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TRADE POLICY TOWARD SUPPLY CHAINS AFTER THE GREAT RECESSION

Abstract

How does trade policy treat intermediate inputs relative to other imported products? Slow economic and trade growth during the recovery from the Great Recession, as well as recent political developments in the United Kingdom and United States, pose a threat to cross-border supply chains and have thus brought this question to the forefront of policy circles. This paper investigates by examining new and detailed data on Group of 20 (G20) trade policy use through 2016, with a special emphasis on changes in policymaking behavior since 2010. First, there is no evidence that the G20 economies made significant changes to their applied import tariffs during this period. However, there has been a modest increase in import protection arising through other policy instruments of note such as the temporary trade barriers (TTBs) of antidumping, countervailing duties and safeguards. More importantly, there is evidence of changes in how countries have applied their TTBs. TTBs were increasingly imposed on imports not only from China, but also on imports from other countries, reversing a post-2001 trend. Furthermore, TTB protection has moved away from imports of final goods and toward imports of intermediate inputs. These shifts in policy have several potential contributing causes as well as economic consequences, including for cross-border supply chains.

JEL Classification: F13

Keywords: antidumping, safeguards, temporary trade barriers, tariffs, WTO, Supply Chains, intermediate inputs

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Trade Policy Toward Supply Chains after the Great Recession

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This version: July 2018

Abstract

How does trade policy treat intermediate inputs relative to other imported products? Slow economic and trade growth during the recovery from the Great Recession, as well as recent political developments in the United Kingdom and United States, pose a threat to cross-border supply chains and have thus brought this question to the forefront of policy circles. This paper investigates by examining new and detailed data on Group of 20 (G20) trade policy use through 2016, with a special emphasis on changes in policymaking behavior since 2010. First, there is no evidence that the G20 economies made significant changes to their applied import tariffs during this period. However, there has been a modest increase in import protection arising through other policy instruments of note such as the temporary trade barriers (TTBs) of antidumping, countervailing duties and safeguards. More importantly, there is evidence of changes in how countries have applied their TTBs. TTBs were increasingly imposed on imports not only from China, but also on imports from other countries, reversing a post-2001 trend. Furthermore, TTB protection has moved away from imports of final goods and toward imports of intermediate inputs. These shifts in policy have several potential contributing causes as well as economic consequences, including for cross-border supply chains.

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1 Introduction

Political developments of 2016 could result in governments making changes to trade policy in ways that impact cross-border supply chains. In response to its June 23, 2016 referendum, the United Kingdom began negotiating new tariff and non-tariff barrier relationships with the European Union and dozens of other countries with which it previously had free trade agreements as part of the EU.¹ On November 8, 2016, the American public elected Donald Trump as President; his inauguration speech included the striking statement that “[p]rotection will lead to great prosperity and strength.” Beyond rhetoric, some of Trump’s trade policy initiatives seem specifically designed to disrupt America’s existing commercial access to imported intermediate inputs.²

While highly-politicized events have brought the issue of how trade policy treats supply chains to the forefront of public discussion, relatively little is known about many aspects of this relationship. In relative terms, what are the barriers to trade in intermediate inputs, for example? How have they been changing over time, and through what policy instruments? This paper empirically investigates these questions by collecting and analyzing new data – from prior to 2017 – on Group of 20 (G20) use of two major sets of trade policies. Perhaps surprisingly, it also provides some evidence that border barriers were already accumulating after the Great Recession of 2008-2009 in ways that may negatively impact the further development of cross-border supply chains.

¹ The UK’s automotive sector is tied into the continental European supply chain and could be disrupted if a “hard Brexit” occurs so UK-EU auto trade reverts to MFN tariffs of 10 percent. For a broader, economy-wide analysis of the impact of Brexit on supply chains, see Vandenbussche, Connell and Simons (2017).

² One example is the Trump administration’s proposals in the NAFTA negotiations for new automobile rules of origin seeking to increase American content at the expense of imported parts and components (Dziczek et al, 2018). A second is the Trump administration’s June 2018 threat of 25 percent tariffs on \$50 billion of imports from China, as roughly 95% of the value of imported products on the list were intermediate inputs or capital equipment (Bown, Jung and Lu 2018).

