995, agricultural exporters ranked 6th to 20th are primarily from South America, Southeast Asia, and Oceania.

The BRIICs – Increasingly Important in Agricultural Trade

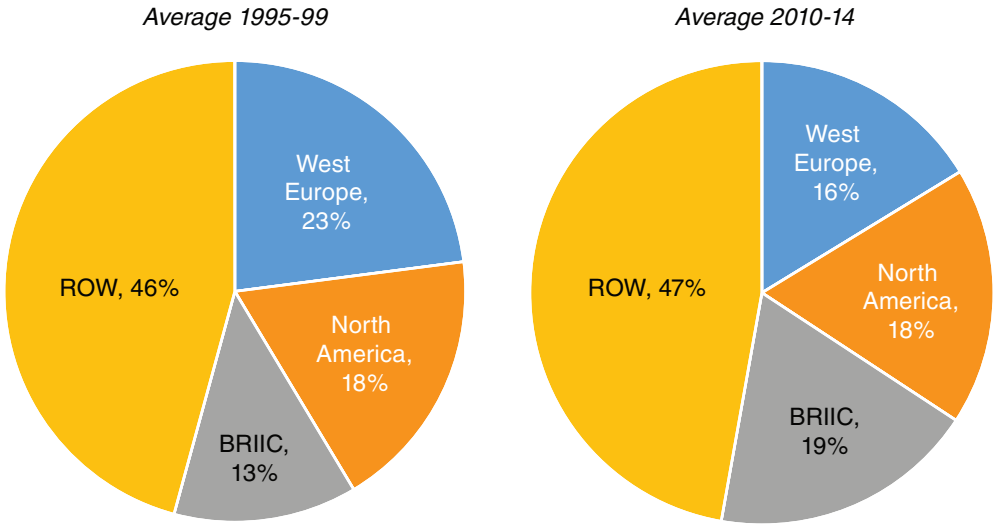
Much of the recent increase in global agricultural trade occurred in Brazil, Russia, India, Indonesia, and China (BRIICs). Their share of nominal agricultural import value rose from 13 percent in 1995-99 to 19 percent in 2011-14 (fig. 4), and their share of export value rose from 14 to 23 percent (fig. 5).

Table 2
Top 20 agricultural exporters during 2012-14 and their rank in 1995

			Export value, $ billion (U.S.)	
Rank	Country	Rank in 1995	2012-14	1995
1	European Union	1	149.1	59.2
2	United States	2	148.1	57
3	Brazil	3	83.8	13.2
4	China	6	46.8	10.6
5	Canada	5	45.5	12.9
6	Argentina	7	39.5	10.2
7	India	12	39.4	5.3
8	Australia	4	36.8	13
9	Indonesia	14	30.4	3.6
10	Malaysia	9	26.5	6.8
11	Thailand	8	25.4	6.9
12	New Zealand	10	23.3	6.7
13	Mexico	11	22.8	5.8
14	Ukraine	31	16.9	0.7
15	Turkey	13	16	4.1
16	Vietnam	26	14	1.4
17	Russia	21	13.9	1.8
18	Chile	19	11.3	2.2
19	South Africa	18	9.2	2.3
20	Switzerland	17	8.8	2.3

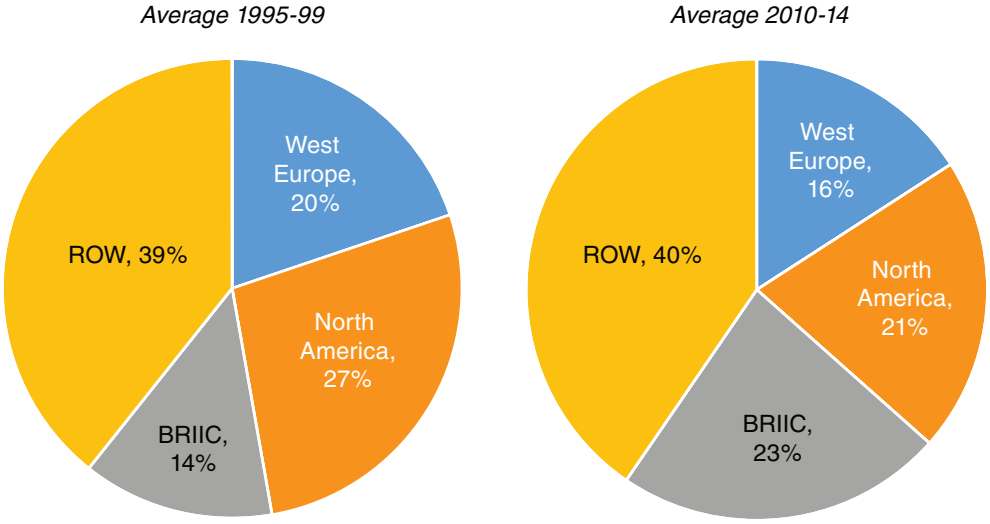
Note: Dollar values are not adjusted to account for inflation.
Source: USDA, Economic Research Service. Authors' calculations using data from United Nations, 2016.

Figure 4
Average share of global agricultural import value by region, 1995-99 and 2010-14



Note: Shares are based on the nominal value of agricultural trade.
Source: Authors' calculations using data from United Nations, 2016.

Figure 5
Average share of global agricultural export value by region, 1995-99 and 2010-14



Note: Shares are based on the nominal value of agricultural trade.
Source: USDA, Economic Research Service. Authors' calculations using data from United Nations, 2016.

Import and export growth was not uniformly distributed across the BRIIC countries (table 3). China's share of global agricultural imports rose from under 3 percent in 1995-99 to 10 percent by 2010-14. India's import share almost doubled during this period. On the export side, Brazil led the expansion of BRIIC trade with a global export share that rose from 5 to 8.5 percent. Russia and Indonesia also more than doubled their global market share of exports.

Increased participation in global agricultural trade by the BRIICs and other developing countries reflects fundamental trends in their economies. Rising household incomes have prompted increased food expenditures. If government policies do not constrain imports, food imports are likely to grow as income levels rise. Although the share of additional income spent on food tends to decline with higher incomes, food spending still increases as incomes rise, benefiting both domestic food producers and food-related importers. Since the marginal propensity to spend extra income on food is greater in lower income countries, income growth in those countries may promote food imports more than in higher income countries (Muhammad et al., 2011).

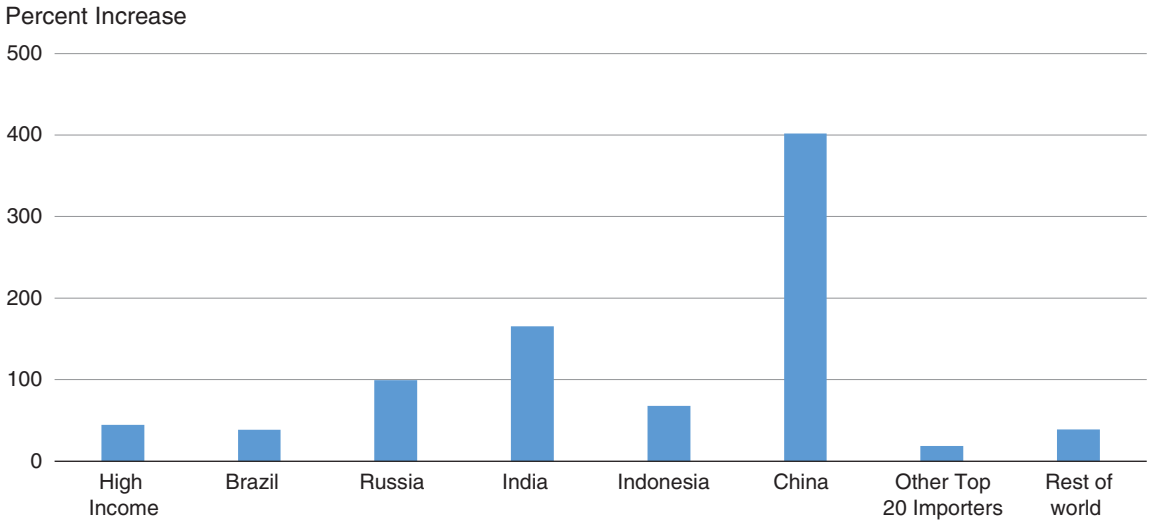
Real GDP growth per person in all BRIIC countries but Brazil[4] was historically high over 1995-2014, comfortably exceeding that of high-income countries, other top-20 importers, and the rest of the world (fig. 6). China's per capita GDP increased more than 400 percent from 1995 to 2014. Projections suggest continued economic growth in China, India, and Indonesia will continue to spur consumption growth. The five BRIIC countries represent nearly half of the world's total population: China and India alone are home to nearly 40 percent (World Bank, 2016). USDA projects that the BRIIC share of the global economy will reach 27 percent by 2025, exceeding that of both Europe and North America (USDA/ERS, 2016c).

Table 3
BRIIC share of agricultural imports and exports value (percent)

	Imports		Exports	
	1995-99	2010-14	1995-99	2010-14
Brazil	2.0	1.1	5.1	8.5
Russia	3.3	3.9	0.5	1.2
India	1.0	1.9	1.9	3.6
Indonesia	1.5	1.8	1.5	3.1
China	2.8	10.0	3.8	4.7

Note: BRIIC = Brazil, Russia, India, Indonesia, and China. Shares are based on the nominal value of agricultural trade.
Source: USDA, Economic Research Service. Authors' calculations using data from United Nations, 2016.

Figure 6
Growth in average real GDP per capita, 1995-2014



Source: USDA, Economic Research Service. Authors' calculations using data from United Nations, 2016.

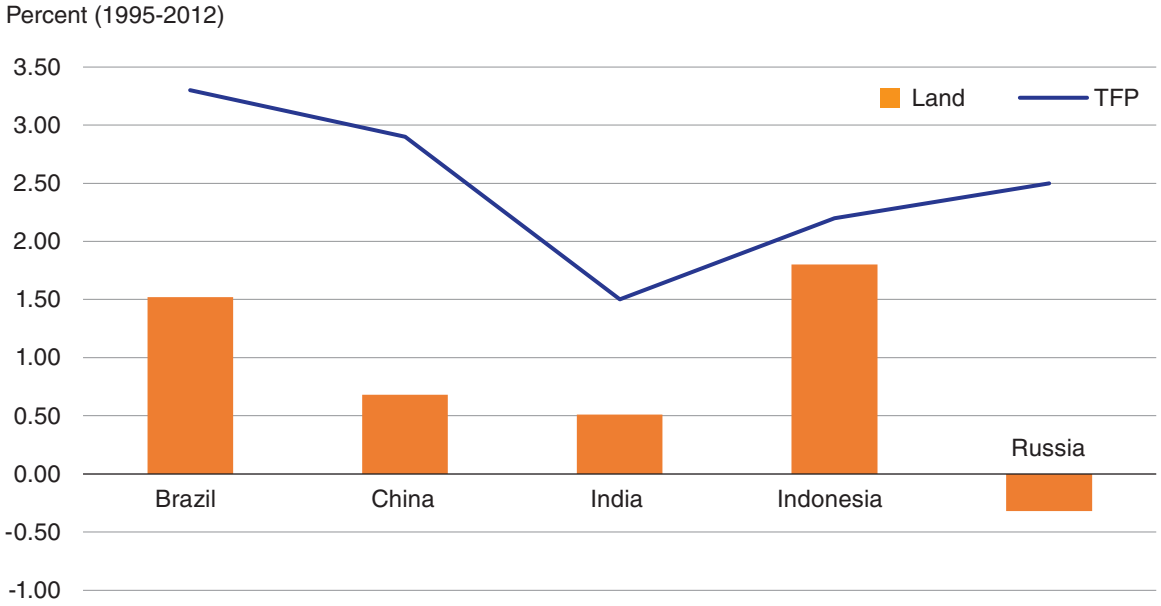
[4]Brazil was also the only BRIIC country whose share of global agricultural imports declined (table 3).

Strong income growth in the BRIICs and other large importers has enabled many households to escape poverty. In the mid-1990s, roughly 40 percent of the populations of China, Vietnam, and Indonesia lived in poverty. By the mid-2010s, the poverty rate was less than 10 percent in each country, and less than 2 percent in China.[5] Because of income growth in these countries alone, over half a billion fewer people—nearly 10 percent of the world's population—live in poverty (World Bank, 2017a).

Both the amount of food consumed and its content change when income grows. Diets in low-income countries tend to revolve around staples such as rice and wheat, whereas wealthier countries consume more expensive vegetable oils, meat, dairy, fruits, nuts, and prepared foods (Muhammad et al., 2011). According to USDA long-term projections, developing countries will drive growth in food demand and trade as incomes continue to rise, promoting international trade in such foods. The increased consumption of animal products requires more use of feeds and, potentially, increased trade in feedstuffs. Trade in oilseeds, the source of both oilseed meals and vegetable oil, is also projected to grow (World Agricultural Outlook Board, 2016).

Increased agricultural supply underlies the increased ***export*** share of the BRIIC countries. From 1995 to 2012, BRIIC countries achieved annual total factor productivity (TFP) growth in agricultural products above the global average of 1.52 percent. Brazil, China, and Indonesia showed especially strong growth, with Brazilian TFP growth topping 3 percent (fig. 7). TFP growth in agriculture exceeded 2 percent in Latin America/Caribbean and Asia.

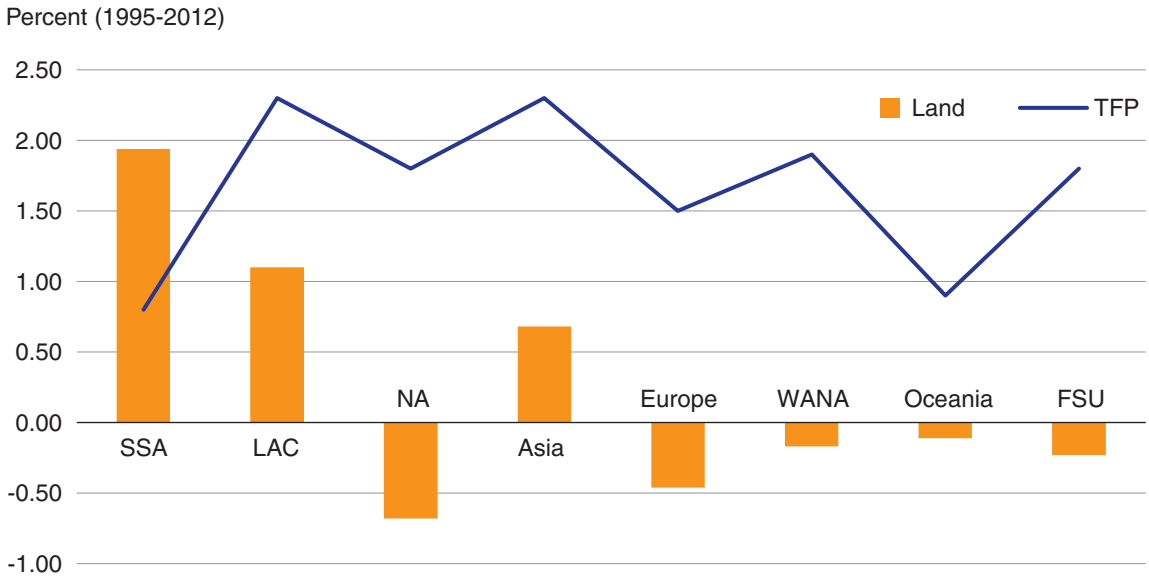
Figure 7
Average annual growth rate of productivity and land use for agriculture in BRIIC countries, 1995-2012



Note: TFP = total factor productivity.
Source: USDA, Economic Research Service. Authors' calculations based on Fuglie and Rada (2015).

[5]The share of the population living in poverty—according to the World Bank Poverty Headcount Ratio at $1.90 per day—fell from 45.9 percent (1996) to 8.3 percent (2014) in Indonesia; from 42.0 percent (1996) to 1.8 percent (2013) in China, and from 34.8 percent (1998) to 3.1 percent in 2014 in Vietnam.

Figure 8
Average annual growth rate of productivity and land use for agriculture by region, 1995-2012



Note: SSA is Sub-Saharan Africa (less South Africa), LAC is Latin America and Caribbean, NA is North America (Canada and the U.S.), WANA is Western Asia and North Africa, and Oceania is Australia and New Zealand. Asia excludes West Asia; Europe excludes the Former Soviet Union (FSU). TFP = total factor productivity.
Source: USDA, Economic Research Service. Authors' calculations based on Fuglie and Rada (2015).

Land used for agriculture increased in some BRIIC countries as well. While land use for agricultural production decreased over 1995-2012 for most regions, it increased in every BRIIC country except Russia, with particularly large growth in Brazil and Indonesia. Sub-Saharan Africa had the largest rate of increase in agricultural land use, but its productivity growth lagged all other regions (fig. 8).

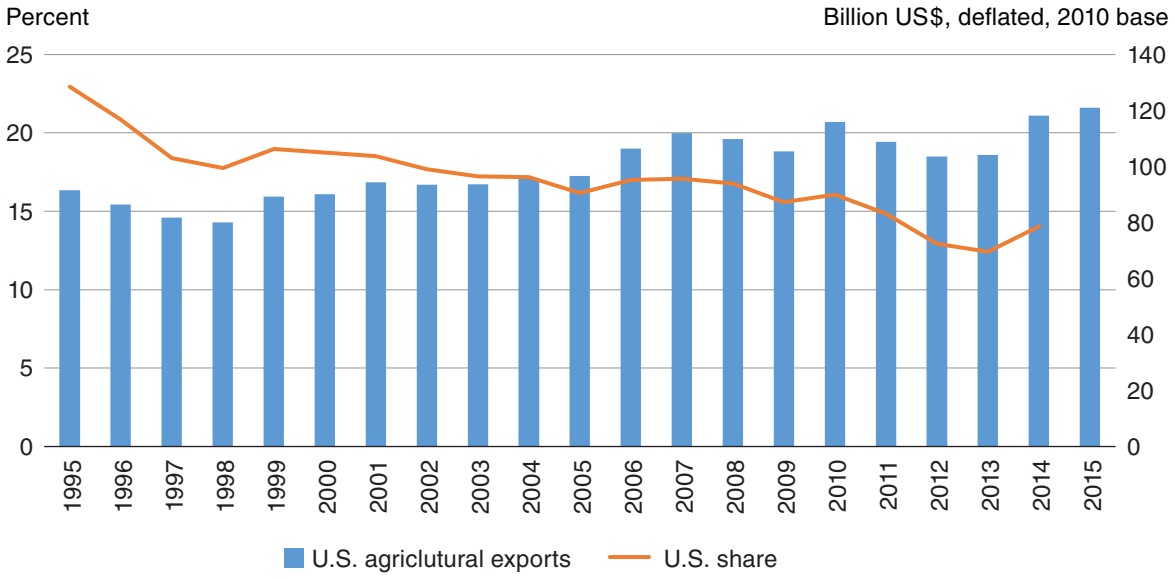
Regional Evolution of U.S. Trade Patterns

The evolution of U.S. trade patterns reflects changes observed at the global level. Perhaps most striking is the drop in the U.S. share of agricultural exports—from 23 percent of global value in 1995 to 12.5 percent in 2013 (fig. 9)—as exports by BRIIC and other emerging markets have risen. Still, the United States remained the second-largest exporter in 2012-14 (table 2).

The decline in the U.S. share of total agricultural ***exports*** conceals a marked shift in destinations for U.S. products. Elimination of agricultural trade barriers within North America boosted exports to Canada and Mexico—partners with the United States in the North American Free Trade Agreement (NAFTA). Rising household incomes and changing trade policies in developing East Asia (China and Southeast Asia, except Singapore) led to a near tripling in its share of U.S. agricultural exports (figs. 10 and 11) (Gale et al., 2015; Arita and Dyck, 2014).

The strong growth in demand for U.S. exports in Asia and North America has been offset by a sharp decline in the share going to Europe and high-income East Asia, particularly Japan. In the EU, a number of barriers—including concerns over genetically modified products—continue to hamper U.S. agricultural trade. The increase in U.S. exports to Asia is driven by China, whose share of U.S. agricultural exports swelled from 3 percent, on average, in 1995-99 to 16 percent in 2011-15. Over half of this increase can be attributed to a single product: soybeans.

Figure 9
U.S. agricultural exports and share of global agricultural trade, 1995-2014

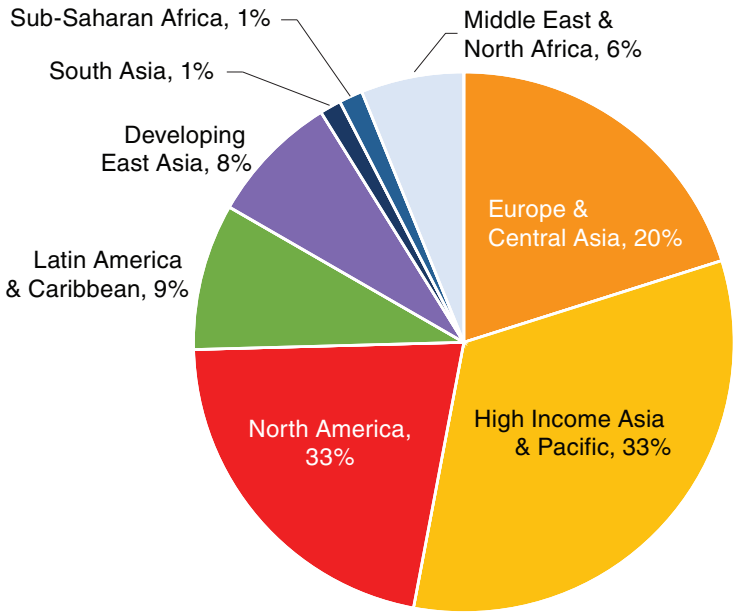


Note: U.S. agricultural export value deflated using Food and Agriculture Organization (2017) and U.S. Bureau of Labor Statistics agricultural export price indices.
Source: Authors' calculations using data from USDA, 2017a.

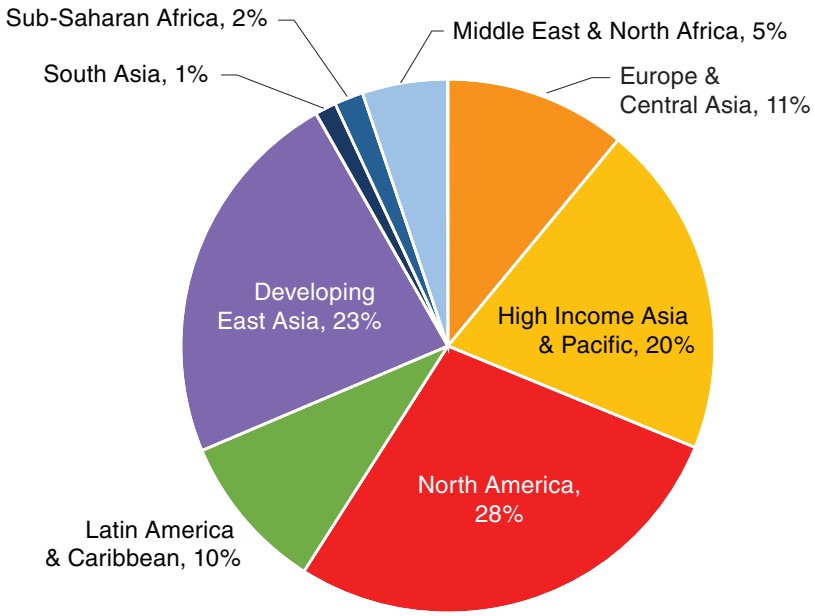
Figure 10

Destinations for U.S. agricultural exports by share of value, 1995-99 and 2011-15

Average 1995-99

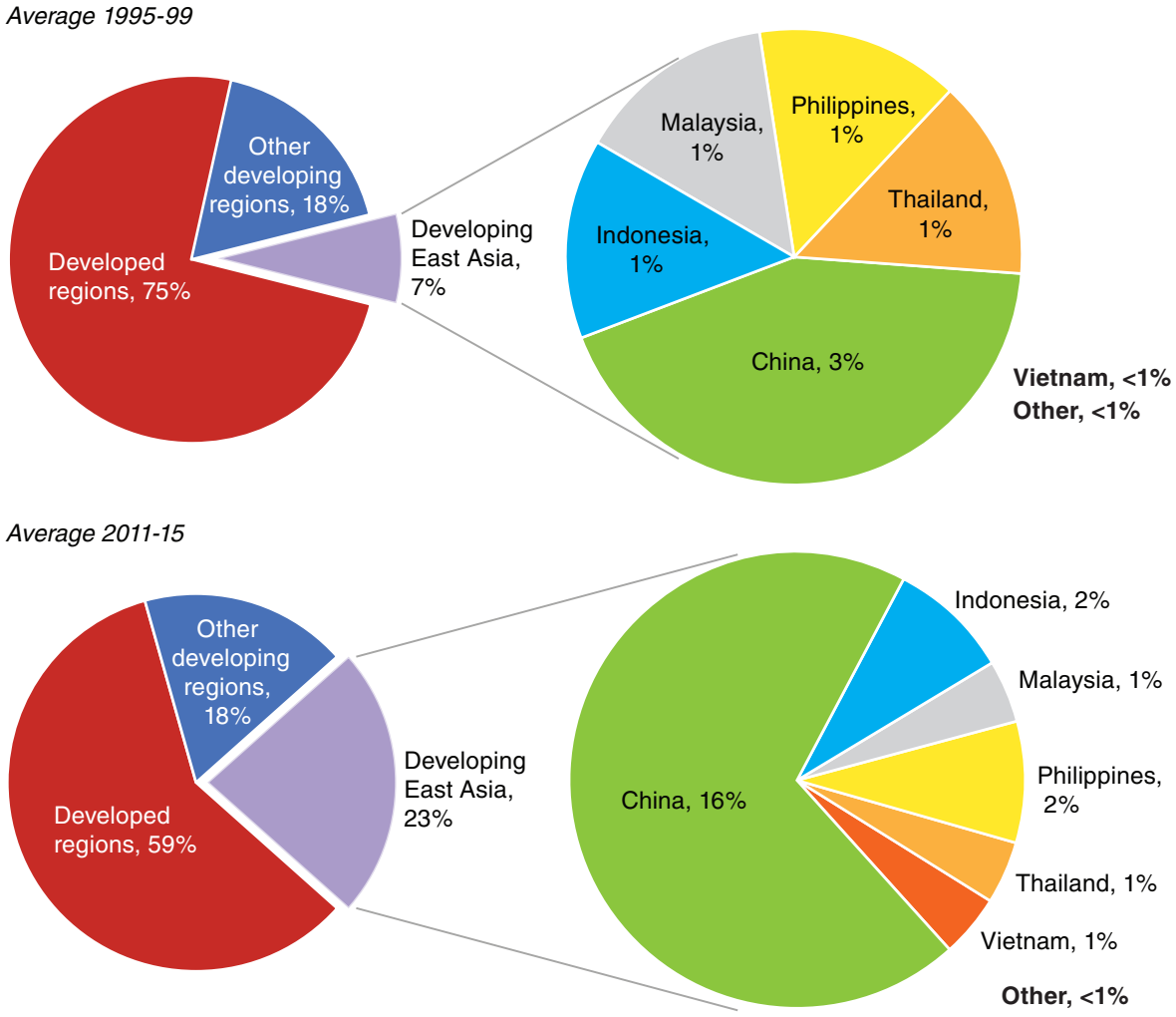


Average 2011-15



Note: Shares are based on the nominal value of agricultural trade.
Source: USDA, Economic Research Service. Authors' calculations using data from United Nations, 2016; USDA, 2017a.

Figure 11
Developing East Asia's increasing share of U.S. agricultural exports and its evolving composition, 1995-99 and 2011-15



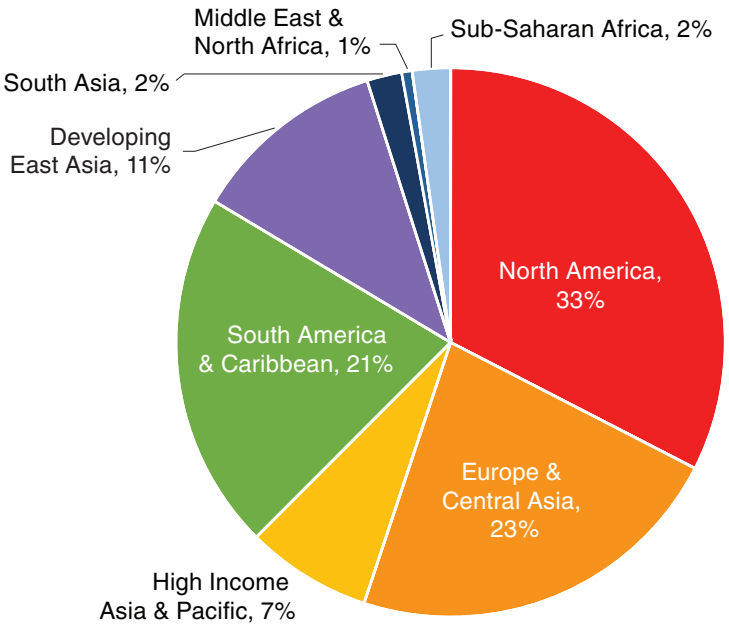
Note: Shares are based on the nominal value of agricultural trade.
Source: USDA, Economic Research Service. Authors' calculations using data from USDA, 2017a.

In contrast to exports, the share of U.S. agricultural ***imports*** from regions dominated by developed countries remained relatively stable from 1995 to 2015, at just over 60 percent (fig. 12), although there was a compositional shift. A decline in Europe's share of U.S. agricultural imports was almost exactly offset by an increase in imports from Canada and Mexico.[6] Notably, U.S. import shares from fast-growing exporters in South America and the former Soviet Union declined while those regions' shares of the global agricultural market expanded.

