Public Disclosure Authorized

Policy Research Working Paper 10356

Trade as an Engine of Growth

Sputtering but Fixable

Franziska Ohnsorge
Lucia Quaglietti

WORLD BANK GROUP
Development Economics
Prospects Group
March 2023

Policy Research Working Paper 10356

Abstract

International trade has been an important engine of output and productivity growth historically. But since the global financial crisis, world trade growth has slowed, reflecting cyclical and structural forces. The COVID-19 pandemic and Russia's invasion of Ukraine have further disrupted commodity markets, global supply chains and the trade that accompanies them. A removal of impediments that raise trade costs could reinvigorate world trade. Trade costs, on average, roughly double the cost of internationally traded goods relative to domestically sold goods. Tariffs amount to only one-twentieth of average trade costs; the bulk are incurred in shipping and logistics, and trade procedures and processes at and behind the border. Despite a decline since 1995, trade costs remain about one-half higher in EMDEs than in advanced economies; about two-fifths of this gap appears to be due to higher shipping and logistics costs and a further two-fifths due to trade policy. A comprehensive reform package to lower trade costs could yield large dividends. It is estimated that among the worst-performing EMDEs, a hypothetical reform package to improve logistics and maritime connectivity to the standards of the best-performing EMDEs would halve trade costs.

This paper is a product of the Prospects Group, Development Economics. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://www.worldbank.org/prwp. The authors may be contacted at fohnsorge@worldbank.org and lucia.quaglietti@oecd.org.

Trade as an Engine of Growth: Sputtering but Fixable

Franziska Ohnsorge and Lucia Quaglietti[1]

Keywords: trade; global recession; emerging markets; developing economies.

JEL Classification: F14, E32, E37; O24

[1] Ohnsorge (Prospects Group, World Bank; CEPR; CAMA; fohnsorge@worldbank.org); Quaglietti (OECD; lucia.quaglietti@oecd.org). Kaltrina Temaj provided outstanding research assistance. This paper will appear as a chapter in the forthcoming World Bank book *Falling Long-Term Growth Prospects: Trends, Expectations, and Policies*. We thank Cordula Rastogi for her practical suggestions for the policy discussion and we thank Amat Adarov, Carlos Arteta, Jean-Francois Arvis, Natalie Chen, Hali Edison, Michael Ferrantino, Caroline Freund, Graham Hacche, Csilla Lakatos, Aaditya Mattoo, Valerie Mercer Blackman, Dennis Novy, David Robinson, Michele Ruta, and Christopher Towe, as well as participants of many internal seminars for excellent feedback and comments. The findings, interpretations and conclusions expressed in this paper are entirely those of the authors and should not be attributed to the institutions they are affiliated with.

I. Introduction

Global trade, powered by trade liberalization and falling transport costs, has historically been an important engine of output and productivity growth. In recent decades, it has helped to lift around 1 billion people out of poverty and many developing countries to integrate into the world economy. Empirical studies indicate that a 1 percentage point of GDP increase in trade openness has lifted per capita income by 0.2 percent (World Bank 2020a). A large part of the gains from trade can be attributed to the expansion of global value chains (World Bank 2020a). Participation in global value chains generates efficiency gains and supports the transfer of knowledge, capital, and other inputs across countries, thereby boosting productivity. Global value chain integration has also been associated with reduced vulnerability of economic activity to domestic shocks, although it has come with increased sensitivity to external shocks (Constantinescu, Mattoo, and Ruta 2020; Espitia et al. 2021).

In the past decade and a half, global trade growth has slowed as global value chains have matured, investment weakness has weighed on goods trade, and trade tensions have emerged between major economies (World Bank 2015, 2017; figure 1). As a result, instead of being twice as fast as global output growth, as it was during 1990-2011, the growth of global trade in goods and services in 2011-19 was just about as fast as global output growth. During the COVID-19 pandemic, global trade was hit particularly hard, falling by nearly 16 percent in the second quarter of 2020. The subsequent rebound was swift, however, especially for goods trade, and much faster than after the 2007-09 global financial crisis. That said, in 2021, global trade growth slowed again, disrupted by lockdowns and closures in the midst of new COVID-19 outbreaks and the emergence of significant supply chain strains in a number of sectors. A further blow to supply chains and trade was dealt by Russia's invasion of Ukraine in February 2022, which dislocated global commodity markets and manufacturing processes that rely on specialized inputs from Russia or Ukraine.

Absent a major policy effort, trade growth is likely to weaken further over the remainder of the 2020s, given the prospect of slower output growth and the fact that some of the key structural factors that supported rapid trade expansion in the past have largely run their course. Although supply chains have been remarkably resilient given the magnitude of recent shocks, the COVID-19 pandemic and Russia's invasion of Ukraine could accelerate changes in supply chains that were already underway, including by further in-sourcing or regionalizing production networks and increasing digitalization. A contraction of supply chains may lower the output elasticity of trade further, continuing a process that has been underway since 2010 (Timmer et al. 2021). Multinational corporations operating in EMDEs have already increased the use of digital technologies and enhanced their diversification of suppliers and production sites to increase their resilience to supply-chain shocks (Saurav et al. 2020). As multinationals seek to diversify, EMDEs may have new opportunities to integrate into global supply chains, provided they can offer a conducive business environment, such as a skilled workforce and adequate infrastructure (Butollo 2021; Arunyanart et al. 2021).

As discussed in Kilic Celik, Kose, and Ohnsorge (2023), potential output growth is expected to slow in many EMDEs in the coming decade amid unfavorable demographics and slowing investment and productivity growth. One way in which policymakers in EMDEs can boost long-term growth of output and productivity is by promoting trade integration through measures to reduce trade costs.

Our study examines the following questions. First, what is the link between trade growth and long-term output and productivity growth? Second, what are the prospects for trade growth in the coming decade? Third, how large are trade costs? Fourth, what are the correlates of trade costs? And fifth, which policies can help to reduce trade costs?

Our study contributes to the literature in a number of ways. First, it expands on World Bank (2021b) with a new, comprehensive review of the theoretical and empirical literature on the links between trade and output growth. Second, it presents an event study of the evolution of trade in goods and services through global recessions, including the pandemic-induced global recession of 2020.

Third, our study revisits an earlier literature that reported estimates of trade costs and their correlates (Arvis et al. 2016; Novy 2013; World Bank 2021b). It uses estimates of the costs of goods trade for up to 180 countries (29 advanced economies and 151 EMDEs) from the World Bank/UNESCAP database for 1995-2019. The drivers of the costs of goods trade, which accounts for about 75 percent of world and EMDE trade in goods and services, are estimated econometrically. Our study also quantifies the contribution of one type of services trade—logistics and shipping services—to the costs of goods trade. In addition, our study goes further than previously published research in assessing the role of trade policy—tariffs, participation in trade agreements—in trade costs.

Fourth, our study builds upon its analytical findings to discuss policy options for lowering trade costs. In particular, it offers scenarios indicating the potential reduction in trade cost associated with a menu of policy measures.

Our study offers the following findings.

First, the theoretical literature indicates that international trade boosts the long-term growth of output and productivity by promoting a more efficient allocation of resources, technological spillovers, and human capital accumulation. The empirical literature supports the theory by finding statistically significant positive relationships between openness and output growth, although they may be conditional on the presence of sound institutions and a supportive business environment in exporting countries. Overwhelmingly, empirical studies find a positive impact of trade on productivity growth.

Second, the COVID-19-induced global recession of 2020 triggered a collapse of global trade in goods and services. Within six months, however, before end-2020, global goods trade had recovered to pre-pandemic levels, and, by September 2021, global services trade had reached pre-pandemic levels even though travel and tourism services trade was still 40 percent lower than before the pandemic. The decline in services trade was considerably more pronounced and the recovery more subdued than in past global recessions, whereas movements in goods trade were broadly comparable to past global recessions.

Third, looking ahead, global trade growth is likely to weaken further over the remainder of this decade owing partly to slower global output growth and partly to the further waning of structural factors that supported rapid trade expansion in the past. The disruptions caused by the pandemic and Russia's invasion of Ukraine may also continue to dampen trade growth over the medium term. A major policy effort to reduce trade costs could help reverse the trade slowdown.

Fourth, trade costs for goods are high: on average, they are almost equivalent to a 100 percent tariff, so that they roughly double the costs of internationally traded goods relative to domestic goods. Tariffs amount to only one-twentieth of average trade costs; the bulk of trade costs are incurred in transport and logistics, non-tariff barriers, and policy-related standards and regulations. Despite a one-third decline since 1995, trade costs in EMDEs remain about one-half higher than in advanced economies. Panel-regression analysis suggests that about two-fifths of the explained difference in trade costs between EMDEs and advanced economies can be accounted for by higher shipping and logistics costs, and a further two-fifths by trade policy (including trade policy uncertainty). Services trade costs tend to be considerably higher than goods trade costs; they can, to a large extent, be attributed to regulatory restrictions.

Fifth, to reduce elevated trade costs in EMDEs, comprehensive reform packages are needed to streamline trade processes and customs clearance requirements; enhance domestic trade-supporting infrastructure; increase competition in domestic logistics, and in retail and wholesale trade; lower tariffs; lower the costs of compliance with standards and regulations; and reduce corruption. Trade agreements can also reduce trade costs and promote trade, especially if they lower nontariff barriers as well as tariffs. Our empirical analysis suggests that an EMDE in the quartile of EMDEs with the highest shipping and logistics costs could halve its trade costs if it improved these conditions to match the quartile of EMDEs with the lowest costs of shipping and logistics.

For the purposes here, trade costs are broadly defined to include all costs of international trade, whether at the border (such as tariffs), behind the border (such as standards and labelling requirements), or between borders (such as shipping and logistics). Trade costs are defined as the excess cost of an internationally traded good compared with a similar good traded domestically (annex A). Hence, trade costs cover the full range of costs associated with trading internationally, including transportation and distribution costs, tariffs and nontariff barriers arising from policies, costs of information and contract enforcement, legal and regulatory costs, as well as the costs of doing business across cultures, languages, and economic systems (Anderson and van Wincoop 2003).

This paper is organized in five additional sections. Section II reviews the theoretical and empirical literature on the linkages between international trade and long-term output growth and the main channels of transmission. Section III discusses developments in global trade over the past decade, with a particular focus on developments since the COVID-19 pandemic and Russia's invasion of Ukraine. Section IV presents patterns of trade costs across sectors and regions, while the section V discusses the correlates of trade costs, including by means of an estimated gravity panel model. Section VI focuses on policies to reduce trade costs, where a wide range of policy options available to policymakers are presented. Section VII concludes with directions for future research.

II. Trade and growth: A review of the literature

An extensive theoretical literature has traced out the channels through which international trade can lift output and productivity growth. The positive association between growth and trade has largely been confirmed in the empirical literature, although some studies have found that its strength depends on country characteristics.

II.1 Theoretical literature

The link between international trade and economic activity has long been a major subject of enquiry in theories of international trade and economic growth. Much traditional trade theory explains how trade raises output levels but is silent about effects on long-term output growth (Feenstra 2003; Ricardo 1817). In contrast, more recent trade and growth theories describe a positive relationship between the two, tracing out the mechanisms through which trade lifts long-term productivity and output growth (Helpman 1981; Krugman 1979; Lucas 1993).

Three main channels have been explored. First, access to foreign markets allows countries to acquire new technologies, especially when trade occurs between countries with different technological endowments. Second, openness to international trade offers opportunities to exploit economies of scale and "learning by doing", which enhance both productivity growth and the variety of goods produced and consumed. Third, the competitive pressures that arise from trade encourage innovation and factor reallocation, including the exit of the least productive firms, thus lifting overall productivity.

Technological progress, by enhancing the productivity of labor and other factors of production, is a critical driver of long-term output growth and poverty reduction. Apart from their immediate impact on productivity, the creation, application, and diffusion of technological advances tend to generate positive externalities and increasing returns to scale (Arrow 1962; Romer 1990). However, as technological innovation tends to occur in a limited number of countries, advances globally depend on international spillovers (Keller 2004). International trade, like foreign direct investment (FDI), is one of the primary channels of diffusion of new technology as it makes available to importers processes and products that embody foreign knowledge and that would otherwise be unavailable or very costly (Helpman 1997; Grossman and Helpman 1991).

The literature identifies two types of externalities generated through trade: pure knowledge spillovers and rent spillovers. Pure knowledge spillovers arise mostly through licensing agreements or through firms that are multinational. Rent spillovers occur when the prices of imported intermediate and capital goods do not fully reflect the costs of innovation embedded in them, so that part of the rents from innovation are transferred from the innovating firm to trading partners (Keller 2021).

International trade also allows countries to exploit economies of scale and network effects in areas where they have a comparative advantage (Helpman 1981; Helpman and Krugman 1985; Krugman 1979). Trade causes output to expand and, in the presence of increasing returns to scale, firms' fixed costs are spread over a larger number of units produced. This results in more efficient production at smaller average cost.a similar mechanism, the output expansion associated with trade may also allow greater product variety, which can enhance productivity (Feenstra 2010). In addition, innovations resulting from international trade often allow workers to acquire new human capital through learning by doing as workers take up new tasks. This also boosts productivity and helps countries move up the product-quality ladder (Lucas 1993).

By increasing competition, trade also promotes productivity growth by reallocating resources toward more efficient firms as the least productive firms are encouraged to exit (Bernard et al. 2007; Melitz 2003). Since entering foreign markets imposes an up-front cost for exporting firms, only relatively productive firms can generally engage in exporting. Once they have entered a new market, exporting firms can expand and attract workers and capital, thus tending to force out firms limited to the domestic market by inferior efficiency. In addition, by raising competitive pressures in the domestic market, international trade lowers firms' markups over marginal cost and encourages organizational change and production upgrades to boost within-firm productivity (Melitz and Ottaviano 2008).

II.2 Empirical literature

The relationship between international trade and long-term output growth has been investigated by a large empirical literature, using cross-country and firm-level data. In addition to aggregate effects, studies have identified specific channels through which trade integration boosts productivity, capital accumulation, and employment growth—the fundamental drivers of long-term economic growth.

Trade and output growth. Most cross-country studies have found a positive link between international trade and output growth.[2] However, the direction of causality and the role of third factors remain matters of debate. Some studies find clear growth-enhancing effects of trade liberalization (Dollar 1992; Bhagwati and Srinivasan

2002) whereas others find that the effects depend on the measure of trade openness used (Rodriguez and Rodrik 2001). This may, in part, reflect omitted variables. For example, some authors find a large positive impact of trade on growth only when this is accompanied by high levels of education, well-developed financial systems, and institutional reforms (Chang, Kaltani, and Loayza 2009). Likewise, regulatory reforms have been found to enhance the impact of trade on growth (Bolaky and Freund 2004).

Trade and productivity. A number of cross-country and firm-level studies find a positive link between trade and labor or total factor productivity.[3] A cross-country study of 138 countries for 1985 finds that a 1 percentage point increase in trade openness is associated with 1.2 percent higher labor productivity (Alcala and Ciccone 2004). A more recent study of a large number of advanced economies and EMDEs finds that around 15 percent of the increase in total factor productivity growth during 1994-2003 was accounted for by rising trade openness, while for developing countries alone, the proportion was larger, at 32 percent (Broda, Greenfield, and Weinstein 2017). Studies that address firm heterogeneity also point to trade-induced productivity gains. For example, one study finds that firms facing international competition enjoy 3-10 percent higher productivity than those that sell only in domestic markets (Pavcnik 2002). A study for Brazil finds evidence of reductions in inefficiencies in firms that engaged in international trade (Muendler 2004).

Trade and capital accumulation. Several studies find evidence of a positive relationship between trade openness and capital accumulation (Alvarez 2017; Sposi, Yi, and Zhang 2019). A study covering the period 1950-98 indicates that countries that liberalized their trade regimes subsequently experienced 1.5 percentage points higher annual investment growth than before liberalization, on average (Wacziarg and Welch 2008). The literature also points to a close association between trade openness and FDI inflows, which are a source of funding for investment in addition to domestic saving (Shah and Khan 2016; Sharma and Kumar 2015; Stone and Jeon 2000). For example, one study found that among 36 developing economies between 1990 and 2008, trade openness was associated with higher FDI inflows in the long run (Liargovas and Skandalis 2012). Trade policies and the quality of infrastructure have been found to affect the strength of the link between trade and FDI. Thus, a study of Asian countries during 2008-13 found that countries with fewer restrictions on imports and exports had a higher chance of attracting FDI, with a 10 percent reduction in bilateral trade costs being accompanied by an 8 percent increase in FDI inflows (Duval, Saggu, and Utoktham 2015).

Trade and employment. Theoretical models often assume long-run full employment, allowing trade to have only limited, short-term effects on jobs. But a number of empirical studies point to positive effects on employment. For example, a cross-country study of OECD economies over 1983-2003 finds that a 10 percent increase in trade

---

[2] See Alesina, Spolaore, and Wacziarg (2000); Dollar and Kray (2004); Frankel and Romer (1999); Noguer and Siscart (2005); and Sachs and Warner (1995).

[3] See Alcala and Ciccone (2004); Chen, Imbs, and Scott (2009); Edwards (1997); and Frankel and Romer (1999).

openness was associated with a 1 percentage point lower rate of unemployment (Felbermayr, Prat, and Schmerer 2009). There is also country-specific evidence suggesting significant employment creation following greater trade integration, such as in China, Madagascar, and Singapore (Hoekman and Winters 2005). And another study, however, found that in the United States, rising imports from China raised unemployment and reduced labor force participation in import-competing manufacturing industries, and that such imports explained one-quarter of the decline in U.S. manufacturing employment (Autor, Dorn, and Hanson 2013). In general, the effects of trade integration on employment differ across countries and depend importantly on the functioning of labor markets, the efficiency of capital markets, and social policies (OECD et al. 2010).