Yet, in some important areas of trade policy, there is no evidence that such changes have taken place. The first step is to document evidence that major economies have continued to apply lower tariffs on imported intermediate inputs and relatively higher levies on final goods. While there has been little additional nondiscriminatory tariff liberalization arising under the WTO system since 2005, nevertheless, this basic structure of tariff protection was a likely contributor to increased trade in intermediate inputs and the facilitation of the supply chains that developed in the period prior to the Great Recession.

The main contribution of this paper arises through its second step, which is a detailed examination of other border barriers with the potential to impact trade flows. The focus is on the temporary trade barrier (TTB) policy instruments of antidumping, countervailing duties and safeguards, and especially how their use has changed since the Great Recession, a previously unexamined period. Such instruments are some of the primary means through which many major economies made time-varying upward adjustment to the trade-restrictiveness of their policies since 1995.³

The first result simply confirms the well-established fact that, since its WTO entry in 2001, China's exports have been the primary target of such TTB policies. However, the data also reveal two further developments arising since the Great Recession. Major economies increasingly applied TTBs on imports beyond China and toward the rest of the world. Furthermore, these new TTBs increasingly cover imports of intermediate inputs, and the emerging gap between TTB coverage of inputs relative to final goods widened during 2010-2016.

³ TTBs are not the only non-tariff policies that could have similar effect. Other examples include local content requirements (Hufbauer et al, 2013) and other policies captured by the Global Trade Alert. A limitation of such other data is its non-availability for the period prior to the Great Recession to establish as a benchmark.

The last two sections consider the potential causes and implications of this change in policy behavior. This includes how it may foment downstream demands for additional import protection as well as its impact the formation of cross-border supply chains and trade growth.

2. Supply chain growth and the pattern of nondiscriminatory tariff protection

Characterizing the economic importance of cross-border supply chains and their linkages with trade policy is notoriously challenging. Nevertheless, major advances have been made by using input-output techniques and focusing on value-added relative to gross trade flows.⁴ Relying on such an approach, Johnson and Noguera (2017) suggest an acceleration in the development of supply chains over 1970-2009, finding that the ratio of value-added to gross exports fell roughly three times as fast between 1990 and 2009 as it did from 1970 to 1990. They find policy – in the form of preferential trade agreements – to have been one important contributor to the acceleration. Other research, such as Osnago, Rocha and Ruta (forthcoming), provides additional evidence that the depth of the legal commitments taken on in such agreements – e.g., such as through rights for intellectual property protection or foreign investors, as well as other standards – is correlated with more vertical foreign direct investment arising over 2003-2011. This is also likely important for cross-border supply chains, given that so much input trade takes place within multinational firms.⁵

This evidence linking policy to an accelerating decline of value-added to gross trade flows, the expansion of supply chains, and more foreign investment all took place during a period of deepening

⁴ See, for example, Johnson and Noguera (2012) and Koopman et al. (2014).

⁵ A separate strain of research examines the impact of supply chains and foreign investment on the formation of trade policy itself. Blanchard and Matschke (2015), for example, find evidence that US multinational affiliates affected US tariffs granted under the Generalized System of Preferences. Furthermore, in a cross-country study, Blanchard, Bown and Johnson (2016) provide evidence from 1995-2009 that the structure of supply chains and value-added trade flows impact tariff preferences – as well as discriminatory TTB protection – across industries, trading partners and time.

preferential trade liberalization. Put differently, until the outcomes of events like the Brexit negotiations or President Trump’s renegotiation of NAFTA are realized and potentially show otherwise, there is no evidence that these previously-adopted deep trade agreement commitments have been weakened or that the low tariffs that arose by negotiating preferential trade agreements were raised.