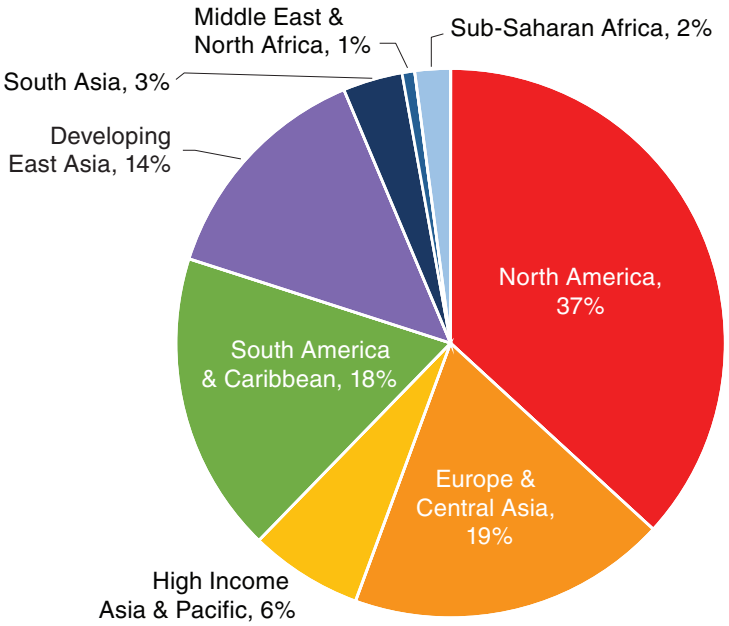
[6]While its geographical position as part of North America places it in a region dominated by developed countries, Mexico is classified by the World Bank as a middle-income economy; as such, it is considered a developing country here. See footnote 1.

Figure 12
Origins of U.S. agricultural imports, 1995-99 and 2011-15

Average 1995-99



Average 2011-15



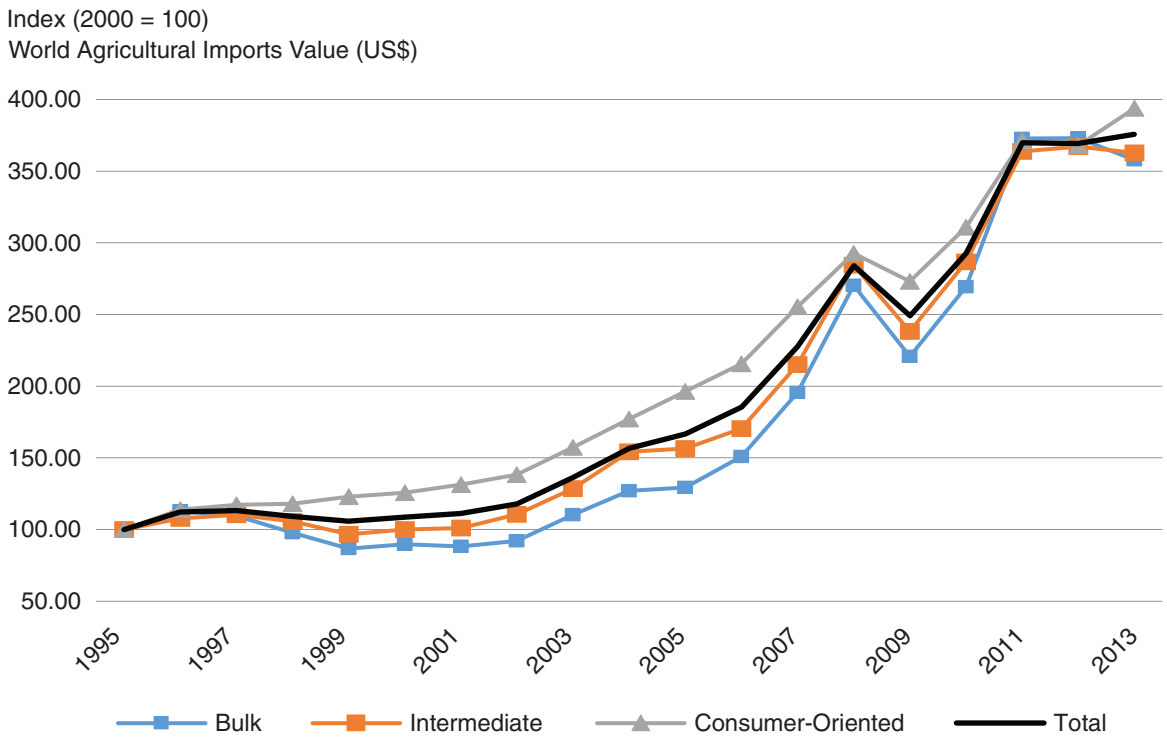
Note: Shares are based on the nominal value of agricultural trade.
Source: USDA, Economic Research Service. Authors' calculations using data from United Nations, 2016; USDA, 2017a.

Growth in Consumer Products and Intermediate Inputs Outpaces Bulk Commodities

Along with regional shifts, the composition of agricultural trade has evolved as well. ***Bulk*** products like grains, oilseeds, fibers, and tropical products are typically destined for further processing. ***Intermediate*** products include animal feed and minimally processed products like edible oils and sweeteners typically used as an ingredient in other products. Both bulk and intermediate goods tend to be homogeneous and/or storable and used primarily by industry. In contrast, ***consumer-oriented*** products like fruits, nuts, vegetables, meats, and processed food products are likely to be purchased directly by consumers. (See Appendix 3 for definitions of each product type.)

Trade grew in all three agricultural product categories from 1995 to 2013 (fig. 13). However, trade in bulk products has lagged total agricultural trade, whereas trade in consumer-oriented products has grown faster. This pattern was particularly marked between 2000 and 2007.

Figure 13
World agricultural imports by product category, 1995-2013



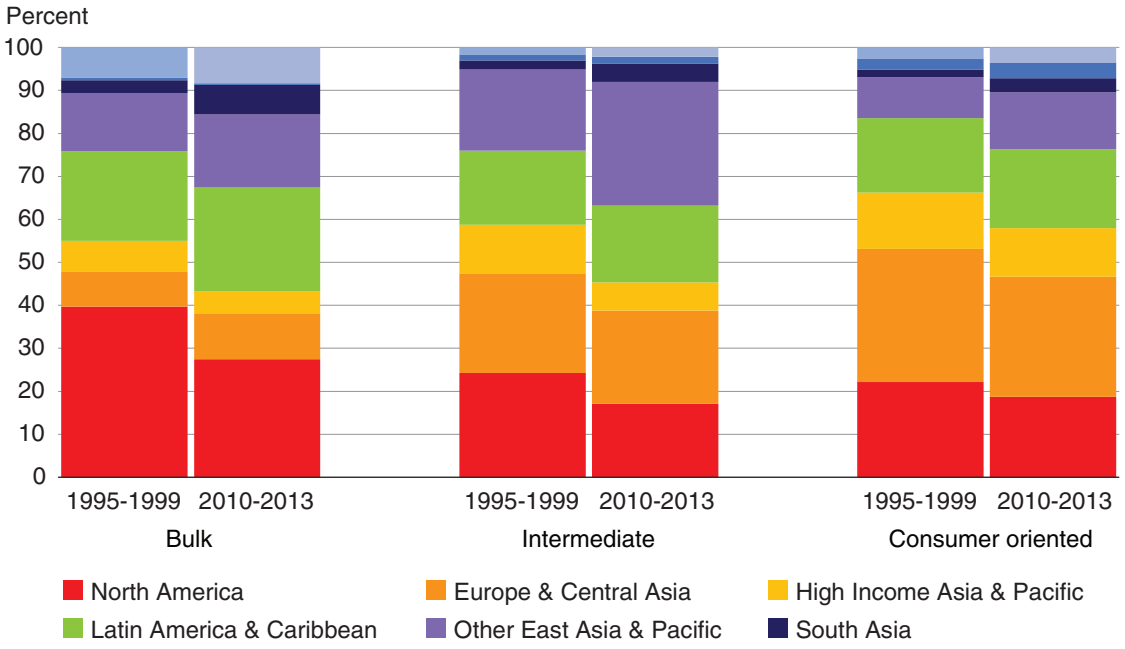
Source: USDA, Economic Research Service. Authors' calculations using data from United Nations, 2016.

Regional shifts in trade patterns are reflected to differing degrees across product categories (fig. 14). While bulk product exports from every region have expanded, the North American share has declined and the Latin American/Caribbean (LAC) share has increased. Whereas in 1995-99 North America accounted for 40 percent of bulk exports and LAC 20 percent, by 2010-13 these two regions each had roughly 25 percent of global bulk market share.[7] Brazil brought vast land areas into cultivation, chiefly to grow soybeans for export, and increased the productivity of its crops (Rada and Valdes, 2012). South Asia's bulk export share more than doubled under increased irrigation and relaxed grain export controls (Rada and Schimmelpfennig, 2015; Jha et al., 2007).

During 1995-99, the export market for intermediate agricultural products was split roughly evenly among North America, Europe, and the developing countries of Other East Asia and Pacific. By 2010-13, exports from developing East Asia had increased by roughly half, whereas the North American share declined by about one-third (fig. 14). This largely reflects export growth from China and Southeast Asia. Gains in Southeast Asia have come partly from palm oil, based on expanding land area dedicated to oil palm (Beckman et al., 2017). China has employed its large labor force to export food ingredients, such as processed fruits, vegetables, and meats (Huang and Gale, 2006).

Shifts in the regional composition of consumer-oriented exports have been less dramatic. Brazil and India have expanded their share of consumer-oriented trade through rapidly growing meat exports, while South American countries and Turkey have expanded horticultural exports.

Figure 14
Global export shares by region and product category, 1995-99 and 2010-13



Source: USDA, Economic Research Service. Authors' calculations using data from United Nations, 2016.

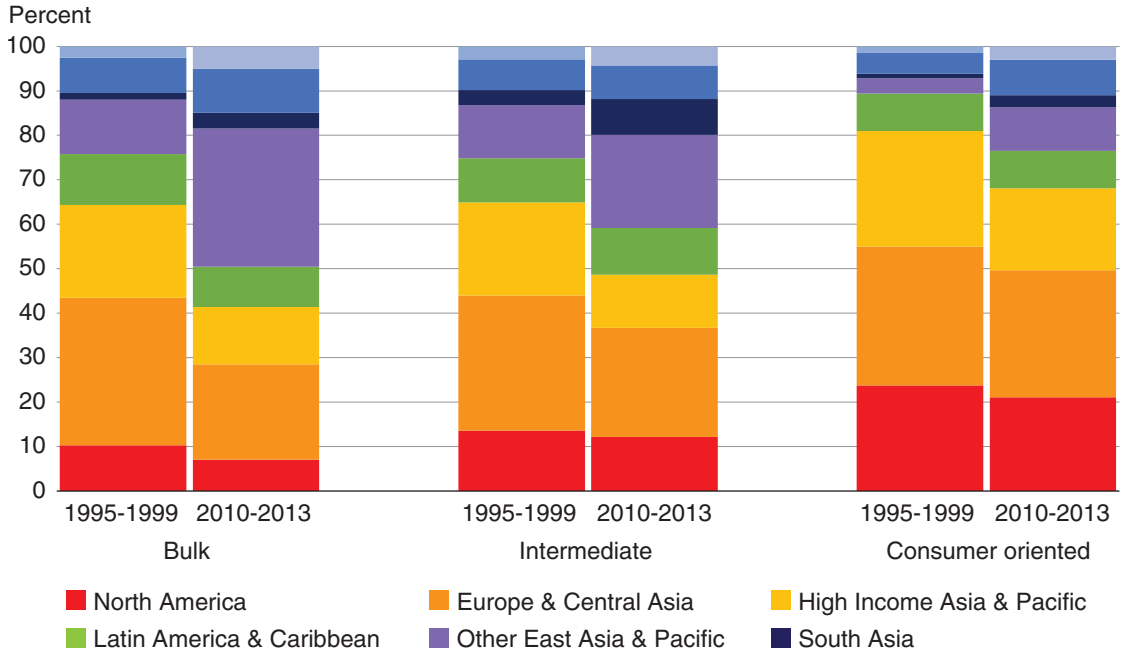
[7]North America's 2010-13 average share was 25 percent, and the Latin America/Caribbean share was 24 percent.

The regional composition of agricultural ***imports*** likewise reveals different trends across product types (fig. 15). The most dramatic shifts in market share are again from developed to developing countries in bulk and intermediate products. Developing regions increased their share of bulk imports from 38 percent, on average, in 1995-99 to 57 percent in 2010-13 and their share of intermediate product imports from 37 to 50 percent. China has led this growth in ***bulk*** imports, largely soybeans due to domestic policies that favor grain production over soybean production and trade policies that impose higher tariffs on animal products than on feedstuffs (Gale et al., 2015).

Vegetable oil imports account for a large share of ***intermediate*** imports by China, South Asia, and the Middle East. Imports of vegetable meal for animal feed have grown in the Middle East, Southeast Asia, and parts of South America. In contrast, intermediate product imports by Europe, Japan, Korea, and Taiwan have been relatively static. With very low population growth and relatively stable diets, the drivers of bulk and intermediate import growth are weak in these countries and regions. Income growth in Europe and Northeast Asia has been slower than in most other regions, and at the high levels of income already reached, food expenditures take a small share of any additional income (Muhammad et al., 2011).

Changes in the destination of ***consumer-oriented*** products are less marked. Nevertheless, the shares going to Japan, Korea, and Taiwan have declined while the shares to China, the Middle East, and Southeast Asia have grown.

Figure 15
Global import shares by region and product type, 1995-99 and 2010-13

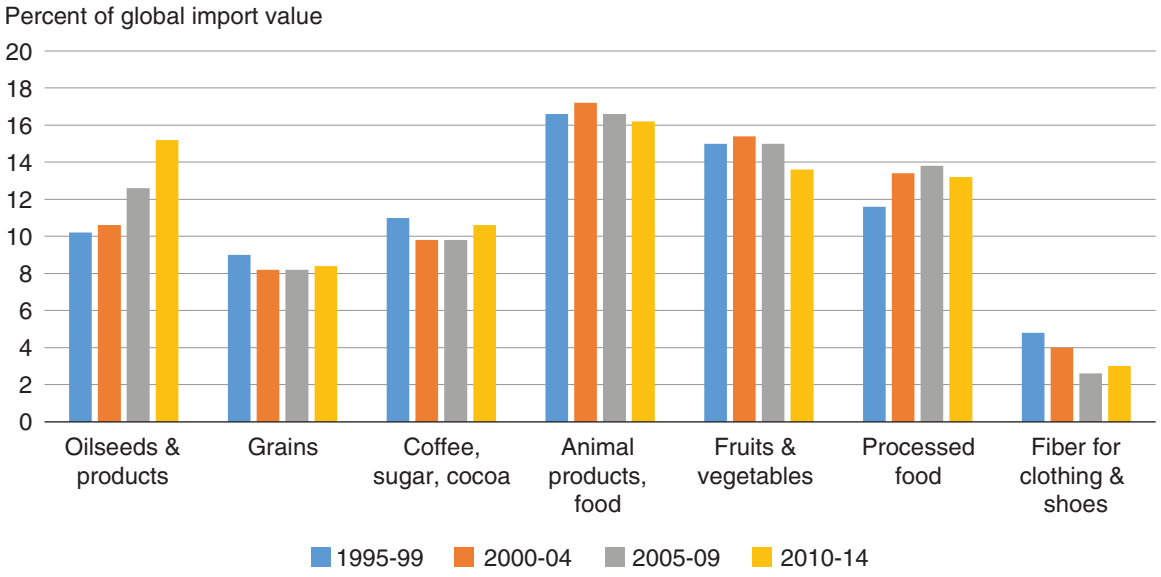


Source: USDA, Economic Research Service. Authors' calculations using data from United Nations, 2016.

A closer look at product categories reveals that the shifts in import/export trends are driven by relatively few product lines (fig. 16). Imports of oilseeds (bulk commodities) and their products (intermediate commodities) grew fastest in share of total value (see box, "Trade Supports Growing Vegetable Oil Consumption in Emerging Economies"). In contrast, the share of trade in two bulk product categories—grains and tropical commodities (coffee, sugar, and cocoa)—declined over 1995-2014. For consumer-oriented products, the share of animal products, fruits/nuts, and vegetables in global agricultural trade declined slightly, while the share of processed food increased.

Fibers, particularly cotton and others used for clothing, witnessed the steepest loss in share of total agricultural import value. Cotton consumption peaked in 2007 before falling off. China, the largest consumer of cotton fiber, cut back its imports beginning in 2012 to rely more on domestic production and stocks (USDA, 2017b).

Figure 16
Share of trade in major agricultural product groups, 1995-2014



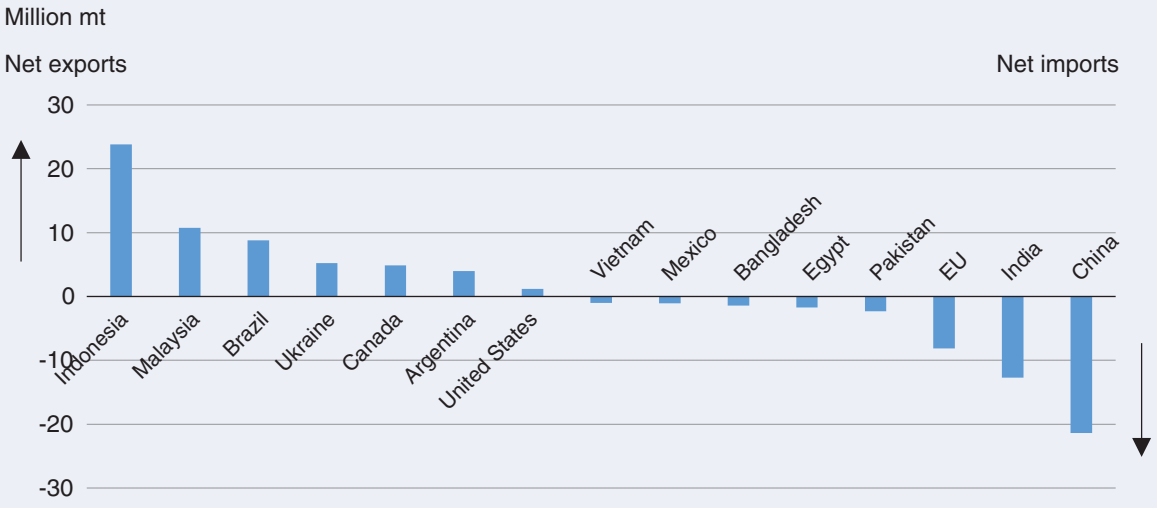
Source: USDA, Economic Research Service. Authors' calculations using data from United Nations, 2016.

Box 2

Trade Supports Growing Vegetable Oil Consumption in Emerging Economies

Global vegetable oil consumption has grown by over 1 percent per year, supported by trade in both vegetable oil itself and oilseeds for crushing (box fig. 1). Vegetable oils are used both directly by households and in the processed foods that are more widely consumed in urban markets as countries develop economically. Oilseed meals, the byproduct of crushing oilseeds for oil, are an integral part of feed rations used to produce animal products. This has been one of the most significant trade shifts of late, largely imports by China and India (linked to economic growth) and exports from Southeast Asia (oils) and the Americas (oilseeds and oils).

Box Figure 1
Vegetable oil trade of selected countries, 1993-95 and 2013-15



Notes: Oils are coconut, palm, palm kernel, cottonseed, peanut, rapeseed, soybean, and sunflower seed, and include the oil equivalent of these oilseeds: cottonseed, peanut, rapeseed, soybean, and sunflower seed.
Source: USDA, Economic Research Service. Authors' calculations using data from USDA, Foreign Agricultural Service, 2017b.

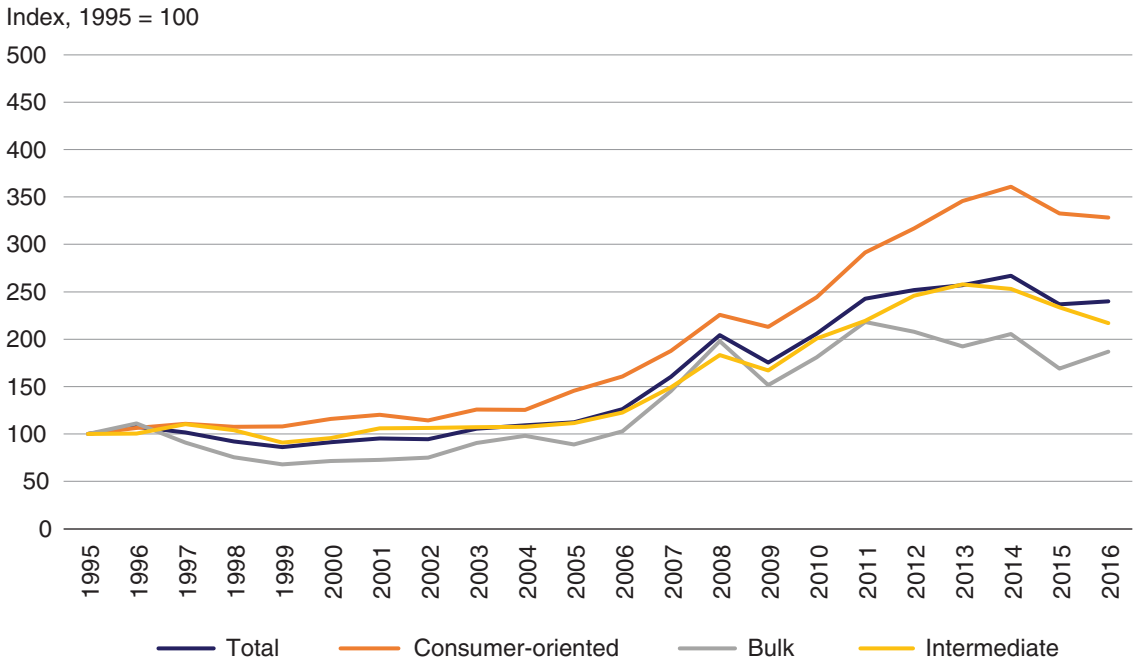
Product Evolution of U.S. Agricultural Trade

The composition of U.S. exports has also changed (fig. 17), with the dollar value of bulk exports in 2015 about double that in 1995 (with yearly fluctuations due to weather, currency movements, and other domestic and international market factors). The only major product to grow rapidly in its share of bulk exports was soybeans, rising from 23 percent in 1993-95 to 44 percent in 2013-15. Soybeans are the single largest U.S. agricultural export, the vast majority of which are destined for a single market—China.

The dollar value of U.S. exports of intermediate products more than doubled between 1995 and 2015. This increase was driven primarily by exports of animal feed products and selected food ingredients. China became the leading destination for intermediate products, primarily cattle hides and distillers' dried grains with solubles (DDGS), a coproduct of ethanol production that is used as animal feed.[8] Mexico and Southeast Asia have likewise become important destinations for U.S. exports of intermediate agricultural products, particularly soymeal for animal feed. High-fructose corn syrup (HFCS) exports to Mexico also grew.

[8]U.S. DDGs exports were substantially reduced after China imposed anti-dumping and countervailing duties in early 2017.

Figure 17
U.S. agricultural exports by type, 1995-2016



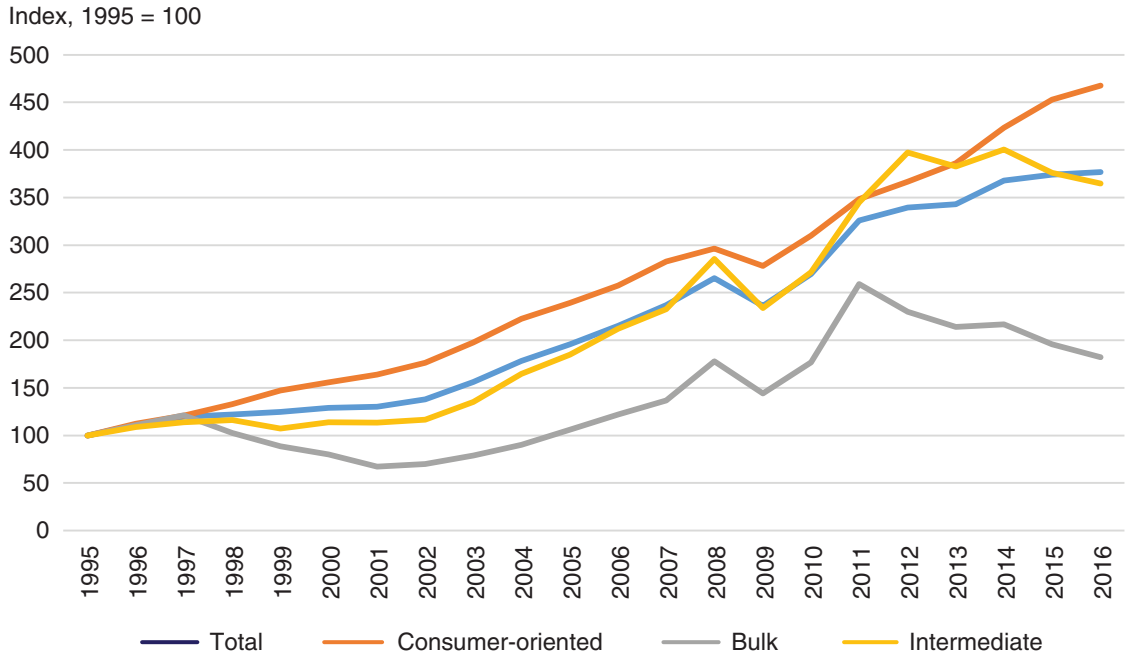
Source: USDA, Economic Research Service. Authors' calculations using nominal data from USDA, Foreign Agricultural Service, 2017a.

The EU, Canada, Mexico, and Japan remained the top foreign destinations for U.S. consumer-oriented products; however, developing country markets—particularly China, India, Colombia, and several countries in Southeast Asia and the Middle East—have been the fastest growing. U.S. tree nut exports, led by almonds primarily destined for the EU and Hong Kong, grew twice as fast as other consumer-oriented exports and became one of the largest U.S. agricultural exports. U.S. pork and dairy exports grew more than twice as fast over 1995-2015 as other consumer-oriented exports, whereas exports of highly processed foods, fresh fruits and vegetables, poultry, and beef grew more slowly.

Consumer-oriented products have long dominated U.S. agricultural imports and have grown faster than total agricultural product imports (fig. 18). Reasons suggested for this include the increased use of imported horticultural products during the offseason in U.S. production and consumer desire for year-round variety in foods and beverages (Arnade and Kuchler, 2015; Huang, 2013; Dohlman and Gehlhar, 2007). Imports of fresh fruit, snack foods, and carbonated soft drinks grew especially quickly. The fastest growing sources of consumer-oriented imports were Vietnam (cashews, pepper), China (fruit and vegetable preparations), Peru (fresh fruits, asparagus), Switzerland (carbonated soft drinks), and Mexico (fresh/processed vegetables and fruits, beer, snack foods, beef).

In contrast, U.S. imports of bulk products have consistently grown more slowly than total agricultural imports. Growth in rice imports has been faster than in other bulk products, while tobacco, sugar, rubber, and coffee imports have grown more slowly. Intermediate product imports have grown in share over time, led by essential oils, sweeteners, seeds, and rapeseed meal for feed.

Figure 18
U.S. agricultural imports by type, 1995-2016



Source: USDA, Economic Research Service. Authors' calculations using nominal data from USDA, Foreign Agricultural Service, 2017a.

Some major trends emerge from this review of world and U.S. agricultural trade:

- Trade in agricultural products grew rapidly from 1995 to 2007, accompanying significant world population and income growth, but the growth rate appears to be slowing after an initial rebound in the years following the global financial crisis in 2008.
- Trade in consumer-oriented and intermediate products has grown faster than trade in bulk products following the development of global supply chains and rising incomes in many developing countries.
- While total U.S. exports have grown, the U.S. share of global agricultural trade has declined with increasing participation of emerging economies—notably Brazil, Russia, India, Indonesia, and China—in agricultural exports.
- Imports by China—particularly soybeans and vegetable oils—have risen strongly as a share of global agricultural trade as WTO membership offered more access to its market and domestic incomes rose.

Today's Agricultural Trade Policy Landscape

Governments intervene in international trade through both import and export policies. Import interventions include tariffs and other trade policies that raise border prices or limit access to a domestic market. Export intervention refers to such policies as export subsidies, export taxes, and embargoes that directly encourage or restrict exports. Import and export interventions were addressed in the Uruguay Round Agreement on Agriculture (URAA) under the market access and export competition pillars, respectively, and the rules and institutions established during the URAA remain important. However, significant barriers to trade remain, and many measures that create an uneven playing field in trade were left unaddressed.

Import Interventions

Market access in agriculture is restricted through a wide range of policy measures. Tariffs remain high for many traded products, despite reductions negotiated within and outside the World Trade Organization (WTO). In addition, countries regularly use trade policy instruments—such as tariff-rate quotas (TRQs), safeguards, and anti-dumping (AD) and countervailing duties (CVDs)—to adjust border protection. State trading, import licensing, and discriminatory application of domestic regulations and standards can further impede market access.

Tariffs

Tariffs are a tax or duty on imports. Making tariffs transparent and reducing their level were primary objectives of the General Agreement on Tariffs and Trade (GATT). In the URAA, negotiators addressed agricultural tariffs, which had previously not faced systematic discipline. URAA negotiations were able to replace an array of quotas, variable levies, and other policies designed to limit market access for some products with a simple tariff. Through a process known as "tariffication," tariffs were calculated to reflect the degree of protection afforded by the practices that the URAA eliminated (WTO, 2008).