III. Recent trade growth and prospects

The slowdown in trade growth in the decade following the global financial crisis reflected weaker global output growth but also a lower responsiveness of international trade to global economic activity (the output elasticity of trade). The subsequent COVID-19 pandemic triggered a goods trade collapse on par with those in earlier global recessions but the services trade collapse was much deeper and was followed by an exceptionally slow recovery. Looking ahead, all major drivers of trade growth point to a period of prolonged weakness.

III.1 Weakness of trade growth in the 2010s

The growth of global trade in goods and nonfactor services was sharply weaker in the pre-pandemic decade, at just 3.8 percent a year during 2011-19, than during 1970-2008, when it averaged 5.8 percent a year. If global trade had expanded at its 1970-2008 trend rate during 2011-19, it would have been around one-third above its actual level in 2019 (figure 2). With the exception of Europe and Central Asia (ECA), the slowdown in trade growth extended across all EMDE regions. In Sub-Saharan Africa (SSA), trade growth was particularly weak, at about half the EMDE average over the 2010s. The slowdown was concentrated in goods trade; services trade continued to outpace world output growth, by 1.5 percentage points a year on average during 2011-19, before the pandemic hit.

The slowdown in trade growth in the decade following the global financial crisis reflected both weaker output growth and a lower responsiveness of trade to global economic activity (the output elasticity of trade). Estimates from an error correction model for 1970-2019 suggest that the long-run output elasticity of trade—the trade increase associated with a 1-percent output increase—declined from 2.2 during 1990-2011 to around 1.0 during 2011-19.[4] In EMDEs, the ratio of import growth to

[4] The model allows estimation of both the long-run elasticity of trade with respect to income (which captures trend, or structural, factors) and the short-run elasticity (which is relevant to short-run or cyclical developments). For further details on the model specification, see Constantinescu, Mattoo, and Ruta (2020).

output growth declined from 1.7 during 1990- 2008 to 0.9 during 2011-19. The decline in the global output elasticity of trade in the decade before the pandemic reflected several factors (World Bank 2015).

Changes in the composition of global demand. The composition of global demand shifted away from advanced economies toward EMDEs and toward less trade-intensive components of aggregate demand. EMDEs, which typically have a lower trade-intensity than advanced economies, accounted for just under two-fifths of global output during 1980-2008 but for about three-fifths during 2010-19 (Cabrillac et al. 2016; World Bank 2015). Investment, which tends to be more trade-intensive than other components of demand, was weak over the past decade, especially in EMDEs (Bussière et al. 2013; Kose et al. 2017). This reflected a number of factors, including a policy-guided shift away from investment-led growth in China and the effects of prolonged weakness of commodity prices on investment in commodity exporters (World Bank 2017, 2019).

Maturing global value chains. Over the past decade, the expansion of global value chains slowed (Antras and Chor 2021; World Bank 2015, 2020a). The share of global value chain-related trade in total world trade grew significantly in the 1990s and early 2000s but has stagnated or even declined since 2011. This has in part reflected rising labor costs in key emerging market economies, a greater appreciation by firms of supply risks in the wake of natural disasters, and mounting trade tensions over the past five years (Cabrillac et al. 2016; Cigna, Gunella, and Quaglietti 2022; World Bank 2020a). Trade in construction and services, which tend not to be embedded in deep global value chains, increased their shares of global trade after 2010 (WTO 2019a).

Trade tensions. A slowing pace of trade liberalization may also have contributed to a lower trade elasticity (World Bank 2015). Tariff rates levelled off in both advanced economies and EMDEs in the early 2000s. At the same time, there was increased use of regulatory measures and other nontariff barriers such as export subsidies, restrictions on licensing or foreign direct investment, and domestic clauses in public procurement (Niu et al. 2018).

III.2 Pandemic-triggered collapse and recovery: Historical comparison

The global recession of 2020 was the deepest since World War II and was accompanied by a collapse in global trade in goods and nonfactor services of nearly 16 percent in the second quarter of 2020—6 percentage points steeper than the drop in the first quarter of 2009, at the nadir of the global recession triggered by the global financial crisis. In 2020 as a whole, goods trade fell by 7 percent, considerably more than in the average global recession since 1975 (figure 3). Unusually for global recessions, the collapse in global services trade was even larger than the collapse in global goods trade. The decline in services trade was considerably more pronounced and the recovery more subdued than in past global recessions, partly reflecting the collapse in global tourism as countries closed their borders to stem the spread of the pandemic. In 2020, services trade fell by 20 percent, more than twice the average drop of 8 percent in global recessions since 1975.

The post-pandemic trade recovery fell just a little short of the average of past global recessions. In 2021 as a whole, goods trade stood at 6 percent above its pre-pandemic level, which compares with 8 percent in the first year of recovery after the average past global recession. The recovery in global trade since 2020 partly reflected a shift in global demand toward trade-intensive manufactured goods—especially durable goods—and away from services, which tend to be non-tradable. The increase in industrial production has been mirrored almost one for one by trade growth. This is consistent with both being lifted by a common factor such as a rebound in global demand (World Bank 2022a). The recovery in goods trade has been fairly broad-based, with global imports of cars, capital goods, consumer goods, and industrial supplies all back at or above pre-pandemic levels by January 2021 (IMF 2021). However, global goods trade stalled in the second half of 2021, amid slowing demand growth and supply bottlenecks. It was dealt a further blow in February 2022 by Russia's invasion of Ukraine, which has disrupted trade flows from the Black Sea and especially curtailed trade in commodities.

Through most of 2021, global services trade remained below pre-pandemic levels, in contrast with earlier global recessions when it typically recovered quite rapidly. Aggregate services trade only reached pre-pandemic levels in September 2021. By January 2022, most components of services trade, including telecommunications and financial services, had fully recovered to pre-pandemic levels, but travel services remained 40 percent lower. Travel and tourism trade recovered to pre-pandemic levels only by July 2022. The recovery in services trade was fastest in East Asia and the Pacific (EAP), where China's services trade had already returned to pre-pandemic levels by December 2020. Services trade, including travel and tourism, has played an increasingly important role in the global economy. For example, since 2000, global travel and tourism revenues have nearly tripled, with the sector in 2021 accounting for 10 percent of global GDP, 30 percent of global services trade, and 10 percent of all jobs worldwide (World Bank 2020b).

Spillovers through global value chains are likely to have amplified the fall in world trade associated with the COVID-19 pandemic (Cigna, Gunnella, and Quaglietti 2022). Companies increasingly turned to digital technologies and diversified suppliers and production sites to mitigate disruptions caused by the pandemic (Saurav et al. 2020). In 2021, strains in global supply chains worsened significantly. The rapid recovery in global goods consumption from mid-2020 put acute pressure on the trade-intensive manufacturing sector. At the same time, COVID-19 outbreaks continued to disrupt production at many points along complex global value chains, creating significant obstacles to final goods production. COVID-19 outbreaks have also shut down some key port facilities, disrupting ocean shipping and air freight and leading to an unprecedented lengthening of supplier delivery times (figure 4). Regression analysis that controls for the effect of demand conditions suggests that global trade could have been 3.5 percent higher in 2021 had it not been for supply chain strains (figure 4).[5] In 2022, these supply

[5] The impact of supply bottlenecks is estimated in an ordinary least squares regression of global trade on the manufacturing PMI for new export orders, the manufacturing PMI for supplier delivery times (a

chain bottlenecks largely dissipated as global demand softened and pandemic-related supply disruptions eased.

Global goods and services trade was dealt a new blow in February 2022 by Russia's invasion of Ukraine, which disrupted trade flows from the Black Sea and especially curtailed trade in commodities. Commodity market disruptions—including delivery delays in natural gas and coal—throttled the production of electricity in several countries, curbing energy-intensive manufacturing activities. Disruptions to wheat shipments from the Black Sea put pressure on supplies of food staples globally (World Bank 2022b). Some car production lines were temporarily closed down for lack of specific components ordinarily produced in Ukraine, such as car wiring. Shortages and unprecedented increases in the prices of key commodities produced in Russia and Ukraine rippled through global value chains, leading to production standstills and elevated producer prices globally. While the commodity price spikes in the immediate wake of the invasion unwound later in 2022, the war has disrupted shipping, especially through the Black Sea, driven up insurance and shipping costs globally, diverted trade to more expensive routes, and discouraged tourism from and to several countries in the ECA region. A prolonged conflict in Ukraine may lead to additional dislocations and fragmentation of global value chains, further exacerbating the marked slowdown in the pace of EMDE integration into global value chains since 2008.

III.3 Prospects for global trade growth

In the January 2023 *Global Economic Prospects* report, global trade growth is projected to slow to under 4 percent in 2022, from more than 10 percent in 2021, and further in 2023. This forecast reflects slower projected global output growth, but also the diminished trade intensity of global output: the structural factors that supported the rapid expansion of trade in the decades preceding the global financial crisis seem to have largely lost their force, so that the recently reduced elasticity of global trade with respect to global output seems likely to constitute a "new normal."

Since global output growth itself is projected to be about 0.4 percentage point slower in the forecast period (2022-30) than in previous decade, world trade growth is also expected to slow (Kilic Celik, Kose, and Ohnsorge 2023; World Bank 2021a). Thus, assuming the trade elasticity to output growth remains around 1 as it was during the 2010s and assuming no major policy change, trade growth over the remainder of the 2020s is likely to be slower by another 0.4 percentage point a year than in the preceding decade, broadly in line with the projected weakening of global potential output growth (World Bank 2021a). The weakness may be more pronounced in the growth of goods trade. In goods trade, new technologies may allow more localized and more centralized production. In services trade, rapidly growing data services promise a return to rapid

proxy for supply bottlenecks), and relevant lags of global trade and PMI new export orders. Counterfactual scenarios assume that the PMI supply delivery times indicator in the period January 2020-November 2021 had remained at the average 2019 level. Estimations are performed over the period 2000-19. The estimation methodology is similar to the one developed by Celasun et al. (2022).

expansion as the pandemic is brought under control (Nayyar and Davies 2023; Coulibaly and Foda 2020; World Bank 2021c; Zhan et al. 2020).

The four decades prior to the global financial crisis saw a steady increase in global economic integration through trade, assisted partly by falling tariffs (figure 4). Since the global financial crisis, however, trade integration has stalled, with the COVID-19 pandemic and Russia's invasion of Ukraine having added further obstacles. With Russia's share of global oil production having increased considerably in recent decades, there is now a material risk that the disruptions caused by Russia's invasion of Ukraine could lead to a major reconfiguration of global trade and investment networks, as countries look for alternative sources of energy. While this may boost trade in some parts of the global economy, it is likely to disrupt trade elsewhere. Since such a reconfiguration would be motivated by political and security considerations rather than economic considerations, it is likely to reduce global economic welfare as well as trade in the long term (Ruta 2022).

IV. Patterns in trade costs

The fading momentum of global trade growth is diminishing its role as an engine of output and productivity growth. Countries therefore need to find new ways to reap the benefits from trade. One possibility is to cut trade costs to boost exports and encourage imports in a manner that is growth-enhancing. A number of studies have documented the negative impact of trade costs on trade growth (Anderson and van Wincoop 2003) and the boost to productivity that can result from lowering trade costs (Bernard, Jensen, and Schott 2006). Trade costs have also been recognized as an important factor in firms' decisions to choose out-sourcing over in-sourcing (Hartman et al. 2017).

IV.1 Definition

The analysis in this paper relies on a comprehensive UNESCAP-World Bank dataset of bilateral trade costs. Following Novy (2013), Arvis et al. (2013) derive measures of annual trade costs for the period 1995-2018. For any given country pair *i* and *j*, trade costs are obtained as geometric averages of trade flows between countries *i* and *j*. They are computed according to the formula:

$$(X_{ii} X_{jj})/(X_{ij} X_{ji})^{1/2\,(\sigma-1)},$$

where X_{ij} represents trade between countries i and j (goods produced in i and sold in j) and σ refers to the elasticity of substitution. This measure assumes that international trade costs relative to domestic trade costs are reflected in international trade flows relative to domestic trade flows: when international trade costs are higher than the costs of domestic trade, countries will trade more domestically than internationally, i.e. the ratio $(X_{ii} X_{jj})/(X_{ij} X_{ji})$ will be higher. In the application of this methodology, domestic trade is proxied by the difference between gross output and total exports. Trade costs thus estimated are expressed as a proportion of the value of traded goods (comparable with an ad valorem tariff rate) and can be computed for the economy as a whole, or specifically for such sectors as manufacturing and agriculture.

Such trade cost estimates refer to bilateral trade. To obtain country and regional measures of multilateral trade costs, bilateral trade costs from the UNESCAP-World Bank database are aggregated using 2018 bilateral country export shares from the UNCTAD database. Regional and sectoral aggregates are obtained as unweighted averages of individual country measures.

IV.2 Literature view

Trade costs and trade. A growing literature has documented evidence that lower trade costs raise trade growth (Anderson and van Wincoop 2003). A study of data for the period 1870-2000 found that declines in trade costs explain roughly 60 percent of the growth in global trade in the pre-World-War 1 period and around 30 percent of trade growth in the period after World War II (Jacks, Meissner, and Novy 2011). Studies of firm-level data have found that lower trade costs have encouraged firms to locate abroad (Amiti and Javorcik 2008), and to choose out-sourcing over in-sourcing and intra-firm rather than arm's-length trade (s).

Trade costs and productivity. A link between lower trade costs and higher productivity has also been substantiated. For advanced economies, one study found that a 1 percentage point lower tariff rate was associated with a 2 percent gain in total factor productivity during 1997-2007 (Ahn et al. 2019). Analyses of firm-level and sector-level data have shown similar results. Industries with larger declines in trade costs had stronger productivity growth; lower-productivity plants in industries with falling trade costs were more likely to close; and non-exporters were more likely to start exporting in response to falling trade costs (Bernard et al. 2007).

IV.3 Patterns across regions and sectors

Despite a sharp decline in the past two and a half decades, recent data show that trade costs in EMDEs raise the prices of goods traded internationally to more than double the prices of goods traded domestically and that they remain about one-half higher than in advanced economies (figure 5). Among EMDE regions, average trade costs range from tariff equivalents of 96 percent in ECA to 142 percent in South Asia (SAR), with wide heterogeneity within regions. This heterogeneity is particularly pronounced in the Middle East and North Africa (MENA), where trade costs range from 86 to 136 percent among different countries. Trade costs have declined since 1995 in all sub-regions except East Asia and Pacific (EAP), with the fastest decline occurring in SSA. Within ECA, average trade costs of countries that are members of the European Union or geographically close to it are two-thirds of the average trade costs of other countries, which are less integrated into EU supply chains.

Trade costs remain particularly elevated in agriculture—about four-fifths higher than in manufacturing. Agricultural trade costs are particularly high in SSA where they stand at 270 percent tariff equivalent. Likewise, manufacturing trade costs are particularly high in SSA and in Latin America and the Caribbean (LAC). Trade costs declined less in agriculture than in manufacturing over 1995-2019, falling from 194 percent to 170 percent, in part because of slower progress in reducing tariffs and the narrower coverage of trade agreements.

Goods and services trade are complementary. Tradable services are key links between stages of value chains and "enablers" of trade in goods, particularly communications, finance, business and logistics services. As a result, services account for almost one-third of the value added of manufacturing exports (Ariu et al. 2019; OECD 2022). Comparable cross-country data on services trade costs and on policies affecting trade in services are scant. The few attempts in the literature to quantify trade costs in services either rely on observed trade and value-added flows, akin to the methodology embedded in the UNESCAP/World Bank database for goods trade costs (Miroudot, Sauvage, and Shepherd 2010), or rely on an inventory of services trade restrictions (Benz 2017). Both types of studies suggest that trade costs for services are considerably higher than trade costs for goods, and that, unlike trade costs for goods, they have not fallen since the 1990s.

V. Correlates of trade costs

Trade costs include the full range of costs associated with trading across borders. These include transportation and distribution costs (Marti and Puertas 2019; Staboulis et al. 2020), trade policy barriers (Bergstrand, Larch, and Yotov 2015), the costs of information and contract enforcement (Hou, Wang, and Xue 2021), legal and regulatory costs, as well as the cost of doing business across cultures, languages, and economic systems (Anderson and van Wincoop 2003).

V.1 Candidate correlates

A number of correlates of trade costs have been identified. They include trade policies, shipping and logistics, regulations, uncertainty, and other factors.

Trade policies: tariffs and trade agreements

Import tariffs raise trade costs. The contribution of tariffs to total trade costs has decreased in the post-war period, including through steep reductions since 1990 in tariffs imposed by EMDEs. Thus tariffs in EMDEs averaged 7.7 percent of the value of imports in 2020, down from 16.0 percent in 1995, although this is still much higher than the average tariff of around 1.9 percent in advanced economies (figure 6). As a result of tariff reductions, tariffs now amount to a small portion of trade costs—about one-twentieth. Agricultural tariffs remain higher than manufacturing tariffs, by one-fifth in EMDEs and two-fifths in advanced economies.

The decline in tariffs in recent decades has been accompanied by the establishment and expansion of regional trade agreements (RTAs). The number of RTAs more than quintupled between the early 1990s and the mid-2010s and their focus has shifted from tariff cuts to the lowering of nontariff barriers (World Bank 2016). The EU alone participates in 46 RTAs, and other advanced economies are members of up to 75. Among EMDEs, membership of RTAs is less common, although all but a handful are members of at least one. Such agreements are most common in ECA, where some countries are EU members and others are members of the free trade area between members of the Commonwealth of Independent States, and in LAC, where most countries are members or associates of MERCOSUR or signatories to trade agreements with the United States, such as the U.S.-Mexico-Canada Agreement (USMCA) or the Dominican Republic-Central America Free Trade Agreement (CAFTA-DR).

Shipping and logistics

A multitude of trade costs arise from the transport of goods and from associated administrative border and customs procedures (Moïsé and Le Bris 2013). Transport costs, much like tariffs, penalize goods produced in multiple stages across different countries, since producers have to pay to move components at each stage of the production process. They can be thought of as services costs—the costs of services related to shipping and logistics. These costs depend on the efficiency and reliability of transport facilities and the burden of administrative procedures.