Yet, global trade growth and global economic growth both slowed considerably in the post-Great Recession period. Compare 2001-2007 to 2010-2016 in Figure 1: average real GDP growth declined from 7.2 to 6.1 percent per year for the emerging economies and from 2.5 percent to 1.9 percent per year for the high-income economies. Similarly, average real import growth declined from 12.8 percent to 6.3 percent per year for the emerging economies and from 5.4 percent to 3.2 percent per year for the high-income economies.⁶

If not through reversals to deep trade agreements, did trade policy show any signs of change during the post-Great Recession period? The natural place to begin a formal analysis is through how countries applied their nondiscriminatory, most-favored nation (MFN) tariffs. Because many emerging economies retain substantial “water” in their WTO tariff commitments, they could have increased their MFN tariffs without running afoul of their WTO obligations during this period.⁷

Figure 2 illustrates the G20 economies’ simple average MFN tariffs applied between 1995 and 2015. The top and bottom panels reflect average tariffs imposed by high-income and emerging economies, respectively. It shows average tariffs for three product categories – final goods,

⁶ For empirical analysis of determinants of the trade slowdown, see Constantinescu, Mattoo, and Ruta (forthcoming) and Freund (2018). IMF (2016) finds only a modest role for changes in trade policy – albeit not defined in the manner explore below – explaining the trade slowdown.

⁷ “Water” or “overhang” refers to the difference between a WTO member’s legally binding tariff commitment – the upper limit it promises not to exceed – and its applied MFN tariff rate. As of 2013, for example, G20 emerging economies like Argentina, Brazil, India and Mexico could have increased their applied tariffs by an average of 15-35 percentage points without breaking their WTO commitments (Bown and Crowley 2016, Table 1 and Figure 2).

intermediate inputs, and capital goods – based on the Broad Economic Categories (BEC) classification system developed by the United Nations. Four stylized facts are confirmed.

First, emerging economies applied tariffs that were, on average, higher than the tariffs that high-income economies imposed. In 2015, emerging economies had an average tariff on final goods of 16.8 percent compared to the high-income economy average of 8.9 percent on those same final goods.

Second, countries tended to impose lower tariffs on intermediate inputs and capital equipment than on final goods. In 2015, high income economies imposed an average tariff on final goods (8.9 percent) that was double the average tariff on intermediates (4.5 percent) and more than triple the average on capital equipment (2.6 percent). This regularity is shown in Figure 2 within country groupings and over time. And for the applied MFN tariffs, the ranking holds for these same product groupings within broadly-defined sectors for these economies (Bown and Crowley 2016, Figure 4). The implication is that the declining applied MFN tariffs on imports of intermediate inputs -- over time and relative to tariffs on final goods – worked to reduce the sort of trade frictions that Johnson and Noguera (2017, Figure 9) determined to play an important role in the development of cross border supply chains over 1970-2009.

Third, applied tariffs trended downward over 1995-2005, largely reflecting implementation of the tariff reductions associated with the last major multilateral agreement to lower tariffs found in the Uruguay Round Agreement of 1994. Nevertheless, while applied MFN tariffs remained low in historical terms, they were also largely unchanged between 2005 and 2015.

Fourth, the flip side of that result is that there is no evidence that G20 economies *increased* their applied MFN tariffs since 2005 in ways that would dramatically affect trade flows or change the trajectory of cross-border supply chains.⁸ And this includes the Great Recession period of 2008-2009,

⁸ This is confirmed through examination of the country-level analogs to Figure 2 for applied MFN tariffs as well.

in which trade flows collapsed and global economy experienced a synchronized macroeconomic contraction unseen since the 1930s (see again Figure 1).

The economic and trade slowdown led to mounting concerns over whether protectionism might have also increased, and if so, whether this is a cause or an effect. But the evidence from Figure 2 indicates that if there is a relationship between the slowdown and increased trade protection, it is unlikely to have arisen through changes in applied MFN tariffs.

3. Temporary trade barriers: Targeting China's exports and change since the Great Recession

Another way that many G20 economies have changed protection over the post-1995 period was through their application of the temporary trade barrier (TTB) policies of antidumping, countervailing duties and safeguards. TTBs are import-restricting policies that governments can implement after investigating whether domestic, import-competing industries are injured by imports that are surging (safeguards), dumped (antidumping), or illegally subsidized (countervailing duties).⁹

Several major economies used TTBs extensively after 1995. Bown and Crowley (2016, Table 6), for example, report that the top four users each had more than 8 percent of their total import product lines become subject to protection under at least one TTB policy at some point during 1995-2013. This includes Mexico (22.9 percent of products), United States (10.3 percent), as well as the European Union and India at around 8 percent each. Argentina, Canada and China each also imposed TTBs over more than 3 percent of imported products.