Nevertheless, high tariffs remain on many agricultural products and while most tariffs are *ad valorem,* or a percentage of the import value, there are some important exceptions (see box, "Tariff Issues"). The simple average agricultural tariff rate extended to WTO members in 2014 averaged 15-22 percent across products. However, this overstates the actual average tariff since countries often apply lower tariffs on a bilateral basis as part of unilateral concessions to developing countries and reciprocal preferences to partners in free-trade agreements.

The irregularities described in the box, "Tariff Issues," complicate comparisons of tariff protection over time and across countries. Databases of tariff information each use a slightly different approach to incorporate these policy instruments into their measures of the average agricultural tariff. For example, the methodology used to convert a specific tariff into a simple *ad valorem* rate may cause one database to produce a higher estimate for the average tariff. Nevertheless, the relative magnitude of average agricultural tariffs across countries is broadly consistent across databases.

Among the largest agricultural trading countries, Korea, Egypt, Turkey, Switzerland, India, and Thailand maintain the highest most favored nation (MFN) agricultural tariffs, with simple averages exceeding 30 percent (fig. 19). The EU, Mexico, Canada, Japan, Russia, and China follow, each recording an average tariff of around 20 percent in at least one of the databases (TRAINS, MAP, WTO). Major global exporters, the United States, Australia, New Zealand, Ukraine, and Chile—as well as importers, Saudi Arabia and the United Arab Emirates—consistently have average applied tariffs below 10 percent. In addition, while most countries apply tariffs to the landed value of imported goods, the United States calculates tariffs on the value of the good at the point of export, declining to tax the cost of shipment.

Tariff averages, of course, mask wide ranges at the product level. Countries often apply tariffs well above the average, known as peak tariffs, to politically sensitive commodities. For example, Korea maintains a 513-percent tariff on rice (table 4)—much higher than its simple average agricultural tariff of 53-66 percent (WTO, MAP, and TRAINS) or 93 percent on a weighted basis—to protect its domestic rice industry from international competition.

Box 4

Tariff Issues

Comparing average tariffs across countries is difficult because tariffs come in several forms. The most common form, an *ad valorem* tariff, is a rate charged on the value of the traded product. Alternatively, a *specific* tariff is charged per unit of measure, e.g., by weight or count—as in dollars/pound. Only 4 of the 32 largest trading countries had no specific tariffs in their schedule. Specific tariffs are especially common in the schedules of Switzerland (100 percent of applied tariffs), the United States (41 percent), the EU (46 percent), and Thailand and Russia (each with 24 percent).

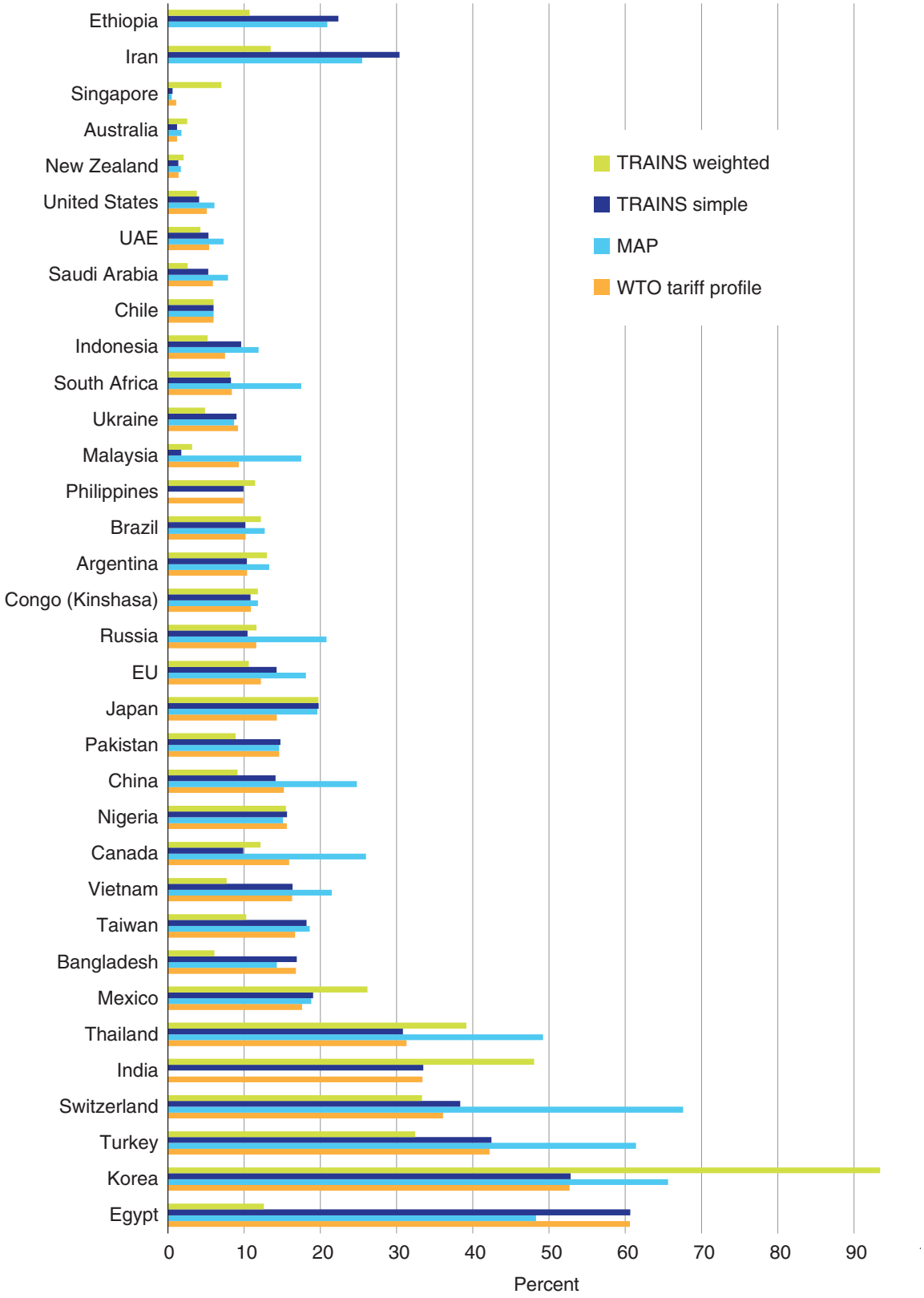
Compound tariffs combine *ad valorem* and specific components. Mixed tariffs may be either *ad valorem* or specific, usually the greater of the two. For example, a tariff on beef could be either 10 percent of the total value or $100/lb, whichever is higher. To compare tariffs across countries, specific, compound, and mixed tariffs must first be converted into *ad valorem* equivalents (AVEs). Each international database in figure 19 takes a different approach to this calculation.

Comparison is further complicated by the distribution of high tariffs across traded products. In some cases, high tariffs effectively prohibit imports. As a result, tariff aggregations weighted by trade volumes assign a low value to those tariff lines (which may otherwise be large), potentially underestimating protection. In contrast, if there are some extremely high tariffs applied to products that are not important in trade, simple averages can overestimate protection.[9]

[9]The sharp difference between Egypt's weighted average tariff of 60.5 percent in 2015 and its simple average tariff of 12.5 percent in 2014 demonstrates how consequential the distribution of tariffs across products can be (Tellioglu and Konandreas, 2017).

Figure 19

Average applied tariffs on agricultural products, 2014 or most recent year



Note: The International Trade Centre (ITC) of the UN Conference on Trade and Development (UNCTAD) and the World Trade Organization provide the Market Access Map (MAP), an online tariff database. UNCTAD and the WTO also maintain the Trade Analysis Information System (TRAINS) database. TRAINS uses the sum of duties collected divided by total import value to estimate a weighted average. The WTO, ITC, and UNCTAD jointly publish the World Trade Profile.
Source: USDA, Economic Research Service.

Table 4
Maximum applied agricultural tariff rate (percent)

1,000 or above	*500-1,000*	*200-500*	*100-200*	*50-100*
Switzerland	Singapore	Canada	EU	China
Egypt	Korea	United States	Mexico	Ukraine
Malaysia	Japan	Russia	India	Philippines
	Taiwan	Thailand	Indonesia	Brazil
		Saudi Arabia	Vietnam	
		Turkey	South Africa	
		UAE		
		Pakistan		

Source: USDA, Economic Research Service, drawing on World Trade Organization: World Tariff Profiles, 2015.

Products in world trade are classified by the Harmonized System (HS) developed by the World Customs Organization in 1988. This system identifies types of products by dividing them into "tariff lines." Under the URAA, WTO members agreed to reduce the average value of all tariffs over a 5-year period for developed countries and a 10-year period for developing countries.[10] In addition, a minimum reduction was required for each tariff line. Each country's legally binding commitments were published in a schedule. The tariffs in this schedule are referred to as a country's bound tariffs. Countries committed not to raise tariffs above URAA bound rates, but remain free to apply lower tariffs.

The global average bound agricultural tariff (for 32 of the largest trading countries) is an estimated 46 percent, more than double the average applied rate of about 20 percent. Countries, then, have some room to raise applied tariffs above current levels without breaking trade rules (table 5). For about half of the 32 leading trade countries, the difference between their average applied and bound tariffs on agricultural goods is 20 percentage points or more.

The freedom of governments to vary applied tariffs introduces a degree of uncertainty into trade. Some countries reduce tariffs temporarily or for a predetermined quantity. South Korea announces TRQs every 6 months, in which tariffs on agricultural imports can be reduced below a base rate or even eliminated for certain quantities—often larger than recent trade flows. Other countries are less regular in adjusting tariffs. India reduced its soybean tariff to zero in 2012 (its bound tariff is 100 percent), before raising it again in 2013 and 2014. Turkey amends its Inward Processing Regime to regulate tariff-free imports that are used as inputs in Turkish industries (USDA/FAS, 2016).

The average applied tariff on agricultural products declined in 2006-11 before rebounding in 2012-13 to earlier levels (Estrades et al., 2016). Applied tariffs on grains/products, raw hides, and dairy products were particularly volatile during 2006-11. Rapidly changing commodity prices since 2006 are likely the cause of tariff adjustments in both directions. Importing countries may drop tariffs to make a commodity more affordable to consumers when world prices rise and then raise the tariffs when global commodity prices fall.

[10]The URAA was fully implemented by 2004. Developed countries committed to cut average tariffs by 36 percent. Developing countries agreed to a 24-percent cut.

Table 5
Average bound tariffs on agricultural products, 32 leading traders, 2016

Tariff percentage

100 or more	50-100	40-50	30-40	20-30	10-20	0-10
Bangladesh	Egypt	Indonesia	Thailand	Chile	Vietnam	New Zealand
Nigeria	Congo (Kinshasa)	Switzerland	Brazil	UAE	Japan	United States
India	Pakistan	Mexico	Philippines	Singapore	Taiwan	Australia
	Malaysia	South Africa	Argentina		Canada	
	Turkey				China	
	Korea				Saudi Arabia	
					EU	
					Russia	
					Ukraine	

Source: USDA, Economic Research Service, authors' calculations based on World Trade Organization, 2016o, which includes *ad valorem* tariffs and *ad valorem* equivalents of non-*ad valorem* tariffs.

Preferential Tariff Reductions

WTO rules permit members to apply tariffs below the MFN (most favored nation) level under two circumstances. First, members may offer preferential tariffs to developing countries on a nonreciprocal basis as part of a Generalized System of Preferences (GSP).[11] A WTO member may choose the set of countries to which it offers access to GSP preferences, and it may define those preferences across products. However, WTO members are required to offer the same level of access to all their GSP recipients. The United States offers the GSP to 108 countries. Some countries offer special preferences for least-developed countries (LDCs) under their GSP.[12] Notably, the EU offers zero tariffs for all imports (except armaments) from 47 countries designated as LDCs by the UN under the Everything But Arms (EBA) initiative (European Commission, 2016).

In addition to the nonreciprocal GSP, WTO members may form preferential trade agreements (PTAs) in which lower tariffs are offered on a reciprocal basis. As of June 2017, 279 separate PTAs covering trade in goods and services had been notified to the WTO and are in force. Of these, 242 PTAs entered into force in 1995 or later (WTO, 2016i).[13] The largest PTAs in terms of trade value are the EU and NAFTA.

PTAs have proliferated in recent years (fig. 20), perhaps because the Doha Round failed to achieve a comprehensive multilateral trade agreement (Zahniser and Moreno, 2014). Most PTAs are between members of the Organisation for Economic Co-operation and Development (OECD)—which are generally wealthier countries—and non-OECD countries, which are often developing economies. The EU has the largest number of PTA memberships at 37, followed by Chile and Singapore (fig.

[11]The basis for such an exemption from the MFN rate is in a decision by the GATT in 1979 (L/4903), known as the enabling clause, to "accord differential and more favorable treatment to developing countries, without according such treatment to other contracting parties" (WTO, 2016d). Countries may also obtain a waiver to offer other preferential arrangements to developing countries outside the GSP. For the United States, arrangements outside the GSP include the African Growth and Opportunity Act (AGOA), Andean Trade Preference Act (ATPA), Caribbean Basin Economic Recovery Act, and Former Trust Territory of the Pacific Islands.

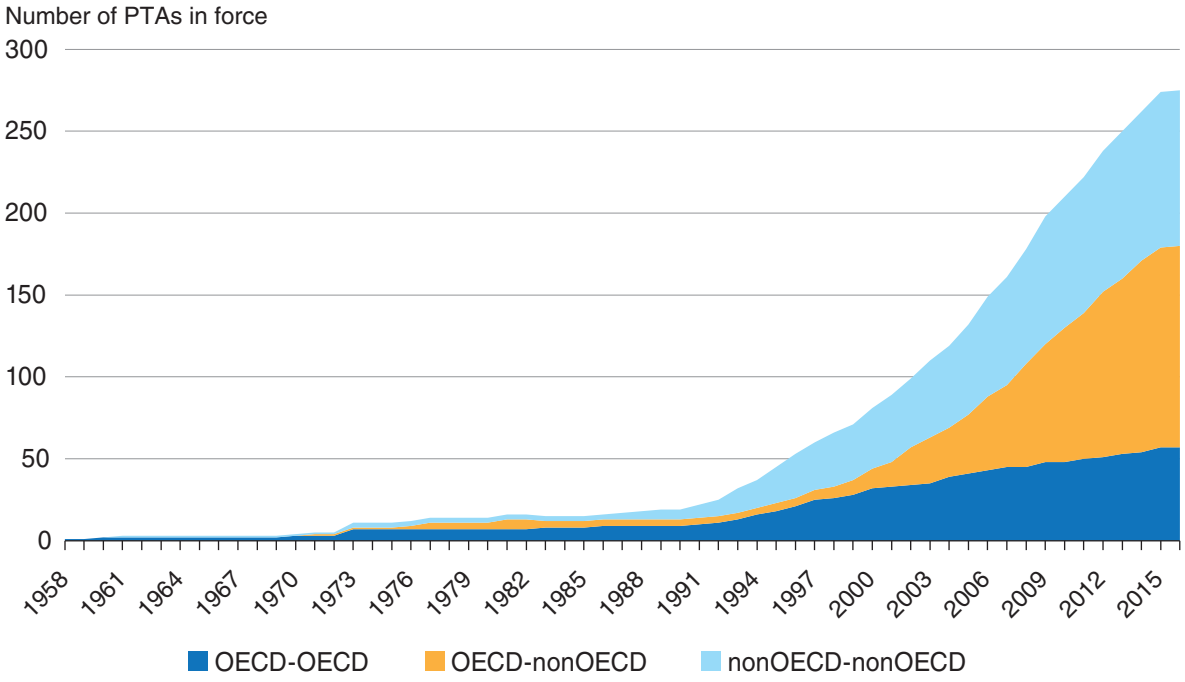
[12]The WTO and United Nations recognize 48 countries as having least-developed status (WTO, 2016g).

[13]WTO (2011) estimated that about 100 PTAs in force in 2010 had not been notified to the WTO.

21).[14] Since 2010, Korea has been most active in pursuing PTAs, followed by China. In contrast, Brazil is a member of only five PTAs, all of which predate 2010 and are under the auspices of the Mercado Común del Sur (MERCOSUR).

The extent to which the web of PTAs has meaningfully lowered barriers to agricultural trade is unclear, although the elimination of all tariffs within the EU and almost all tariffs within NAFTA signal comprehensive liberalization. The difference between the preferential tariff offered under a PTA and the MFN rate, referred to as the margin of preference, measures the extent to which a PTA offers additional access to its members. The World Trade Organization (2011) finds that the average margin of preference was 4 percent for agriculture in 2008, versus just 1 percent for all merchandise trade. This difference may be due to the higher average tariffs on agricultural goods than on nonagricultural goods, offering a wider margin or preference (WTO, 2011). The margins of preference available to the United States and its key competitors in global beef trade offer an important example (see box, "Margins of Preference and the U.S. Beef Trade").

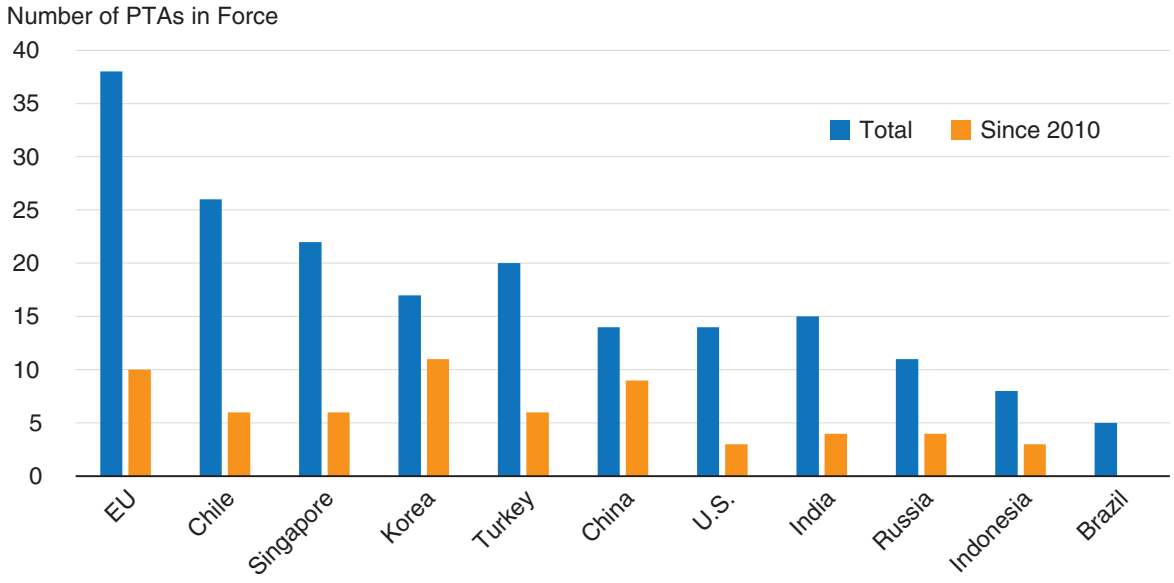
Figure 20
Number of preferential trade agreements (PTAs) by OECD status, 1958-2015



Source: USDA, Economic Research Service. Authors' calculations using WTO, 2016j.

[14]The EU total counts the accession of each member of the bloc itself as a PTA.

Figure 21
Number of preferential trade agreements (PTAs) by country/region



Source: USDA, Economic Research Service. Authors' calculations using WTO, 2016j.

Box 4

Margins of Preference and the U.S. Beef Trade

U.S. beef trade averaged over $5 billion in exports and almost $5 billion in imports during 2013-15 (nominal value) (USDA/FAS, 2017a). Tariffs on beef are often high, exceeding 20 percent in some key markets. Several preferential trade agreements (PTAs) apply tariff levels that vary by country, both for U.S. exports and imports.

NAFTA eliminated tariffs and quotas on beef traded among the United States, Canada, and Mexico, giving the U.S. beef industry duty-free access to the large Mexican and Canadian markets. By comparison, the MFN tariffs facing beef competitors Australia, New Zealand, Brazil, and Uruguay are 20 percent in Mexico and 26.5 percent in Canada (outside the tariff quota). NAFTA also gave Canada and Mexico a roughly 10-percent margin of preference in the U.S. market over competitors facing the MFN rate. Beef producers in Chile and Australia also have preferential access through their countries' PTAs with the United States. New Zealand, Brazil, Uruguay, and other beef-exporting countries face the higher MFN tariffs in the U.S. market.

China's PTAs with New Zealand and Chile eliminated tariffs governing bilateral beef trade with those countries. Australia's PTA with Japan reduced the beef tariff by 2.4 percent below the 12-percent MFN tariff that the United States and other exporters pay. The Japan-Australia PTA will, when fully implemented in 2031, lead to a 19-percent lower tariff for Australian beef than beef from the United States and most other exporters to Japan. Muhammad and colleagues (2016) project that without any other intervening changes affecting trade, this advantage will lead to a gain of about $100 million in Australia's beef exports to Japan and a loss of about $100 million for the United States. In contrast, if Japan extended the tariff levels from the Japan-Australia PTA to all countries, U.S. beef exports would be projected to increase by $130 million.

Even when they offer positive preferential margins on average, many PTAs include extensive exemptions and exceptions for the most sensitive agricultural products, and some exclude agriculture entirely (WTO, 2011). In a study of 15 trade agreements between the 4 largest trading countries and their largest trading partners, Damuri (2009) finds that agricultural products are excluded from liberalization more often than other products. Of the food and agricultural tariff lines in his sample, 27 percent are excluded from at least one agreement, whereas only about 1 percent of manufacturing products are excluded. Moreover, products that are more likely to generate trade in a PTA are also more likely to be excluded, eroding the possible gains from trade. U.S. PTAs typically include the eventual elimination of all or almost all tariffs.

Tariff-Rate Quotas

Tariff-rate quotas (TRQs) offer improved market access for a specified quantity of imports. In-quota tariffs are often set at zero or close to it. Imports outside the quota are unlimited but face a tariff rate that is usually higher. Sometimes, however, both the in-quota and out-of-quota tariffs are high. For example, Thailand levies a 65-percent tariff on sugar imports within its TRQ and a 94-percent tariff otherwise (authors' calculations using WTO, 2016o).

The URAA established a system of TRQs to replace restrictive measures that members agreed to phase out (Abbott, 2002). Most TRQs established in the Uruguay Round are offered on an MFN basis, although a few country-specific TRQs were established, such as Japan's for prepared edible fats from New Zealand. TRQs have been specified in the WTO schedules of only 39 member countries and are concentrated on a few products. Among the BRIIC countries, China, Russia, and India each maintain several WTO-notified TRQs, as does the United States. The EU TRQs span all the major commodities in table 6, with high over-quota tariffs. TRQs on dairy products and rice involve the largest number of countries (authors' calculations using WTO, 2016o).

Since the Uruguay Round, country-specific TRQs have been established or adjusted to solve bilateral disagreements. For example, the EU established a processed chicken meat TRQ for Thailand that would allow that country to preserve access to the EU market after an avian influenza outbreak. Country-specific TRQs also feature in many PTAs.

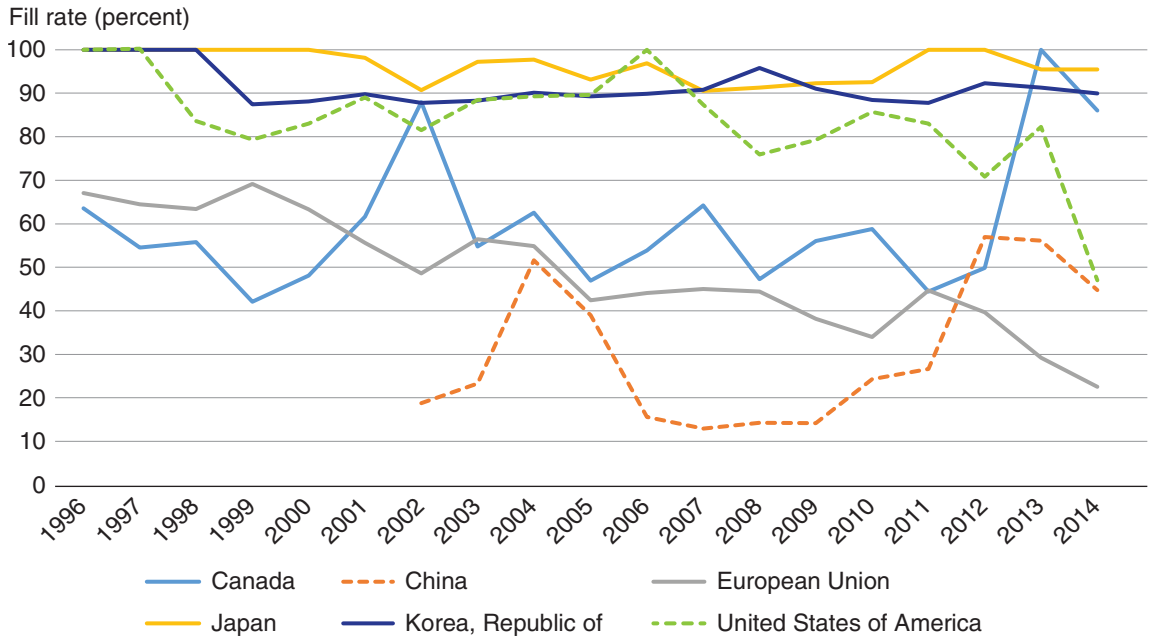
TRQs offer exporters a degree of market access while providing domestic producers more certainty about the amount of foreign competition. However, quotas for which the lower tariff rate is available frequently go unfilled. Across all WTO-notified TRQs, fill rates averaged 59 percent in 2013 (authors' calculations using WTO, 2016o). The fill rate differs across countries (fig. 22).

Table 6
Selected WTO-notified tariff-rate quotas of major trading countries

		Brazil	China	EU	India	Indonesia[1]	Russia	United States
Beef	TRQ	No	No	Yes	No	No	Yes	Yes
	Over-quota tariff	NA	NA	127	NA	NA	50	26
Pork	TRQ	No	No	Yes	No	No	Yes	No
	Over-quota tariff	NA	NA	31	NA	NA	65	NA
Poultry meat	TRQ	No	No	Yes	No	No	Yes	No
	Over-quota tariff	NA	NA	43	NA	NA	80	NA
NFDM	TRQ	No	No	Yes	Yes	Yes	No	Yes
	Over-quota tariff	NA	NA	46	60	5	NA	26[2]
Butter	TRQ	No	No	Yes	No	No	No	Yes
	Over-quota tariff	NA	NA	59	NA	NA	NA	31
Wheat	TRQ	No	Yes	Yes	No	No	No	No
	Over-quota tariff	NA	65	33	NA	NA	NA	NA
Corn	TRQ	No	Yes	Yes	Yes	No	No	No
	Over-quota tariff	NA	65	42	60	NA	NA	NA
Rice	TRQ	No	Yes	Yes	No	Yes	No	No
	Over-quota tariff	NA	65	59	NA	450 R/kg[3]	NA	NA

Notes: NFDM = Nonfat dairy milk. *Ad valorem* equivalents calculated by Beckman and Arita. Ad valorem tariffs for India and Indonesia. WTO = World Trade Organization.
[1]Indonesia notifies the WTO that there are no imports within the TRQ because the general applied rate is lower than the in-quota tariff.
[2] Lowest of several tariff lines.
[3] R/kg = Rupiahs per kilogram
Sources: USDA, Economic Research Service. For China, EU, Russia, and United States: Beckman and Arita, 2016. Country tariff schedules of Japan, India, and Indonesia.

Figure 22
Tariff-rate quota fill rates, 1995-2014



Source: USDA, Economic Research Service. WTO, 2016o.

WTO rules require notifications on TRQ operation and administration. The WTO Committee on Agriculture (CoA) provides a forum in which members can publicly raise concerns. For example, the United States voiced concerns over China's allocation of its grain TRQs, which do not appear to be allocated efficiently to end-users (WTO, 2016f). Despite domestic corn and wheat prices exceeding international prices by 20-50 percent in recent years (net of transport costs), Chinese TRQs continue to be persistently underfilled (Gale, 2015). Roughly 1,400 concerns have been raised in the CoA about TRQ administration, with concerns raised more frequently in 1995-2006 than in more recent years (WTO, 2016o). Concerns over the underfilling of TRQs were the most common.

The WTO's Bali Ministerial (in 2013) brought TRQ administration under the Uruguay Round Agreement on Import Licensing Procedures and spelled out rules for timely and transparent quota administration.

Exceptions to Tariff Ceilings

WTO members have agreed to bind effectively all of their agricultural tariffs at a certain level. In general, countries cannot raise tariffs above these ceilings. However, contingency measures are available in certain cases that allow duties applied at the border to surpass the bound tariffs. Safeguard mechanisms and duties on imports that are found to be dumped or supported by government subsidies are among these measures. Unlike bound tariffs, contingency measures are of limited duration, with their implementation subject to specific rules.

Safeguards

Safeguards allow governments to temporarily impose duties above bound tariff rates or to impose quantitative restrictions outside TRQs (under a limited set of conditions) when the quantity of an import rises or the price falls dramatically. A safeguard can thus provide extra protection for domestic producers in extraordinary circumstances.

WTO rules on the use of safeguards in agriculture are established under the URAA and the Agreement on Safeguards (SG Agreement). The URAA set up an agriculture-specific special safeguard mechanism (SSG) that could be applied to tariff lines for which import barriers prohibited by the URAA were converted to tariffs at the time the URAA was signed or upon accession to the WTO. Access to the SSG was thus a one-time opportunity gained in exchange for a negotiating concession. Only 33 WTO members reserved the right to use the SSG, and only 11 had used it as of 2015 (WTO, 2017b).[15] Dairy products, rice, sugar, and pork are among the commodities most often granted an SSG.