Transit delays have been identified as important deterrents to trade flows, together with poor shipping connectivity and inadequate logistics infrastructure and services (Freund and Rocha 2011). For most of U.S. trading partners, transport costs are higher than tariff costs, and for the broader group of advanced economies, poor logistics have resulted in larger trade costs than geographic distance alone (Marti and Puertas 2019; Staboulis et al. 2020). Transport costs, much like tariffs, penalize goods produced in multiple stages across different countries, since producers have to pay to move components at each stage of the production process. Estimates of the tariff equivalent of transit time find that each day in transit is equivalent to a 0.8 percent tariff (Hummels et al. 2007). For a 20-day sea-transport route (the average for imports to the United States), this amounts to a tariff rate of 16 percent—much higher than the actual average tariff rate. Using gravity models, studies find that a 10 percent increase in the time taken to transport exports reduces trade by 5-25 percent, depending on the sector and export destination (Djankov, Freund, and Pham 2010; Hausman, Lee, and Subramanian 2005; Kox and Nordas 2007, Nordas 2007).

Transport costs in real terms have declined over time, as land, sea, and air shipping costs have fallen. Technological improvements in transport services, such as jet engines and containerization, have reduced both transport costs per unit of time and transport times. Average shipping time for imports to the United States declined from 40 to 10 days between 1950 and 1998 (Hummels 2001). Evaluated at an average cost per day of 0.8 percent ad valorem (see previous paragraph), this increase in the speed of transport is equivalent to a reduction in the tariff rate of 24 percentage points.

In addition, advances in communication technologies have allowed the development of more effective multi-modal transport systems, which have helped both to reduce delivery times and to increase the reliability of deliveries. However, such advances have been uneven among countries, and global shipping connectivity and logistics remain considerably weaker for EMDEs than for advanced economies (figure 6), with trade costs correspondingly higher (figure 7).

Regulations

Trade costs can be lowered significantly by streamlining trade and customs compliance procedures and processes (Staboulis et al. 2020). Reductions in regulations have been associated with significantly higher trade volumes: each additional signature that has to be collected for exports has been found to cost almost as much as the average tariff (Hillberry and Zhang 2015; Sadikov 2007).

Regulatory requirements for trading across borders have been streamlined significantly over the past decade, especially in ECA, SAR, and SSA. In ECA and SSA, these developments appear to be linked to automation and digitalization of trade processes in a number of countries, which have reduced the time taken for compliance assessments at the location of customs clearance. In SAR, they appear to be related to the upgrading of port infrastructure in India, coupled with the introduction of a new system of electronic submission of import documents. In EAP, better governance and less burdensome customs procedures have been associated with somewhat lower trade costs.

Trade uncertainty

Uncertainty about the costs associated with transport, customs and border processes, tariffs, and non-tariff trade policies can impose significant burdens on investment and output as well as trade. For example, uncertainty about trade policy may have lowered U.S. investment by more than 1 percent in 2018 (Caldara et al. 2020).

One dimension of trade uncertainty is the scope that countries have to raise tariffs without violating WTO rules—that is, the difference between applied tariffs and bound tariffs, the so-called “tariff water” (Osnago, Piermartini, and Rocha 2015). This dimension of trade uncertainty increased steadily in advanced economies in the two decades to 2013, but it has since declined significantly. In EMDEs, the gap between applied and bound tariffs has remained much wider than in advanced economies, with little sign of any sustained decline (figure 6).

Uncertainty about delivery times can also impose significant costs. In Africa, for example, a single-day transit delay for an exporter is estimated to be equivalent to a 2 percent tariff in importing partner countries (Freund and Rocha 2011).

Other factors

Policy-related nontariff barriers may include sanitary, phytosanitary, and other standards (often aimed at protecting consumer health and safety), pre-shipment inspections, licensing requirements, and quotas. These are important determinants of trade costs. Measuring non-tariff barriers is difficult. A common method is to construct a measure of the prevalence of non-tariff barriers, such as the percent of tariff lines covered by non-tariff barriers. One study estimated the average non-tariff barrier globally as equivalent to an 11.5 percent tariff, significantly higher than the average tariff rate of 4 percent (Kee and Nicita 2016). Non-tariff barriers have risen over time. In 2015, about 2,850 product lines were subject to at least one nontariff barrier, about double the 1,456 product lines in 1997 (Niu et al. 2018). Nontariff barriers affect a higher share of imports in advanced economies than in EMDEs (but a lower share of exports). Almost all agricultural imports face non-tariff barriers, compared with about 40 percent on average across all sectors (World Bank and UNCTAD 2018). Low-income countries are particularly affected by nontariff barriers because administrative requirements are particularly frequently applied to agricultural products and firms in low-income countries are less able to comply with such requirements.

Noncompetitive market structures can drive-up trade costs. In some countries in SSA, for example, the cost of moving goods domestically is up to five times higher than in the United States (Atkin and Donaldson 2015; Donaldson, Jinhage, and Verhoogen 2017). This difference has in part been attributed to a lack of competition in the domestic transport sector. Elsewhere, excessive competition can drive down the quality of transport services, with high road mortality, deteriorated roads, and poor vehicle quality (Teravaninthorn and Raballand 2008).

Institutional quality and economic infrastructure affect trade costs. Better energy provisioning, more highly developed transport and communication infrastructure and services, financial development, and greater transparency of policy decisions have all been associated with lower trade costs (Cali and te Velde 2011; Hou, Wang, and Xue 2021). Analysis of data for a large sample of countries in the early 2000s indicates that more transparent and effective institutions—such as the availability of trade-related information, the simplification and harmonization of documents, the streamlining of procedures, and the use of automated processes—were associated with more than 10 percent lower trade costs (Moïsé and Sorescu 2013). Findings on the effects of corruption have been more ambiguous: it may raise trade costs when corrupt officials extort bribes or it may lower trade costs when corrupt officials allow tariff evasion (Dutt and Traca 2010). Consistent with concerns about institutional quality, trade finance of a type that reduces risk of non-payment or non-delivery (such as letters of credit) has been associated with more resilient trade flows during times of economic or financial stress (Crozet, Demir, and Javorcik 2021).

Regulatory restrictions on services trade can add to trade costs, even for goods trade. To a large extent, trade costs in the services sector reflect regulations that create entry barriers, such as licensing quotas. The OECD's Services Trade Restrictions Index (STRI) measures de jure regulatory restrictions on services trade in 44 countries (figure 8). As with goods trade, services trade remains more restricted in EMDEs than in advanced economies, especially with respect to the entry of foreign firms. Across regions, the most restrictive policies are applied in SAR and EAP, whereas countries in LAC tend to be more open.

V.2 Estimation

Gravity equations are widely used to analyze the determinants of bilateral trade flows. Chen and Novy (2012) and Arvis et al. (2013) employ a gravity specification to analyze the determinants of bilateral trade costs in a cross-sectional dataset. The determinants of trade costs, as defined above, are estimated in a panel specification with time fixed effects, in line with the established literature (Moïsé, Orliac, and Minor 2011). The regression equation takes the following form:

$$TC_{ijt} = \beta_1\, RTA_{ijt} + \beta_2\, tariff_{ijt} + \beta_3\, LSCI_{ijt} + \beta_4\, LPI_{ijt} + \beta_5\, Trade\ Policy\ Uncertainty_{ijt} + \beta_6\, Gravity_{ij} + \eta_t + \varepsilon_{ijt}, \quad (1)$$

where, for any given country pair *ij*, bilateral trade costs *TC* observed at time *t* are regressed on a wide range of candidate drivers. These include membership in a regional trade agreement (RTA); sector-specific bilateral tariffs; shipping connectivity (UNCTAD's Liner Shipping Connectivity Index, or LSCI) and logistics (the World Bank's Logistics Performance Index, or LPI); a proxy for trade policy uncertainty; and standard gravity indicators (distance, a common language, and a common border). In line with Osnago, Piermartini, and Rocha (2018), trade policy uncertainty is defined as the gap between binding tariff commitments and applied tariffs. To ascertain the role of policies aimed at facilitating trade, indexes of logistic performance and maritime connectivity are included.

The model is estimated for the economy as a whole and for manufacturing separately. The regression uses bilateral trade data for 2007-18 for up to 23 advanced economies and 72 EMDEs for which data on trade costs and its determinants are available (table 1). The choice of variables in the panel is informed by Arvis et al. (2013), but also by findings from the discussion of the drivers of trade costs presented in the previous sections. Full details on data and sources are presented in annex A (table 2).

In the estimation results, all coefficients have signs and magnitudes consistent with expectations from the literature (annex A, table 3). Geographic distance and bilateral tariff rates are positively associated with trade costs, while proximity, common language, and membership in a common RTA tend to reduce trade costs. Specifically, membership in a common RTA lowers bilateral trade costs statistically significantly, by just under one-fifth.[6] Greater trade policy uncertainty is also associated with higher trade costs, including in the manufacturing sector.

The regression results help shed light on the sources of the higher trade costs in EMDEs than in advanced economies and of the decline in trade costs over time. In 2018, trade costs for the average EMDE in the regression sample were almost one-quarter higher

[6] This is somewhat smaller than the effect found by Bergstrand, Larch, and Yotov (2015), who estimate that an economic integration agreement lowered trade costs by 30 percent in a smaller and earlier sample (41 mostly advanced economies during 1996-2000). Qualitatively, the results are consistent with Brenton, Portugal-Perez, and Regolo (2014) who found that trade agreements helped to reduce the price differential between domestic and traded foods.

than for the average advanced economy in the sample. The panel estimation explains most of this gap and attributes about two-fifths of it to poorer logistics and shipping connectivity in EMDEs, a further two-fifths to trade policy (including trade policy uncertainty), and just under one-fifth to the greater remoteness (geographically and culturally) of EMDEs.

Between 2007 and 2018, trade costs fell by one-eighth, on average, in the countries in the sample, somewhat more than predicted by the regression. The regression attributes almost three-fourths of this decline to improved shipping connectivity and logistics and one-fourth to trade policy (tariff cuts, membership in RTAs, and uncertainty related to trade policy).[7]

VI. Policies to lower trade costs

A menu of policy options is available to reduce trade costs at the border (OECD and WTO 2015). Some of the policies to reduce trade costs are under the control of individual country authorities (such as improving border and customs regulations and processes, and facilitating shipping and logistics) while others require international agreements (such as RTAs). While some policies can be implemented quickly, others, such as those aimed at increasing competition, can take years to establish.

- Measures that lower trade costs *at the border* include trade facilitation (through reform of customs and border procedures), tariff reductions, and trade agreements.
- Measures that lower trade costs *between borders* include improvements in transport, communications, and energy infrastructure and services networks.
- Measures that reduce trade costs *behind the border* include reforms of trade-related regulations and institutions; improvements in logistics and broader market governance; improvements in domestic transport infrastructure and in the market structure of domestic trucking and port operations; and the lowering of other nontariff barriers (e.g., standards, accreditation procedures for standards, quotas).

Beyond policies to facilitate trade, a wider set of institutional policies might also be needed to ensure that the benefits are sustainable and widely shared.

VI.1 At-the-border measures

Possible sources of at-the-border trade costs include tariffs; an absence of or weak trade agreements; poor trade facilitation; and burdensome border processes. A package that

[7] Daudin, Héricourt, and Patureau (2022) decompose the decline in transport costs over 1974-2019 into "purw transport cost" and compositional effects (that is, changes in the composition of origin countries and goods baskets) and find that the decline in "pure transport cost" accounted for most of the decline in global transport costs.

reduces these at-the-border obstacles could significantly lower trade costs.

Reductions in tariffs, often embedded in broader trade agreements, have contributed to rapid trade growth in much of the period since World War II. However, tariffs have risen over the past five years as trade tensions have mounted, contributing to concerns about a protectionist turn among some major economies (World Bank 2021a). Reversing these increases and making further progress with tariff reduction would serve to lower trade costs. Reforms that lower import tariffs have generally been found to be associated faster economic growth, although effects have been heterogeneous (Irwin 2019). For example, the widespread removal of trade barriers and reduction of import tariffs in the mid-1980s to mid-1990s ushered in a period of rapid global trade integration (Irwin 2022). Removing uncertainty about trade policy by reducing the gap between actual applied tariffs and maximum (bound) tariffs, could further lower trade costs: the regression results suggest that a 10-percentage point reduction in this gap would be associated with about one-seventh lower trade costs .

The decline in trade costs over the past three decades has stemmed partly from new RTAs and RTA reforms. The number of RTAs more than quintupled between the early 1990s and the mid-2010s, and the focus of agreements has shifted from tariff cuts to lowering nontariff barriers (World Bank 2016). The largest RTA in terms of the number of member countries, the African Continental Free Trade Area (AfCTA), for example, have raised real incomes among its members mostly by lowering nontariff barriers and through the implementing of trade facilitation measures (World Bank 2020c). The members of the major RTAs in North America (the USMCA) and Europe (the EU) account for more than 40 percent of global GDP (figure 9). RTAs have fostered domestic reforms in EMDEs and generated momentum for greater liberalization and expansion of trade opportunities (Baccini and Urpelainen 2014a, 2014b; Baldwin and Jaimovich 2010).

A multitude of costs are imposed on trade by administrative border and customs procedures. Documentation and other customs compliance requirements, lengthy administrative procedures, and other delays have been estimated to increase transaction costs by 2-24 percent of the value of traded goods. In some countries, government revenue losses from inefficient border procedures may exceed 5 percent of GDP (Moïsé and Le Bris 2013).

The WTO Agreement on Trade Facilitation (WTO TFA), adopted in 2014 and ratified by more than 90 percent of WTO members, provides a framework to streamline inefficient control and clearance procedures of border authorities, reduce unnecessary border formalities, and cut opaque administrative costs. 72 percent of the commitments made under the agreement have been implemented to date, but progress has been uneven, with less than 40 percent of commitments implemented in low-income countries. In West Africa, an initiative is underway to cut trade costs by electronically sharing customs transit data (World Bank 2021d). Guatemala and Honduras have reduced the time taken by traders to cross the border from 10 hours to 7 minutes by integrating their trade procedures, replacing duplicative processes with a single online instrument (de Moran 2018).

VI.2 Between-borders measures

The bulk of trade costs arises from the shipping and logistics involved in moving goods between borders. These costs depend in part on the quality of transport infrastructure and the government institutions involved in transport logistics, and on market structure in the transport sector. Countries have several avenues for lowering such costs.

High-quality and well-maintained transport infrastructure—at ports, airports, and on land—and efficient shipping services are associated with lower transport and logistics costs. Thus, policy measures to improve maritime connectivity and logistics performance should help lower trade costs. The regression results suggest that if a country were to move up from the bottom quartile on these two indicators' scores to the highest quartile—equivalent to a shift from conditions in Sierra Leone to conditions in Poland—trade costs would be lowered by between one-tenth and one-third (annex A).

Bribes and transport monopolies tend to drive up trade costs. In a pilot study of four African countries, more than two-thirds of survey respondents reported that bribery to accelerate transport services was common (Christie, Smith, and Conroy 2013). Efforts to reduce and eliminate such corruption and to increase competition in the transport sector should help lower transport costs.

Policies that strengthen regional integration can also be beneficial, particularly for small countries and countries that are geographically isolated from trade hubs. Coupled with regional institutions that help to reduce impediments to cross-border trade, improved regional infrastructure can help countries exploit the benefits of regional and global trade networks (Deichmann and Gill 2008). Transport-related trade costs can also be lowered theough RTAs (Brenton, Portugal-Perez, and Regolo 2014).

Efforts to improve matching and liaison between trucking service providers and shippers can also cut trade costs by reducing wait times and empty backhauls. High transport costs may, in part, reflect unbalanced trade flows, since shipping at full capacity in both directions of a route is least costly (Ishikawa and Tarui 2018). At any one time, two-fifths of ships have been estimated to carry no cargo (Brancaccio, Kalouptsidi, and Papageorgiou 2020). Such asymmetries in demand for shipping services have been a major cause of shipping and supply bottlenecks in the wake of the COVID-19 pandemic. While shipping costs from China to the United States and Europe have risen to historically high levels, costs of shipping on ocean routes to China have remained low. Efforts to reduce wait times and empty backhauls may involve information and communications infrastructure and services to facilitate the timely provision of information about shipping capacity and schedules in order to allow exporters and shippers with available capacity to be matched more efficiently. Over the longer term, and in a favorable business environment more broadly, increased global value-chain participation can expand the volume of bi-directional trade and thus help lower shipping costs.

VI.3 Behind-the-border measures

Although not included in the empirical exercise described above because of lack of data, behind-the-border policies such as regulations, standards, inspection requirements, and labelling requirements, can impose considerable costs (Moïsé and Le Bris 2013). In Central America, sanitary and phytosanitary requirements, such as inspection requirements or labeling standards for meats and grains, have been estimated to raise import prices by about 30 percent on average (OECD and WTO 2015). Harmonization of standards can significantly reduce or eliminate such costs and increase trade, but smaller gains can also be achieved by mutual recognition of standards or conformity assessments (Chen and Mattoo 2008; World Bank 2016).

A shift from trade-based taxation to income-based or consumption-based taxation can further lower barriers to trade. In middle- and high-income EMDEs, such shifts have not been associated with lasting revenue losses, but revenue losses have occurred in low-income countries (Baunsgaard and Keen 2010).

VI.4 Comprehensive reform packages

Some of the most successful trade reform programs have covered a wide range of policies. In Cambodia, a combination of customs and border improvements, regulatory reform, and streamlined import and export procedures helped the country leap 46 rankings in the Logistics Performance Index (LPI) between 2010 and 2014 (World Bank 2018). In Africa's Great Lakes region, improved trade and commercial infrastructure in the border areas and simplified border crossing procedures have been credited with improving accountability of officials, reducing rates of harassment at key borders (from 78 percent to 45 percent of survey respondents in south Lake Kivu), extending border opening hours, increasing trade flows, and doubling border crossings (World Bank 2021d).