⁹ The WTO has agreements outlining how countries are to use these policies, but it is up to a WTO member to apply the policy in a WTO-consistent manner. The policy data used in this paper is available from 1995 (or even earlier, depending on the country) and is taken from the Temporary Trade Barriers Database (Bown, 2016a) with 2016 updates done by the author. The database provides information on the policy-imposing countries, affected trading partners, the dates and outcomes of investigations, the dates and types of import restrictions imposed (and sometimes removed), and the tariff-line products impacted. For more information, see Bown (2016a). For a survey of the economics literature on antidumping, see Blonigen and Prusa (2016).

The analysis here relies on a constructed series defined as the trade-weighted share of imports covered by TTBs in effect each year, where the trade weights are taken from 6-digit Harmonized System (HS06) product-level bilateral imports from the year prior to imposition of the TTB.¹⁰ This technique addresses standard endogeneity concerns by accounting for counterfactual import growth of products subject to TTBs during the period that the import restrictions are in effect.¹¹ It is one way to address the tremendous variation in the economic size (trade coverage) of any single act of protection, even within a country, industry and year. At one extreme, a country may apply a new trade barrier to a narrowly defined product and only one trading partner and thus only a few million dollars of imports; in other instances, dozens of partners and products could be impacted, thereby affecting billions of dollars of trade.

Figure 3 presents measures of the share of G20 imports covered by their applied TTB policies in effect, each year, over 1995-2016. For the top two panels, the import coverage ratios are further broken out into whether the exporter subject to imposed TTBs was China versus non-China. Four results stand out.

First, there is clear evidence of a difference in the *levels* of the policy-imposing economies' imports from China subject to TTBs relative to their imports from the rest of the world. For both high-

¹⁰ The switch from average ad valorem rates for tariffs (Figure 2) to import coverage ratios for TTB policies (Figure 3, 4 and 5) is deliberate. Countries frequently do not apply TTBs as ad valorem tariffs but instead as specific duties, quotas, price undertaking or voluntary export restraints. Furthermore, when the tariffs are applied as ad valorem duties they may be set at levels higher than necessary to be prohibitive. E.g., Bown (2016b) finds average US antidumping tariffs in 2015 applied to China were over 81 percent and applied to the rest of the world were over 54 percent.

¹¹ These measures are dynamic, trade-weighted import coverage ratios constructed as described in Bown (2011). The trade weights are taken from the year prior to the TTB investigation. The methodology also requires an assumption for how imports that are subject to TTBs would have grown had the TTB not been in place. The conservative assumption made here is that TTB-impacted imports would have grown at the same rate as non-TTB impacted imports, which fixes import market shares at their levels from prior to the initiation of the TTB investigation.

income and emerging economies, roughly 6 percent of imports from China were covered by TTBs by 2016. For imports from the rest of the world, less than 2 percent of imports were covered by TTBs. Finally, the lowest panel indicates that China imposed TTBs over about 1.4 percent of imports from the world in 2016, down from a recent high of 2.2 percent in 2011.¹²

The second notable feature of Figure 3 arises from the Great Recession period of 2008-2009. Despite the macroeconomic shock (see again Figure 1) as well as concerns over policy uncertainty and murky protectionism (Baldwin and Evenett, 2009), TTB coverage of imports from most countries – i.e., imports *from non-China* – did not increase substantially. This evidence is consistent with earlier results (Bown 2011).

Third, there is evidence that countries increased the TTB coverage of their imports from China during the Great Recession. There is a spike in emerging economy imposed-barriers from 5.0 percent of imports in 2007 to 7.7 percent by 2009. High-income economies also increased their barriers toward imports from China; however, the increased China import coverage is hard to disentangle from a longer-term upward trend after China's WTO accession in 2001.¹³

Fourth, Figure 3 also reveals the first sign of changes in how the G20 applied its TTBs in the period after the Great Recession. Both high-income and emerging economies applied TTBs on an increasing share of imports *from non-China* – i.e., imports from the rest of the world – between 2010

¹² China's spike in 2003 at 3 percent of total imports was due to a safeguard import restriction imposed on a broad set of imported steel products, during a period of excess global capacity, following similarly expansive safeguard import restrictions on steel products imposed by the United States and European Union.