The SSG has two possible triggers. Under the volume-based trigger, an extra duty can be imposed if imports in the current year exceed the average in the 3 preceding years plus the change in consumption in the most recent year.[16] The extra duty can be as high as one-third of the duty in effect when the import increases occurred, and can be levied until the end of the year in which it is imposed. The extra duty does not apply to imports within TRQs.

[15]Barbados, Costa Rica, EU, Japan, Korea, Nicaragua, Norway, Philippines, Switzerland, Taiwan, United States.

[16]Increases in import volume of less than 5 percent cannot trigger an extra duty. If imports in the 3 preceding years were a large share of consumption, an increase in imports of 5 percent or more can trigger the extra duty. If imports have been a small share of consumption, the volume increase must be 25 percent or more to trigger the action.

In the case of an SSG action based on price, when the price of a shipment falls more than 10 percent below the average for the 1986-88 base period (the trigger price), a duty based on the difference between the trigger and current prices can be applied. The price-based safeguard is applied to all shipments with a price at least 10 percent below the trigger until the end of the year. Countries using an SSG must promptly notify the CoA when safeguard duties are applied (WTO, 1995a).

Under the SG Agreement, a tariff exceeding the bound rate or a new quantitative restriction can be imposed if the country can demonstrate that imports cause serious damage to a domestic industry, or pose a serious threat of inflicting such damage. The safeguard can be in place up to 4 years, with a possible 4-year extension. However, the safeguard restriction must be progressively reduced over the application period (WTO, 2017c). Safeguards have been invoked for imports of lamb and wheat gluten by the United States, leeks and mushrooms by Japan, preserved mandarin oranges by the EU, and powdered milk by Egypt (WTO, 2017c).

A proposed special safeguard mechanism (SSM), which would reopen the possibility to establish safeguards, has been a prominent issue in the Doha Round. At the 2015 WTO ministerial meeting (Nairobi), it was decided that "developing country Members will have the right to have recourse to a special safeguard mechanism" (WTO, 2015d). The 2005 ministerial meeting (Hong Kong) had agreed that an SSM would be "based on import quantity and price triggers" (WTO, 2005a), together with ambitious and significant tariff reductions and further market access reforms. However, SSM design and implementation have been deferred to future WTO discussions.

Anti-Dumping and Countervailing Duties

Anti-dumping (AD) and countervailing duty (CVD) measures are invoked to protect domestic producers from the harmful trade policies of competitors, as when the products of a foreign competitor enter the domestic market at less than the normal value of the products (dumping). CVDs are charges imposed by governments on shipments in order to offset a subsidy provided by the exporting country. In the Uruguay Round, WTO members addressed product dumping in the Agreement on Implementation of Article VI (Anti-dumping, or AD, Agreement) and the use of CVDs in the Agreement on Subsidies and Countervailing Measures (SCM Agreement) (WTO, 2016k).

Chinese and South African AD duties applied to U.S. frozen poultry parts highlight the influence of AD findings on trade. South Africa's AD action effectively eliminated its imports of U.S. broiler parts for over 15 years, and China's action has depressed U.S. exports for over 5 years. The Chinese duties were found to violate WTO rules in 2013. In July 2016, the WTO established a compliance panel to review the U.S. claim that China had not complied with the 2013 ruling (WTO, 2016e). In 2015, South Africa agreed to open a 65,000-metric ton TRQ for U.S. poultry meat; under the TRQ, U.S. meat is afforded the MFN tariff (37 percent), has the AD duties rebated within the TRQ, and continues to face AD duties for imports above the TRQ (Esterhuizen, 2016).

Among the most notable CVD actions, China has imposed CVDs between 4.0 and 30.3 percent on U.S. broiler meat since 2010, claiming that U.S. programs for corn and soybeans provide an indirect feed subsidy for U.S. broiler production. In 2013, a WTO dispute panel ruled against China's claim. As with the AD dispute, a compliance panel was formed in June 2016 (WTO, 2016e).

The remedy for dumping under the AD Agreement is an extra duty equal to the difference between the import unit value and the price charged (or its proxy) in the domestic market of the

exporting country—the "margin of dumping" (WTO, 1995b).[17] In order to take an AD action, a WTO member must first establish that exports meet the definition of dumping and provide evidence of damage to the domestic industry through a transparent process.[18] Calculation of a margin of dumping must likewise be transparent and investigations must finish within 12-18 months. Transparency is important to trading firms, which face considerable uncertainty while the investigation is underway. AD duties expire as soon as the dumping ceases to cause damage, or after 5 years. If further investigation finds continued dumping or the likelihood that dumping and injury would recur before the 5-year period is over, the duties can be extended.

CVDs can be applied to offset a subsidy of 1 percent or more (2 percent for developing countries) of a product's import value.[19] To apply a CVD, the importing country must demonstrate material damage or a threat of such damage to its firms through an open and transparent investigation conducted by the government within 12-18 months. Duties cannot exceed the value of the subsidy but may vary across exporting firms. CVDs must expire within 5 years, unless a continuation is successfully requested.

In January 2017, China imposed AD and CVDs on imports of distillers' dried grains (DDGS) from the United States (U.S. Grains Council, 2017). China's DDGS imports from the United States totaled almost $2 billion in 2015 and over $680 million in 2016 (GTA, 2017).

State Trading Enterprises

Within some countries, commercial activity in select agricultural commodities is managed—at least in part—through a state trading enterprise (STE). STEs are government-sponsored institutions that have special privileges in a country's domestic markets for a given commodity and are thus able to influence the level or direction of imports or exports (WTO, 2016l). STE control over trade introduces the possibility of political influence on commodity markets and can inhibit the market-based balancing of supply and demand.

STEs usually function to stabilize farm or consumer prices for staple foods. For import-competing products, STEs often influence the volume of both domestic and imported products. For instance, the Canadian Dairy Commission chairs Canada's Milk Supply Management Committee, purchases and sells a portion of domestic butter output, and directs import permits for Canada's butter TRQ to processors (Dairy Farmers of Canada, 2017). Some STEs have the exclusive right to import (export) or dispense import (export) licenses to private firms.[20] Other STEs influence markets less directly. Pakistan's Agricultural and Storage Services Commission purchases around one-third of domestic wheat production, giving the Commission market power that may affect domestic prices and thereby influence the level of imports or exports.

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[17]Or, if that price is not available, between the import unit value and the highest unit value from the exporting country to any other trade partner for that good or the cost of production of the good in the exporting country, including "administrative, selling, and general costs."

[18]If a margin of dumping is less than 2 percent of the export product's price, or if imports that are found to be dumped are less than 3 percent of total imports of the good, an investigation must be terminated.

[19]The WTO defines a subsidy as a financial contribution by a government or public body that provides a benefit. A benefit can be a cash grant, a loan, equity infusion, a purchase, or other transaction, and must be shown to improve on what a firm could have gotten in the private market (WTO, 2016k).

[20]For example, on imports, Malaysia and the Philippines for rice; on exports, China for grains and cotton, India for onions, and the Philippines for rice and corn.

A number of once influential STEs have been discontinued or transformed since the Uruguay Round (WTO, 2017d). The Australian Wheat Board was privatized in 1999 and ceded control over wheat exports in 2008. The Canadian Wheat Board was fully commercialized in 2015 and ceded control over wheat exports in 2012. Today, among the top 10 wheat-exporting countries, only Turkey maintains an STE, the Turkish Grain Board, in the wheat market.

State trading enterprises have special influence in domestic and import markets for several staple products in China, India, and Indonesia.[21] STEs remain active in some OECD countries[22] and are dominant in the grain import markets of several countries in the Middle East, North Africa, and South/Southeast Asia. Some countries fail to notify the WTO of their STEs, even though they have enterprises that fit the WTO's definition. For instance, the General Authority of Supply Commodities in Egypt and the Saudi Grains Organization are major, state-owned wheat importers that are not notified to the WTO (table 7). The Turkish Grain Board is also not notified as an STE to the WTO.

Table 7
State influence in wheat markets among the largest importing countries

Wheat-importing country	Rank	Average imports, 2014-16	STE notified to WTO	Leading government-recognized enterprise active in wheat market
		1,000 mt		
Egypt	1	11,125		General Authority of Supply Commodities
Indonesia	2	8,328		
Algeria	3	7,631		Office Algérien Interprofessionnel des Céréales
Brazil	4	6,395		National Company of Food and Supply
Japan	5	5,905	*	Ministry of Agriculture, Forestry and Fisheries
EU	6	5,624		
Iran	7	4,888		Government Trading Corporation of Iran
Turkey	8	4,786		Turkish Grain Board
Mexico	9	4,640		
Philippines	10	4,460		
Nigeria	11	4,411		
Korea, South	12	4,217		
Morocco	13	4,148		
China	14	4,058	*	China National Cereals, Oil and Foodstuffs Import & Export Co.
Bangladesh	15	3,992		Directorate General of Food
United States	16	3,961		
Thailand	17	3,374		
Yemen	18	3,331		
Saudi Arabia	19	3,282		Saudi Grains Organization
Iraq	20	2,572		General Company for Grain Trading

Note: STE = State trading enterprise.
Sources: USDA, Economic Research Service. Authors' calculations using USDA, Foreign Agricultural Service, 2017b for average imports and GAIN reports for identification of some government-recognized enterprises; WTO, 2016l; World-Grain.com for identification of some government-recognized enterprises.

[21]China (grains, sugar, tobacco, cotton); India (grains, vegetable oils, dairy products, sugar, onions, etc.); Indonesia (rice, sugar).

[22]Dairy imports (Canada, Japan); rice imports (Japan, Korea) and exports (Australia); and wheat and flour trade (Turkey).

Import Licensing

International trade does not ordinarily require licensing. Imports are typically registered at customs without prior approval. In cases where import licenses are required, the Uruguay Round Agreement on Import Licensing Procedures (Import Licensing Agreement) requires that licensing not restrict trade beyond the extra effort required to apply for a license. The Agreement also specifies several steps to ensure transparency in licensing procedures and requires notification of new and changed licensing procedures.

At times, however, import licenses do restrict agricultural trade, most notably when they are used in the allocation of TRQs, either by the exporting or importing country. When governments do not promptly or automatically renew import licenses, the extra time involved can reduce trade (Shepherd, 2013).

Since 1995, 65 cases involving import licenses have been submitted to the WTO for dispute settlement, over 30 dealing with agricultural products. Indonesia, with seven current cases involving agriculture, is the most frequent target of import licensing disputes (see box, "Indonesia's Import Licensing Steps"). The Indonesian Government introduced new import licensing measures on animals, animal products, horticultural products, and other foods and beverages over 2008-12, in part to implement policies to boost agricultural self-sufficiency (WTO, 2013). In addition to the challenge by Brazil (see box), New Zealand and the United States in 2014 also sought dispute settlement with Indonesia over import licensing. The WTO established a panel, which found in 2016 that Indonesia's licensing regime was in violation of WTO rules. In 2017, Indonesia appealed the decision.

Box 5

Indonesia's Import Licensing Steps

Indonesia requires import licensing for a number of perishable agricultural products, including meat, fruit, and vegetables. Several countries have requested WTO consultations with Indonesia regarding this policy, and their allegations help explain how import licensing can restrict trade.

Brazil's request for consultation identifies five formal steps that Indonesia requires before it will issue an import license:

- Trade Operation Permit (Ministry of Trade),
- Certificate of Customs Registration (Ministry of Finance),
- Importer Identification Number (Ministry of Trade),
- Recommendation from the Minister of Agriculture, and
- Import Approval from the Minister of Trade.

All five steps have strict deadlines. Brazil regards this procedure as complicated, onerous, and a source of additional uncertainty regarding import approval. Potentially, each office could be late in approving, and any one office could withhold approval. Delays and uncertainty with this process could cause financial losses to exporting and importing firms.

Indonesia's latest notification of import licensing practices to the WTO (for 2013) states that import licensing of horticultural and animal products is "automatic" (WTO, 2015c). The licensing procedures disputed by Brazil and other complainants had not been notified to the WTO (WTO, 2016h). Licensing measures that an exporter regards as restricting trade access may not be considered restrictive by the importing country, or the importing country may have no interest in drawing attention to the measures. The extent of overly restrictive licensing requirements may be greater than indicated by the notifications provided to the WTO.

Other Taxes at the Border

Value-added taxes (VATs) are used by over 160 countries—including all OECD countries other than the United States—to raise revenue by taxing the value added to a product at each stage of the chain from the producer to the consumer. A percentage tax is applied to the value-added amount. Some countries also apply taxes or levies on the final sales value of a product. These taxes can be *ad valorem* or specific duties, and can be quite substantial. The price of consumer goods imported to Brazil, for example, is normally more than doubled when all taxes are included (Fonseca, 2016).

Value-added taxes typically apply equally to all products, whether imported or domestic. However, countries sometimes apply a higher tax rate to imports than to domestic products. For example, Switzerland levies fees on imports, but not on domestic products, to fund reserve stocks on certain foodstuffs (WTO, 2017d). Under the international norm for a VAT system, the tax is refunded on exported products in the source country. The goods are then subject to the full VAT in the importing country, usually collected at the same time as an import tariff (OECD, 2016b).

Other taxes on consumption, such as excise taxes in India and Brazil, are also collected on imports at the border. Because the rates on VAT and other sales taxes vary across countries, and because some countries do not have VAT systems, the consumer tax burden on imports varies depending on the origin and destination of goods in international trade. While the Uruguay Round Agreement on Subsidies and Countervailing Measures (SCM Agreement) deems "government revenue that is otherwise due [which is] foregone or not collected" as an export subsidy, tax exemptions for exports are allowed as long as the taxes apply equally to the "like product when destined for domestic consumption" (WTO, 2016a).

Other Nontariff Measures

International agricultural trade is also affected by a suite of other nontariff measures (NTMs). Countries are free to impose regulations and standards to meet domestic goals, although, as WTO members, they have committed to base such measures on science and to not discriminate against foreign producers. Nevertheless, exporters regularly raise concerns over measures they view as disguised barriers to trade (Anderson et al., 2012).

Uruguay Round agreements established rules intended to minimize the use of two types of domestic regulations as barriers to trade.[23] Sanitary and phytosanitary (SPS) measures protect human, animal, or plant life or health from risks arising from the entry or spread of plant- or animal-borne pests or diseases, or from additives, contaminants, toxins, or disease-causing organisms in foods,

[23]Normile (1998) points out that the GATT had rules governing SPS and TBTs before the Uruguay Round; however, there were many loopholes and no SPS measure was successfully challenged.

beverages, or feedstuffs (U.S. Trade Representative, 2014a). Technical Barriers to Trade (TBTs) are specific technical or other requirements such as organic labeling rules, along with the procedures that ensure these requirements are met (U.S. Trade Representative, 2014b).

Export Interventions

Governments intervene both to promote and to discourage exports. In some ways, export interventions are comparable to policies affecting imports (table 8). Export-promoting policies include export subsidies and other forms of export competition disciplined in the URAA. Export-reducing policies range from outright bans to export licensing regimes. These policies are subject to fewer disciplines than import interventions.

Table 8
Import and export interventions contrasted

		Import	Export
Bans		Prohibited in UR	Prohibited in UR
Quotas			
	Maximum	Prohibited in UR	Prohibited in UR
	Minimum	Not disciplined	Not disciplined
Tariff rate quotas		Permitted, disciplined	Banned in UR
Licenses that restrict		Disciplined	Banned in UR
Tariffs		Bound	Not bound
Subsidies		Not disciplined	Disciplined in UR, banned in Nairobi WTO Ministerial
Application of VAT and other charges		Not disciplined	Not disciplined
State trading		Disciplined in UR	Disciplined in UR
Minimum price		Banned in UR	Not disciplined

Note: The Nairobi Decision does lead to the eventual elimination of export subsidies, but their full elimination is not immediate. The table pertains to the URAA and measures affecting agricultural imports and exports. UR = Uruguay Round.
Source: USDA, Economic Research Service. Authors' calculations using information from WTO, 2017b.

Policies That Increase Exports

Exports add to demand for commodities produced in a country, and many governments attempt to increase exports. Often, these efforts involve providing information, certification, or documentation that can assist exporting firms, but do not provide a monetary award for exporting. Sometimes explicit subsidies have been provided per unit of exports.

Export Subsidies

Export subsidies applied to a specific product are among the most blatantly distorting trade policies (Peters, 2006). Historically, they have been used in conjunction with domestic support policies to maintain a price floor. In many cases, these policies have led to excess domestic supply, further requiring high import tariffs to minimize surpluses (Peters, 2006). Along with encouraging domestic production, export subsidies offer domestic exporters an advantage in foreign markets.

Under the URAA, countries agreed to cap and reduce their export subsidies over the implementation period, and to not introduce new export subsidies.[24]

Developed economies—particularly the EU—have historically accounted for the great majority of export subsidy commitments under the URAA. The EU accounted for 87 percent of all export subsidies used between 1995 and 2000 (Hoekman and Messerlin, 2005). However, reforms to the EU's domestic agricultural policy and WTO litigation remedies drastically reduced the number of commodities receiving export subsidy payments from the EU. By 2010, only meat products received EU export subsidies; by 2014, no export subsidies were made, as reported to the WTO (table 9).

Table 9
Export subsidies by country, 1995-2014 (million $U.S.)

	1995-2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Australia	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada	0	0	64	75	86	89	84	84	79	86	89	100	81	73
Columbia	89	0	0	0	0	0	0	0	0	0	0	0	0	0
EU	31,728	3,541	3,674	3,421	2,415	1,845	1,172	658	519	230	187	77	0	0
Iceland	2	0	0	0	0	0	0	0	0	0	0	0	0	0
India	13	1	9	13	12	11	29	64	102	N/A	N/A	N/A	N/A	216*
Israel	21	6	4	1	1	0	0	0	1	2	2	1	1	2
Korea	37	20	20	22	27	29	30	28	31	34	32	33	29	N/A
Mexico	58	0	0	0	0	0	0	0	0	0	0	0	0	0
Morocco	3	0	4	4	4	6	7	9	6	4	14	N/A	N/A	N/A
New Zealand	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Norway	534	34	47	56	51	53	40	35	39	45	40	39	44	30
Pakistan	7	0	0	6	18	0	4	0	0	0	0	0	0	N/A
Panama	71	0	0	0	0	0	0	0	0	0	0	0	0	0
South Africa	637	0	0	0	0	0	0	0	0	0	0	0	0	0
Switzerland	2,287	156	172	162	121	114	88	97	112	74	84	65	70	70
Thailand	26	0	0	0	0	0	0	0	0	0	0	0	0	0
Tunisia	23	3	5	3	6	2	8	4	4	3	2	3	4	3
Turkey	140	0	0	0	0	0	0	0	0	0	0	0	0	0
U.S.	501	32	3	0	0	0	0	19	2	0	0	0	0	0
Venezuela	31	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	36,212	3,792	4,002	3,761	2,742	2,150	1,460	999	895	478	450	317	228	394

Note: Brazil, Indonesia, and Uruguay had commitments but did not notify their use in the 1995-2014 period. N/A indicates that the country did not provide notifications for that year.
*India's export subsidies for 2014 are estimated from their publicly stated subsidy for sugar.
Source: USDA, Economic Research Service. Authors' calculations using WTO, 2017b.

[24]See Peters (2006) for more information.

Like the EU, other countries that had previously subsidized exports went beyond Uruguay Round commitments to reduce subsidies unilaterally. By 2014, export subsidies notified to the WTO totaled $394 million, compared to $6.5 billion in 1995.[25] Some export subsidies, such as India's subsidized wheat exports during 2000-05, have not been notified to the WTO (Jha et al., 2007; WTO, 2017b).[26] In the Doha Round negotiations, it became clear that WTO members were prepared to phase out export subsidies completely. These discussions culminated in commitments to eliminate export subsidies at the 2015 WTO Ministerial Meeting (see box, "The Nairobi WTO Ministerial Decision About Export Competition").

Despite URAA disciplines that permit some countries' use of export subsidies on agricultural products, export subsidies are also disciplined under the SCM Agreement,[27] which allows countries to challenge a competitor's policies if they can demonstrate an adverse effect on the interests of the country making the complaint. Adverse effects of an export subsidy can be increased import competition in domestic markets or unfair competition in third-country markets, including that of the country offering the subsidy (WTO, 2016a).

Export Credits, Export Credit Guarantees, and Insurance Programs

Other government measures intended to facilitate foreign trade are suggestive of export subsidies. Under the URAA, WTO members agreed to disciplines that would minimize the subsidizing aspect of these measures. Most common among such policies are export credits and export credit guarantees, in which a government or government-owned institution provides credit directly or guarantees a loan to a private firm to finance an export transaction. Governments may likewise provide or facilitate the purchase of insurance for international transactions (WTO, 2000).

In general, government-sponsored export facilitation programs exist to address failures in credit and insurance markets for international transactions. Private-sector financing may be subject to delays that are incompatible with trading perishable goods, or private financing may be nonexistent or prohibitively expensive because of insufficient institutional financial capacity and/or perceived risk of default from importing countries.

The United States offers multiple programs that assist with agricultural export financing. Firms exporting from a country that does not offer such help may face a disadvantage compared to firms exporting with some form of government-assisted financing. The degree to which export credits create unfair competition in international transactions depends on the generosity of the interest rate, duration of the payback period, and other terms. Insurance programs are evaluated based on the degree to which premiums are subsidized. The Nairobi Package tightened disciplines on the use of these policies (see box, "The Nairobi WTO Ministerial Decision About Export Competition").

[25]Turkey notifies its export subsidies for agricultural products to the Committee on Subsidies and Countervailing Measures rather than to the Committee on Agriculture. Its subsidies continued through at least 2015, according to the notifications (WTO, TPR for Turkey, 2016n). India has not notified its export subsidies past 2009.

[26]Singh (2015) reports that Indian wheat exports were also sold below the cost to the government exporting agent in early 2014.

[27]The SCM Agreement covers a range of policies. Its provisions do not exclusively apply to export subsidies.

Box 6

The Nairobi WTO Ministerial Decision About Export Competition

The Doha Development Agenda includes several export competition issues. At the 2015 WTO Ministerial conference in Nairobi, attendees agreed to phase out export subsidies entirely and to further discipline export financing support and food aid—all with the goal of reducing policy-driven distortions and enhancing open competition in trade. Under the Ministerial Decision, developed-country members agreed to eliminate all export subsidies immediately. Developing-country members agreed to phase them out by the end of 2018, with limited exceptions. The first pertains to products for which a country has notified export subsidies in one of its three latest WTO notifications by the end of 2022. The other exception is for certain types of marketing-related export subsidies provided by developing countries, which are to be eliminated by the end of 2023 for developing countries and 2030 for least developed countries (LDCs).

The Ministerial Decision also limits the repayment period for export financing support to 18 months (as of the end of 2017), with a 4-year transition period for developing countries, and requires all export financing programs to be self-financing and to cover long-term operating costs and losses. LDCs and net food-importing developing countries are granted a maximum payback period of 36-54 months, for importing basic foodstuffs. Longer repayment periods can be granted in exceptional cases (WTO, 2015b).

The Ministerial Decision also addresses food aid, ensuring food aid is needs-based and in fully grant form, not tied to commercial exports or market development activities of the donor country. In addition, the Decision encourages the use of cash to enable purchase of food aid, using local sources when possible. The Decision requires donors of in-kind food aid to be mindful of local production and to minimize harm to local producers. Monetization of food aid—the practice of sending foodstuffs to be sold by local authorities—was placed under stricter supervision. Members agreed that food aid should be monetized only when it is necessary in order to deliver or transport food assistance or to fund measures to enhance food production.

Food Aid

The primary purpose of food aid is to provide in-kind assistance to populations facing hunger, malnutrition, and domestic shortages. However, depending on its design, a food aid program could depress prices for farmers in aid-receiving countries. Food aid programs may operate, unofficially, as surplus disposal tools for the donor countries. Government purchases for donated food abroad provide a market for domestic producers but distort competition with suppliers in the recipient country and other countries.

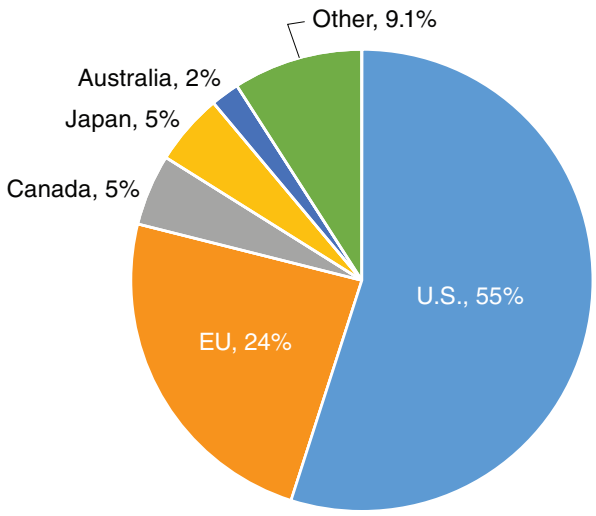
Article 10.4 of the URAA specifies conditions that are intended to prevent food aid programs from being used as surplus disposal tools and encourages countries to provide food aid in the form of grants. Rules applying to food aid were tightened in the Nairobi Ministerial Decision on Export Competition. Food aid is divided into three types:

- ***Emergency food aid*** (about 60 percent of the total) is food distributed for free in times of disaster and extreme food insecurity;
- ***Program food aid*** (20 percent of the total) is bilateral aid that is sold for below-market prices on the local market to generate income for the recipient government; and
- ***Project aid*** (20 percent of the total) is provided to support specific activities and projects (WTO, 2005b).

Before the WTO was established in 1995, program food aid was by far the largest type of food aid both globally and from the United States. Program food aid can affect the prices farmers receive in the importing country, and monitoring the use of the funds by the importing government can be difficult. Since 1995, emergency food aid and project food aid have accounted for 75 percent of all U.S. food aid.

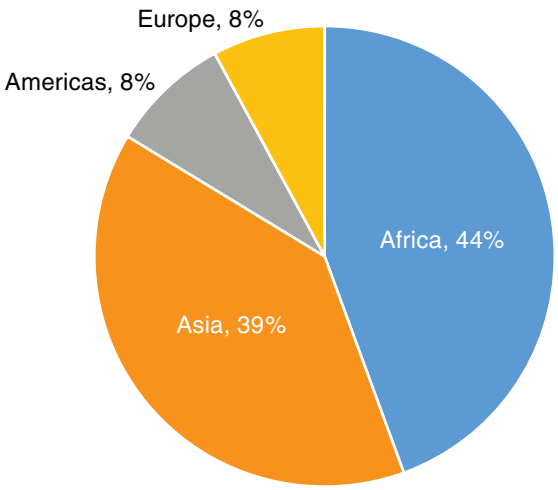
From 1988 to 2012, the United States, EU, Canada, Japan, and Australia provided about 91 percent of all international food aid (fig. 23). The United States alone provided 55 percent. African and Asian countries received the most food aid over 1995-2014 (fig. 24), with North Korea and Ethiopia the two largest recipients (fig. 25). However, even some of the largest agricultural producers (Russia, India) have received food aid.

Figure 23
Food aid by governments/organizations, 1988-2012



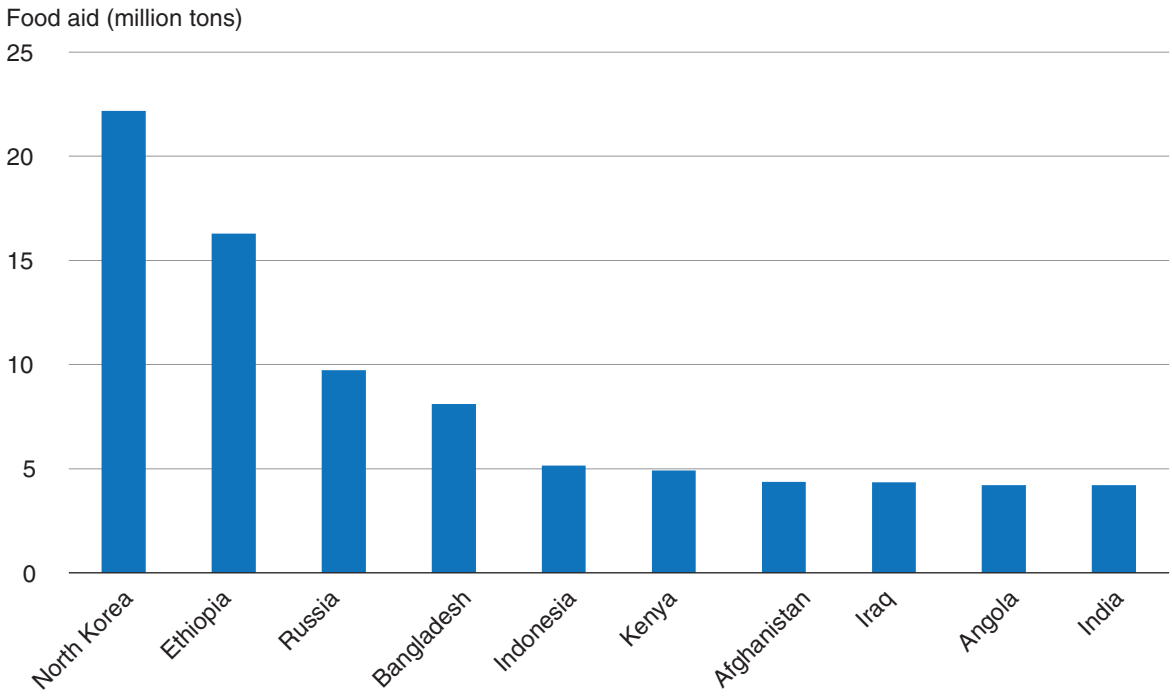
Source: USDA, Economic Research Service. Authors' calculations using data from the World Food Programme (2016).