The regression results reported above can be applied to a hypothetical comprehensive reform scenario, focusing on pairs of countries that are in the bottom quartiles of the LPI and the Liner Shipping Connectivity Index (LSCI); three-quarters of these countries are in SSA. The coefficients estimated from the panel regression suggest that improvements in average logistics performance and shipping connectivity among these country pairs to the top quartile of the distribution of country pairs would halve their trade costs (figure 10).

Since manufacturers use services to produce and export goods, policies aimed at lowering trade costs in the services sector can help lower the costs of trading goods. Opening services markets to more competition, including in road and rail transport services and shipping, may be an effective way to reduce trade costs. Liberal bilateral air services agreements can also help lower trade costs for many goods that form part of global value chains or for high value-added agricultural products.

Given the perishable nature of agricultural products, measures that accelerate their movement across borders are particularly important (USAID 2019). The WTO TFA contains several provisions aimed at making agricultural trade faster and more predictable. This includes simplified and more efficient requirements for risk-based document verifications, physical inspections, and laboratory testing. A centralized "Single Window" authority for document processing and coordinating across all relevant agencies can reduce paperwork, too (UNESCAP 2011). Improved storage facilities can reduce spoilage and losses of perishable agricultural goods (UNESCAP 2017; Webber and Labaste 2010). Tracking and monitoring technologies can help accelerate paperwork and improve the monitoring of environmental conditions (Beghin and Schweizer 2020). Such measures to lower agricultural trade costs can also help prevent or reduce food insecurity.

A comprehensive package could also address the potential distributional consequences of trade. The failure of some firms participating in global value chains to pass cost reductions on to consumers and the declining share of labor income in countries integrated into global value chains have contributed to the perception of unequally shared gains from trade (World Bank 2020a). Conversely, growing services trade, global supply chains, and digitalization have offered new economic opportunities to women (World Bank and WTO 2020). Labor market policies that could promote a more equitable sharing of gains from global value chain participation include policies to facilitate labor mobility, active labor market programs, and wage insurance schemes (World Bank 2020b).

Trade can play a critical role in the climate transition. Trade has the potential to shift resources to cleaner production techniques and to promote the production of goods and services necessary for transitioning to low-carbon economies. In addition, trade delivers goods and services that are key to help countries recover from extreme weather events. However, evidence indicates that in some countries, entry into global value chains in manufacturing has been accompanied by greater carbon dioxide emissions, and that global value chains have contributed to greater waste and increased shipping (World Bank 2020a). Shipping accounts for 7 percent of global carbon dioxide emissions and 15 percent of global emissions of sulfur dioxide and nitrogen oxides (World Bank 2020a). Being heavily concentrated in the electronics sector, global value chains have also contributed to e-waste (discarded electronic devices), which accounts for more than 70 percent of toxic waste in U.S. landfills (World Bank 2020a).

A number of policies can be implemented to reduce trade costs in a climate-friendly way, including policies that remove the current bias in many countries' tariff schedules favoring carbon-intensive goods, and that eliminate restrictions on access to environmentally friendly goods and services (Brenton and Chemutai 2021; World Bank 2020a). In addition, multilateral negotiations can focus not only on tariffs on environmental goods but also on nontariff measures and regulations affecting services—access to which is often vital for implementing the new technologies embodied in environmentally friendly goods.

Digital technologies may eventually lower trade costs behind the border, at the border, and between borders, including by improving transparency and price discovery as well as information flows between exporters, shippers, and country authorities.[8] This may particularly support global supply chains. Robotics can help accelerate port procedures. Artificial intelligence can help lower logistics costs by optimizing route planning, storage, and inventory, as well as by improving tracking and monitoring; 3D printing can help shorten and localize supply chains, thus reducing the environmental footprint of trade; blockchain technology can help reduce time spent in customs, especially for time-sensitive goods, facilitate cross-border payments by increasing transparency and credibility, and enhance information sharing within supply chains (Fan, Weitz, and Lam 2019; WTO 2018). Such technologies may disproportionately benefit small and medium-sized enterprises that currently face higher trade costs than large enterprises (WTO 2019b). Shipping supply chains, in particular, could benefit from digitization to improve efficiency (Song 2021).

VII. Conclusions

Despite a decline over the past three decades, international trade costs are high. In EMDEs, they amount to the equivalent of a tariff of more than 100 percent: thus they roughly double the price of an internationally traded good relative to a similar domestically traded good. Trade costs are on average about four-fifths higher for agricultural products than for manufactured goods and more than one-half higher for EMDEs than for advanced economies.

Trade costs have a number of components. Tariffs amount to only about one-twentieth of trade costs. The remainder are mostly costs of transport, logistics, and adherence to regulations, and, thus, reflect market conditions in the transport sector, administrative practices, and non-tariff policy barriers. About two-fifths of the difference in trade costs between EMDEs and advanced economies is accounted for by differences in the costs of logistics and shipping, and another two-fifths by differences in trade policies, including trade policy uncertainty (figure 11) .

Comprehensive packages of reforms have often been successful in reducing trade costs. Such packages can include trade facilitation measures; bilateral and multilateral agreements aimed at deeper trade integration; coordinated efforts to streamline trade procedures and processes at and behind the border; improved domestic infrastructure; increased competition in shipping and logistics; reduced corruption; simplified trade-related procedures and regulations; and the harmonization or mutual recognition of standards. Many of these reforms, especially those relating to the business climate and governance, would stimulate private, trade-intensive investment and output growth more broadly (Stamm and Vorisek 2023).

Further research and analysis on trade costs is warranted, particularly regarding

[8] Digitization can make the enforcement of value added tax payments of ever smaller payment

patterns and correlates of services trade costs. Measures of services trade costs remain scant, which makes it difficult to assess and quantify their determinants. In addition, since trade costs in services are largely associated with regulatory barriers, further analysis of the role of regulatory heterogeneity across sectors and regions seems warranted. Trade costs accumulate with multiple border crossings through the global value chain. Investigating what policy measures can be most effective in reducing trade costs when countries are involved in complex value chains is also key. Finally, further research could aim to better understand the distributional and climate-related effects of reducing trade costs.

transactions profitable (World Bank 2021c).

Annex A Methodological annex

Measures of trade costs

Conceptually, trade costs may be defined as the excess cost of an internationally traded good compared with a similar good traded domestically. By construction, trade costs can therefore move without any change in external costs of trading, simply as a result of changes in domestic trading costs. To measure trade costs, two main approaches have been developed in the literature: direct and indirect approaches (Chen and Novy 2012).

Direct approaches rely on observable data that serve as a proxy for individual components. For instance, measures of costs faced at the border are often based on counting the average number of days that is needed for a good to cross the border, while transport costs are often inferred from the cost of ocean and air shipping (Hummels et al. 2007). Policy barriers such as tariffs and nontariff measures are directly available from a range of statistical sources. Direct approaches suffer from a series of limitations, including the fact the underlying variables are only partially observable and may not be easily converted to plausible ad-valorem tariff equivalents, which makes it difficult to compare them but also to aggregate them into a summary measure of trade costs (Anderson and van Wincoop 2004). Therefore, trade cost estimates taken from such measures tend to be only partial.

Indirect approaches aim to circumvent these difficulties. These infer trade impediments top-down, from measures of trade flows and aggregate value added. Under this approach, trade costs correspond to the difference between the trade flows that would be expected in a hypothetical "frictionless" world and what is observed in the data and are computed relative to domestic trade costs. Measures built through the indirect approach can be tracked over time and include all observed and unobserved factors that explain why trading with another country is more costly than trading domestically. Novy (2013) developed a micro-founded measure of aggregate bilateral trade costs using a theoretical gravity equation for the trade cost parameters that capture the barriers to international trade. The resulting solution expresses the trade cost parameters as a function of observable trade data, providing a micro-founded measure of bilateral trade costs. The measure is easy to implement empirically for a number of countries with readily available data. One drawback is that the contribution of the individual cost factors cannot be easily disentangled by simple inspection of the measure. A way proposed in the literature to overcome this is to combine indirect and direct measurements into a single regression (Arvis et al. 2013).

Determinants of trade costs

To estimate the contribution of different determinants of trade costs, a gravity model is estimated for a panel of up to 23 advanced economies and 72 EMDEs with annual data for both trade costs and all determinants of trade costs over 2007-18. The sample includes 25 industrial commodity (energy and metals) exporters, all of which are

EMDEs.

Data

The estimation relies on bilateral trade costs from the UNESCAP-World Bank Trade Costs Database. Following Novy (2013) and Arvis et al. (2013), bilateral trade costs are obtained as geometric averages of flows between countries *i* and *j*. They are computed according to the formula below:

$(X_{ii}\, X_{jj})/(X_{ij}\, X_{ji})^{1/2\,(\sigma-1)}$,

where X_{ij} represents trade flows between countries *i* and *j* (goods produced in *i* and sold in *j*) and σ refers to the elasticity of substitution. This measure captures international trade costs relative to domestic trade costs. Intuitively, trade costs are higher when countries trade more domestically than they trade with each other, i.e., as the ratio $(X_{ii}\, X_{jj})/(X_{ij}\, X_{ji})$ increases. Intra-national (that is, domestic) trade is proxied by the difference of gross output and total exports.

Trade costs thus computed implicitly account for a wide range of frictions associated with international trade, including transport costs, tariffs, and nontariff measures, and costs associated with differences in languages, currencies and import or export procedures. Trade costs are expressed as ad valorem (tariff) equivalents of the value of traded goods and can be computed as an aggregate referring to all sectors of the economy, but also specifically for the manufacturing and agriculture sectors.

Estimation

Gravity equations are widely used as a workhorse to analyze the determinants of bilateral trade flows. Chen and Novy (2012) and Arvis et al. (2013) also employ a gravity specification to analyze the determinants of bilateral trade costs in a cross-sectional dataset. In line also with Moïsé, Orliac, and Minor (2011), this study estimates determinants of trade costs in a panel specification.

The regression equation takes the following form:

$$TC_{ijt} = \beta_1\, RTA_{ijt} + \beta_2\, tariff_{ijt} + \beta_3\, LSCI_{ijt} + \beta_4\, LPI_{ijt} \\ + \beta_5\, Trade\ Policy\ Uncertainty_{ijt} + \beta_6\, Gravity_{ij} + \eta_t + \varepsilon_{ijt} \qquad (1)$$

where for any given country pair *ij*, bilateral trade costs *TC* observed at time *t* are regressed on a wide range of candidate drivers. These include membership in a regional trade agreement (RTA); sector-specific bilateral tariffs; shipping connectivity (UNCTAD's Liner Shipping Connectivity Index, or LSCI) and logistics (the World Bank's Logistics Performance Index, or LPI); a proxy for trade policy uncertainty; and standard gravity indicators (distance, a common language, and a common border). In line with Osnago, Piermartini, and Rocha (2018), trade policy uncertainty is defined as the gap between binding tariff commitments and applied tariffs. To ascertain the role of policies aimed at facilitating trade, indexes of logistic performance and maritime connectivity are included.

Specifically, the World Bank's Logistics Performance Index (LPI) is based on surveys of global freight operators and express carriers on customs, logistics and transport infrastructure, international shipments, logistics competence, tracking and tracing, and delays. UNCTAD's Liner Shipping Connectivity Index (LSCI) is derived from the number of ships, their container-carrying capacity, maximum vessel size, number of services, and number of companies that deploy container ships in a country's ports. The choice of variables in the panel is informed by Arvis et al. (2013), but also by findings from the stylized facts presented in the main text. Full details of data and sources are presented in table 2.[9]

Since trade costs data are obtained as bilateral geometric averages, trade facilitation indicators available at individual country level are transformed into bilateral measures by taking the geometric average of each country pair direction. Therefore, the unit of analysis is each individual country pair. Time fixed effects η_t are included in the estimation to control for global trends. As the measures of trade costs already net out multilateral resistance components, in line with Novy (2013), the estimation does not include additional fixed effects.[10] Instead, to control for possible correlation of error terms, clustered standard errors by country pairs are used.

Two models are estimated: a general model for the determinants of trade costs in all sectors of the economy, and a sectoral model for the determinants of trade costs in the manufacturing sector. The two models follow the specification presented in equation 1, but trade costs and tariff rates are sector specific. Table 3 shows results from the estimations.

Results

All estimated coefficients have signs and magnitudes in line with prior expectations based on the literature. Geographical distance and high bilateral tariff rates are positively associated with trade costs. In contrast, adjacency, common language, and membership in a common regional trade agreement tend to reduce trade costs. Policies aimed at facilitating trade, including maritime connectivity and stronger logistics performance, are also associated with lower bilateral trade costs, both overall and in the manufacturing sector. Trade uncertainty is also positively associated with trade costs, including in the manufacturing sector. With an R-squared above 50 percent, the regression explains most of the variation in trade costs in the sample.

[9] Nontariff barriers or exchange rate volatility would ideally have been included in the regression estimation. However, these are difficult to measure and the available cross-country, over-time panel measures were too crude to yield statistically significant results. Ideally, the regression would also be applied to services; however, the database does not include trade costs for services.

[10] Multilateral resistance captures global trends. Specifically, outward multilateral resistance measures the degree to which trade flows between i and j depend on trade costs across all potential markets for i's exports, while inward multilateral resistance measures the degree to which bilateral trade depends on trade costs across all potential import markets. Therefore, the two indexes summarize third-country effects that might affect bilateral trade flows between i and j. Novy (2013) shows that simple algebra makes it possible to eliminate the multilateral resistance terms from the gravity equations, and in so doing he derives an expression for trade costs.

The panel estimation also explains most of the difference in trade costs between the average EMDE and the average advanced economy, and attributes about two-fifths of this gap to higher shipping and logistics costs in EMDEs and a further two-fifths to trade policy (including trade policy uncertainty). The regression also explains most of the decline in average trade costs between 2008 and 2018 and attributes three-fourth of it to falling shipping and logistics costs and another
one -fourth to trade policy.

There are significant differences in the drivers of trade costs between advanced economies (which are mostly industrial commodity importers) and EMDEs, and between industrial commodity exporters and importers. The regression is re-estimated for a sample of bilateral trade costs among EMDEs only, a sample of bilateral trade costs among advanced economies only, and a sample of bilateral trade costs between EMDEs and advanced economies. It is also re-estimated for a sample of bilateral trade costs between industrial commodity importers or commodity exporters only as well as a sample of bilateral trade costs between industrial commodity exporters and importers. Tables 4A and 4B show the results.

For trade between advanced economies only, logistics performance and distance are critical sources of trade costs, whereas the roles of tariffs and regional trade agreement membership are negligible. By comparison, better logistics performance reduces trade costs between an advanced economy-EMDE country pair or between a pair of EMDEs by only one-fifth as much between a pair of advanced economies. Instead, membership in regional trade agreements significantly reduces trade costs between pairs of EMDEs (but not between pairs of advanced economies or in advanced economy-EMDE country pairs).

Logistics performance and distance are also more important sources of trade costs among commodity importers than between commodity importers and exporters. For tariffs, the reverse is true. For example, an improvement in logistics performance lowers trade costs between commodity importers by almost twice as much as between commodity importers and exporters. Conversely, a cut in tariffs lower trade costs between commodity exporters and importers by twice as much as between commodity importers only. These patterns are evident both for trade costs in all sectors and in manufacturing alone.

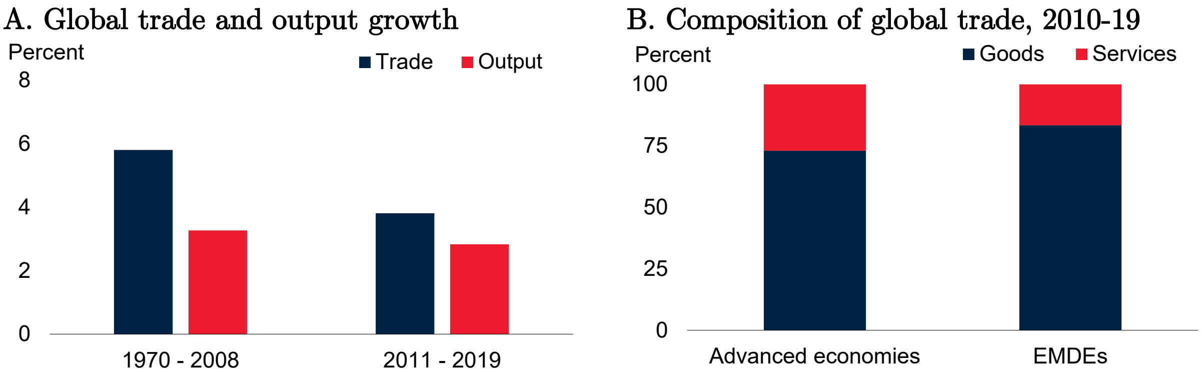
Robustness

The estimations are robust to different specifications, lag structures, and estimators. An alternative estimation performed with the Poisson Maximum Likelihood estimator, which is often employed in the literature on gravity models (Santos Silva and Tenreyro 2006) to control for heteroskedasticity produces similar results to those presented in table 3.

Adding further variables, including bilateral real exchange rates, GDP per capita, institutional variables, and a dummy characterizing landlocked country pairs, does not alter the regression results, and the variables turn out to be statistically insignificant. Likewise, adding country fixed effects does not alter the stability of the model, with both the gravity and trade policy variables retaining the expected sign and statistically significant effects. While there are concerns about multicollinearity (including regarding the 0.5 correlations between the LPI with the LSCI), a variable inflation factor test (a standard diagnostic test) does not detect the presence of significant multicollinearity among regressors.

A few caveats apply to the analysis. The effect of policies on trade costs can be difficult to disentangle. Changes in trade costs between two countries can be due to actions taken by one government or the other, or both together. The fact that the variables featuring in the regression (including the measure of trade costs) are computed as country-pair geometric averages does not allow a disentangling of the source of policy actions. In addition, due to the lack of sufficiently long time series data, the approach taken here does not take into account the possibility that the regression coefficients have changed over time, as has been found in other studies for the effect of distance (Yotov 2012) or trade agreements (de Sousa 2012).

Figure 1. Global trade



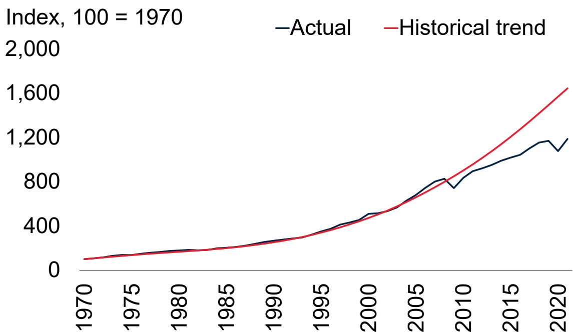
Source: World Bank.

Note: EMDEs = emerging market and developing economies.

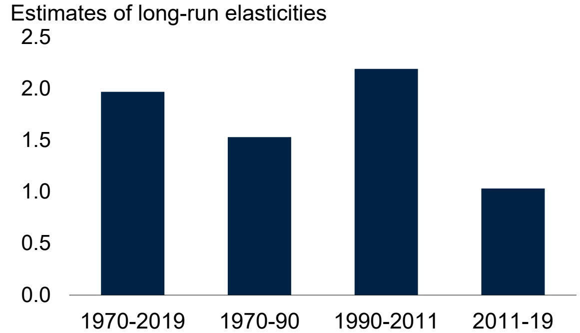
A. Bars indicate annual average growth. World output growth is real GDP growth computed as a weighted average (at 2010-19 average prices and exchange rates) as reported in the January 2023 *Global Economic Prospects* report. Trade growth refers to the average growth of import and export volumes.

Figure 2. Factors lowering the elasticity of global trade with respect to global output

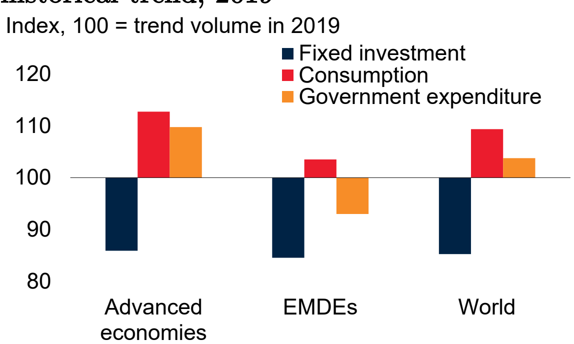
A. World trade, actual and trend



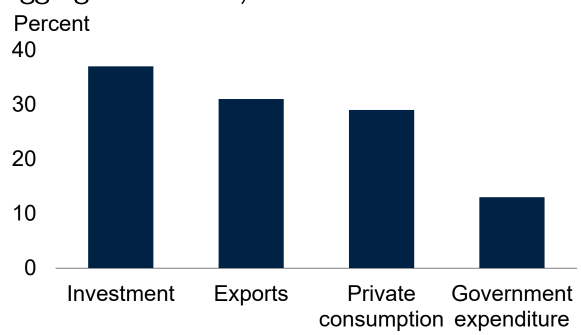
B. Elasticity of global trade with respect to global output



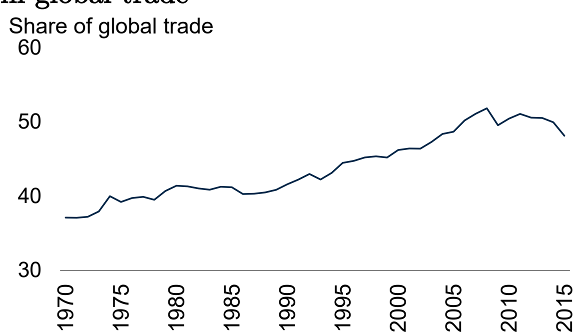
C. Aggregate demand components relative to historical trend, 2019



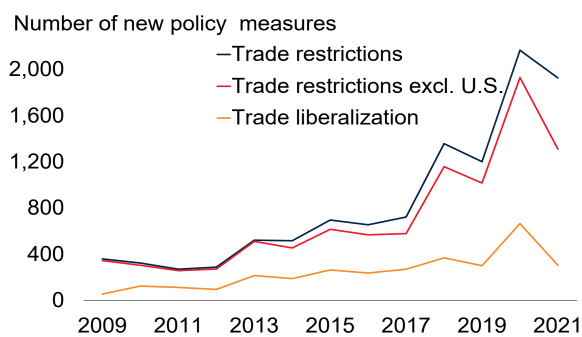
D. Import content of components of aggregate demand, 2014



E. Share of global value chain-related trade in global trade



F. New trade measures



Sources: Auboin and Borino (2018); Constantinescu, Mattoo, and Ruta (2020); CPB Netherlands Bureau for Economic Policy Analysis; Global Trade Alert Database; World Bank.

Note: EMDEs = emerging market and developing economies; GVC = global value chain.

A. World trade refers to average of imports and exports, indexed to 1970 = 100. The historical trend is computed over 1970-2008, smoothed using a Hodrick-Prescott filter.

B. Estimates from an error correction model estimated over the period 1970-2019. The model allows both the long-run elasticity of trade with respect to income (which captures trend, or structural, factors) and the short-run elasticity (which is relevant to short run or cyclical developments). For further details on the model specification, see Constantinescu, Mattoo, and Ruta (2020).

C. Trend levels in 2019 are obtained on the basis of the historical average trend growth computed over the period 1995-2008 and rebased to 100. Bars below 100 show deviations of actual 2019 levels from trends. Investment is aggregate investment.

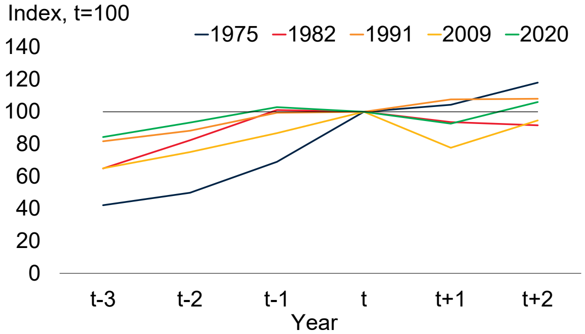
D. Data for 2014 as estimated in Auboin and Borino (2018).

E. Share of global value chain-related trade in global trade as defined in *World Development Report* 2020. Data available through 2015.

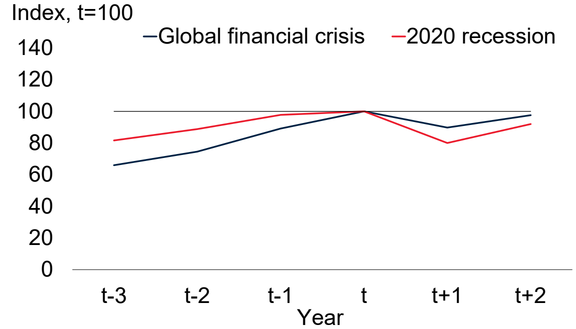
F. Data exclude late reports for the respective reporting years (the cut-off date is 31 December of each year).

Figure 3. Trade during global recessions

A. Global goods trade



B. Global services trade

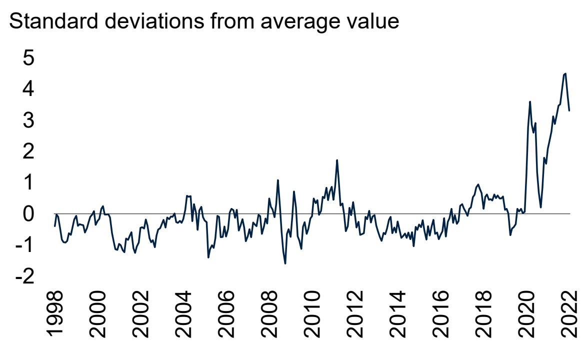


Source: World Bank.

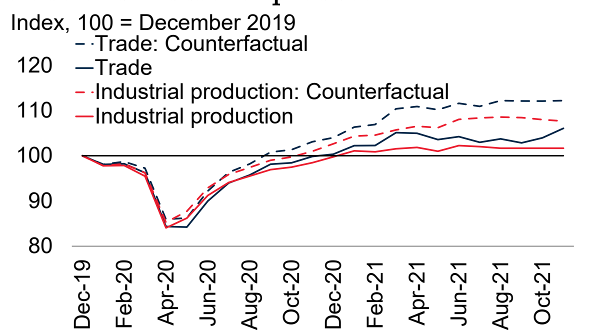
A B. Figures show annual levels of goods and services trade in the run-up to and aftermath of past recessions and in 2020. t refers to the year before the recession.

Figure 4. Supply chain bottlenecks and trade integration

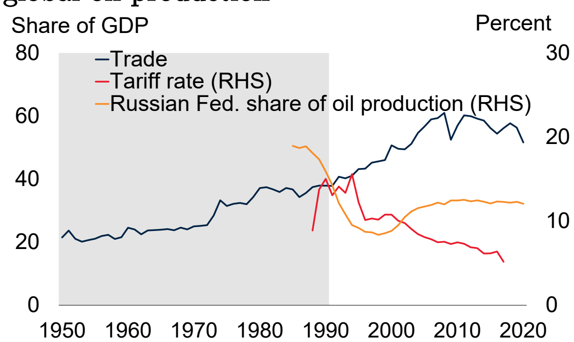
A. Supply chain pressures



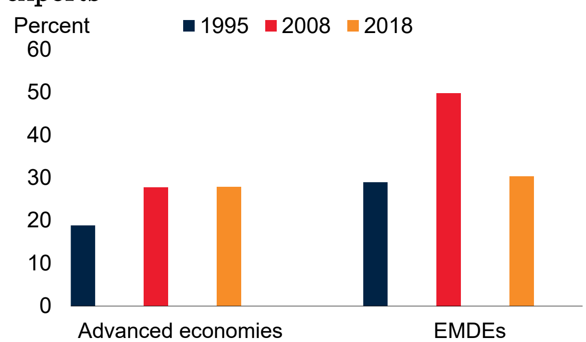
B. Impact of supply bottlenecks on goods trade and industrial production



C. Global trade, tariffs, and Russia's share in global oil production



D. Foreign value added content of gross exports



Sources: Benigno et al. (2022); BP Statistical Review; Organisation for Economic Co-operation and Development; Federal Reserve Bank of New York; Penn World Tables; World Bank.

Note: EMDEs = emerging market and developing economies.

A. Chart shows the New York Federal Reserve's Global Supply Chain Pressure Index on a monthly basis since 1998. The index is normalized such that a zero indicates that the index is at its average value, with positive/negative values representing how many standard deviations the index is above/below average.

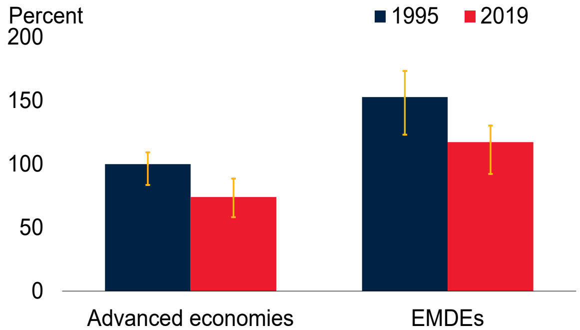
B. The effect of supply bottlenecks is derived from an ordinary least squares regression of global trade on the manufacturing PMI for new export orders, the manufacturing PMI for supplier delivery times, and two lags. Dotted lines show counterfactual scenarios derived by assuming that the PMI for supply delivery times (a proxy for supply bottlenecks) in January 2020-November 2021 had remained at its average 2019 level. Estimations are performed over the period from 2000-19.

C. Blue line shows global trade in percent of global GDP. Red line shows unweighted average tariffs for all products. Orange line shows oil production in the Russian Federation in percent of global oil production. Shaded area indicates cold war period of 1950-1990.

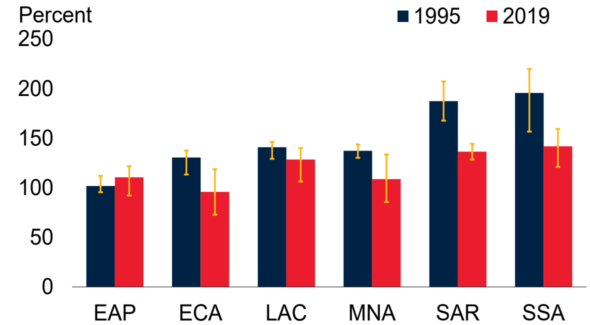
D. Chart shows the share of foreign value added content of gross exports in advanced economies and EMDEs, as defined in the OECD's TiVA database.

Figure 5. International trade costs relative to domestic trade costs

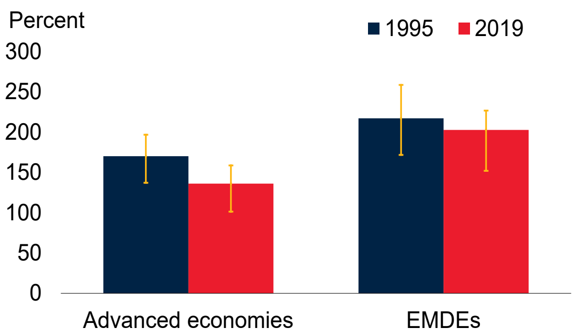
A. Average trade costs in 1995 and 2019



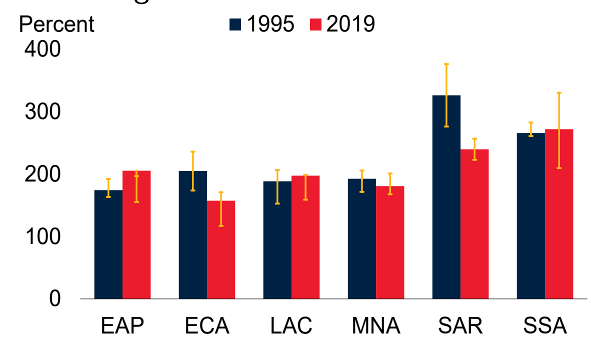
B. Average trade costs in EMDE regions



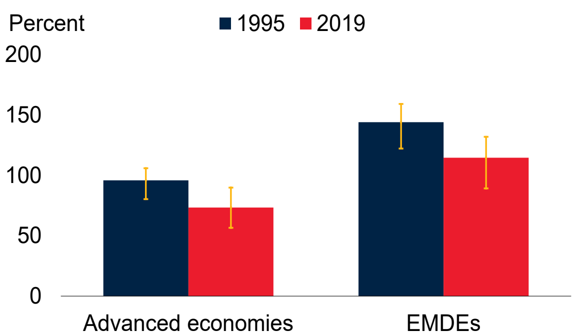
C. Average trade costs for agriculture in 1995 and 2019



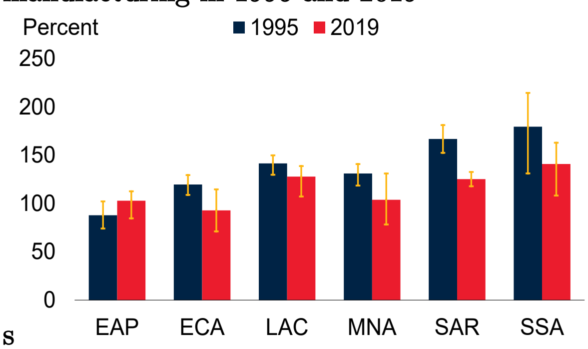
D. Average trade costs for agriculture for EMDE regions in 1995 and 2019



E. Average trade costs for manufacturing in 1995 and 2019



F. Average trade costs for EMDE regions for manufacturing in 1995 and 2019

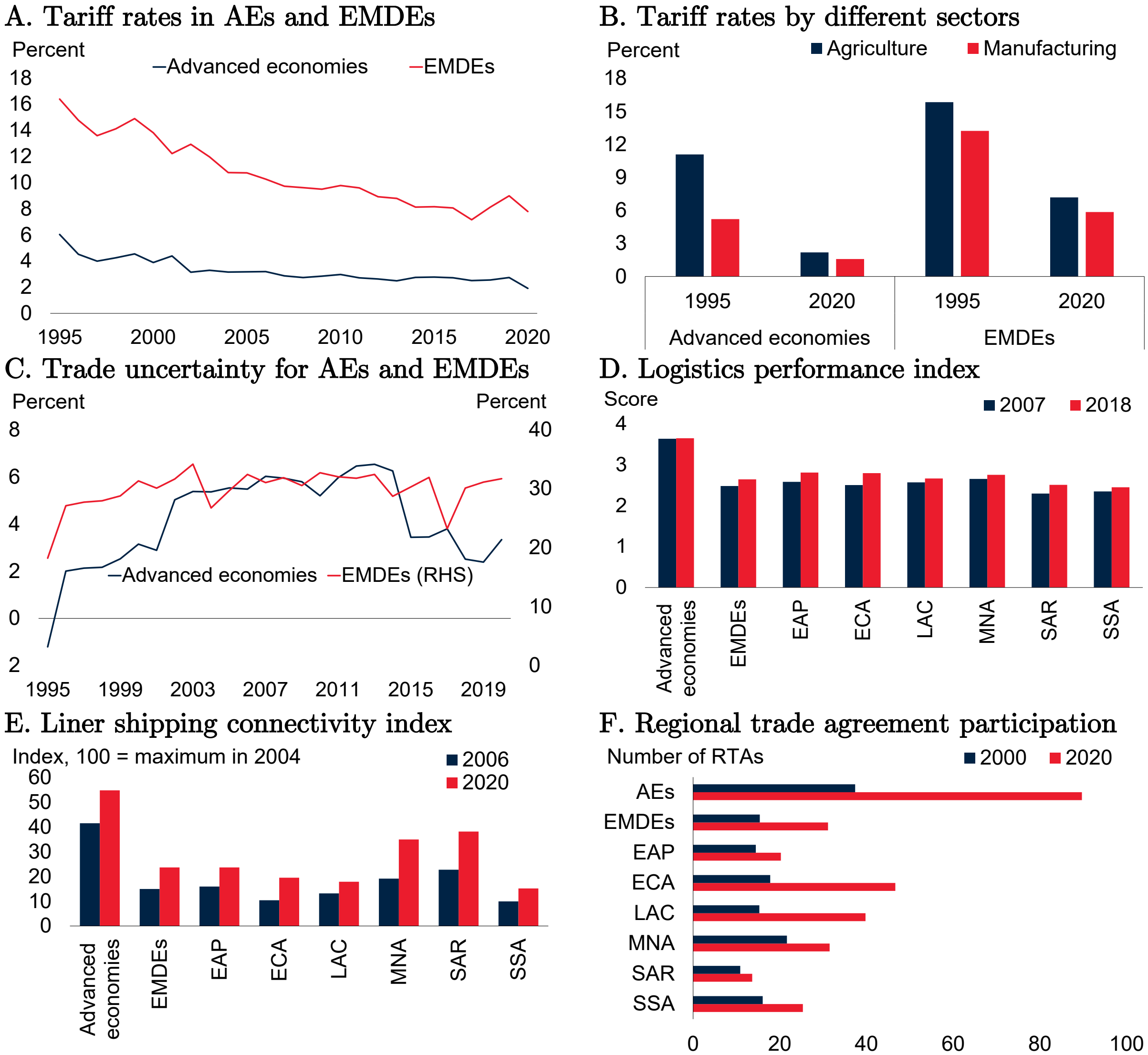


s

Sources: Comtrade (database); ESCAP-World Bank Trade Costs Database; World Bank; World Trade Organization.