Figure 24
Food aid received, 1995-2014



Source: USDA, Economic Research Service. Authors' calculations using data from the Food and Agriculture Organization Corporate Statistical Database (FAOSTAT, 2016).

Figure 25
Cumulative food aid received by country, 1995-2014



Note: The Food and Agriculture Organization uses data from the World Food Programme, with provisional data for 2013-14.
Source: USDA, Economic Research Service. Authors' calculations using data from the Food and Agriculture Organization (2016).

Policies That Reduce Exports

Governments may also introduce measures to reduce or control exports, often temporarily. Such policies are widely used and appear not to be waning. However, the reasons they are imposed continue to change. During the global price spikes of 2007-09 and 2011, some countries restricted exports of food commodities to promote stable prices and supplies for domestic consumers; for example, India banned wheat exports during most of the 2007-11 period (Singh, 2011).

Export restrictions on products that are unprocessed or not fully processed have also been used to provide indirect subsidies (through low input prices) for domestic processing industries (Piermartini, 2004). Export taxes are particularly important for the oilseed-processing industry (see box, "Export Taxation in the Oilseed Sector").

Some governments levy taxes on exports as a source of revenue (Estrades et al., 2016; Liefert and Westcott, 2015). Geopolitical conflicts have also triggered export restrictions. For instance, the United States and other countries imposed a grain embargo on the Soviet Union in 1980 in an effort to sanction the Soviet Union for its invasion of Afghanistan. The United States has also maintained an economic embargo on Cuba, affecting agricultural trade since 1962 (USDA/ERS, 1986; Zahniser et al 2015).[28]

In addition to outright bans, quotas, and export taxes, countries also restrict exports using licensing requirements or minimum export prices. For example, Vietnam prohibits rice export sales at prices below a certain threshold.

In a comprehensive examination of export restrictions from 2005 to 2014, Estrades and colleagues (2016) found that new restrictions outnumber the removal of previously implemented measures. Export taxes affected the largest number of products, followed by export bans and export licensing.

Many commodities are affected by export restrictions. Rice, with 11 percent of all such measures, is the single most targeted commodity. Countries applying one or more export restriction to rice include major exporters India, Vietnam, and Pakistan. Estrades and colleagues (2016) estimate that agricultural exports subject to restriction represented 9.2 percent of global agricultural export value in 2014, and 14 percent of volume.

WTO rules generally prohibit quantitative limitations, including bans, on exports. Exceptions are made in cases of food shortages or where restrictions are necessary to implement standards (Bonarriva et al., 2009). Under Article 12 of the URAA, members agreed that quantitative export limits by net-exporting countries must be notified to the WTO Committee on Agriculture in advance, and affected importing countries must be consulted (Bonarriva et al., 2009). Voluntary export restraints, which had been used as a way to mitigate trade conflicts, were also banned under the URAA. Unlike import tariffs, export taxes were not subject to binding or reductions in the URAA. However, several countries that acceded to the WTO after the Uruguay Round—Russia, China, Vietnam, Cambodia, Ukraine, and Armenia—did agree to bind or reduce their export taxes (WTO, 2016n; Estrades et al., 2016).

[28]The embargo's restrictions on agriculture were loosened under the Trade Sanctions Reform and Export Enhancement Act in October 2000 (Zahniser et al., 2015).

Box 7

Export Taxation in the Oilseed Sector

A number of countries impose export restrictions on oilseeds to support their domestic processing industries. Oilseeds are crushed to produce crude vegetable oil and a residual meal that is used for animal feed. Crude vegetable oil is often subsequently processed into refined oil, and vegetable oils are also broken down into components (such as fatty acids) with distinct uses.

Countries set up systems of taxes that vary with the degree of processing, called differential export taxes, in order to encourage domestic production of high-value products. Mitra and Josling (2009) describe these taxes as subsidies to processors "without any burden to the government." These tax differentials act as subsidies to mills and to factories further processing the oil, disadvantaging processors in other countries.

Argentina has a longstanding policy of taxing soybean exports at a higher rate than it taxes soy oil or soy meal exports and imposes no export taxes on highly processed products of soy oil, such as biodiesel (Sandoval and Joseph, 2015; Sandoval, 2016). These taxes have supported the emergence of a large crushing industry and a biodiesel industry in Argentina.[29] In 2013-14, Argentina produced about 19 percent of the world's soybeans and exported 46 percent of global soy oil and 44 percent of soy meal versus just 8 percent of global soybean exports (USDA, FAS, 2017b).

Indonesia and Malaysia likewise tax exports of crude palm oil, while taxing exports of refined oil and oil-derived products at a lower rate (Wright and Rahmanulloh, 2015; Wahab, 2016). Indonesia not only restricts crude oil exports through its levy (thus putting downward pressure on the domestic price) but also uses most of the resulting tax revenues to subsidize the production of biodiesel from palm oil (Wright and Rahmanulloh, 2015 and 2016). Together, Indonesia and Malaysia provide over 90 percent of global palm oil exports (USDA, FAS, 2017b).

Increases in applied tariffs in importing countries are sometimes accompanied by lower export taxes in their trading partners to maintain bilateral export flows (Estrades et al., 2016). Competition to support processing industries is evident in the case of palm oil. India charges a higher import tariff on refined oil than on crude oil (Aradhey, 2016). Malaysia and Indonesia, the main sources of India's palm oil, set export taxes higher on crude palm oil than on refined oil.

Liapis (2013) found that export restrictions imposed during 2007-11 did not have a large effect on global trade volumes. While Estrades and colleagues (2016) found that export taxes imposed during 2005-14 had a negative impact on the value and volume of exports, they produced strong evidence of an effect on global prices for only a few commodity groups.[30]

[29]Argentina lifted export taxes on wheat and corn and cut the tax on soybeans from 35 to 30 percent in 2016.

[30]The commodity groups with a strong likelihood of a price effect were HS6, live trees and other plants; and HS13, lacs, gums, resins, etc.

Even when export restrictions do not have significant global impacts, they are likely to affect markets in the country imposing the restriction. Export restrictions increase domestic supply, depressing domestic prices. This benefits consumers, but hurts sellers. If an export restriction is perceived as long term, producers may reduce their output of the affected commodity (Piermartini, 2004), defeating the purpose of most interventions. Export restrictions particularly concern countries that depend on imports, which have proposed disciplines and stricter limits on export restrictions (WTO, 2004).

Key facts and central issues in agricultural trade policy debates highlighted by this chapter include:

- Applied tariffs on agricultural imports remain substantial, averaging 15-22 percent worldwide.
- EU tariffs are high in a complex system of tariff-rate quotas.
- Bound tariffs were reduced as a result of the multilateral Uruguay Round and now average 46 percent.
- Applied tariffs can be changed, creating uncertainty.
- Numerous tariff preferences have been created in bilateral and preferential trade agreements.
- NAFTA and the EU have eliminated almost all tariffs among member countries.
- Anti-dumping duties (AD), countervailing duties (CVD), and safeguards are used to raise import levies above tariff levels.
- ADs and CVDs are used by China and other potentially large importers.
- Challenging and reversing AD and CVD measures takes years of negotiation and dispute settlement.
- The use of licensing, quotas, and bans to hinder imports is significant, despite WTO disciplines against such distortion.
- Direct export subsidies have waned and are scheduled to be eliminated as part of the multilateral agreement reached in Nairobi (2015).
- The Nairobi Decision on Export Competition places donations of food commodities under further discipline.
- Export taxes, license allotments, bans, and other interventions increase uncertainty about supply in importing countries.

Today's Domestic Agricultural Policy Landscape

Domestic farm programs have undergone many changes since the implementation of the URAA in 1995. Developed countries have generally tried to provide less trade-distorting forms of support than they provided before the URAA. However, over the same time, a number of emerging economies have shifted from taxing their domestic producers (at least indirectly) to subsidizing them, sometimes substantially (Anderson, 2010; Josling, 2015).

Domestic agricultural and food policies are often linked to other government policies that extend beyond production agriculture. These interlinked policies include rural development initiatives, environmental regulations, and antipoverty measures. Additionally, other macroeconomic government policies have great potential to affect agricultural production and trade through changes to economic growth, taxation, and exchange rates, but such broad policies are beyond the scope of this report. Rather, we focus on policies that aim to explicitly subsidize or tax agricultural production or food consumption.

Several worldwide measures of countries' domestic agricultural support exist, and each has its own strengths and weaknesses. We use the data that OECD and WTO gather and maintain, which are among the most used in the literature. WTO notifications[31] demonstrate what information countries provide for global discussions. However, because these notifications are often out of date and inconsistent, we supplement them with OECD data.[32]

Domestic Support Policies of Major Trading Countries

Forms of domestic support and their distribution across commodities vary across countries. Here, we summarize the evolution and current state of domestic support in key agricultural trading countries.

[31]The URAA limits some but not all domestic agricultural support policies. Essentially, there are two main categories of domestic support. The first is often referred to as "green box," and these policies (such as government-funded research or training) create little or no trade distortion. The second category is commonly referred to as "amber box," and these policies (such as government buying in at a guaranteed price) do create trade distortions. Domestic support policies that fall within the amber box criteria are limited by URAA—subject to reduction commitments. (An additional category, "blue box," has been used by countries less frequently than green or amber.) Spending limits are country-specific and, for some countries, take the form of a bound Total Aggregate Measurement of Support (TAMS), which is listed in the country's schedule in the URAA. The TAMS sets a limit on a country's applied level of nonexempt domestic support. This support is measured separately for individual products (product-specific Aggregate Measurements of Support, AMSs), and there is also an AMS that is not product-specific. All product-specific AMSs and the non-product-specific AMS that are above a *de minimis* for a particular year are summed to calculate the TAMS. Target TAMS is 5 percent for developed countries and 10 percent for developing countries (8.5 percent for China). Most countries established a bound TAMS of nil, so their current TAMS must be nil. This means that the *de minimis* levels function as limits on the country's individual AMSs (Brink, 2015).

[32]The OECD publishes several indicators of support to the agricultural sector. The producer support estimate (PSE) is a measure of the value of transfers from domestic consumers and taxpayers to agricultural producers from policies that support agriculture. The PSE can be separated into four components: transfers provided on the basis of (1) a single commodity, (2) a group of commodities, (3) all commodities, or (4) no obligation on the part of recipients to produce commodities (OECD, 2016c). The consumer support estimate (CSE) is a measure of the value of transfers to and from consumers of agricultural commodities from policies that support agriculture. The PSE and CSE measure support provided through both trade and domestic support policies. The value of trade policy transfers is captured by the difference between domestic and border prices when there is a policy in place (such as a tariff) that could affect the price difference. The support arising from this price difference is referred to as market price support (MPS). See WTO (2017a) for more information.

European Union. The Common Agricultural Policy (CAP) governs farm support in the EU. At the time Uruguay Round negotiations began in 1986, the CAP provided generous production-tied domestic support for several commodities. A major reform of the CAP in 1992 significantly reduced EU support prices for cereals and beef and compensated farmers in the form of partially coupled direct payments. This reform was deepened following the Uruguay Round through additional cuts to support prices and reforms to other commodity supports.[33] Nearly all remaining payments were decoupled by 2012, although individual member states retain the option of providing some coupled payments within their national envelopes.[34]

The most recent CAP reform, enacted in 2013 for the 2014-20 period, authorized the following: measures to more fairly distribute direct payments; allocation of 30 percent of direct payments to a "green payment" to farmers in return for actions favorable to the environment and climate; more targeted support for young farmers and small farmers; new tools for crisis management; measures to strengthen the position of producers in the food chain; and additional investment in research and innovation (Swinnen, 2015). Given that EU domestic support for agriculture has increased over time (relative to 1986), the EU might be expected to see less of a need for border protection—in the form of tariffs and TRQs, nontariff measures, and other restrictions. However, border protection has remained high and changed only marginally (Polet, 2017).

The EU has provided WTO notifications on domestic support through 2013 (table 10). In that year, green box support totalled $91.6 billion (assuming €1 = $0.71), blue box support was $3.6 billion, and the TAMS (Total Aggregate Measurement of Support) equalled about $8 billion. The EU's level of product-specific AMS support in 2013 was under the bound TAMS ($96.5 billion). The majority of AMS support beyond the *de minimis* exemption went to wheat, skim milk powder, and butter (WTO, 2017b). Decoupled income support received almost half of the green box payments. Total domestic support has been around $100 million since 1995 (Matthews et al., 2017).

United States. U.S. domestic support policies are largely set by Federal legislation, generally on a 5-year cycle.[35] Prior to the 1996 Farm Bill, U.S. farm commodity support policy primarily relied on price support loans that were coupled with the production of select commodities and target price programs. These programs were greatly reduced in the 1990s to move agriculture in a more market-oriented direction (Gardner, 2002). The first Farm Bill following the URAA (the 1996 Act) shifted agricultural policy toward decoupling payments, basing support payments (direct payments) on fixed historical acres and yields and thereby moving those expenditures into the green box category. In 1998, as commodity prices fell, farmers received emergency market-loss assistance payments that supplemented direct payments.[36] To avoid reliance on such measures in the future, subsequent Farm Bills (2002 and 2008) introduced countercyclical payments, which were paid when prices were low

[33]See Matthews et al. (2017) for a detailed discussion of the evolution of CAP reforms.

[34]Per European Commission's "Glossary of terms related to the Common Agriculture Policy," to decouple direct payments is to remove the link between the receipt of a direct payment and the production of a specific product. Before the 2003 reform of the Common Agricultural Policy, farmers received a direct payment only if they produced the specific product to which the direct payment linked. With coupled payments, the profitability of producing a product (cereals, beef, etc.) depended not only on the price at which the farmer could sell the product in the market but also on the amount of the direct payment that was associated with that particular product. Decoupling has moved the agricultural sector more toward the free market and given farmers greater freedom to produce according to market demand.

[35]This legislation is colloquially referred to as the Farm Bill, even after the legislation is enacted (ERS, 2016a). Federal crop insurance, which in recent years has become as large an agricultural program expenditure as commodity and conservation programs, is governed by separate legislation but has been modified in recent years through the Farm Bill (ERS, 2016b).

[36]These payments were made on the same decoupled historical base as the direct payments established in the 1996 Act.

but were still decoupled from current production. Legislation in 2000 expanded the Federal crop insurance program by increasing premium subsides, among other modifications. The 2008 Farm Bill established standing disaster programs for both crops and livestock.

The 2014 Farm Act eliminated the direct payment and countercyclical payment programs and introduced price- and revenue-based payments on historical base acreage. But it expanded Federal crop insurance to additional products, and new programs were added, including the Stacked Income Protection Plan (STAX) program for cotton (Hungerford et al., 2016). The Act also replaced the existing dairy target price support program with an insurance program to protect margins (the difference between milk price and feed costs) (Tyler et al., 2016). It also expanded a longstanding program for crops ineligible for Federal crop insurance (Hungerford et al., 2017).

The United States has provided the WTO with notifications of its spending for domestic agricultural support through 2014. As part of its URAA commitments, it agreed to limit its annual TAMS to $19.1 billion, beginning in 2000 (ERS, 2016a). Only in 1999 and 2000 was the level of TAMS close to that limit ($16.9 billion in each of those years). In 2014, the United States' TAMS equaled about $3.8 billion. Total U.S. domestic agricultural support, including spending in both AMS and green box categories, has exceeded $100 billion each year since 2009. Most green box expenditures by the United States are for domestic food aid. In 2014, U.S. green box expenditures were $124.5 billion, of which just over $102.8 billion was for domestic food assistance (WTO, 2017b).

Table 10
Notified total aggregate measurement of support for selected countries

Region	Latest year of notification	$ Million (U.S.)		
		Total value of agricultural production (2013)	Aggregate measurement of support	
			Actual	Ceiling
Australia	2014	51,481	0	458
Brazil	2015	200,418	0	912
Canada	2013	51,005	480	4,136
China	2010	1,300,248	nil	nil
EU	2013	511,127	7,962	96,504
India	2013	383,859	nil	nil
Indonesia	2011	130,641	nil	nil
Japan	2014	86,752	5,009	47,162
Korea	2011	40,741	0	1,372
New Zealand	2015	21,566	0	236
Russia	2015	97,300	50	7,200
United States	2014	394,251	3,810	19,103

Note: The Organization for Economic Co-operation and Development's Producer and Consumer Support Estimates Database (2017) does not provide the value of agricultural production for India. Thus, we use data from the United Nations, Food and Agriculture Organization's FAOSTAT database (2017) to estimate India's value of agricultural production. Specifically, we use the categories "agriculture" and "food." These estimates tend to be larger than those from OECD. For the United States, the overestimate is 5 percent. Nil refers to a country not having a legal basis to make payments.
Source: USDA, Economic Research Service. The World Trade Organization's Agriculture Information Management System (2017) for measurement of support and the Organization for Economic Co-operation and Development's Producer and Consumer Support Estimates Database (2017) for total value of agricultural production.

Other OECD Countries. Of the remaining OECD countries, Iceland, Japan, Korea, Norway, and Switzerland stand out for having policies that restrict imports in favor of domestic production (OECD, 2017).[37] The OECD (2017) notes that around half of gross farm receipts come from agricultural policies. In addition, farm support in Japan and Korea remains dominated by the most production and trade distorting forms of support (e.g., supporting market prices) (OECD, 2017). Norway and Switzerland have largely replaced production/trade distorting support with direct payments to farmers, while support in Iceland has partially shifted to decoupled payments.

Canada is noted as having support levels below the OECD average; however, it protects dairy, poultry meat, and egg producers from foreign competition by using a supply management system of price-support policies, production limits, and border measures (Burfisher et al., 2014). Canada also is one of the few remaining developed countries that provides export subsidies (table 9).

BRIICs. Each BRIIC country claims to provide little or no AMS support. Russia joined the WTO as a developed country with a positive bound TAMS limit. As self-proclaimed developing countries, Brazil, India, and Indonesia have used certain special and differential treatment for domestic support under the URAA.[38] Only Brazil established a positive bound TAMS with accompanying support limits. By not establishing an AMS ceiling, India, Indonesia, and China agreed not to provide nonexempt support above *de minimis* levels (10 percent for India and Indonesia, and 8.5 percent for China). Although they each notified the WTO Committee on Agriculture that they did not provide support above these levels, data reported to the WTO suggest the three countries provided market price supports and domestic subsidies.

Brazil: Brazil's farm policy distinguishes between commercial and family farmers. It delivers support to both types of farmers, primarily through credit programs, including debt rescheduling. Because Brazil is considered a developing country, such programs are not subject to spending limits. The exception is input subsidies, which have to be limited to low-income farmers. Nevertheless, the programs encourage production by decreasing risk aversion in farmers, who believe that debt they take on can be renegotiated in the future. The U.S International Trade Commission (2012) notes that both public and private credit programs make capital available at below-market rates, which has boosted agricultural productivity and production.

Brazil also provides price and income supports for certain commodities most often raised by commercial farmers (Nassar, 2011). For these 12 commodities (including corn, rice, and wheat), Brazil's Government sets a minimum guaranteed price and ensures that returns to producers do not fall below a certain level (DTB Associates, 2014). It has used its positive bound TAMS to provide support in excess of *de minimis* for cotton or wheat in some years.

China: Government policy in China previously discriminated against the country's agricultural sector by imposing agriculture-specific taxes or maintaining commodity prices below market-determined levels (Gale, 2013). An about face has seen China providing market price support in most years since 2000 (Brink et al., 2013). China's notified green box support consists of infrastructure investments, environmental programs, and public stockholding. (Agriculture-related infrastructure investment is a large component of China's agricultural support (Cheng, 2011).) A small fraction of China's green box spending (less than 1 percent of total agricultural production value) goes to decoupled income support to farms.

[37]Australia and New Zealand have the smallest level of support among OECD countries (OECD, 2017).

[38]This is discussed in detail later in the section.

Using data from China's Ministry of Finance, Gale (2013) calculated China's recent agricultural expenditures in the absence of WTO notifications. Expenditures on agricultural support were equivalent to about 11 percent of the value of China's agricultural output in 2012. The fastest growing component of China's farm payments was a general input subsidy to grain producers tied to annual increases in fertilizer and fuel prices. The general input subsidy was in place for 10 years. In 2016, it was combined with two other payments into a single "support and protection payment" that should be paid to farmers based on grain area planted (FCA, 2016). Direct payments linked to area planted to grain and transfer payments to grain-producing counties—as well as price supports for grains, oilseeds, and cotton production—all encouraged expanded production (Gale, 2013).

To support prices, China purchased large quantities of grains, oilseeds, and cotton to help keep market prices near targeted levels. Firms using these products often turned to imports or close substitutes, rather than pay the higher supported prices, leading to the accumulation of large stocks by the Chinese Government. In 2016, however, China purportedly removed the price floor for some commodities and reportedly intends to replace price support policies with new subsidies or other mechanisms, perhaps on a regional basis (Anderson-Sprecher and Ji, 2016).[39]

India: Food self-sufficiency has been a goal of Indian agricultural policy since the country's independence in 1947. To protect its agricultural sector, the Government imposes import and export restrictions and sets prices for several commodities. It administers price support policies that incorporate administered prices countercyclically at times of high world prices, making them particularly trade-distorting. In addition, India has provided substantial subsidies for inputs such as fertilizer, electricity, and irrigation (Hoda and Gulati, 2013). India's green box support consists primarily of expenditures on public stockholding (government purchasing of commodities for redistribution) (Gopinath, 2012).

India's domestic support has increased over the past decade. Support prices for corn, rice, and wheat have all increased by more than 100 percent from 2005 (Hoda and Gulati, 2013). However, India has notified nonexempt domestic support as below the 10 percent *de minimis* limit. The Government maintains minimum support prices for corn, rice, and wheat by purchasing them at a set price. During 2012-14, such purchases accounted for 33 percent of India's wheat production and 32 percent of rice production. At the same time, the country's public distribution system provides lower income consumers with reduced-price supplies of staple foods. The importance of rice and wheat was evident when India banned exports from 2007 to 2011 to ensure domestic price stability (Govindan, 2007; Singh, 2011).

Indonesia: Indonesia has subsidized its agricultural sector since 1990, with the amount of support growing over time (Sudaryanto, 2015). Like India, Indonesia's domestic agricultural support policies are aimed at achieving food self-sufficiency. It has established self-sufficiency targets for five staple products—rice, maize, soybeans, sugar, and beef—and has encouraged increased production of chili peppers and onions (OECD, 2015).

Indonesia provides market price support through border measures and government procurement, and additional support through input subsidies (OECD, 2015). Fertilizer subsidies are the leading direct subsidy to farmers (Rafani, 2015). Indonesia claims these input subsidies are exempt from WTO discipline because Indonesia's developing-country status qualifies it for special and differential treatment (WTO, 2017d). Like India and Brazil, Indonesia provides large subsidies for food consumption,

[39]In another move to boost demand for corn, China has announced plans to double biofuel production by 2020 (Beckman and Nigatu, 2017.).

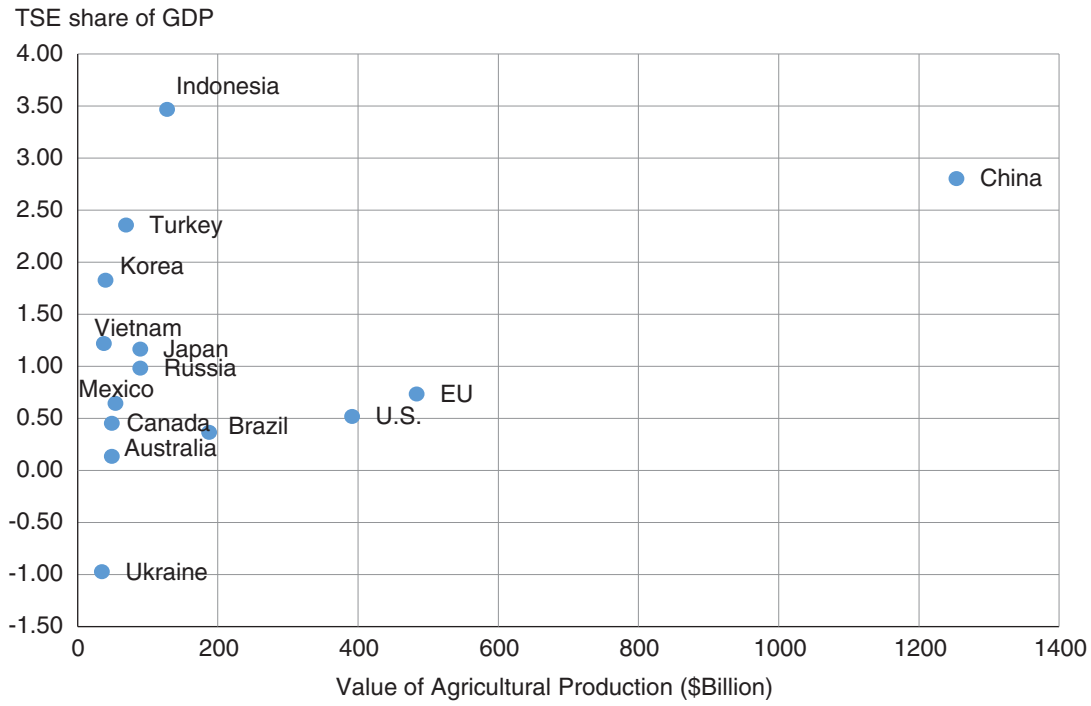
chiefly by purchasing rice and distributing it at lower prices to low-income consumers through its Raskin program (OECD, 2015).

Russia: Immediately after the breakup of the Soviet Union in 1991, state support for the economy in general and agriculture in particular fell substantially. More recently, Russia's support of agricultural producers has increased, primarily through market price support and payments based on input use (FAO, 2013). However, Russia claimed large *negative* market price support for 2014 because of government taxation of grain exports. Although Russia provides product-specific support for several livestock products, the majority of its TAMS in 2015 was non-product-specific subsidies to interest rates for short-term loans (WTO, 2017b). In its 2015 WTO notification, Russia reported decoupled income support at $513 million (WTO, 2017b).

Measuring Domestic Support

Although WTO data are based on notifications by countries, it is difficult to use them to make cross-country comparisons. Consequently, we supplement the WTO data with OECD data. We begin with a comprehensive measure, the Total Support Estimate (TSE), which is an OECD indicator of the annual monetary value of all gross transfers from taxpayers and consumers arising from agricultural support policies. OECD calculations illustrate the relationship between the value of agricultural production and all forms of farm support (fig. 26). Ukraine is the only country in the OECD database with a negative TSE—effectively a net tax on agriculture. Among the countries in the database with more than $30 billion of annual agricultural production, China and Indonesia have the highest level of support relative to their GDP. Turkey, Korea, Vietnam, Japan, and Russia also have shares greater than 1 percent. (OECD does not provide estimates for India.) In contrast, the United States, the EU, and Brazil have TSEs of less than 1 percent of GDP.

Figure 26
Agricultural production and Total Support Estimate (TSE) as share of GDP



Note: GDP = Gross Domestic Product. Value is the average over 2011-16, except for Russia, which is the 2010-15 average.
Source: USDA, Economic Research Service calculations using data from the Organization for Economic Co-operation and Development (OECD) (2017b).

OECD also uses the Producer Support Estimate (PSE) to measure support. For most OECD countries, PSE as a share of gross farm revenue (GFR) has decreased over time (table 11).[40] For most of the OECD countries with large agricultural production values, the dollar amount of support has stayed about the same over time.[41] However, many OECD countries still have high PSEs relative to GFR: Iceland, Japan, Korea, Norway, and Switzerland each averaged more than 50 percent over the last decade. The only OECD countries whose PSE was less than 10 percent of GFR over 2006-15 are Australia, Chile, New Zealand, and the United States.

Table 11
2015 value of agricultural production and Producer Support Estimate (PSE) as a share of gross farm revenue

		Value of production ($ billion)	PSE as percent of gross farm revenue					
					Average			
			1995	2015	1995-2015	2006-2015	Low	High
OECD	Australia	31.3	6.43	1.34	3.74	2.96	1.34	6.43
	Canada	31.1	18.80	9.40	16.44	14.27	9.40	24.19
	Chile	7.8	8.15	3.34	5.53	3.27	2.62	10.93
	Iceland	0.2	60.19	56.32	58.57	50.07	41.49	73.76
	Isreal	5.3	20.99	12.97	13.97	10.19	1.95	22.21
	Japan	83.5	62.21	43.07	53.98	50.06	43.07	62.21
	Korea	33.1	72.77	48.93	56.81	50.85	44.55	72.77
	Mexico	38.4	-4.44	9.20	13.39	11.83	-4.44	26.79
	NZ	11.0	1.13	0.66	0.69	0.69	0.30	1.37
	Norway	3.2	64.32	62.03	64.25	59.98	54.29	73.68
	Switzerland	8.0	63.51	62.39	61.00	53.67	46.37	73.71
	Turkey	46.3	26.98	19.82	26.72	24.32	16.67	35.99
	United States	271.0	9.74	9.44	13.32	9.09	6.90	24.73
	EU	362.7	34.95	18.92	27.77	21.34	18.11	38.49
non-OECD	Brazil	101.7	-14.81	2.57	1.59	4.77	-14.81	8.07
	China	600.6	6.14	21.34	8.79	14.06	-3.16	21.34
	Columbia	17.9	21.54	13.79	19.22	17.93	13.12	24.39
	India*	313.0	3.06	8.21	7.00	9.13	2.93	15.86
	Indonesia	63.5	6.25	29.10	5.79	15.35	-88.07	29.10
	Kazakhstan	7.7	14.85	14.64	10.16	10.96	-5.14	27.26
	Russia	53.6	15.36	15.34	14.53	17.45	-3.85	22.23
	South Africa	12.7	14.70	3.76	6.19	3.87	1.82	14.70
	Ukraine	20.5	-22.15	-6.97	0.52	1.07	-22.15	10.92
	Vietnam	22.9	9.27	0.49	5.01	2.94	-19.85	16.32

OECD = Organization for Economic Co-operation and Development; * = India data are for 2001-13; Vietnam data are for 2000-15.
Note: The Organization for Economic Co-operation (OECD) (2017b) does not provide the value of agricultural production for India; see note below table 10 on India estimates.
Sources: USDA, Economic Research Service calculations for India; all others from OECD (2017b).