Note: EMDEs = emerging market and developing economies, EAP = East Asia and Pacific, ECA = Europe and Central Asia, LAC = Latin America and the Caribbean, MNA = Middle East and North Africa, SAR = South Asia, SSA = Sub-Saharan Africa. Bilateral trade costs (as defined in the UNESCAP/World Bank database) measure the costs of a good traded internationally in excess of the same good traded domestically and are expressed as ad valorem tariff equivalent. Bilateral trade costs are aggregated into individual country measures using 2018 bilateral country exports shares from the Comtrade database. Regional and sectoral aggregates are averages of individual country measures. Bars show unweighted averages, whiskers show interquartile ranges. Sample in 1995 includes 33 advanced economies and 46 EMDEs (4 in EAP, 8 in ECA, 15 in LAC, 4 in MNA, 2 in SAR, and 13 in SSA). Sample in 2019 includes 23 advanced economies and 53 EMDEs (9 in EAP, 12 in ECA, 16 in LAC, 4 in MNA, 2 in SAR, and 10 in SSA).

Figure 6. International trade policy, border processes, and logistics



Sources: CEPII (Gravity database); Gurevich and Herman (2018); World Bank; World Trade Organization: UNCTAD.

Note: AEs = advanced economies; EMDEs = emerging market and developing economies. EAP = East Asia and Pacific, ECA = Europe and Central Asia, LAC = Latin America and the Caribbean, MNA = Middle East and North Africa, SAR = South Asia, SSA = Sub-Saharan Africa. RTA = regional trade agreement.

A. B. Average tariff rates are computed as unweighted cross-country averages of applied weighted tariff rates. Sample includes up to 35 advanced economies and 123 EMDEs. Primary tariffs are used as a proxy for agriculture tariffs.

C. Proxy for trade uncertainty is the difference between the bound and applied tariff rates, as defined by the WTO. Data through 2020. Sample includes up to 27 advanced economies and 97 EMDEs.

D. World Bank's logistics performance index is a summary indicator of logistics sector performance, combining data on six core performance components into a single aggregate measure. The indicator is available for a sample of 160 countries. Sample includes 36 advanced economies and 123 EMDEs.

E. UNCTAD's liner shipping connectivity index is an average of five components and captures how well countries are connected to global shipping networks. The index value 100 refers to the country with the highest average index in 2004. Sample includes up to 30 advanced economies and 118 EMDEs.

F. Regional trade agreements are reciprocal agreements between two or more partners and include both free trade agreements and custom unions. The EU Treaty, United States-Mexico-Canada Agreement, and Pacific Agreement on Closer Economic Relations Plus are included. Regional aggregates are computed as averages of individual country participation in RTAs.

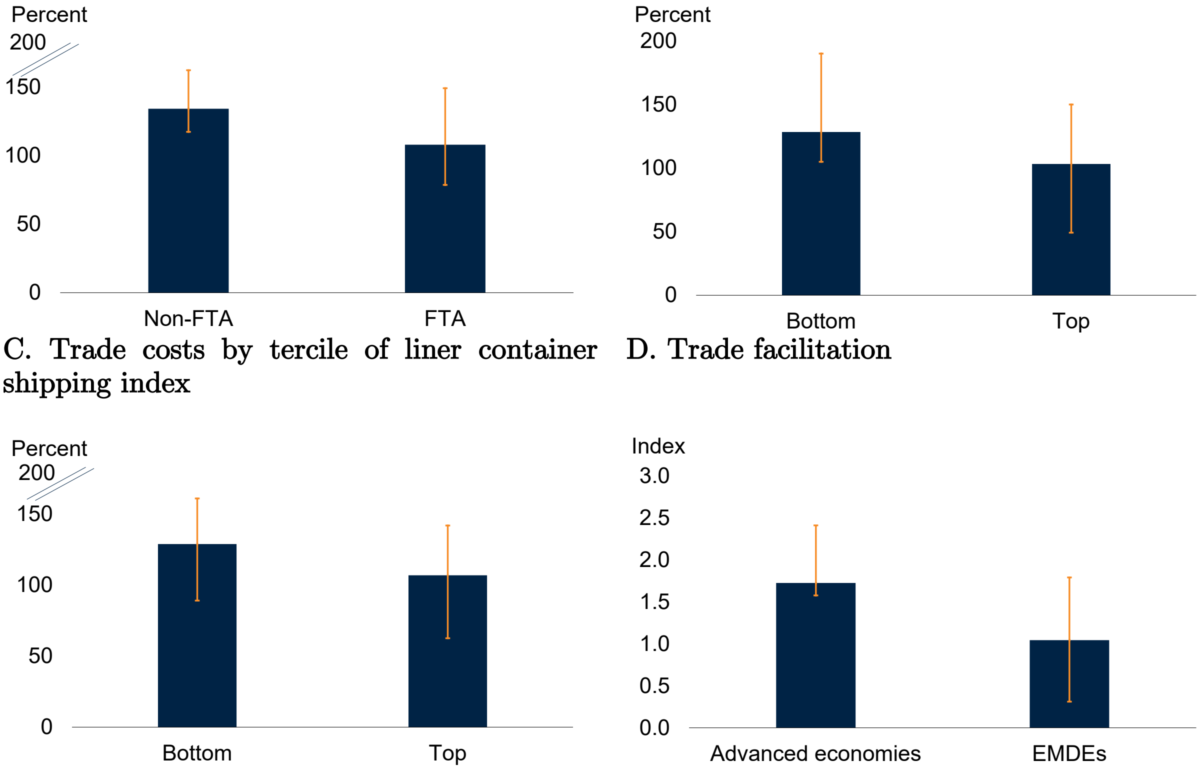
Figure 7. International trade costs in EMDEs, by country characteristics

A. Trade costs by free trade agreements

B. Trade costs by tercile of logistics performance index

C. Trade costs by tercile of liner container shipping index

D. Trade facilitation



Sources: Comtrade (database); Gurevich and Herman (2018); OECD; UNESCAP-World Bank Trade Costs Database; World Bank; World Trade Organization.

Note: EMDEs = emerging market and developing economies; FTA = free trade agreements; LSCI = Liner Shipping Connectivity Index; LPI = Logistics Performance Index. Orange whiskers indicate minimum and maximum range. Sample includes 52 EMDEs.

A. Average trade costs (unweighted) of countries based on their membership in free trade agreements as defined in Gurevich and Herman (2018).

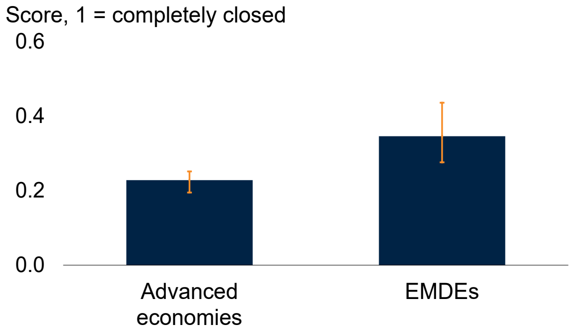
B. Average trade costs (unweighted) for countries ranked in the bottom and top quartiles of the Logistics Performance Index.

C. Bars show average trade costs (unweighted) for countries in the bottom and top quartiles of the liner shipping index.

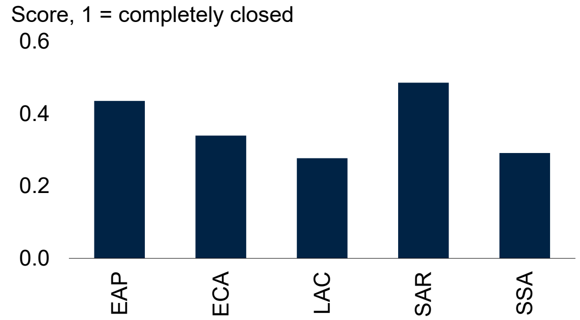
D. Unweighted average for 36 advanced economies and 122 EMDEs. Trade facilitation index is an unweighted average of 11 subindexes, all scored on a scale of 0-2. A higher index indicates greater trade facilitation. The indexes score countries on information availability, trade consultations, advance rulings, appeals procedures for administrative decisions by border agencies, fees and charges on imports and exports, simplicity of trade document requirements, automation of border procedures and documentation, simplicity of border procedures, cooperation between domestic agencies, cooperation with neighboring agencies, and governance and impartiality. The data is collected from publicly available sources, country submissions, and private sector feedback. Orange whiskers indicate minimum and maximum range

Figure 8. Services trade restriction policies

A. Services trade restrictions



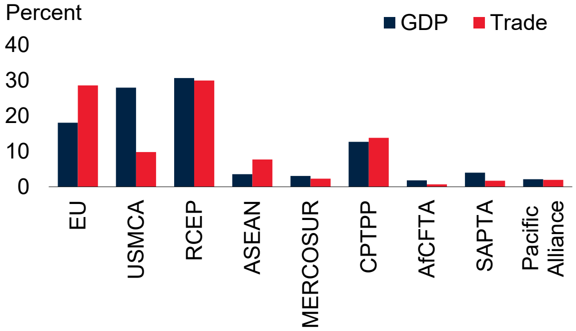
B. Services trade restrictions in EMDE regions



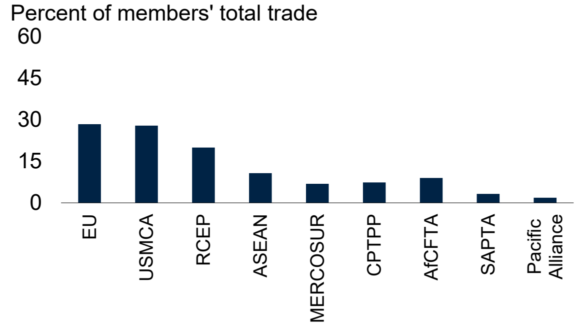
Sources: Organisation for Economic Co-operation and Development; World Bank.
Note: EMDEs = emerging market and developing economies; EAP = East Asia and Pacific, ECA = Europe and Central Asia, LAC = Latin America and the Caribbean, SAR = South Asia, SSA = Sub-Saharan Africa.
A. B. Services trade restrictions index (STRI) helps identify which policy measures restrict trade. The STRI takes values from 0 to 1, where 0 is completely open and 1 is completely closed. They are calculated on the basis of information in the STRI database which reports regulation currently in force. Bars show the unweighted average and orange whiskers indicate the minimum and maximum range. Sample includes 31 advanced economies and 17 EMDEs in 2020.

Figure 9. Regional trade agreements

A. Share of members of major RTAs in global GDP and trade



B. Share of intra-RTA trade in members' total trade



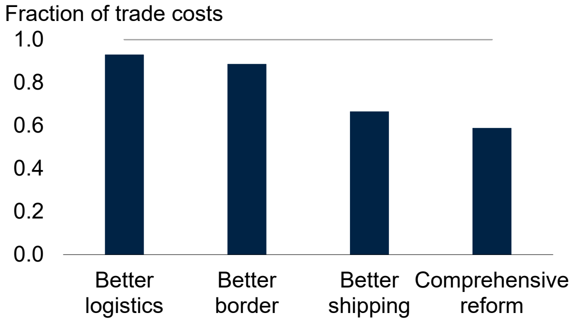
Sources: Comtrade (database); World Bank; World Trade Organization.

Note: RTAs are reciprocal trade agreements between two or more partners and include both free trade agreements and customs unions. Data for 2019.

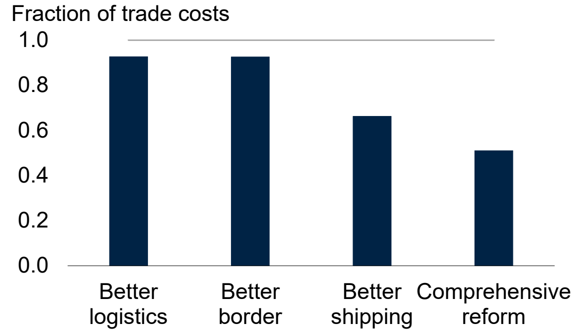
A.B. AfCFTA = African Continental Free Trade Area; ASEAN = Association of South East Nations; CPTPP = Comprehensive and Progressive Agreement for Trans-Pacific Partnership; EU = European Union; MERCOSUR = Southern Common Market; RCEP = Regional Comprehensive Economic Partnership; SAPTA = South Asian Preferential Trading Arrangement; USMCA = United States-Mexico-Canada Agreement.

Figure 10. Impact of policy improvements on trade costs

A. Reduction in overall trade costs associated with policy improvements



B. Reduction in manufacturing trade costs associated with policy improvements



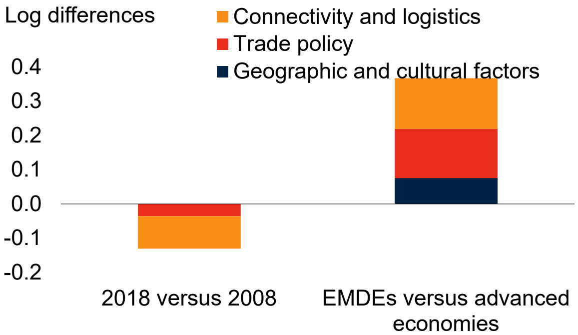
Source: World Bank.

Note: EMDEs = emerging market and developing economies.

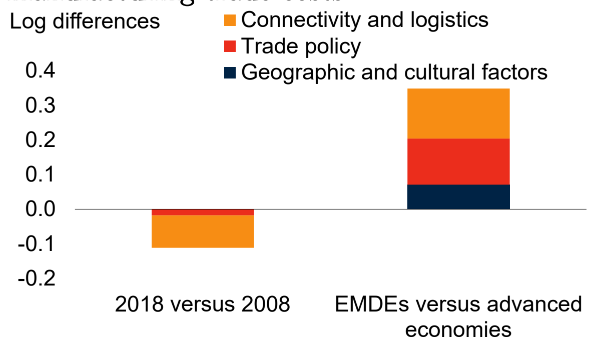
A.B. Bars show the fraction of trade costs that would remain after policy improvements. Policy improvements assume that the average EMDE in the quartile of EMDEs with the poorest scores in the liner shipping connectivity index (LSCI) and logistics performance index (LPI) improves to match the score of the average EMDE in the quartile of EMDEs with the best score for liner shipping connectivity index (LSCI), logistics performance index (LPI). The comprehensive package assumes that all three scores are improved simultaneously. Data refer to 2018. Gray line indicates 1 for unchanged trade costs in 2018 among the sample of EMDEs scoring in the poorest quartile on these indicators.

Figure 11. Estimated contributions to trade costs

A. Model-based contributions to differences in overall trade costs



B. Model-based contributions to differences in manufacturing trade costs



Sources: Comtrade (database); World Bank.
Note: EMDEs = emerging market and developing economies.
A.B. Difference in predicted contributions to predicted logarithm of overall trade costs in 2008 and 2018 (A) or in advanced economies and EMDEs (B). Computed using coefficient estimates for each variable and the following realizations for each indicator included in the regression: trade-weighted averages for all countries in the sample in 2018 minus equivalent values for 2008; and trade-weighted averages for EMDEs minus equivalent values for advanced economies in 2018. Trade policy includes tariffs and membership in regional trade agreements; geographic and cultural factors include distance, common border, and common language; border regulation includes connectivity and logistics include liner shipping connectivity index and logistics performance index.

TABLE 1 Regression sample

Country group	Countries
Advanced economies	23 (Australia, Belgium, Canada, Cyprus, Denmark, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovenia, Sweden, United Kingdom, United States)
EMDEs	72 (Albania, Angola, Argentina, Bahrain, Bangladesh, Benin, Brazil, Brunei Darussalam, Bulgaria, Cambodia, Cameroon, Chile, China, Colombia, Congo, Rep., Costa Rica, Côte d'Ivoire, Croatia, Dominican Republic, Ecuador, Arab Republic of Egypt, El Salvador, Gabon, The Gambia, Georgia, Ghana, Guatemala, Guyana, Honduras, India, Indonesia, Jamaica, Jordan, Kenya, Kuwait, Liberia, Madagascar, Malaysia, Maldives, Mauritania, Mexico, Moldova, Mozambique, Myanmar, Namibia, Nicaragua, Nigeria, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Qatar, Romania, Russian Federation, Saudi Arabia, Senegal, Sierra Leone, South Africa, Sri Lanka, Tanzania, Thailand, Togo, Tunisia, Turkey, Ukraine, Uruguay, Venezuela, RB, Vietnam)

Source: World Bank.

TABLE 2 Data employed in the panel regression

Data	Definition	Source
Trade costs	Logarithm of the geometric average of country i's and j's bilateral trade costs	UNESCAP-World Bank Trade Costs Database
Tariff rates	Logarithm of the geometric average of country i's and j's bilateral tariff rates	UNESCAP-World Bank Trade Costs Database
Regional Trade Agreements (RTA)	Dummy variable equal to unity if countries i and j share a common RTA	CEPII
Common border	Dummy variable equal to unity if countries i and j share a common land border (adjacency).	CEPII
Common language	Dummy variable equal to unity if countries i and j share a common language	CEPII
Distance	Logarithm of distance (in kilometers) between the largest cities in two countries	CEPII
Logistic Performance Index	Logarithm of the geometric average of country i's and j's scores	World Bank
Liner Shipping Connectivity Index	Logarithm of the geometric average of country i's and j's scores	World Bank
Trade policy uncertainty	Logarithm of the geometric average of the country *i*'s and *j*'s gap between bounded and applied tariff rates	World Development Indicators Database

Source: CEPII; United Nations Conference on Trade and Development; World Bank.

TABLE 3 Baseline panel regression results

	All Sectors	Manufacturing Sector
Liner Shipping Connectivity Index	-0.2299***	-0.2271**
	(0.007)	(0.007)
Logistics Performance Index	-0.5004***	-0.5156***
	(0.032)	(0.356)
Tariffs	0.3449***	0.4265***
	(0.044)	(0.057)
trade agreement membership	-0.0487***	-0.0567***
	(0.006)	(0.006)
Trade policy uncertainty	0.0907**	0.0902**
	(0.004)	(0.005)
	0.2605***	0.2687***
	(0.007)	(0.007)
Common border	-0.4070***	-0.4125***
	(0.033)	(0.035)
Common language	-0.1516***	-0.1369***
	(0.013)	(0.141)
Observations	56,038	52,060
	0.569	0.569

Source: World Bank.

Note: * p<0.05, ** p<0.01, ***p<0.001. Robust standard errors are shown in parentheses. The table shows estimated coefficients from a gravity panel regression estimated for up to 95 countries using annual data for 2007-18 where the dependent variable is the log of bilateral trade costs. The regression includes time fixed effects. Standard errors are clustered by country pairs.

TABLE 4A Panel regression results for subsamples: All sectors

	All sectors					
	Advanced economies only	Advanced economies EMDEs	EMDEs andonly	Commodity importers only	Commodity importers exporters	Commodity andexporters only
Liner Shipping Connectivity Index	-0.195*** [0.0237]	-0.230***[0.0111]	-0.209*** † [0.0093]	-0.230*** [0.00886]	-0.231*** ‡ [0.0109]	-0.198*** ‡ [0.0226]
Logistics Performance Index	-1.526*** [0.107]	-0.298*** † [0.055]	-0.277*** † [0.048]	-0.596*** [0.0438]	-0.317*** ‡ [0.0471]	-0.273*** ‡ [0.097]
Distance	0.343*** [0.0157]	0.221*** † [0.0112]	0.233*** † [0.00993]	0.306*** [0.0103]	0.223*** ‡ [0.00962]	0.241*** ‡ [0.0202]
Tariffs	-0.0998 [0.239]	0.517*** † [0.0916]	0.203*** † [0.0488]	0.189** [0.0878]	0.453*** ‡ [0.0647]	0.238*** [0.0682]
Regional trade agreement membership	-0.00793 [0.0125]	-0.0289*** [0.00714]	-0.0850*** † [0.0117]	-0.0326*** [0.00789]	-0.0545*** [0.00844]	-0.0796*** [0.0265]
Trade policy uncertainty	0.0383*** [0.0128]	0.0897*** †[0.00706]	0.0583*** † [0.00684]	0.0799*** [0.00633]	0.0794*** ‡ [0.00666]	0.0103 ‡ [0.0132]
Common border	-0.389*** [0.114]	-0.380*** [0.136]	-0.453*** [0.0334]	-0.327*** [0.0581]	-0.494*** ‡ [0.0566]	-0.356*** [0.0541]
Common language	-0.166***	-0.0878*** †	-0.186***	-0.117***	-0.145***	-0.273*** ‡
Observations	504	668	102	802	450	408

Source: World Bank.
Note: * p<0.05, ** p<0.01, ***p<0.001,. Robust standard errors are shown in parentheses. đ indicates statistically significant difference of the coefficient estimate from the coefficient estimate for a sample of advanced economies only. † indicates statistically significant difference of the coefficient estimate from the coefficient estimate for a sample of commodity importers only. The table shows estimated coefficients from a gravity panel regression estimated for up to 95 countries using annual data for 2007-18 where the dependent variable is the log of bilateral trade costs. The regression includes time fixed effects. Standard errors are clustered by country pairs.

TABLE 4B Panel regression results for subsamples: Manufacturing

	Manufacturing					
	Advanced economies only	Advanced economies and EMDEs	EMDEs only	Commodity importers only	Commodity importers and exporters	Commodity exporters only
Liner Shipping Connectivity Index	-0.215*** [0.0266]	-0.235*** † [0.0117]	-0.206*** † [0.0104]	-0.234*** [0.00947]	-0.227*** ‡ [0.0119]	-0.198*** ‡[0.0258]
Logistics Performance Index	-1.788*** [0.123]	-0.298*** † [0.058]	-0.336*** † [0.0539]	-0.686*** [0.0486]	-0.327*** ‡ [0.0525]	-0.237** ‡ [0.107]
Distance	0.353*** [0.0179]	0.239*** † [0.0122]	0.247*** † [0.0103]	0.303*** [0.011]	0.236*** ‡ [0.0107]	0.255*** ‡ [0.0199]
Tariffs	-0.225 [0.302]	0.804*** [0.11]	0.218*** [0.0569]	0.243** [0.107]	0.621*** [0.0827]	0.258*** [0.099]
Regional trade agreement membership	-0.005 [0.0131]	-0.0243*** [0.00791]	-0.108*** † [0.0122]	-0.0478*** [0.00841]	-0.0515*** [0.00981]	-0.107*** [0.0255]
Trade policy uncertainty	0.0287* [0.0171]	0.0744*** [0.00867]	0.0382*** [0.00701]	0.104*** [0.0069]	0.0615*** [0.00748]	-0.000122 [0.0132]
Common border	-0.283** [0.111]	-0.371** [0.145]	-0.466*** † [0.0364]	-0.325*** [0.0561]	-0.511*** ‡ [0.0609]	-0.354*** [0.0626]
Common language	-0.136***	-0.0924***	-0.183***	-0.153***	-0.146***	-0.254*** ‡
Observations	642	538	632	134	382	408

Source: World Bank.

Note: * p<0.05, ** p<0.01, ***p<0.001,. Robust standard errors are shown in parentheses. đ indicates statistically significant difference of the coefficient estimate from the coefficient estimate for a sample of advanced economies only. † indicates statistically significant difference of the coefficient estimate from the coefficient estimate for a sample of commodity importers only. The table shows estimated coefficients from a gravity panel regression estimated for up to 95 countries using annual data for 2007-18 where the dependent variable is the log of bilateral trade costs. The regression includes time fixed effects. Standard errors are clustered by country pairs.

References

Ahn, J., E. Dabla-Norris, R. Duval, H. Bingjie, and N. Lamin. 2019. "Reassessing the Productivity Gains from Trade Liberalization."*Review of International Economics* 27 (1): 130-54.

Alcala, F., and A. Ciccone. 2004. "Trade and Productivity." *The Quarterly Journal of Economics* 119 (2): 613-46.

Alesina, A., E. Spolaore, and R. Wacziarg. 2000. "Economic Integration and Political Disintegration." *American Economic Review* 90 (5): 1276-96.

Alvarez, F. 2017. "Capital Accumulation and International Trade."*Journal of Monetary Economics* 91 (C): 1-18.

Amiti, M., and B. S. Javorcik. 2008. "Trade Costs and Location of Foreign Firms in China."*Journal of Development Economics* 85 (1-2): 129-49.

Anderson, J. E., and E. Van Wincoop. 2003. "Gravity with Gravitas: A Solution to the Border Puzzle." *American Economic Review* 93 (1): 170-92.

Anderson, J. E., and E. Van Wincoop. 2004. "Trade Costs.'' *Journal of Economic Literature* 42 (3): 691-751.

Antras, P., and D. Chor. 2021. "Global Value Chains." Discussion Paper 15908, Center for Economic Policy Research, London.

Ariu, A., H. Breinlich, G. Corcos, and G. Mion. 2019. "The Interconnections Between Services and Goods Trade at the Firm-level." *Journal of International Economics* 116 (January): 173-88.

Arrow, K. 1962."The Economic Implications of Learning by Doing." *The Review of Economic Studies* 29 (3): 155-73.

Arunyanart, S., P. Sureeyatanapas, K. Ponhan, W. Sessomboon, and T. Niyamosoth. 2021. "International Location Selection for Production Fragmentation."*Expert Systems with Applications*171: 114564.

Arvis, J.-F., Y. Duval, B. Shepherd, C. Utoktham, and A. Raj. 2016. "Trade Costs in the Developing World: 1996-2010." *World Trade Review* 15 (3): 451-74.

Arvis, J.-F., B. Shepherd, Y. Duval, and C. Utoktham. 2013. "Trade Costs and Development: A New Data Set." *Economic Premise* series, Issue 104, World Bank, Washington, DC.

Atkin, D., and D. Donaldson. 2015. "Who's Getting Globalized? The Size and Implications of Intra-national Trade Costs." NBER Working Paper 21439, National Bureau of Economic Research, Cambridge, MA.

Auboin, M., and F. Borino, 2018. "The Falling Elasticity of Global Trade to Economic

Activity: Testing the Demand Channel,"Working Paper , Center for Economic Studies and Ifo Institute, Munich.

Autor, D. H., D. Dorn, and G, Hanson.."The China Syndrome: Local Labor Market Effects of Import Competition in the United States."*American Economic Review*(6): 2121-68.

Baccini, L., and J. Urpelainen. 2014a. "Before Ratification: Understanding the Timing of International Treaty Effects on Domestic Policies." *International Studies Quarterly* 58 (1): 29-43.

Baccini, L., and J. Urpelainen. 2014b. "International Institutions and Domestic Politics: Can Preferential Trading Agreements Help Leaders Promote Economic Reform?" *Journal of Politics* 76 (1): 195-214.

Baldwin, R., and D. Jaimovich. 2010. "Are Free Trade Agreements Contagious?" NBER Working Paper 16084, National Bureau of Economic Research, Cambridge, MA.

Baunsgaard, T., and M. Keen. 2010. "Tax Revenue and (or?) Trade Liberalization." *Journal of Public Economics* 94 (9-10): 563-77.

Beghin, J. C., and H. Schweizer. 2020. "Agricultural Trade Costs." *Applied Economic Perspectives and Policy* 43 (2): 500-30.

Benigno. G., J. di Giovanni, J. Groen, and A. Noble. 2022. "Global Supply Chain Pressure Index: March 2022 Update."*Liberty Street Economics* (blog), March 3, 2022, Federal Reserve Bank of New York.

Benz, S. 2017. "Services Trade Costs: Tariff Equivalents of Services Trade Restrictions Using Gravity Estimation." OECD Trade Policy Paper 200, Organisation for Economic Co-operation and Development, Paris.

Bergstrand, J. H., M. Larch, and Y. V. Yotov. 2015. "Economic Integration Agreements, Border Effects, and Distance Elasticities in the Gravity Equation." *European Economic Review* 78 (C): 307-27.

Bernard, A. B., J. B. Jensen, S. J. Redding, and P. K. Schott. 2007. "Firms in International Trade." *Journal of Economic Perspectives* 21 (3): 105-30.

Bernard, A. B., J. B. Jensen, and P. Schott. 2006. "Trade Costs, Firms and Productivity." *Journal of Monetary Economics* 53 (5): 917-37.

Bhagwati, J. and T. N. Srinivasan. 2002. "Trade and Poverty in the Poor Countries." *American Economic Review* 92(2): 180-183.

Bolaky, B., and C. L. Freund. 2004. "Trade, Regulations, and Growth." Policy Research Working Paper 3255, World Bank, Washington, DC.

Brancaccio, G., M. Kalouptsidi, and T. Papageorgiou. 2020. "Geography, Transportation, and Endogenous Trade Costs." *Econometrica* 88 (2): 657-91.

Brenton, P., and V. Chemutai. 2021. *The Trade and Climate Change Nexus: The Urgency and Opportunities for Developing Countries*. Washington, DC: World Bank.

Brenton, P., A. Portugal-Perez, and J. Regolo. 2014. "Food Prices, Road Infrastructure, and Market Integration in Central and Eastern Africa." Policy Research Working Paper 7003, World Bank, Washington, DC.

Broda, C., J. Greenfield, and D. Weinstein. 2017. "From Groundnuts to Globalization: A Structural Estimate of Trade and Growth." *Research in Economics* 71 (4): 759-83.

Bussière, M., G. Callegari, F. Ghironi, G. Sestieri, and N. Yamano. 2013. "Estimating Trade Elasticities: Demand Composition and the Trade Collapse of 2008–2009." *American Economic Journal: Macroeconomics* 5(3): 118-151.

Butollo, F. 2021. "Digitalization and the Geographies of Production: Towards Reshoring or Global Fragmentation?" *Competition and Change* 25 (2): 259-78.

Cabrillac, B., A. Al-Haschimi, O. B. Kucharčuková, A. Borin,. Bussiere, R. Cezar,. Dervizal. 2016. "Understanding the Weakness in Global Trade—What is the New Normal?" Occasional Paper 2016-09, European Central Bank, Frankfurt.

Caldara, D., M. Iacoviello, P. Molligo, A. Prestipino, and A. Raffo. 2020. "The Economic Effects of Trade Policy Uncertainty." *Journal of Monetary Economics* (January): 38-59.

Calì, M., and D. W. te Velde. 2011. "Does Aid for Trade Really Improve Trade Performance?" *World Development* 39 (5): 725-40.

Celasun, O., N.-J. Hansen, A. Mineshima, M. Spector, and J. Zhou. 2022. "Supply Bottlenecks: Where, Why, How Much, and What Next?" IMF Working Paper 31, International Monetary Fund, Washington, DC.

CEPII (Gravity Database). Centre d Etudes Prospectives et d Informations Internationales. Accessed May 25, 2021. http://www.cepii.fr/CEPII/en/bdd_modele/bdd_modele.asp

Chang, R., L. Kaltani, and N. Loayza. 2009. "Openness Can be Good for Growth: The Role of Policy Complementarities." *Journal of Development Economics* 90 (1): 33-49.

Chen, M. X., and A. Mattoo. 2008. "Regionalism in Standards: Good or Bad for Trade?" *Canadian Journal of Economics* 41 (3): 838-63.

Chen, N., J. Imbs, and A. Scott. 2009. "The Dynamics of Trade and Competition," *Journal of International Economics* 77 (1): 50-62.

Chen, N., and D. Novy. 2012. "On the Measurement of Trade Costs: Direct vs. Indirect Approaches to Quantifying Standards and Technical Regulations." *World Trade Review* 11 (3): 401-14.

Christie, A., D. Smith, and K. Conroy. 2013. "Transport Governance Indicators in

Sub-Saharan Africa." Sub-Saharan Africa Transport Policy Program Working Paper 95, World Bank, Washington, DC.

Cigna, S., V. Gunnella, and L. Quaglietti. 2022. "Global Value Chains: Measurement, Trends and Drivers."Paper 289, European Central Bank, Frankfurt.

Comtrade (database). United Nations. Accessed May 25, 2021. https://comtrade.un.org.

Constantinescu, C., A. Mattoo, and M. Ruta. 2020. "The Global Trade Slowdown: Cyclical or Structural?" *World Bank Economic Review* 34 (1): 121-42.

Coulibaly, B. S., and K. Foda. 2020. "The Future of Global Manufacturing." *Up Front* (blog), Brookings Institution, March 4, 2020. https://www.brookings.edu/blog/up-front/2020/03/04/the-future-of-global- manufacturing.

Crozet, M., B. Demir, and B. Javorcik. 2021. "International Trade and Letters of Credit: A Double-edged Sword in Times of Crises."Discussion Paper, Centre for Economic Policy Research, London.

Daudin, G., J. Héricourt, and L. Patureau. Forthcoming. "International Transport Costs: New Findings from Modeling Additive Costs." *Journal of Economic Geography*.

de Moran, M. A. 2018. "Customs Union Between Guatemala and Honduras, from 10 hours to 15 Minutes!" *Latin America and Caribbean* (blog), World Bank, April 2, 2018. https://blogs.worldbank.org/latinamerica/customs-union-between-guatemala-and-honduras-10-hours-15-minutes.

de Sousa, J. 2012. "The Currency Union Effect on Trade is Decreasing Over Time." *Economics Letters* 117 (3): 917-20.

Deichmann, U., and I. Gill. 2008. "The Economic Geography of Regional Integration." *Finance and Development* 45 (4): 45-47.

Djankov, S., C. Freund, and C. S. Pham. 2010. "Trading on Time." *The Review of Economics and Statistics* 92 (1): 166-73.

Dollar, D. 1992. "Outward-Oriented Developing Economies Really Do Grow More Rapidly: Evidence from 95 LDCs, 1976-85." *Economic Development and Cultural Change* 40 (3): 523- 44.

Dollar, D., and A. Kraay. 2004. "Trade, Growth, and Poverty." *The Economic Journal* 114 (493): 22-49.

Donaldson, D., A. Jinhage, and E. Verhoogen. 2017. "Beyond Borders: Making Transport Work for African Trade." IGC Growth Brief 009, International Growth Centre, London.

Dutt, P., D. Mitra, and P. Ranjan. 2009. "International Trade and Unemployment: Theory and Cross-National Evidence." *Journal of International Economics* 78 (1): 32-44.

Dutt, P., and D. Traca. 2010. “Corruption and Bilateral Trade Flows: Extortion or Evasion?” *The Review of Economics and Statistics* 92 (4): 843-60.