[40]For other support, see the appendices.

[41]Appendix 5, figures A1-A3 show the total real PSE ($ billion) from 1995 to 2015.

China is notable for its increases in agricultural support (fig. 27). Brazil similarly had consistent, though much smaller, increases until 2014/15, moving from agricultural taxation (negative PSE) to subsidization. Russia, Kazakhstan, and several other countries show considerable volatility in PSE, as they provide support primarily through border protection rather than less volatile measures (i.e., input subsidies). See Appendix 5 for more information on PSE payments to certain countries. Indonesia's PSE has gone from relatively low levels to the highest among the non-OECD countries, at 29 percent of GFR.

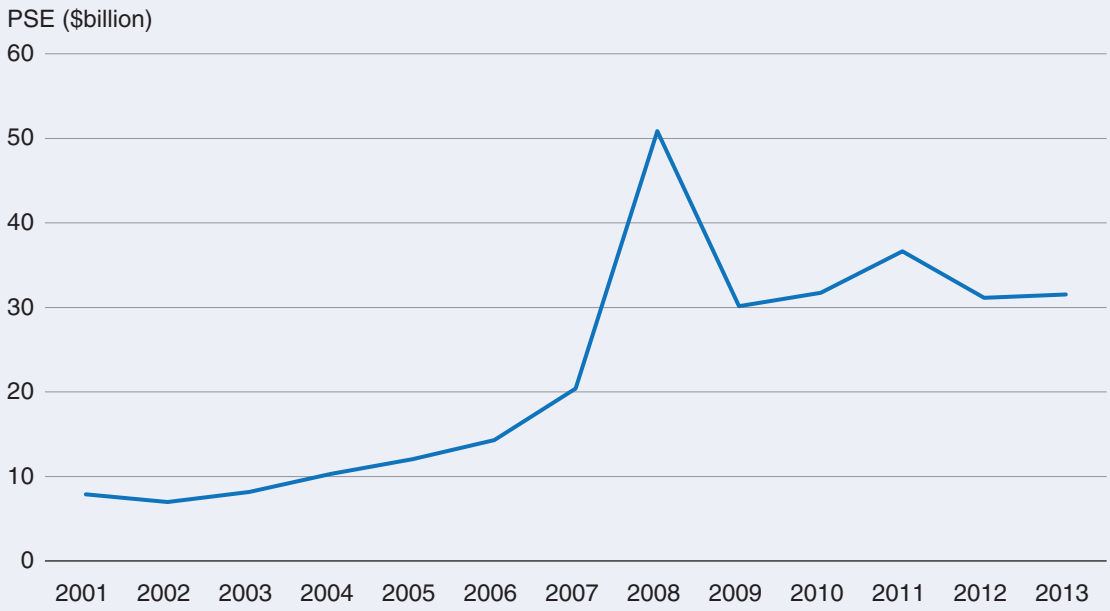
Box 8

Constructing a PSE for India

To assess the level of support provided by India, a non-OCED member, in the framework of the OECD database, we estimate the amount of support India gave as output and input subsidies during 2001-13 (box fig. 1).[42] Payments to agriculture steadily increased from 2001 to 2007 but were always less than $15 billion a year. In 2007, payments spiked; in 2008, payments totaled more than $50 billion (largely support to wheat) and were greater than those in China. By 2009, payments had declined; since then, they have tended to remain around $30 billion per year.

Box 8 Figure 1

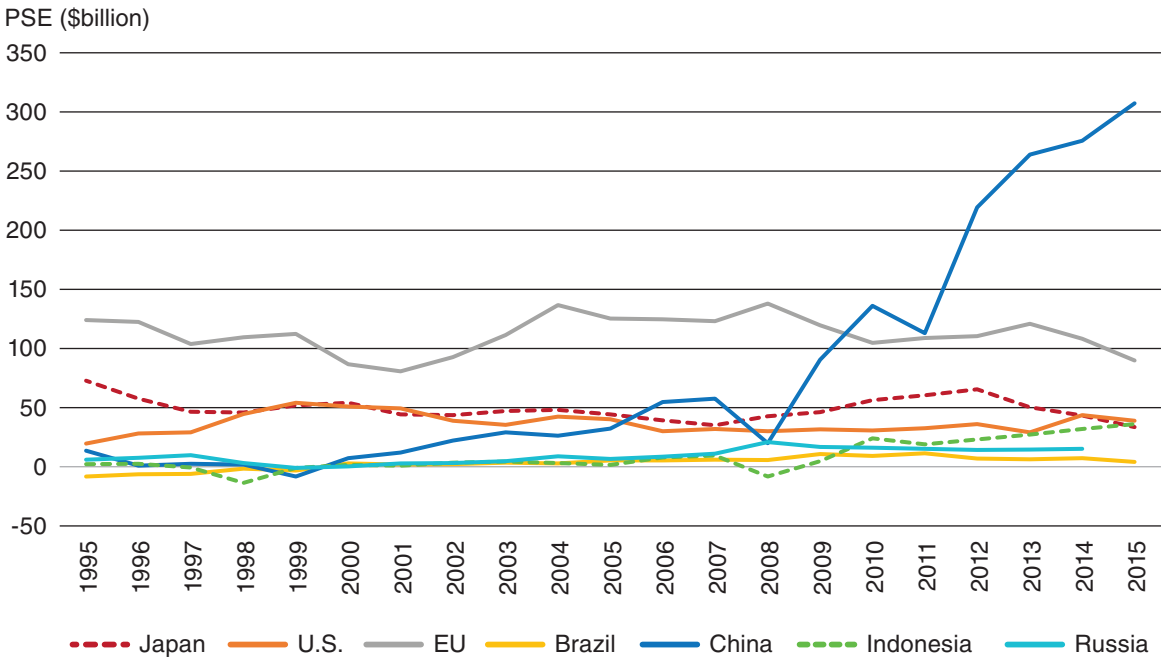
Producer Support Estimates (PSEs) for India, 2001-2013



Source: USDA, Economic Research Service calculations based on data from the Government of India (GOI). (2015) and Singh (2014).

[42]Note that any PSE calculation based on price gaps support would not be included in the calculation.

Figure 27
Producer Support Estimates (PSEs) for countries with annual agricultural production over $50 billion



Source: USDA, Economic Research Service calculations using data from the Organisation for Economic Co-operation and Development (OECD) (2017b).

Evolving Issues

Domestic support for farmers has changed over the last 20 years. Adoption of WTO rules shaped some of these changes. However, further multilateral negotiations to reform domestic support have been slow.[43] Going forward, the quest for self-sufficiency may drive changes in domestic support. Biofuel policies are another new development impacting agriculture.

The URAA differentiates between developed and developing countries. Countries have largely been able to classify themselves. Thus, Russia (which acceded to the WTO in 2012) is classified as developed, while Korea is classified as developing, even though Korea's per capita GDP in purchasing power parity (PPP) terms is higher than Russia's. Developing-country status is especially important with respect to domestic agricultural support. The *de minimis* threshold for developed countries is 5 percent of production value versus 10 percent for developing countries. Developing countries are also able to place general investment support for agriculture and input subsidies to low-income or resource-poor producers in a "development box." Indonesia used this box to classify $16 billion in fertilizer subsidies in 2011; India used it for $29 billion in input subsidies in 2010/11 (WTO, 2017b).

A focus of the Doha Round was restructuring global trade rules to aid economic development, but it did not reach a consensus on how to accomplish that. The sheer size of the WTO (164 members in 2017) and the requirement that a binding agreement must have the assent of all members have

[43]The current landscape of the international debate on domestic support evolved from the Doha Development Agenda. Although resolution of those issues is at best stalled, the issues remain.

contributed to the lack of progress since the Uruguay Round in further disciplining domestic support. The concepts of self-sufficiency and government stockholding for food security through supported prices proved particularly controversial and are still being discussed.

Self-Sufficiency

Numerous countries claim they need to be self-sufficient in agricultural production. These countries include some very populous countries that have become wealthier over the last decades. For countries that seek self-sufficiency, most of the focus is on grain production—corn, rice, and wheat, in particular.

Three of the BRIIC countries—China, India, and Indonesia—are among those with self-sufficiency goals. China's 11th (2006-10) and 12th (2011-15) 5-year plans and its 2009 National Plan for the Expansion of Grain Production highlight its desire for self-sufficiency. China has advocated maintaining a grain self-sufficiency rate of 95 percent (Ghose, 2014). India is a large grain exporter and is currently said to be food self-sufficient. However, its policies to encourage grain production are based, in part, on fears that consumption could, at times, outstrip domestic supplies. Indonesia has focused on self-sufficiency in recent years after a period in which it had lower border barriers than most countries. It effectively banned poultry meat imports in 2007 and has limited imports of beef, fruit, vegetables, and corn to foster domestic production (WTO, 2013; Wright and Meylinah, 2016).

The issue of self-sufficiency in food production is often tied to government stockholding through the purchase of domestic commodities at supported prices for the purpose of redistributing them (often to the poor or to urban households).[44] Some countries (e.g., a group of African countries in 2002) sought to classify such stockholding as green box. Montemayor (2014) notes that Annex 2 of the URAA exempts public stockholding programs for food security purposes from a product's AMS if they are constructed a certain way. The existence of price supports is key (WTO, 2014a).[45] Paragraph 3 of the Annex stipulates that when the stockholding purchases are made at supported prices, the difference between the acquisition price and the external reference price must be included in the country's AMS calculations.

Stockholding is a prominent issue in international trade negotiations because stocks could distort trade if they are used for export (which could lead to dumping) or if they encourage production that displaces imports. Deuss (2014) identifies three types of stockholding—buffer stocks, social safety net stocks, and emergency stocks—with the first two types influencing prices. Diaz-Bonilla (2014) explains that government purchases of commodities from farmers at prices above the prevailing market price could encourage more production than market conditions warrant, and government sale of excess stocks in the world market—possibly below the costs incurred in buying and storing the food—could depress world prices for farmers.

Wright (2010) notes that grain stocks had a role in the agricultural price volatility of 2007-08. Thailand's policies since 2004 illustrate what can happen when government purchases are made at above-market prices. After several years of offering above-market prices for unlimited quantities of rice, Thailand's stocks exceeded consumption in 2013-15 (Prasertsri, 2015; PSDonline, 2017). One

[44]Although in some cases, the purchase of agricultural commodities by a government could be with the intent to provide price support or to guarantee a production amount.

[45]WTO (2014a) notes that this issue only arises if purchases are made at supported prices; purchases made at market prices are not considered supported.

of the top three rice-exporting countries in the world, Thailand reduced its stocks, in part, through subsidized exports (Prasertsri, 2015). Nonetheless, Thailand's last WTO domestic support notification (2008) listed its rice purchase spending as just under its 10-percent *de minimis* level, and its export subsidy notifications through 2013 (the last year reported) stated that no subsidies were provided for rice (WTO, 2017).

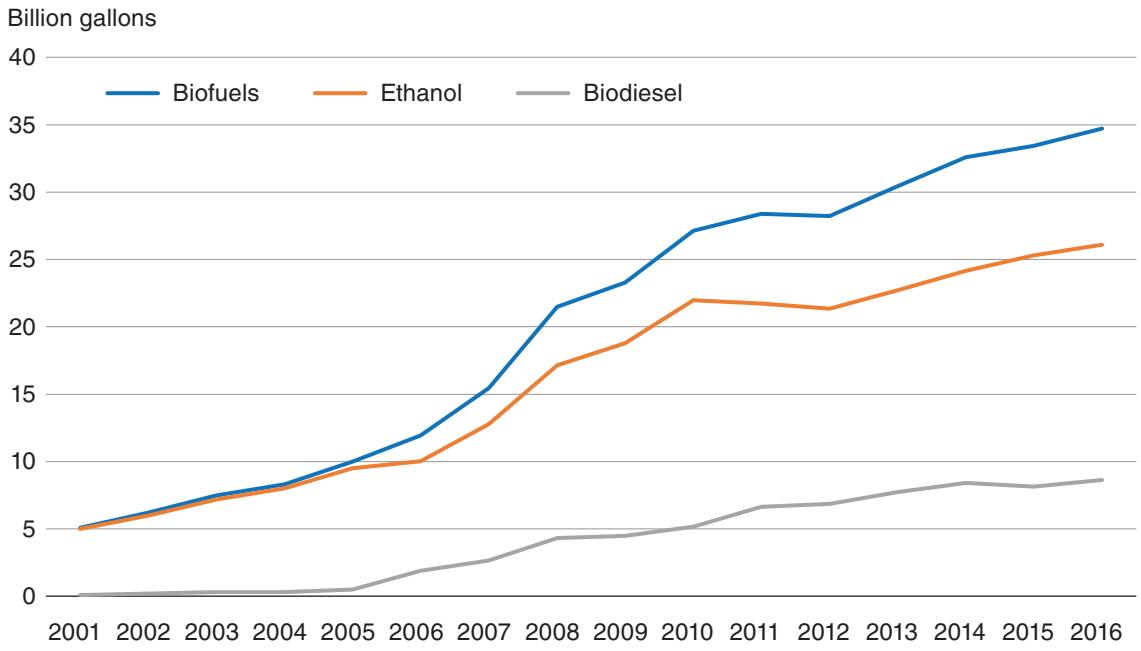
The WTO Bali Ministerial Conference (2013) resulted in an agreement to negotiate a permanent solution to public stockholding for food security purposes and to refrain from challenging breaches of domestic support commitments resulting from developing countries' public stockholding programs if certain conditions are met. At the WTO Nairobi Ministerial Conference in 2015, a Ministerial Decision on Public Stockholding for Food Security Purpose committed WTO members to "make all concerted efforts to agree and adopt a permanent solution on the issue of public stockholding for food security purposes" and delegated further discussion to the WTO Committee on Agriculture to make more rapid progress (WTO, 2015e).

Biofuels

Large-scale biofuel production has fundamentally altered the agricultural sector (Beckman et al., 2011). In particular, biofuels have led to market impacts for agricultural commodities. This includes impacts on food prices (Zilberman et al., 2013), agricultural commodity prices (Taheripour et al., 2010), and fertilizer prices (Beckman and Riche, 2015). Almost all of the feedstocks used in the world's biofuel production consist of agricultural commodities that could be used directly as food or as feed for animal production. In the United States, for instance, more than 35 percent of corn production is used to make biofuels. This leads to a reduction in how much corn can be exported and encourages corn planting; as a result, U.S. corn production has increased (Wallender et al., 2011). Several countries (e.g., China and India) have taken steps to exclude traditional food crops from being used as biofuel feedstocks.

Production of biofuels for transportation use—primarily from grains, oilseeds, sugarcane, and cassava—has dramatically increased over the last 15 years, going from 5 billion gallons in 2001 to almost 35 billion gallons in 2016 (fig. 28). Many countries now blend biofuels with traditional transportation fuels. In the United States, ethanol accounts for about 10 percent of total gasoline use (Beckman, 2015) (see box, "Biofuel Producers").

Figure 28
Total biofuels, ethanol, and biodiesel production, 2001-16



Source: USDA, Economic Research Service calculations from USDA, Foreign Agricultural Service GAIN reports.

Box 9

Biofuel Producers

Although the world's fuel ethanol production is currently concentrated in Brazil, the European Union (EU), and the United States, and more than two dozen other countries have ethanol production or consumption blending targets or mandates (Beckman and Nigatu, 2017). Most recently, some African countries instituted ethanol blending mandates, ranging from 2 percent in South Africa to 15 percent in Zimbabwe. Countries with significant potential to expand ethanol production include China, India, Canada, several Latin American energy exporters (including Argentina and Colombia), several Asian energy exporters (including Indonesia and Malaysia), Thailand, and the Philippines. Biodiesel has received far less research attention than ethanol, although more than 45 countries have biodiesel mandates (box table 1). Brazil, the EU, and the United States are major players in the world biodiesel market, but Argentina, Canada, Indonesia, Malaysia, and Thailand are also large producers and/or consumers of biodiesel. Argentina, Indonesia, and Malaysia are major biodiesel exporters.

continued—

Box 9 table 1

Biodiesel mandates by country (% blending)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Americas										
Argentina				5%	5%	5%	5%	9-10%	10%	10%
Brazil		2%	2%	5%	5%	5%	5%	7%	7%	7%
Canada					2%	2%	2%	2%	2%	2%
Colombia				8-10%	8-10%	8-10%	8-10%	8-10%	8-10%	8-10%
Costa Rica				20%	20%	20%	20%	20%	20%	20%
Ecuador							5%	5%	5%	5%
Paraguay							1%	1%	1%	1%
Peru	2%	2%	2%	2%	5%	5%	5%	5%	5%	5%
U.S. (billion gallons)			0.50	0.65	0.80	1.00	1.28	1.63	1.73	1.90
Uruguay			2%	2%	2%	5%	5%	5%	5%	5%

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Asia-Pacific										
Australia	2% in New South Wales									
China								Goal of 550 million gallons by 2020.		
India	Policy exists that encourages biodiesel production. A 20% target by 2017 exists.									
Indonesia			1%	3%	5%	5%	5%	10%	15%	20%
Malaysia					5%	5%	5%	5-7%	10%	10%
Philippines	1%	1%	2%	2%	2%	2%	2%	2%	2%	2%
South Korea					2%	2%	2%	2%	2.5%	2.5%
Thailand					3-5%	5%	5%	7%	7%	7%

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Europe										
EU	Rewable Energy Directive target of 10% biofuels by 2020; only 7% can be from food crop- based biofuels.									
Norway				3.5%	3.5%	3.5%	3.5%	3.5%	3.5-5.5%	5.5%
Turkey								1%	2%	3%

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Africa										
South Africa									5%	5%

Source: USDA, Economic Research Service calculation using USDA, Foreign Agricultural Service GAIN reports.

In most cases, biofuel output has grown in response to government mandates as well as market incentives (Beckman, 2015). Often, but not always, the mandates have required fuel refiners to use a specified amount of biofuel in products destined for consumption. Other measures to stimulate biofuel production include such incentives as tax credits or direct subsidies.

The effects of these policies on agricultural trade are complex. When more biofuel use is required, prices rise and producers grow more feedstock materials. Some of the feedstock materials may be bid away from other uses, including exports. If biofuels are tradable, one country's mandate may stimulate feedstock production in another country. A justification often given for a biofuel mandate is to increase a country's energy self-sufficiency. Other motivations include replacing fossil fuels and increasing domestic prices of the feedstock commodity.

Biofuels can also affect trade policy. The EU has applied anti-dumping duties on several major biofuel exporters (Argentina, Brazil, Indonesia, and the United States) to protect its domestic biofuel sector and has limited biodiesel imports from some countries, ostensibly because of environmental concerns. Coproducts of biofuels production—such as distillers' dried grains with solubles (DDGS), which are used in animal feed—have become increasingly important in world trade. Some countries, including China, have restricted DDGS imports.

Current themes in domestic support and its relationship to trade:

- The United States and the EU have decreased spending on policies that are considered the most trade-distorting; however, along with Japan, their budgetary expenditures on support to agriculture remain higher than those for other countries, although other countries may provide significant domestic support through additional border measures.
- Developing countries have allocated more spending to domestic support programs as their GDP has increased and have shifted from taxing agriculture to providing significant market price support.
- India and Indonesia have only made partial notifications to the WTO. In addition, their developing-country status makes them eligible for special and differential treatment. China and India have inadequately notified the WTO of their amber box spending.
- National self-sufficiency in agricultural commodities is a growing justification for trade-distorting agricultural support policies in BRIIC countries.
- Government policies have helped create incentives for biofuels production.

Trade Impacts of Nontrade Policies

Government regulations and standards are essential to ensure the safety of food and agricultural systems and provide consumers with reliable product information. Sanitary and phytosanitary (SPS) regulations protect plant/animal health and food safety. Product standards and labeling requirements not directly related to health and safety can give consumers information on product quality attributes that enhance and expand their choices and create value for firms (Moenius, 2006; Swinnen, 2016). Customs procedures and other measures affecting cross-border transactions ensure that imported goods meet domestic requirements. However, regulations, standards, and border measures can also be used to favor domestic producers or discriminate against certain importers. Such nontariff measures (NTMs) present additional challenges to maintaining an open and level playing field for agricultural trade.

Regulations and Standards Affecting Food and Agriculture

Gathering information on and complying with regulations and standards that vary across countries can add significant costs to trade. Some studies have found that these costs are more burdensome than tariffs (Kee et al., 2009; United Nations Conference on Trade and Development, 2013; Orden et al., 2012; Disdier et al., 2016).[46] Most studies use the extensive information on domestic regulations and standards available from the WTO's Integrated Trade Intelligence Portal (I-TIP) or the United Nations Conference on Trade and Development (UNCTAD) Trade Analysis Information System (TRAINS), which categorizes policy measures and their role in international trade (UNCTAD, 2015). However, the sheer number of measures covered by these databases makes it difficult to identify which measures are true impediments to trade (Grant and Arita, 2016). While not all regulations, standards, and compliance determinations directly or indirectly discriminate against trade partners, those that do and those that are more costly than necessary are considered NTMs.

Recognizing the need to balance their rights to use regulations and standards to achieve domestic objectives with the desire to maintain an open and predictable trading system, countries have negotiated frameworks to minimize the use of regulations/standards as NTMs. The primary international commitments are found in two Uruguay Round agreements. The Agreement on the Application of Sanitary and Phytosanitary Barriers (SPS Agreement) establishes rules to lessen the impact of animal/plant health and food safety regulations on trade. The Agreement on Technical Barriers to Trade (TBT Agreement) applies to regulations and standards not covered by the SPS Agreement. Its coverage is not limited to agriculture, but key issues in agricultural trade—such as labeling, certification, and quality standards—fall under its mandate (see box, "Uruguay Round Agreements Address Domestic Regulations").

[46]See Grant and Arita (2016) for an extensive literature review.

Box 10

Uruguay Round Agreements Address Domestic Regulations

Agreement on the Application of Sanitary and Phytosanitary Barriers (SPS Agreement)

Under the SPS Agreement, WTO members commit to maintain domestic animal and plant health and food safety regulations following four key principles.

Principle 1: Harmonization with international standards. Members are encouraged to establish national sanitary and phytosanitary (SPS) measures consistent with those advocated by three international standard-setting bodies.[47] The Agreement does not proscribe regulations more stringent than the international standard; however, regulations that diverge from a standard— where one exists—must be supported by a scientific assessment of risk. SPS measures should be no more restrictive than necessary to achieve the desired level of protection.

Principle 2: Recognition of equivalence. Members are encouraged to accept alternative regulations and compliance determinations as equivalent if partner countries can demonstrate that they ensure the same level of protection.

Principle 3: Regionalization of measures. Governments are encouraged to recognize pest- or disease-free areas that may not correspond to political boundaries. Differences in climate, presence of pests and diseases, or food safety conditions may warrant differentiation in measures applied between countries or regions within a country.

Principle 4: Transparency. The SPS and TBT Agreements require countries to notify the WTO of new or modified regulations that may affect trade, establish accompanying inquiry points, and take into account the concerns of their trading partners.

The Agreement on Technical Barriers to Trade (TBT Agreement)

The TBT Agreement affirms the right of member countries to issue technical regulations, standards, and conformity assessment procedures[48] necessary to achieve legitimate domestic objectives, including ensuring the quality of goods traded, environmental protection, protection from deceptive trade practices, and the protection of national security. As in the SPS Agreement, the TBT Agreement encourages governments to establish regulations in accordance with international standards, where appropriate. WTO members are required to consider the regulations and conformity assessments of their trading partners as equivalent if it can be demonstrated that those measures adequately fulfill the importing country's domestic objectives. Finally, the TBT Agreement encourages (but does not compel) WTO members to establish regulations based on performance requirements (e.g., prohibiting tobacco products that produce a fruit flavor) rather than design or descriptive features (e.g., prohibiting specific ingredients in tobacco products that can produce a fruit flavor) (McGrady, 2011).

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[47]The Codex Alimentarius Commission (Codex) covers food safety, the International Plant Protection Convention (IPPC) covers plant health, and the World Organisation for Animal Health (OIE) covers animal health risks.

[48]While technical regulations and conformity assessments are covered in the body of the TBT Agreement, standards are covered in Annex 3, the Code of Good Practice for the Preparation, Adoption and Application of Standards (Code of Good Practice).

WTO provisions that mandate transparency and provide access to enforcement mechanisms are among the most advantageous (Grant and Arita, 2016). Notification systems are widely used, allowing suppliers to gather information necessary to comply with each country's regulations and governments of partner countries to evaluate whether such measures are NTMs (Unnevehr and Roberts, 2003). The agreements each establish a committee with representation from all WTO members to discuss contentious measures. Issues formally raised in these meetings are known as Specific Trade Concerns (STCs). If a country believes that a policy violates one of the agreements, it may initiate a dispute settlement case under the WTO's Dispute Settlement Understanding (DSU). However, most STCs are resolved before cases are filed (Grant and Arita, 2016; Unnevehr and Roberts, 2003).

Many preferential trade agreements (PTAs) also establish rules and institutions to limit trade discrimination via domestic regulations. Many PTAs simply affirm their signatories' recognition of the SPS and TBT Agreements. However, most PTAs since 2000 incorporate some provisions, often commitments to transparency, that are stronger or more specific than in the WTO agreements (Fulponi et al., 2011; Lejàrraga, 2014).

It is difficult to measure the trade effects of domestic regulations and standards because they differ in form, function, and application. Several case studies measured significant trade costs associated with individual policies identified as NTMs (Arita et al., 2015; Peterson et al., 2013; Grant et al., 2015). Some studies have found that individual measures may promote trade by providing consumers information on a product's quality or safety or by lowering transaction costs (Li and Beghin, 2012; Swinnen, 2016). However, few studies have attempted a broad-based examination of NTMs.

One that did is Grant and Arita (2016), who first identified SPS regulations as key NTMs affecting agricultural trade (see box, "Identifying Major NTMs and Their Impact on Agricultural Trade"). These regulations are the subject of Specific Trade Concerns (STCs) in the WTO SPS Committee. To measure the effect of STCs, Grant and Arita compare bilateral trade flows, from several product and country angles, with and without an active STC.

Trade flows were found to be 41 percent lower, on average, when an STC is active than when it is not active (table 12). However, this average conceals variation across policies, products, and countries. Microbiological regulations are the most restrictive policies; an active STC with a microbiological-related regulation implies trade is virtually prohibited. Plant contamination and animal disease STCs also have a large impact, reducing trade by 75 and 52 percent, respectively.

Grant and Arita also compare the effect of STCs across agricultural subsectors, estimating a 72-percent decline in animal product trade under an active STC. Other sectors for which active STCs especially constrict trade include oilseeds, dairy, seafood/fish products, and "other" agricultural products (e.g., confectionary, hides and skins, etc.). Interestingly, STCs have a relatively small impact on trade in fresh fruits and vegetables, the sector with the most STCs.

Finally, Grant and Arita assess the degree to which importer policies restrict trade. They measure a relatively small average effect of STCs for policies maintained by the United States (decreasing agri-food trade by 21 percent) and the European Union (-28 percent). In contrast, STCs reduce China and India's trade by an estimated 75 and 47 percent, on average.

Box 11

Identifying Major NTMs and Their Impact on Agricultural Trade

Grant and Arita (2016) use a unique "revealed concerns" approach to classify and measure the global impact of NTMs generated by SPS regulations. They use STCs raised in the WTO SPS Committee to identify measures that represent the most contentious barriers to trade.[49] Grant and Arita classify STCs into nine types of measures (box table 1). Regulations intended to counter the spread of ***animal disease*** represent almost one-third of all STCs lodged between 1995 and 2015 (box fig. 1). This reflects widespread concern that regulations used to address such high-profile animal disease outbreaks, as foot-and-mouth disease (FMD) and bovine spongiform encephalopathy (BSE) in the early 2000s were, in fact, NTMs. Many of these STCs have since been resolved by engagement on technical and political levels, including the SPS Committee.

Box 11 table 1

Grant/Arita classification of sanitary/phytosanitary Specific Trade Concerns

Type	Abbreviation	Description/Example
Animal disease related	ADR	Restrictions due to disease, e.g., FMD, BSE; applications of waste from infected animals on other sectors
Customs, procedures, certification, licensing	CPR	Discretionary import licensing problems; excessive comment periods for new regulations
Conformity standards & risk assessment	CRA	Mandatory risk assessment, e.g., before entry of queen bees
Food additives & alterations	FAD	Restrictions on ingredients and substances added to food
Microbiological-related	MICB	Measures to reduce the spread of salmonella, campylobacter, listeria, etc.
Treatments	PHT	Cold and heat treatment, fumigation, pest-free zones, systems approaches to pest risk
Plant contamination	PLCT	Diseases on plant parts, noxious weed seeds, pests
Production & process requirements	PPR	Hygiene requirements, Grade A facilities, restrictions on hormones/beta agonists
Tolerances and limits	TOL	Maximum residue limits, tolerances, international standards

Note: FMD = foot-and-mouth disease; BSE = bovine spongiform encephalopathy.
Source: USDA, Economic Research Service. Grant and Arita, 2017.