Duval, Y., A. Saggu, and C. Utoktham. 2015. “Reducing Trade Costs in Asia-Pacific Developing Countries.” Studies in Trade and Investment 84, United Nations Economic and Social Commission for Asia and the Pacific.

Edwards, S. 1997. "Openness, Productivity and Growth: What Do We Really Know?"Working Paper, National Bureau of Economic Research, Cambridge, MA.

Espitia, A., A. Mattoo, N. Rocha, M. Ruta, and D. Winkler. 2021. “Pandemic Trade: COVID-19, Remote Work and Global Value Chains.” Policy Research Working Paper 9508, World Bank, Washington, DC.

Fan, C. F., A. Weitz, and Y. Lam. 2019. “Blockchain is Already Transforming Trade and Logistics—And That’s Just the Beginning!” *Transport for Development* (blog), World Bank, June 6, 2019. https://blogs.worldbank.org/transport/blockchain-already-transforming-trade-and-logistics-and-thats-just-beginning.

Feenstra, R. C. 2003.*Advanced International Trade: Theory and Evidence*. Princeton, NJ: Princeton University Press.

Feenstra, R. C. 2010. *Product Variety and the Gains from International Trade*. Cambridge, MA: MIT Press.

Felbermayr, G., J. Prat, and H. J. Schmerer. 2009. “Trade and Unemployment: What Do the Data Say?” IZA Discussion Paper 4184, Institute for the Study of Labor (IZA), Bonn.

Feyrer, J. 2019. “Trade and Income—Exploiting Time Series in Geography.”*American Economic Journal* 11 (4): 1-35.

Frankel, J., and D. H. Romer. 1999. “Does Trade Cause Growth?” *American Economic Review* 89 (3): 379-99.

Freund, C., and N. Rocha. 2011. “What Constrains Africa’s Exports?” *World Bank Economic Review* 25 (3): 361-86.

Global Trade Alert. 2020. *21st Century Tracking of Pandemic-Era Trade and Investment Policies in Food and Medical Products*. Geneva: Global Trade Alert.

Grossman, G., and E. Helpman. 1991. “Trade, Knowledge Spillovers, and Growth.”*European Economic Review* 35 (2-3): 517-26.

Gurevich, T., and P. Herman. 2018. “The Dynamic Gravity Dataset: 1948-2016.” USITC Working Paper 2018-02-A, U.S. International Trade Commission, Washington DC.

Hartman, P L., J. A. Ogden, J. Wirthlin, and B. Hazen. 2017. "Nearshoring, Reshoring, and Insourcing: Moving Beyond the Total Cost of Ownership Conversation." *Business Horizons* 60 (3): 363-73.

Hausman, W. H., H. Lee, and U. Subramanian. 2005. "Global Logistics Indicators, Supply Chain Metrics and Bilateral Trade Patterns." Policy Research Working Paper 3773, World Bank, Washington, DC.

Helpman, E. 1981. "International Trade in the Presence of Product Differentiation, Economies of Scale and Monopolistic Competition: A Chamberlin-Heckscher-Ohlin Approach." *Journal of International Economics* 11 (3): 305-40.

Helpman, E. 1997. "R&D and Productivity: The International Connection." NBER Working Paper 6101, National Bureau of Economic Research, Cambridge, MA.

Helpman, E., and P. Krugman. 1985. *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy*. Cambridge, MA: MIT Press.

Hillberry, R., and X. Zhang. 2015. "Policy and Performance in Customs: Evaluating the Trade Facilitation Agreement." Policy Research Working Paper 7211, World Bank, Washington, DC.

Hoekman, B., and L. A. Winters. 2005."Trade and Employment: Stylized Facts and Research Findings."Research Working Paper 3676,Bank, Washington, D.C.

Hou, Y., Y. Wang, and W. Xue. 2021. "What Explains Trade Costs? Institutional Quality and Other Determinants." *Review of Development Economics* 25 (1): 478-99.

Hummels, D. 2001. "Time as a Trade Barrier." GTAP Working Paper 1152, Center for Global Trade Analysis, Department of Agricultural Economics, Purdue University.

Hummels, D., P. Minor, M. Reisman, and E. Endean. 2007. "Calculating Tariff Equivalents of Time in Trade." Produced by Nathan Associates Inc. for review by the United States Agency for International Development, Washington, DC.

IMF (International Monetary Fund). 2021. *World Economic Outlook: Managing Divergent Recoveries*. April. International Monetary Fund, Washington, D.C.

Irwin, D. A. 2019. "Does Trade Reform Promote Economic Growth? A Review of Recent Evidence," Working Paper 19-9, Peterson Institute for International Economics, Washington, DC.

Irwin, D. A. 2022. "The Trade Reform Wave of 1985-1995", Working Paper 29973, National Bureau of Economic Research, Cambridge, MA.

Ishikawa, J., and N. Tarui. 2018. "Backfiring with Backhaul Problems: Trade and Industrial Policies with Endogenous Transport Costs." *Journal of International Economics* 111 (March):
81-98.

Jacks, D. S., C. M. Meissner, and D. Novy. 2011. “Trade Booms, Trade Busts, and Trade Costs.” *Journal of International Economics* 83 (2): 185-201.

Kee, H. L., and A. Nicita. 2016. “Trade Frauds, Trade Elasticities, and Non-Tariff Measures.” 5th IMF-World Bank-WTO Joint Trade Research Workshop, November 30, 2016, Washington, DC.

Keller, W. 2004. “International Technology Diffusion.” *Journal of Economic Literature* 42 (3): 752-82.

Keller, W. 2021. “Knowledge Spillovers, Trade, and FDI.”Working Papers, National Bureau of Economic Research, Cambridge, MA.

Kilic Celik, S., M. A. Kose, and F. Ohnsorge. 2023. “Potential Growth Prospects: Risks, Rewards, and Policies.” In *Falling Long-Term Growth Prospects: Trends, Expectations, and Policies*, edited by M. A. Kose and F. Ohnsorge, 287-323. Washington, DC: World Bank.

Kose, M. A., F. Ohnsorge, Y. Lei, and I. Ergys. 2017. “Weakness in Investment Growth: Causes, Implications and Policy Responses.” Policy Research Working Paper 7990, World Bank, Washington, DC.

Kox, H., and H. K. Nordas. 2007. “Services Trade and Domestic Regulation,” Trade Policy Paper 49, Organisation for Economic Co-operation and Development, Paris.

Krugman, P. 1979. “Increasing Returns, Monopolistic Competition and International Trade.” *Journal of International Economics* 9 (4):469-79.

Liargovas, P., and K. Skandalis. 2012. “Foreign Direct Investment and Trade Openness: The Case of Developing Economies.”*Social Indicators Research*(2): 323-31.

Lucas, R. 1993. “Making a Miracle.”*Econometrica* 61 (2): 251-72.

Marti, L., and R. Puertas. 2019. “Factors Determining the Trade Costs of Major European Exporters.” *Maritime Economics and Logistics* 21 (3): 324-33.

Melitz, M. 2003. “The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity.” *Econometrica* 71 (6): 1695-725.

Melitz, M., and G. Ottaviano. 2008. “Market Size, Trade, and Productivity.”*Review of Economic Studies* 75 (1): 295-316.

Miroudot, S., J. Sauvage, and B. Shepherd. 2010. “Measuring the Cost of International Trade in Services.” MPRA Paper 27655, University Library of Munich, Germany.

Moïsé, E., and F. Le Bris. 2013. “Trade Costs—What Have We Learned?: A Synthesis Report.” OECD Trade Policy Paper 150, Organisation for Economic Co-operation and Development, Paris.

Moïsé, E., T. Orliac, and P. Minor. 2011. “Trade Facilitation Indicators: The Impact on

Trade Costs." OECD Trade Policy Paper 118, Organisation for Economic Co-operation and Development, Paris.

Moïsé, E., and S. Sorescu. 2013. "Trade Facilitation Indicators: The Potential Impact of Trade Facilitation on Developing Countries' Trade." OECD Trade Policy Paper 144, Organisation for Economic Co-operation and Development, Paris.

Muendler, M. 2004. "Trade, Technology, and Productivity: A Study of Brazilian Manufacturers, 1986-1998."Working Paper 1148, Center for Economic Studies and Ifo Institute, Munich.

Nayyar, G. and E. Davies. 2023. "Services-Led Growth: Better Prospects After the Pandemic." In *Falling Long-Term Growth Prospects: Trends, Expectations, and Policies*, edited by M. A. Kose and F. Ohnsorge, 365-395. Washington, DC: World Bank.

Niu, Z., C. Liu, S. Gunessee, and C. Milner. 2018. "Non-Tariff and Overall Protection: Evidence Across Countries and Over Time." *Review of World Economics* 154 (4): 675-703.

Noguer, M., and M. Siscart. 2005. "Trade Raises Income: A Precise and Robust Result." *Journal of International Economics* 65 (2): 447-60.

Nordas, H. K. 2007. "Logistics and Time as a Trade Barrier: Implications for Low-Income Countries" *OECD Economic Studies*(1): 137-67.

Novy, D. 2013. "Gravity Redux: Measuring International Trade Costs with Panel Data." *Economic Inquiry* 51 (1): 101-121.

OECD (Organisation for Economic Co-operation and Development). 2018. "Trade in Value Added Database." Paris: OECD Publishing.

OECD (Organisation for Economic Co-operation and Development) database. "Trade in Value Added" database (2021 edition). Accessed August, 18, 2022. https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm.

OECD (Organisation for Economic Co-operation and Development), International Labour Organization, World Bank, and World Health Organization. 2010. "Seizing the Benefits of Trade for Employment and Growth." Final report to the G-20 Summit meeting in Seoul (Republic of Korea), November 11-12, 2010.

OECD (Organisation for Economic Co-operation and Development) and WTO (World Trade Organization). 2015. "Why Trade Costs Matter for Inclusive, Sustainable Growth." In *Aid for Trade at a Glance 2015: Reducing Trade Costs for Inclusive, Sustainable Growth*. Paris: OECD Publishing.

Osnago, A., R. Piermartini, and N. Rocha. 2015. "Trade Policy Uncertainty as Barrier to Trade." WTO Staff Working Paper ERSD-2015-05, World Trade Organization, Geneva.

Osnago, A., R. Piermartini, and N. Rocha. 2018. “The Heterogeneous Effects of Trade Policy Uncertainty: How Much Do Trade Commitments Boost Trade?” Policy Research Working Paper 8567, World Bank, Washington, DC.

Pavcnik, N. 2002. “Trade Liberalization, Exit, and Productivity Improvements: Evidence from Chilean Plants.” *Review of Economic Studies* 69 (1): 245-76.

Ricardo D. 1817. “On the Principles of Political Economy and Taxation.” London: John Murray.

Rodríguez, F., and D. Rodrik. 2001. “Trade Policy and Economic Growth: A Skeptic s Guide to the Cross-National Evidence.” *NBER Macroeconomics Annual 2000* 15: 261-338.

Romer, P. M. 1990. “Endogenous Technological Change.” *Journal of Political Economy* 98(5): S71-S102.

Ruta, M., ed. 2022. *The Impact of the War in Ukraine on Global Trade and Investment*." Equitable Growth, Finance, and Institutions Insights series. Washington, DC: World Bank.

Sachs, J., and A. Warner. 1995. “Economic Reform and the Process of Global Integration.” *Brookings Papers on Economic Activity* 1: 1-118.

Sadikov, A. 2007. “Border and Behind-the-Border Trade Barriers and Country Exports.” IMF Working Paper 07/292, International Monetary Fund, Washington D.C.

Santos Silva, J., and S. Tenreyro. 2006. “The Log of Gravity.” *Review of Economics and Statistics* 88 (4): 641-58.

Saurav, A., P. Kusek, R. Kuo, and B. Viney. 2020. “The Impact of COVID-19 on Foreign Investors: Evidence from the Second Round of a Global Pulse Survey.” World Bank, Washington, DC.

Shah, M., and Y. Khan. 2016. “Trade Liberalisation and FDI Inflows in Emerging Economies.” *Business & Economic Review* 8 (1): 35-52.

Sharma, C., and M. Kumar. 2015. “International Trade and Performance of firms: Unraveling Export, Import and Productivity Puzzle.” *Quarterly Review of Economics and Finance* 57 (C): 61-74.

Sposi, M., M. Yi, and J. Zhang. 2019 “Trade Integration, Global Value Chains and Capital Accumulation.” NBER Working Paper 28087, National Bureau of Economic Research, Cambridge, MA.

Song, D. 2021. “A Literature Review, Container Shipping Supply Chain: Planning Problems and Research Opportunities.” *Logistics* 5 (41): 1-26.

Staboulis, C., D. Natos, E. Tsakiridou, and K. Mattas. 2020. “International Trade Costs in OECD Countries.” *Operational Research* 20 (3): 1177-87.

Stamm, K. and D. Vorisek. 2023. "The Global Investment Slowdown: Challenges and Policies." In *Falling Long-Term Growth Prospects: Trends, Expectations, and Policies*, edited by M. A. Kose and F. Ohnsorge, 150-209. Washington, DC: World Bank.

Stone, S., and B. Jeon. 2000. "Foreign Direct Investment and Trade in the Asia-Pacific Region: Complementarity, Distance and Regional Economic Integration." *Journal of Economic Integration* 15 (3): 460-85.

Teravaninthorn, S., and G. Raballand. 2008. *Transport Prices and Costs in Africa: A Review of the International Corridors*. Washington, DC: World Bank.

Timmer, M. P., B. Los, R. Stehrer, and G. J. De Vries. 2021. "Supply Chain Fragmentation and the Global Trade Elasticity: A New Accounting Framework." *IMF Economic Review* 69 (4): 656-80.

UNESCAP (United Nations Economic and Social Commission for Asia and the Pacific). 2011. "Facilitating Agricultural Trade in Asia and the Pacific." Studies in Trade and Investment 74, United Nations, New York.

UNESCAP (United Nations Economic and Social Commission for Asia and the Pacific). 2017. "Tackling Agricultural Trade Costs in Asia and the Pacific." United Nations, New York.

USAID (United States Agency for International Development). 2019. *Assessing the Benefits of the Trade Facilitation Agreement for Agricultural Trade*. Washington, DC: USAID.

Wacziarg, R., and K. Welch. 2008. "Trade Liberalization and Growth: New Evidence." *World Bank Economic Review* 22 (2): 187-231.

Webber, C. M., and P. Labaste. 2010. *Building Competitiveness in Africa's Agriculture*. Washington, DC: World Bank.

World Bank. 2015. *Global Economic Prospects: Having Fiscal Space and Using It*. January. Washington, DC: World Bank.

World Bank. 2016. *Global Economic Prospects: Spillovers amid Weak Growth*. January. Washington, DC: World Bank.

World Bank. 2017. *Global Economic Prospects: Weak Investment in Uncertain Times*. January. Washington, DC: World Bank.

World Bank. 2018. "Cambodia: Trade Facilitation and Competitiveness." World Bank, Washington, DC. https://projects.worldbank.org/en/projects-operations/project-detail/P089196.

World Bank. 2019. *Global Economic Prospects: Heightened Tensions, Subdued Investment*. June. Washington, DC: World Bank.

World Bank. 2020a. *World Development Report: Trading for Development in the Age* *of Global Value Chains*. Washington, DC: World Bank.

World Bank. 2020b. "Rebuilding Tourism Competitiveness. Tourism Response, Recovery and the Covid-19 Crisis." Markets & Technology Global Tourism Team note, World Bank, Washington, DC.

World Bank. 2020c. *The African Continental Free Trade Area: Economic and Distributional Effects*. Washington, DC: World Bank.

World Bank. 2021a. *Global Economic Prospects*. January. Washington, DC: World Bank.

World Bank. 2021b. *Global Economic Prospects*. June. Washington, DC: World Bank.

World Bank. 2021c. "Creating Value in the Data Economy: The Role of Competition, Trade, and Tax Policy." In *World Development Report 2021: Data for Better Lives,* 227-64. Washington, DC: World Bank.

World Bank. 2021d. "Implementation Status and Results Report: AFR RI-Great Lakes Trade Facilitation." World Bank, Washington, DC.

World Bank. 2022a. *Global Economic Prospects*. January. Washington, DC: World Bank.

World Bank and WTO (World Trade Organization). 2018. *Trade and Poverty Reduction: New Evidence of Impacts in Developing Countries*. Washington, DC: World Bank.

World Bank and WTO (World Trade Organization). 2020. *Women and Trade: The Role of Trade in Promoting Gender Equality*. Washington, DC: World Bank.

World Bank and UNCTAD (United Nations Conference on Trade and Development). 2018. *The Unseen Impact of Non-Tariff Measures: Insights from a New Database*. Washington, DC: World Bank.

World Economic Forum. 2013. "Enabling Trade: Valuing Growth Opportunities." In collaboration with Bain & Company and the World Bank. World Economic Forum, Geneva.

WTO (World Trade Organization). 2015. *World Trade Report 2015: Speeding up Trade: Benefits and Challenges of Implementing the WTO Trade Facilitation Agreement*. Geneva: World Trade Organization.

WTO (World Trade Organization). 2018. *World Trade Report 2018: The Future of World Trade: How Digital Technologies are Transforming Global Commerce.* Geneva: World Trade Organization.

WTO (World Trade Organization). 2019a. *World Trade Report 2019: The Future of Services Trade.* Geneva: World Trade Organization.

WTO (World Trade Organization). 2019b. *The Digital Economy: GVCs and SMEs.* Geneva: World Trade Organization.

Yotov, Y. V. 2012. "A Simple Solution to the Distance Puzzle in International Trade." *Economic Letters* 117 (3): 794-98.

Zhan, J., R. Baldwinn, B. Casella, and A. S. Santos-Paulino. 2020. "Global Value Chain Transformation to 2030: Overall Direction and Policy Implications." VoxEU.org, CEPR Policy Portal, August 13, 2020. https://voxeu.org/article/global-value-chain-transformation-decade-ahead.