[49]STCs may represent a small share of NTMs. Nontariff issues are also addressed in bilateral and multilateral agreements outside of the WTO, in bilateral meetings outside of the SPS Committee, and in other technical discussions.

continued—

Regulations specifying maximum residue limits (MRLs) and other ***tolerances*** are, at 16 percent of all STCs, the second most common STC raised during 1995-2015. ***Conformity and risk assessment*** measures that accompany SPS regulations were the subject of 11 percent of all STCs (box figure 1). These procedures can be significant barriers to trade when they are not communicated transparently or are excessively costly.

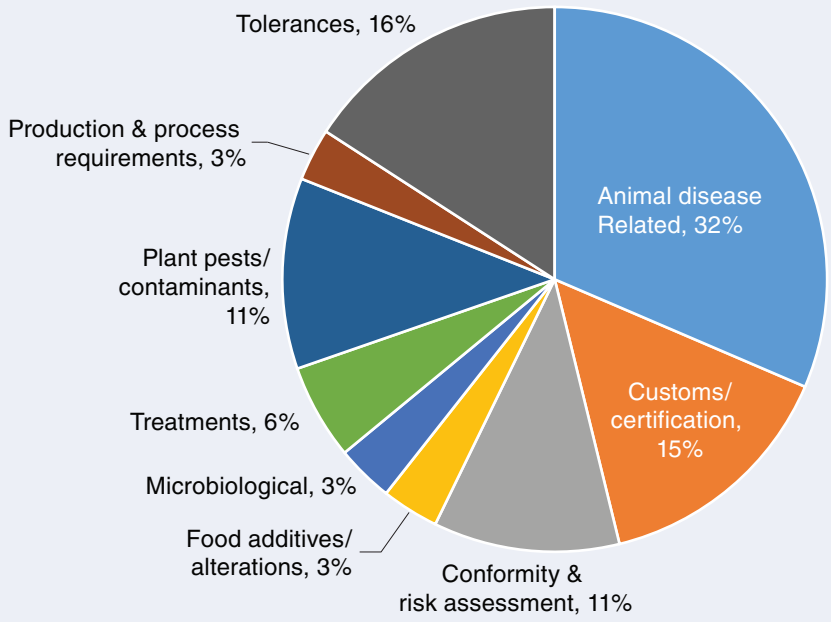
Customs procedures, certification, and licensing represented 15 percent of STCs instigated from 1995 to 2015. Such measures can raise trade costs directly and indirectly by increasing the time it takes for goods to cross the border. Many of these measures are covered by provisions in the WTO's Trade Facilitation Agreement (see box, p. 74).

Grant and Arita also categorize STCs by country. The European Union and the United States were the most frequent targets of STCs brought between 1995 and 2015 (box figure 2), which is not surprising given their share of trade. STCs targeting the EU were concentrated on its tolerance regulations, while U.S. animal disease/plant health regulations are the most common subject of STCs brought by trading partners.

Despite having been parties to the SPS Agreement for a shorter period than other countries,[50] China and Russia have been the target of numerous sanitary/phytosanitary STCs. In particular, Grant and Arita find a growing number of STCs with China's risk assessment regulations and certification measures related to food safety. China's zero-tolerance measures on pathogens (microbiological) have long been the subject of STCs brought by trading partners.

Box 11 figure 1

Breakdown of sanitary/phytosanitary Specific Trade Concerns by Grant/Arita classification, 1995-2015



Source: USDA, Economic Research Service. Authors' calculations from Grant and Arita, 2017.

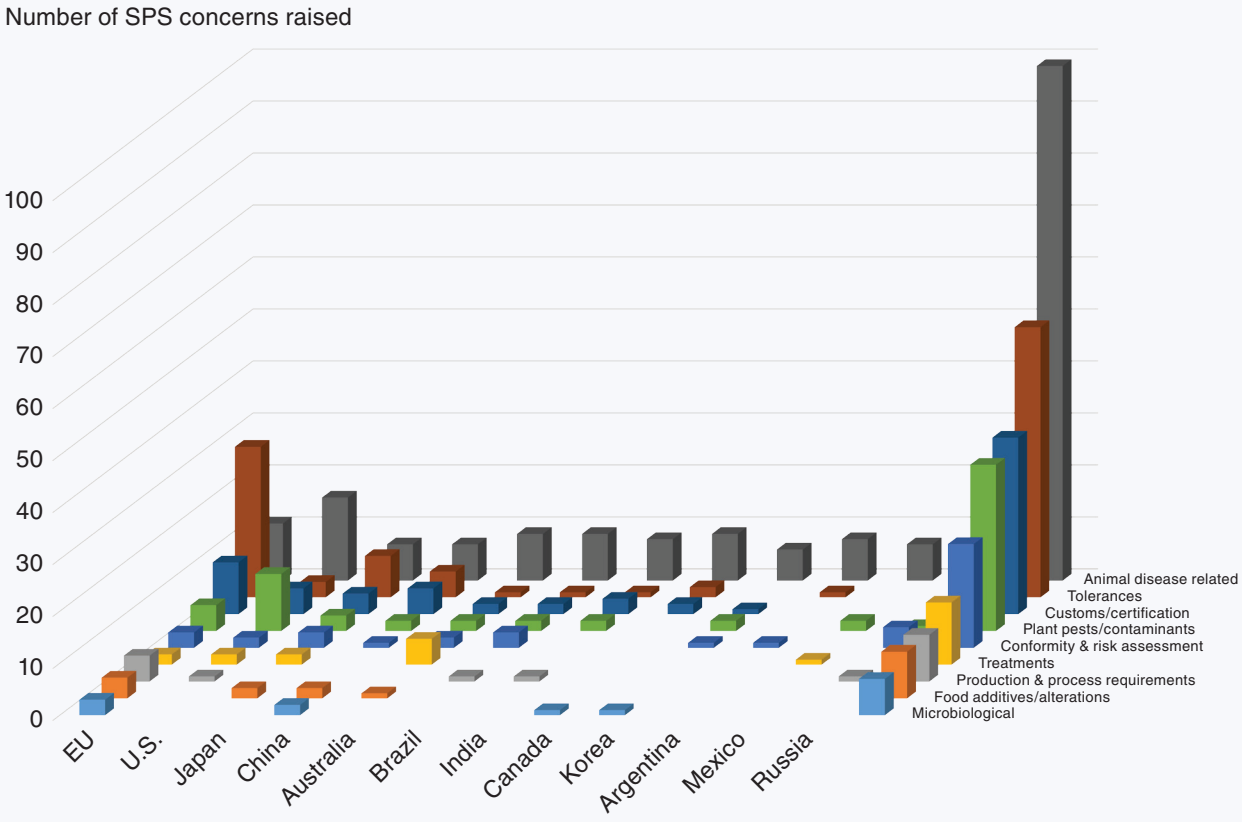
continued—

[51]China acceded in December 2001 and Russia in August 2012.

Products from just five Harmonized System (HS) chapters account for nearly two-thirds of all STCs.[51] Meat and edible offal products (HS Chapter 02) generated the most STCs—roughly one-quarter of all STCs brought from 1995 to 2015 address regulations on these products. The rest of the top five HS chapters in regard to number of STCs are fresh fruits and nuts (HS 08); live animals (HS 01); dairy products (HS 04); and edible vegetables, roots, and tubers (HS 07).

Box 11 figure 2

Sanitary/phytosanitary Specific Trade Concerns by type for selected countries, 1995-2015



Source: USDA, Economic Research Service. Authors' calculations drawing from Grant and Arita, 2017.

[51]Agricultural products are found in 20 HS chapters.

Table 12
Trade flow impacts of Specific Trade Concerns (STC) over sanitary and phytosanitary (SPS) regulations

	% difference in trade volume with active STC
All STCs	-41%
By policy type1	
Animal disease related	-52%
Customs, procedures, certification, licensing	-24%
Conformity standards & risk assessment	-42%
Food additives & alterations	-18%
Microbiological-related	-99%
Treatments	-43%
Plant contamination	-75%
Production & process requirements	-15%
Tolerances and limits	-24%
By subsector[2]	
Animal products	-72%
Oilseeds	-52%
Other	-45%
Dairy	-44%
Seafood and fish products	-43%
Cereals	-29%
Fruits and vegetables	-28%
Coffee, tea, mate, and spices	-19%
Beverages and tobacco	-7%
By importer (selected)	
European Union	-28%
United States	-21%
Japan	-46%
China	-75%
India	-47%

1See box 11.
2World Trade Organization Multinational Trade Negotiating Sectors.
Source: USDA, Economic Research Service. Grant and Arita, 2017

Sources of Conflict

There are systematic differences in the way countries interpret and apply key WTO agreements, and domestic pressures and priorities are often difficult to reconcile with multilateral rules. Some of the most contentious debates in international trade stem from disagreements within and across countries on the appropriate level of risk and the sufficiency of scientific evidence of risk. Absent a risk to

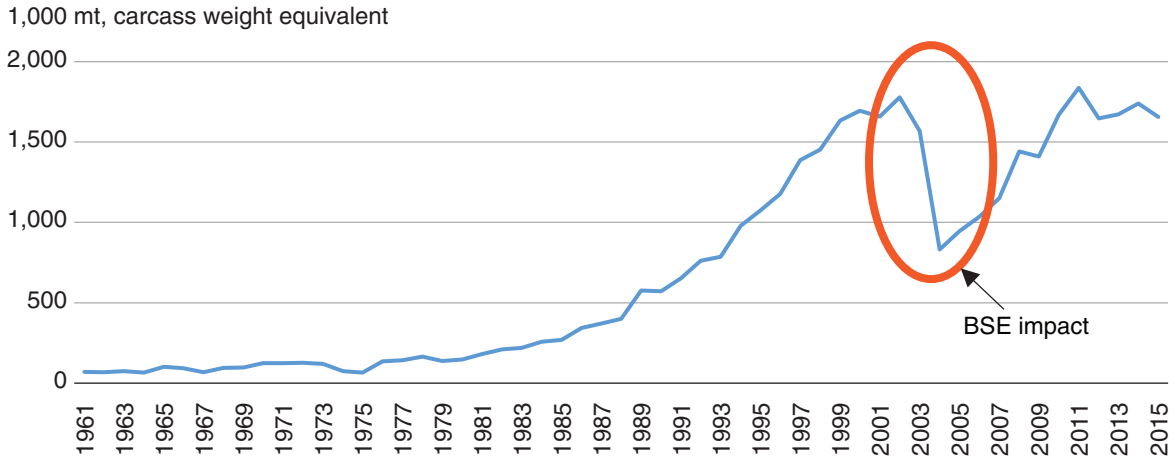
health and safety, there is further disagreement on the forms and circumstances under which government intervention to provide consumers with information on product quality attributes distorts trade. Disagreements on these fundamental questions have considerable potential to manifest as NTMs.

Variation in Risk Tolerance

The SPS Agreement encourages countries to base regulations on international standards where available, but permits them to apply more stringent standards when they can be justified by scientific risk assessment. Difficulties arise when trading partners differ in their definition of the acceptable level of risk or the strength of the scientific evidence used to support it (Unnevehr and Roberts, 2003). In some cases, SPS measures that go beyond international standards are used to reduce competition for favored producers. Countries may dispute these measures when they see them as disproportionately restrictive relative to the risk. For example, differences in risk tolerance have been central to clashes between trade partners on regulations governing maximum residue limits (MRLs) for productivity-enhancing inputs and pathogen-reduction treatments (PRTs). As a result of its restrictions on PRTs that are ubiquitous in U.S. domestic production, the European Union imports very little U.S. broiler meat (Arita et al., 2014).

In some cases, SPS regulations necessarily and directly restrict international trade in order to mitigate risk, as when temporary import bans are imposed in response to outbreaks of animal disease. Their legitimacy in these cases is supported by the SPS Agreement, regardless of any effect they have on trade flows. However, countries vary in their determination of when the risk has abated sufficiently that restrictions can be lifted. In such cases, temporary measures can become NTMs from the perspective of exporters. For example, reluctance in key import markets to ease restrictions according to international standards and to recognize regional variation contributed to the slow recovery of U.S. and Canadian beef exports following discoveries of bovine spongiform encephalopathy (BSE) in 2004 (fig. 29).

Figure 29
North American beef exports before and after BSE discovery



BSE = bovine spongiform encephalopathy; mt = metric ton.
Source: USDA, Foreign Agricultural Service, 2017b.

Precautionary Principle

The SPS Agreement requires health and safety regulations to be justified by positive scientific evidence of risk. In cases where scientific evidence is uncertain or incomplete, an alternative justification known as the "precautionary principle" can be used as a basis for temporary regulation.[52] Importantly, the precautionary principle may not be used indefinitely without evidence of harm to justify regulations. Critics argue that the principle is used to restrict trade in practice.

Limits on the precautionary justification were clarified in a WTO dispute brought by the United States and Canada over an EU ban on the sale of beef from cattle that had received growth-promoting hormone treatments—a more stringent regulation than recommended by the World Organization for Animal Health. In defending its policy, the EU provided no scientific evidence of a harmful effect on human health, instead invoking the precautionary principle. A dispute resolution panel ruled against the EU on the basis that a precautionary measure can be provisional only while seeking more information (WTO, 1997).

Advocates of the precautionary approach argue that it should be more widely accepted, particularly for new productivity-enhancing inputs or production/processing technology (Josling et al., 2004). They contend that the burden of proof of safety should be on those advocating the new technology. This principle is enshrined in the Cartagena Protocol on Biosafety, an international agreement that entered into force in 2003, and whose signatories overlap extensively with the WTO.[53] The Protocol affirms the precautionary approach as a basis for regulating imports of living modified organisms, including genetically engineered (GE) crops. However, the Protocol explicitly does not "change the rights and obligations" of countries "under existing international agreements" (Convention on Biological Diversity, 2016).

Consumer Demand for Information

Growing consumer interest in the contents of food and the conditions under which it has been produced—information that goes beyond health and safety concerns supported by scientific risk assessment—has increasingly led to government intervention in the form of regulations, standards, and labeling requirements (Unnevehr and Roberts, 2003; Arita et al., 2017; Caswell and Joseph, 2008; Bowman et al., 2016). These policies allow interested consumers to exercise their preference for characteristics that are undetectable at the point of purchase, such as product quality, nutritional information, environmental impacts of production practices, and producer welfare. Labeling policies may also allow producers to charge a premium by differentiating their products (Anania and Nistico, 2004). Such policies need not be mandatory. For example, several governments establish or recognize criteria developed by a third party that define organic production. Producers who choose to follow predetermined production practices can become certified as organic and obtain the right to label their products as "organic."

However, when these differentiating measures suggest that a process more commonly used by domestic producers is of higher quality or safer for human health or the environment, they repress demand for the imported product and become NTMs. Geographical indications and production process regulations unrelated to health and safety risks are two prominent types of policy that are nominally intended to provide consumer information, but can restrict trade.

[52]SPS Agreement, Article 5, paragraph 7.

[53]The United States is not a party to the Cartagena Protocol. It has not ratified the Convention on Biological Diversity that authorizes the Protocol (U.S. State Department, 2004).

Geographical Indications

WTO members agree to safeguard exclusive rights to the territory-based labeling terms on agricultural products known as geographical indications (GIs) under the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS Agreement). Government protection of GIs is nominally intended to prevent consumers from being misled about product quality attributes (Josling, 2006). GIs can provide benefits to consumers and producers in specific circumstances. However, GI protection can encroach on generic names. Consumers who value the distinction between the generic version and the territorial qualities implied by the GI benefit from the policy because the characteristics they desire are easier to identify. Producers holding the labeling rights may be able to differentiate their products, increasing their value (Moschini et al., 2008; Babcock and Clemens, 2004; Josling, 2006). Producers and consumers in countries where GIs have become common indicators of a quality not directly tied to the territory face analogous losses if a labeling change is required to respect a GI (Babcock and Clemens, 2004; Josling, 2006; Zago and Pick, 2002).

The TRIPS Agreement specifies two levels of protection for GIs. The first level applies to all products and requires WTO members to provide legal means to prevent the use of a territory-based labeling term that misleads consumers or creates unfair competition. The second, stronger level of protection obliges WTO members to prohibit the use of terminology associated with protected GIs on wines and spirits not originating from the corresponding territory unless the geographic term is an accepted generic in the importing country or was in continuous use for 10 years prior to the agreement or the term's protection in the country of origin. There is no requirement to prove that use of the term misleads consumers or creates unfair competition.

Several countries, primarily the EU, extend the stronger level of GI protection to some food and agricultural products beyond wines and spirits, including hundreds of cheeses, olives, cured meats, and other products. They have pressed for negotiations to extend these protections to other food products globally at the WTO level and bilaterally in PTA negotiations (Babcock and Clemens, 2004). This has created a particular conflict between the EU and countries like the United States where centuries of immigration have resulted in a few European geographic terms, like champagne, becoming common descriptors of particular food products.

Production Process Regulations

Measures that identify production process attributes of food and agricultural products are a source of contention in the global trading system and make up a large share of SPS standards. Since these attributes are often undetectable even after consuming the product, regulations on process characteristics require verification of compliance or an equivalence agreement. The latter has thus far been rare (Unnevehr and Roberts, 2003). Regulation is more difficult when the process does not become a testable part of the product. In such cases, verification cannot be accomplished at the border and may require extensive documentation to trace the product to its producer.

Policies that mandate identification of production processes that some consumers perceive as a risk to human health or the environment, without positive scientific evidence, are particularly controversial. Governments often justify these policies as a response to consumer demand. But producers using the purportedly less desirable techniques may view the production process policies as disguised protection. In many cases, critics dispute whether the process itself is unique or transmits unique properties to the product. Such a conflict is at the heart of the general principle of nondiscrimination based on "like products" (Josling et al., 2004; Unnevehr and Roberts, 2003; Blandford, 2013).

Regulation of genetically engineered (GE) crops is a familiar example. A vocal and often influential subset of consumers has argued in favor of mandatory measures that allow them to identify products derived from GE varieties and thus decide whether to avoid them. For example, current EU regulations require all ingredients produced from GE commodities to be labeled and traceable (Disdier and Fontagné, 2010). This includes products like soy oil, in which the novel protein is removed in the processing stage, making it impossible to determine through testing whether the oil comes from genetically engineered soy or not. Extensive recordkeeping on product identity and segregation of GE and non-GE crops is required for products entering the EU from countries where GE crops are grown (Unnevehr and Roberts, 2003; Disdier and Fontagné, 2010). Product labeling is one way to provide information on production process attributes for interested consumers. However, labeling a process attribute such that it implies risk to human or environmental health generally represses demand (Josling et al., 2004).

Requirements of private firms in certain markets are often more stringent than those advocated by government (Josling et al., 2004; Fulponi, 2006) and more important drivers of international trade than government regulations, particularly in markets for high-quality food products (Grant and Arita, 2016; Henson, 2008). This presents a challenge to the role of government and the WTO agreements (Henson, 2008) (See box, "Private Standards and Agricultural Trade").

Box 12

Private Standards and Agricultural Trade

In addition to government requirements, exporters may also encounter standards issued by private firms and nonprofit institutions. These "private standards" are used both to manage safety and quality along complex global supply chains and as a means of attribute-based product differentiation (Henson, 2008; Liu, 2009; Henson and Reardon, 2005; Blandford, 2013; Smith, 2009). In principle, private standards are voluntary. However, the market power resulting from industrial concentration among buyers of many agricultural products in many markets means that private standards are often mandatory in practice (Wolff, 2009; Henson, 2008; Fulponi, 2006; Smith, 2009). Although official data do not track trade flows under private standards, they likely affect a large share of food and agricultural trade (Liu, 2009). Consequently, regardless of the direction taken by government policy, as long as trends toward globalized supply chains continue, private standards will remain significant in international trade.

Despite their influence on market access, private standards are not currently subject to multilateral rules or required to be consistent with WTO principles.[54] Indeed, a lack of transparency in private standards complicates, and may even fully determine access to, supply chains and thus to some markets. Private standards associated with health and safety claims are not required to be based in science. Critics argue that some private standards are more reflective of some consumers' perceptions of what is safe than what is actually safe (Wolff, 2009).

[54]WTO members disagree about whether private standards can be addressed under existing trade rules. The SPS Agreement states that countries should take steps to ensure that "nongovernment entities within their territories" comply with the SPS Agreement provisions. However, there is significant debate over the meaning of nongovernmental entities (Wolff, 2009).

Private standards also tend to be more stringent and prescriptive than their government counterparts, and issuers of private standards are under no obligation to construct them to be no more trade restricting than necessary (Wolff, 2009; Liu, 2009). Encouragingly, however, the WTO principles of harmonization and mutual recognition appear to be more feasible in the private realm. Firms seeking efficiencies in global supply chain management increasingly recognize collective private standards, and may base requirements on quality metasystems such as the International Standards Organization (ISO) (Henson, 2008; Smith, 2009).

Food Safety Regulation and Trade

Many countries have increased the number and stringency of food safety regulations since the 1990s (Unnevehr and Roberts, 2003; Henson and Caswell, 1999). In some cases, high-profile food safety scares, such as outbreaks of foodborne illness or the detection of harmful substances in food, have prompted their adoption (Henson and Caswell, 1999; Swinnen, 2016).

The complexity of the global food value chain, engendered by increased agricultural trade, makes some consumers and regulators uneasy about being able to identify and address the source of a foodborne illness or other threat to plant, animal, or human health. Many countries have responded to this concern by increasing regulations that specify actions throughout the supply chain and moving away from a reliance on testing the final product for safety (Unnevehr and Roberts, 2003; Humphrey, 2012). For example, the U.S. Food Safety Modernization Act mandates procedures at production and harvesting for fruit and vegetable products that have been associated with foodborne illness outbreaks (Humphrey, 2012).

The SPS Agreement requires food safety regulations to be supported by science-based risk assessment. Still, regulators may feel pressure to respond to domestic demands to address product quality attributes perceived as influencing food safety. In such cases, the line between food safety regulations and standards intended to convey product qualities and trade protectionism can be blurred (Josling et al., 2004; Unnevehr and Roberts, 2003).

Trade Facilitation

The process of getting agricultural products across a border can be burdensome, costly, and restrictive of trade. Indeed, Grant and Arita (2017) find that customs procedures, certification, and licensing measures for imports are a significant source of NTMs. Trade facilitation measures are intended to minimize the cost and time spent at the border.

Inefficient border procedures are particularly costly for perishables such as meats, horticultural products, and frozen foods, which can spoil at the border. Intermediate products in global value chains are also disproportionately disadvantaged by border delays, as timeliness is a critical component of their value (Djankov et al., 2010; Freund and Rocha, 2010).

Recognizing that trade facilitation measures can improve the functioning of the global trade system, WTO members negotiated the Trade Facilitation Agreement (TFA), which was signed at the WTO's Ninth Ministerial Conference in Bali in 2013 (see box, "TFA Aims To Maximize Transparency, Efficiency"). The TFA enumerates best practices to maximize transparency and efficiency at the border. For agriculture, this includes facilitating clearance of products that require SPS inspections and explicitly targeting "avoidable loss or deterioration of perishable goods" (Durkin, 2017). Like other WTO agreements, it provides ways to comment on trade procedures and to appeal perceived shortcomings (WTO, 2015f).

The potential impact of the TFA is difficult to estimate since it offers developing countries a great deal of flexibility in the timing and nature of implementation. However, the WTO Secretariat estimates that global exports could increase from $US 750 billion annually to $US 1.045 trillion (2007 dollars)—or by 2.06-2.73 percent annually over 2015-30 (WTO, 2015f). Likewise, Hilberry and Zhang (2015) and Moïsé and Sorescu (2013) estimate substantial time savings at the border and lower trade costs from full implementation of the TFA.

Quantitative measures of trade facilitation reveal relatively easy trade access to the United States and the EU, particularly EU member states with key ports of entry such as the Netherlands, Germany, and Denmark. While the most common measures of trade facilitation abstract from agriculture-specific issues, they nevertheless provide useful information about the relative ease of trade across countries.

The United States and most EU countries tend to be ranked high above the BRIICs (Brazil, Russia, India, Indonesia, China) in the World Bank's "Doing Business" indicators (DB) and Logistics Performance Index (LPI) as well as the World Economic Forum's Enabling Trade Indicators (ETI) (table 13). Many of the criteria used in these measures are addressed in the TFA. The United States and EU also tend to receive high scores from the OECD's Trade Facilitation Indicators (TFI), which can range from 0 (worst performance) to 2 (best).

BRIIC countries' decidedly lower scores and rankings suggest that improved trade facilitation in those countries could lower the cost of their imports and exports. Both Hilberry/Zhang and Moïsé/Sorescu report that gains are concentrated among these and other developing countries, given the already high degree of trade facilitation in developed countries. Hilberry and Zhang list China, Indonesia, and Russia among the largest beneficiaries of full TFA implementation, with one-fourth of China's estimated global gains attributable to the TFA.

Table 13
Trade facilitation indicators, scores, and ranking of selected countries

	World Bank "Doing Business" (DB), 2015	World Bank Logistics Performance Index (LPI), 2014	World Economic Forum's Enabling Trade Indicators (ETI), 2014	OECD's Trade Facilitation Indicators (TFI), 2015
	Minimum/Maximum Rank			*Scale*
	1-189	1-160	1-138	0-2
	Rank			
European Union	3-80[1]	1-58[2]	3-75[3]	1.3-1.8[4]
United States	7	9	15	1.7
Brazil	116	65	86	1.5
Russia	51	90	105	1.2
India	130	54	96	1.5
Indonesia	109	53	58	1.4
China	84	28	54	1.4
Highest rank				
Singapore	1		1	
Germany		1		
Hong Kong, Australia, Lithuania				1.8

1 Individual EU members range in rank from 3 (Denmark) to 80 (Malta).
2 Individual EU members range in rank from 1 (Germany) to 58 (Cyprus).
3 Individual EU members range in rank from 2 (Netherlands) to 53 (Bulgaria).
4 Individual EU members range in rank from 1.3 (Hungary) to 1.8 (Lithuania).
Sources: USDA, Economic Research Service. DB: World Bank, 2015; LPI: World Bank, 2014; TFI: OECD 2017d. ETI: World Economic Forum, 2014.

Box 12

TFA Aims To Maximize Transparency, Efficiency

The Trade Facilitation Agreement (TFA) was the first multilateral agreement reached by the WTO since the Uruguay Round and the first major accomplishment of the Doha Round. The TFA, which entered into force on February 22, 2017, was designed to "clarify and improve" GATT articles addressing border measures that had not been changed since the 1940s (WTO, 2015f).[55]

The TFA contains several provisions aimed at promoting transparency and nondiscrimination in border procedures (Articles 1-5). Article 5 imposes requirements for transparency in border measures relating to food, beverages, and feedstuffs. WTO members are asked to base any enhanced border controls on risk, notify the importer when shipments are detained, and authorize a second test if a shipment fails to pass a required test on inspection. The agreement also spells out best practices for fees (Article 6), release and clearance of goods (Article 7), and other formalities (Article 10). Other provisions specify coordination among border agencies across countries (Articles 8, 11, and 12) and within countries (Article 9).

[55]Articles V (freedom of transit), VIII (fees and formalities connected with importation and exportation), and X (publication and administration of trade regulations)

Current themes in the relationship of nontariff measures to trade:

- Although essential to protect the health and safety of consumers and the value of agricultural products, regulations and standards can be significant barriers to agricultural trade;
- Under the SPS and TBT Agreements, WTO members agree to establish regulations and standards that achieve domestic goals in the least trade-distorting manner;
- Differences in the interpretation of WTO rules and domestic pressures have generated areas of conflict among trading partners, including;
    1. The appropriate level of tolerance for risks to health and safety;
    2. The use of the precautionary principle as a justification for health and safety regulations and standards; and
    3. The appropriate response to consumer demands for information beyond that necessary to ensure health and safety;
- Food safety regulation and government-mandated food standards are a source of increasing conflict over nontariff measures;
- Under the TFA, WTO members commit to take concrete steps to minimize the cost and the time it takes for goods to cross borders;
- The potential value of the TFA is considerable, but flexibilities on implementation for developing countries create uncertainty about the gains that will actually be realized.

Conclusion

Agricultural trade and trade policy have fundamentally changed since ERS's last comprehensive analysis in 2001 (Burfisher et al., 2001). This report covers the policies of an expanded set of countries and describes a broader and more complex policy landscape. In 2001, Burfisher and colleagues could adequately depict global agricultural trade by focusing on developed countries. Since 2001, several developing economies—notably the BRIICs (Brazil, Russia, India, Indonesia, and China)—have emerged as leading suppliers of agricultural exports and sizeable markets for global agricultural imports. Similarly, the policy focus in Burfisher was on anticipated reforms under the three pillars of the Uruguay Round framework, as part of agricultural negotiations later subsumed into the Doha Round of WTO negotiations.

However, the comprehensive, multilateral trade agreement that was envisioned has proved elusive. Today, the issues that are central to international trade policy debates have changed. Moreover, the value of the multilateral system is more frequently in question, and trade reform and liberalization have increasingly been pursued in preferential or bilateral contexts. The trends documented in this report—along with other economic, technological, and policy developments—will shape the future of agricultural trade.

The BRIICs are large in terms of both population and land area, and many have experienced substantial boosts to agricultural productivity and income growth. This presents both opportunities and challenges for the United States and other traditional agricultural exporters. While the market opportunities for U.S. exporters will continue to expand, the competition they face will also intensify. As the BRIICs have become wealthier, their desire to protect and support agriculture has grown. Many of the BRIICs have moved from being net taxers of their agricultural sector to being net subsidizers (Anderson, 2010; Krueger et al., 1988). India and Indonesia together spent about $35 billion on fertilizer subsidies alone in 2011. Despite its WTO notifications, China appears to have provided excessive support to farmers by guaranteeing high support prices for wheat, corn, and rice that exceed world prices.

While the WTO institutions have largely enforced countries' Uruguay Round commitments, the impulse to restrain imports—and sometimes exports—to benefit domestic producers or consumers remains. Domestic farm policies, which are not easy to address with the formula-based commitments used in previous WTO negotiations, have become increasingly influential, though the exact impact of these policies on trade flows deserves further study and analysis.

SPS regulations and product standards are increasing in number and in their use as nontariff measures. Disciplining these policies in order to mitigate their trade impact is complicated by the fast and unpredictable emergence of disease and safety issues, as well as by changing consumer attitudes and worries about border security. Differences in the interpretation of the Agreement on the Application of Sanitary and Phyto-Sanitary Barriers (SPS Agreement) and the Agreement on Technical Barriers to Trade (TBT Agreement) have generated conflict among trading partners on the appropriate degree and form of risk abatement.

If these issues cannot be resolved in the context of new negotiated rules at the multilateral level, individual matters may be settled on an *ad hoc* basis through consultation with the WTO's Committee on Agriculture, through technical discussions among the countries involved, or even through litigation under the WTO's Dispute Settlement Understanding. This unsettled environment can produce

conditions under which countries resort to trade remedies and safeguards to rectify damages caused by their trading partners' policies but, in doing so, impede rather than promote trade.

Driven in part by the Doha Round's failure to deliver a comprehensive agreement, preferential trade agreements (PTAs) have proliferated in the past 20 years (Zahniser and Moreno, 2014). PTAs can create market access deals that are meaningful to individual countries within participating regions, but they are not capable of addressing systemic issues. Domestic support rules, for example, are unlikely to be reformed within a PTA because the benefits (to domestic farmers, for example) cannot be extended on a preferential basis.

However, rules established within PTAs may have consequences for nonparties. For example, whereas geographical indication (GI) protections do not apply beyond wine and spirits at the multilateral level, the number of markets in which products—particularly from the European Union—enjoy such protections has increased.

Although the scope of this report is limited to government policy, the forces that have driven increases in trade volume and changes in trade patterns have also reshaped production of food and agricultural products. Final goods are increasingly produced with intermediate agricultural products sourced from around the world, creating global value chains that have proliferated and transformed the meaning of market access for many products. Trade policies, as well as government-issued regulations and standards, shape the environment in which firms engage in international trade. As such, they play an important role in the organization of global value chains and the private standards imposed by the firms that manage them.

The past 20 years have seen historically fast growth in trade, including in agricultural trade. Trade growth slowed in 2012-16 as the global economy recovered from financial crisis. While trade growth appears to be picking up in 2017 (Oxford Economics, 2017), research suggests growth rates will return to the slower rates that prevailed in the 1970s and 1980s as global value chains mature and income growth slows in China and other developing countries (Constantinescu et al., 2015). Urbanization, growing populations, and the uneven distribution of arable land across the globe suggest agricultural trade will continue to grow in the future.

Glossary

AD	Anti-dumping
AVE	Ad valorem equivalent
BLS	United States Bureau of Labor Statistics
BRIIC	Brazil, Russia, India, Indonesia, China
BSE	Bovine Spongiform Encephalopathy
CAP	Common Agricultural Policy
CoA	WTO Committee on Agriculture
CPI	Consumer price index
CVD	Countervailing duty
DB	Doing Business Indicators
DDGs	Distillers' dried grains
DSU	Dispute Settlement Understanding
EBA	Everything but Arms
ETI	Enabling Trade Indicators
EU	European Union
FAO	United Nations Food and Agriculture Organization
FMD	Foot and Mouth Disease
FSU	Former Soviet Union
GATT	General Agreement on Tariffs and Trade
GE	Genetically engineered
GFR	Gross Farm Revenue
GI	Geographical indication
GSP	Generalized system of preferences
GVC	Global value chain
HFCS	High-fructose corn syrup

HS	Harmonized system
ISO	International Standards Organization
I-TIP	WTO Integrated Trade Intelligence Portal
LDC	Least-developed country
LPI	Logistics Performance Index
MERCOSUR	Mercado Común del Sur
MFN	Most-favored nation
MRL	Maximum residue limit
NAFTA	North American Free Trade Agreement
NTM	Nontariff measure
OECD	Organisation for Economic Co-operation and Development
PPP	Purchasing Power Parity
PRT	Pathogen reduction treatment
PSE	Producer Support Estimate
PTA	Preferential trade agreement
S&DT	Special and differential treatment
SCM Agreement	Subsidies and Countervailing Measures Agreement
SG Agreement	Safeguard Agreement
SPS	Sanitary and Phytosanitary
SSG	Special Safeguard
SSM	Special Safeguard Mechanism
STC	Specific Trade Concern
STE	State Trading Enterprises
TBT	Technical barrier to trade
TFA	Trade Facilitation Agreement
TFP	Total factor productivity
TFI	Trade Facilitation Indicators

TRAINS	United Nations Trade Analysis Information System
TRIPS Agreement	Agreement on Trade Related Aspects of Intellectual Property Rights
TRQ	Tariff rate quota
TSE	Total Support Estimate
UAE	United Arab Emirates
UNCTAD	United Nations Conference on Trade and development
UR	Uruguay Round
URAA	Uruguay Round Agreement on Agriculture
VAT	Value-added tax
WTO	World Trade Organization

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Appendix 1: Definition of Agricultural Trade

USDA Agricultural Products Definition

USDA, Foreign Agricultural Service, *Global Agricultural Trade System* online notes the following:

All of the products found in Chapters 1-24 of the U.S. Harmonized Tariff Schedule (except for fishery products in Chapters 3 and 16, manufactured tobacco products like cigarettes and cigars in Chapter 24, and spirits in Chapter 22) are considered agricultural products. Agricultural products within these chapters generally fall into the following categories: grains, animal feeds, and grain products (like bread and pasta); oilseeds and oilseed products (like soybean oil and olive oil); livestock, poultry, and dairy products including live animals, meats, eggs, and feathers; horticultural products including all fresh and processed fruits, vegetables, tree nuts, as well as nursery products, and beer and wine; unmanufactured tobacco; and tropical products like sugar, cocoa and coffee.

Certain other products outside of Chapters 1-24 are also considered agricultural products. The most significant are essential oils (Chapter 33), raw rubber (Chapter 40), raw animal hides and skins (Chapter 41), and wool and cotton (Chapters 51-52).

The major products derived from plants or animals that are not considered "agricultural" because of their manufactured nature are cotton thread and yarn; fabric, textiles and clothing; leather and leather articles of apparel; cigarettes and cigars; and spirits.

Differences Between USDA and WTO Agricultural Trade Definitions

USDA's definition of agricultural trade and the WTO's definition generally overlap. Each organization's definition includes some items that the other does not include(Appendix 1, table 1).

Appendix 1 table 1
Differences between USDA and WTO agricultural trade definitions

WTO agricultural trade has:	HS	USDA agricultural trade has:	HS
Glycerol	1520	Extracts of meat and fish	1603
Degras	1522	Palmitic, stearic acid	291570
Unsweetened waters	2201	Oleic/linoleic/linolenic acid	291615
Ethyl alcohol	2207	Lecithins and other phosphoaminolipids	292320
Spirits	2208	Rennet and enzymes	3507
Mannitol	290543	Stearic acid	382311
Sorbitol, or D-glucitol	290544, 382360	Oleic acid	382312
Finishing agents, etc., with an amylaceous basis	380910	Industrial monocarboxylic acids, nesoi	382319
		Sisal	5304
		Coconut fiber, abaca, ramie	5305

Source: USDA, Economic Research Service. Author's calculations based on FAS, 2017a and United Nations, 2016.

Appendix 2: Export and Import Average Values and Global Shares, 1995-99 and 2010-14

Appendix 2 table 1
Changes in world agricultural trade

	Export value		Import value		Share of world exports		Share of world imports	
	1995-99	2010-14	1995-99	2010-14	1995-99	2010-14	1995-99	2010-14
	Billion real U.S. dollars (2004-06 prices)				*Percent*			
World total[1]	440.3	800.8	475.6	820.1	100.00	100.00	100.00	100.00
West and Central Europe	88.5	130.5	112.4	138.7	20.11	16.29	23.63	16.91
European Union	83.1	119.0	98.1	116.3	18.86	14.86	20.63	14.19
Other[2]	5.5	11.5	14.2	22.4	1.24	1.44	2.99	2.73
Former Soviet Union	7.4	30.6	29.1	47.3	1.67	3.82	6.11	5.77
Russia	1.4	8.0	23.1	32.4	0.32	1.00	4.85	3.94
Ukraine	2.0	12.5	1.6	4.5	0.46	1.56	0.34	0.55
Other[3]	3.9	10.1	4.4	10.5	0.88	1.26	0.92	1.28
North America[4]	120.7	165.7	87.8	147.5	27.40	20.69	18.46	17.99
United States	86.6	109.6	58.6	99.4	19.67	13.69	12.32	12.12
Canada	25.4	36.1	17.1	27.4	5.78	4.51	3.60	3.34
Mexico	8.6	19.9	12.0	20.6	1.95	2.49	2.53	2.51
Northeast Asia[1]	27.0	47.2	102.7	173.9	6.14	5.90	21.60	21.21
China-Hong Kong-Macao	20.7	38.2	29.2	96.4	4.69	4.77	6.14	11.75
Japan	2.9	3.0	54.2	48.4	0.66	0.37	11.41	5.91
Korea	2.3	4.1	13.7	19.7	0.53	0.51	2.88	2.41
Taiwan[1]	1.6	1.8	8.9	9.1	0.35	0.22	1.87	1.10
South America and Caribbean	65.1	155.5	33.4	50.1	14.77	19.41	7.03	6.11
Brazil	20.5	73.3	10.4	9.4	4.66	9.15	2.18	1.15
Argentina	17.6	32.2	2.1	1.5	4.00	4.02	0.45	0.19
Other	27.0	50.0	21.0	39.1	6.12	6.24	4.41	4.77
Southeast Asia	43.3	100.4	29.7	65.8	9.84	12.54	6.24	8.02
Indonesia	6.9	28.5	7.6	16.0	1.58	3.56	1.60	1.95
Malaysia	11.5	25.1	7.7	13.3	2.61	3.14	1.62	1.62
Thailand	14.2	22.3	3.0	8.5	3.22	2.79	0.62	1.03
Vietnam	3.3	11.3	0.5	8.5	0.75	1.41	0.10	1.03
Other	7.4	13.2	10.9	19.5	1.68	1.64	2.29	2.38
South Asia	12.9	43.6	11.7	31.0	2.94	5.44	2.46	3.79
India	10.4	36.4	5.2	16.0	2.35	4.55	1.09	1.96
Pakistan	1.3	4.6	2.7	4.9	0.30	0.57	0.57	0.59
Other	1.3	2.6	3.8	10.1	0.29	0.32	0.80	1.24

continued—

Appendix 2 table 1

Changes in world agricultural trade—continued

	Export value		Import value		Share of world exports		Share of world imports	
	1995-99	2010-14	1995-99	2010-14	1995-99	2010-14	1995-99	2010-14
	Billion real U.S. dollars (2004-06 prices)				*Percent*			
Sub-Saharan Africa	22.8	38.3	14.3	39.7	5.17	4.79	3.01	4.84
South Africa	4.9	9.2	2.8	6.1	1.12	1.15	0.60	0.74
Nigeria	0.2	3.6	1.3	5.0	0.06	0.45	0.28	0.61
Other	17.6	25.5	10.1	28.6	3.99	3.19	2.13	3.49
Middle East & North Africa	15.9	38.3	47.8	110.0	3.61	4.79	10.04	13.42
Turkey	6.0	12.2	5.1	11.7	1.36	1.53	1.08	1.43
Saudi Arabia	0.6	2.6	7.2	17.1	0.14	0.33	1.52	2.08
UAE	0.7	3.7	3.3	12.4	0.17	0.46	0.70	1.51
Iran	1.6	4.3	4.2	9.2	0.36	0.53	0.88	1.12
Egypt	1.0	4.5	5.7	11.1	0.23	0.56	1.19	1.36
Other	5.9	11.0	22.2	48.5	1.35	1.38	4.67	5.92
Oceania[5]	36.8	50.7	6.7	15.9	8.36	6.33	1.41	1.94
Australia	24.3	31.6	4.5	10.5	5.52	3.95	0.94	1.28
New Zealand	11.3	17.7	1.1	3.4	2.56	2.21	0.24	0.42

1Trade data for Taiwan were not available for 1995 and 1996. Averages for Taiwan, Northeast Asia, and the world were made using Taiwanese trade for 1997-99.

2Other Europe includes Iceland, Norway, Switzerland, Serbia, Bosnia, Albania, Macedonia, and Andorra.

3Other Former Soviet Union includes other former republics except for Estonia, Latvia, and Lithuania, which are in the EU.

4North America total includes Greenland.

5Oceania total includes Papua New Guinea, Solomon Islands, and Pacific Island nations.

Source: USDA, Economic Research Service. Authors' calculations using data from United Nations, 2016, deflated by price indices from FAO.

Appendix 3: USDA BICO Definition

Bulk Agricultural Products

Wheat
Corn
Coarse Grains (ex. corn)
Rice
Soybeans
Rapeseed
Oilseeds NESOI
Cotton
Peanuts
Pulses
Coffee, Unroasted
Cocoa Beans
Tobacco
Rubber & Allied Gums
Other Bulk Commodities

Intermediate Agricultural Products

Soybean meal
Oilseed Meal/Cake (ex. soybean)
Soybean Oil
Palm Oil
Vegetable Oils NESOI
Distillers Grains
Hay
Feeds & Fodders NESOI
Live Animals
Hides & Skins
Animal Fats
Essential Oils
Planting Seeds
Sugars & Sweeteners
Other Intermediate Products

Consumer-Oriented Agricultural Products

Beef & Beef Products
Pork & Pork Products
Poultry Meat & Prods. (ex. eggs)

Meat Products NESOI
Eggs & Products
Dairy Products
Fresh Fruit
Processed Fruit
Fresh Vegetables
Processed Vegetables
Fruit & Vegetable Juices
Tree Nuts
Chocolate & Cocoa Products
Snack Foods NESOI
Condiments & Sauces
Prepared Foods
Spices
Tea
Coffee, Roasted and Extracts
Non-Alcoholic Bev. (ex. juices, coffee, tea)
Wine & Beer
Dog & Cat Food
Nursery Products & Cut Flowers

Source: USDA, Foreign Agricultural Service, 2017a.

Appendix 4: General Services Support Estimates

The General Services Support Estimates (GSSE) measure payments made to producers collectively, i.e., individual commodities are not targeted. This includes expenditures on agricultural knowledge and innovation system, food inspection and control, development and maintenance of rural infrastructure, marketing and promotion, and cost of public stockholding. GSSE (and CSE) categories are similar to the classification of WTO green box payments; Effland (2011) points out how they differ (Appendix 4, table 1).[56] Or as noted in OECD (2002), measures included in the green box are much less trade and production distorting than traditional forms of support (i.e., target prices), while the GSSE includes measures that are not commodity specific and may have only indirect effects on trade and production.

Appendix 4 table 1

WTO's green box and OECD's General Services Support Estimate (GSSE) /Consumer Support Estimate (CSE) subcategories

WTO	OECD
Green box:	**GSSE:**
General services (includes research, extension, inspection, infrastructure, and domestic marketing programs)	Agricultural knowledge and innovation system
	Food inspection and control
	Development and maintenance of rural infrastructure
Public stockholding	Marketing and promotion
Domestic food aid	Cost of public stockholding
Decoupled income support	Miscellaneous (e.g., undifferentiated state-level expenditures)
Income insurance and safety net	
Relief from natural disasters	
Structural adjustment—producer retirement	**CSE:**
Structural adjustment—resource retirement	Transfers to producers from consumers
Structural adjustment—investment aids	Other transfers from consumers
Environmental payments	Transfers to consumers from taxpayers
Regional assistance	Excess feed costs

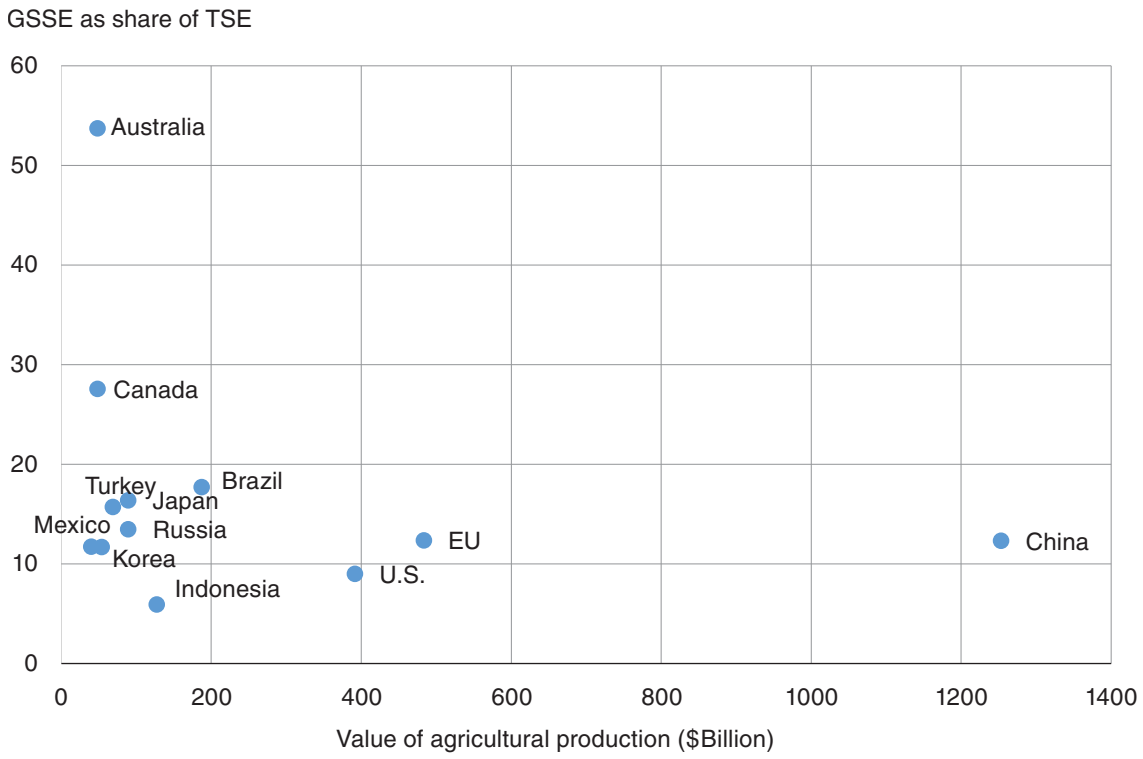
Note: The GSSE categories have been updated.
Source: USDA, Economic Research Service. Effland (2011).

GSSE payments as a share of Total Support Estimates (TSE) vary across developed and developing countries. Appendix 4, fig. 1 plots the value of agricultural production and the GSSE share for the OECD and non-OECD countries in the OECD database that have agricultural production greater than $30 billion. The countries with the largest share are Australia and Canada, while the smallest share belongs to Indonesia. Many countries reside in the 10-20 percent range. The United States has the second smallest share of GSSE in TSE. This is mainly because most U.S. domestic support is in the consumer support estimate (CSE) portion. That is, from 2011-15, the U.S. TSE averaged $87 billion, the amount just in the "transfers to consumers from taxpayers" was $43 billion. This, as noted in Table 1, is just one component of CSE.

[56]Using the U.S. as an example, she shows that WTO green box notifications consistently exceed the total outlay in both the GSSE and Consumer Support Estimate (CSE) categories.

Appendix 4 figure 1

Value of Agricultural Production and GSSE as a Share of TSE



Source: USDA, Economic Research Service calculations using OECD (2017b).

The WTO notifications on green box support shed some light on the origin of the transfers. As shown in Appendix 3, table 2, the majority of U.S. green box payments take the form of domestic food aid.[57] Indeed, domestic food aid has ranged from 65 percent of green box payments in 2000 and 2002 to 84 percent in 2012. Some examples of general services include funding allocated to USDA's Agricultural Research Service (ARS), National Institute of Food and Agriculture (NIFA), and Animal and Plant Health Inspection Service (APHIS).

[57]Some examples include: USDA Supplemental Nutrition Assistance Program (SNAP), the Emergency Food Assistance Program (TEFAP), Commodity Supplemental Food Program (CSFP), Fresh Fruit and Vegetable Program, and the Senior Farmers' Market Nutrition Program.

Appendix 4 Table 2

U.S. expenditures in the green box

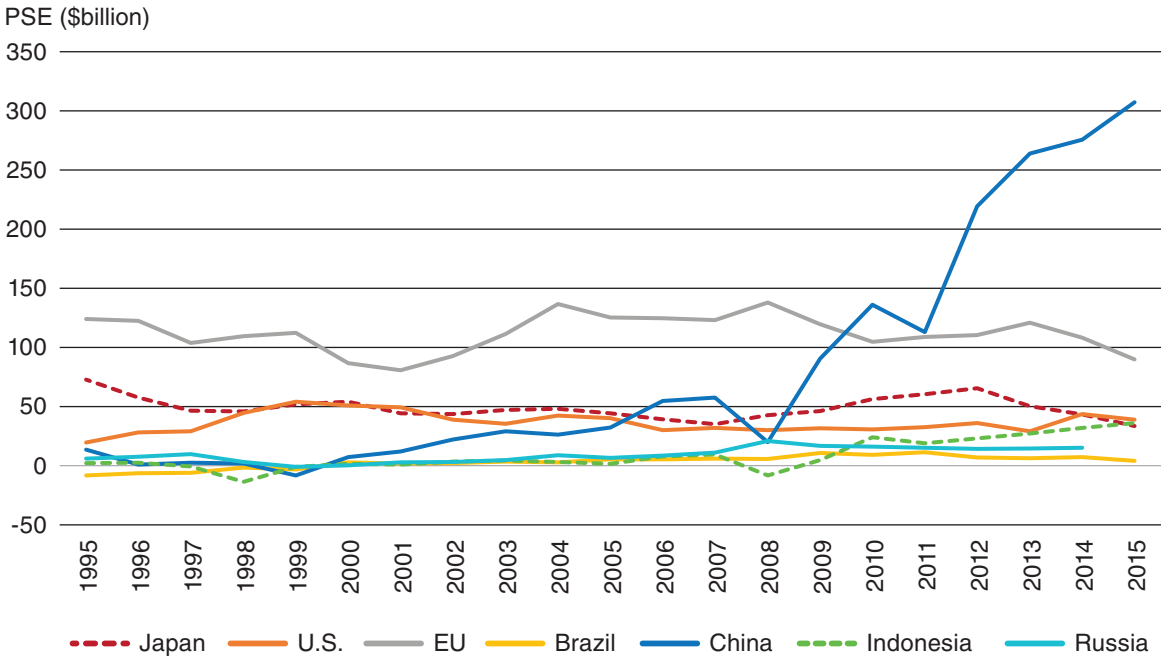
Year	General services	Domestic food aid	Decoupled income support	Disaster assistance	Environmental payments	Other	Total
				--$ million--			
1995	6,419	37,470	-	102	1,966	84	46,041
1996	6,550	37,834	5,186	156	2,011	88	51,825
1997	6,796	35,963	6,286	161	1,957	89	51,252
1998	7,225	33,487	5,659	1,412	1,944	93	49,820
1999	7,694	33,050	5,471	1,635	1,766	134	49,750
2000	8,554	32,377	5,068	2,141	1,785	132	50,057
2001	9,214	33,916	4,100	1,421	1,915	106	50,672
2002	10,258	38,013	5,301	2,121	2,505	124	58,321
2003	10,942	42,376	6,488	1,694	2,450	112	64,062
2004	11,198	45,861	5,270	1,964	3,038	93	67,424
2005	11,345	50,672	6,164	169	3,400	79	71,829
2006	10,783	54,177	6,145	1,068	3,726	136	76,035
2007	10,747	54,408	6,130	926	3,827	124	76,162
2008	15,752	60,519	5,776	65	3,983	123	86,218
2009	11,550	78,796	6,176	93	4,044	120	100,779
2010	13,073	94,915	5,852	63	4,828	226	118,957
2011	10,936	103,151	5,698	264	4,914	154	125,117
2012	10,252	106,781	4,790	344	5,139	135	127,441
2013	12,670	109,591	4,995	174	4,988	93	132,511

Source: USDA, Economic Research Service. Authors' calculations using WTO, 2017b.

Appendix 5: Country-Specific Producer Support Estimates (PSE)

Appendix 5 figure 1

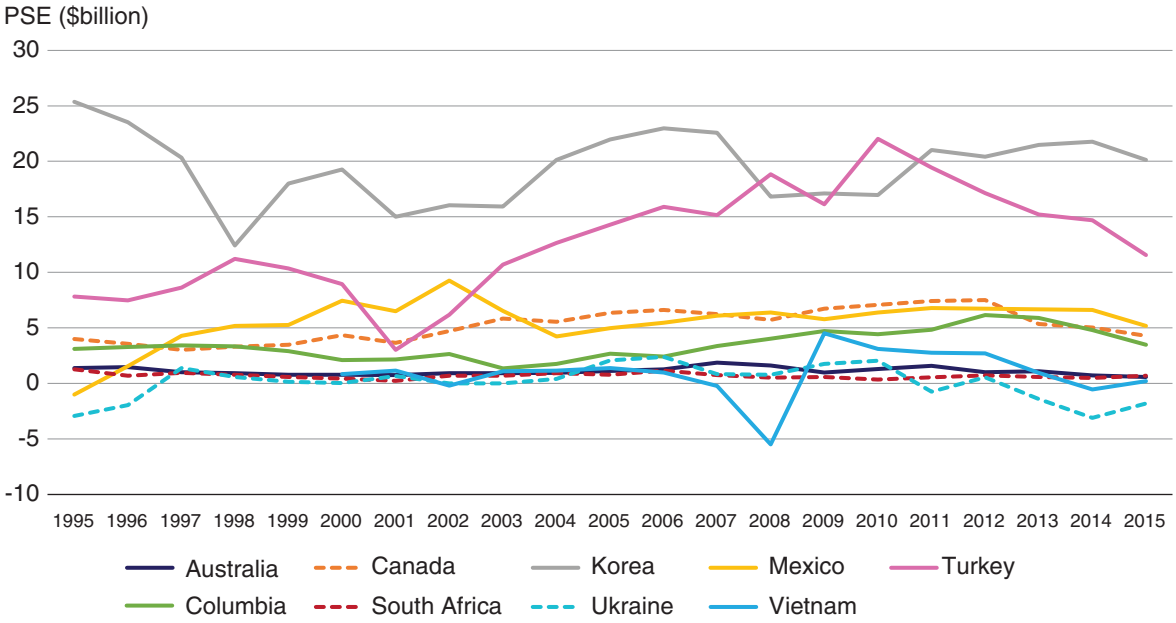
PSE for countries with annual agricultural production greater than $50 billion



Source: USDA, Economic Research Service. Authors' calculations using Organisation for Economic Co-operation and Development (2017b).

Appendix 5 figure 2

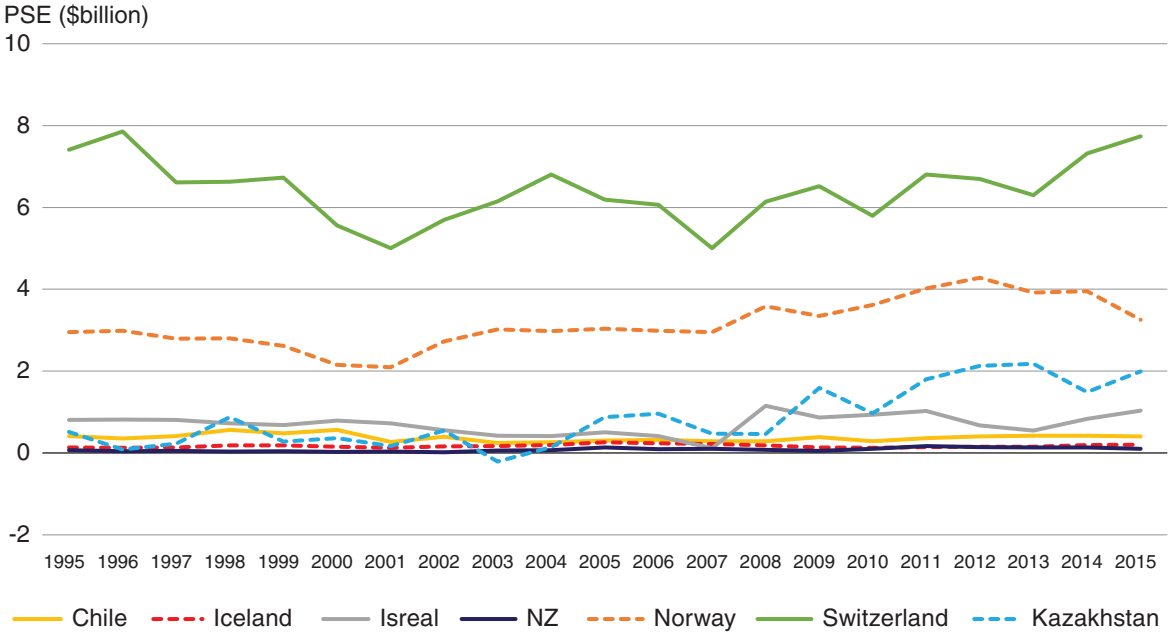
PSE for countries with agricultural production value less than $50 billion and greater than $11 billion



Source: USDA, Economic Research Service. Authors' calculations using Organisation for Economic Co-operation and Development (2017b).

Appendix 5 figure 3

PSE for countries with agricultural production value less than $11 billion



Source: USDA, Economic Research Service. Authors' calculations using OECD (2017b).