¹³ In 2016, nearly 6 percent of high-income economy imports from China were subject to TTBs, up from 2 percent in 2000. There are a number of factors likely contributing to the upward trend in TTBs on imports from China after its WTO accession. These include China's receipt of permanent MFN tariffs and converting other (potentially WTO-inconsistent, pre-2001) forms of non-tariff barriers on China into WTO-consistent protection such as TTBs. Another reason is the adjustment pressure caused by China's increased exports triggering new TTBs. A final explanation is the ease with which countries could apply antidumping toward imports from China – in ways that they could not toward imports from other countries – because of China's special treatment as a non-market economy (Bown 2016b).

and 2016. Emerging economies increased their TTB coverage from 0.9 to 1.6 percent of total imports, and high-income countries increased their TTB coverage from 0.9 to 1.2 percent of imports.

4 Supply chains and post-Great Recession changes to applied TTB import protection

What is the source of the underlying changes in TTB import protection arising since the Great Recession? Figure 4 illustrates the TTB covered share of G20 imports, now broken out into final goods, intermediate inputs, and capital goods according to the same BEC classification as utilized in Figure 2. The rows split by policy-imposing economies (high-income, emerging, China) and the columns split by export target (China or non-China).

First, the seemingly ubiquitous “tariff escalation” ranking of products in the tariff data (Figure 2) is not replicated for TTB policies. In many instances, the share of intermediate inputs subject to TTBs is higher than TTB coverage of final goods imports. This is a new and somewhat puzzling stylized fact.

Second, there is evidence in all five panels of Figure 4 of a widening gap arising over 2010 – 2016 between TTB coverage of imported intermediate inputs versus final goods. The largest gaps by 2016 arose in how countries treated imports from China. By 2016, high-income countries covered 12.2 percent of imports of Chinese intermediates with protection and only 4.0 percent of imports of Chinese final goods. But the same widening gap also arose for how countries treated imports from non-China after the Great Recession. In 2010, roughly 1 percent of high-income imports from non-China of both intermediates and final goods were subject to TTBs. By 2016, that had increased to 1.7 percent of imports of intermediates, whereas the share of imports of final goods covered by TTBs had fallen to less than 0.8 percent.

Finally, the lowest row in Figure 4 indicates that since 2014, China has also used TTBs to cover an increasingly higher share of imports of intermediate inputs relative to final goods.

Overall, these data indicate that an increasingly large share of imports of intermediate inputs – initially from China, but also from non-China – became subject to the TTB protection of antidumping, safeguards, and countervailing duties over 2010-2016.

5 The sectoral allocation of post-Great Recession TTB import protection on inputs

Figure 5 illustrates the sectors over which these economies have covered large shares of imports of intermediate inputs with TTB protection, as well as the sectors for which this coverage has increased during the period since the Great Recession.

First, metals is historically a sector with high TTB coverage of trade in intermediate inputs. Even by 2010, 7.0 percent of G20 imports of metals were already covered by such policies. However, steel and aluminum were not alone. Other manufacturing sectors with a relatively high share of imports of intermediate inputs covered by TTBs include textiles and apparel, wood products, plastics and rubber, chemicals and prepared food.

Second, Figure 5 also indicates a considerable increase in the metals sector between 2010 and 2016 – from 7.0 percent to 11.6 percent – of imports of intermediates covered by TTBs. But again, the increase is also not limited to steel and aluminum. The TTB coverage of imported intermediate inputs also increased for wood products, prepared food, and electronics. However, it is worth noting that the TTB imported intermediate input coverage declined slightly in sectors like textiles and apparel, plastics and rubber, as well as chemicals after the Great Recession.

6 Potential causes of increased protection on imports of intermediate inputs

These results lead to an empirical puzzle. Given such a clear rank order in the applied tariff data – high tariffs for final goods, low tariffs for intermediates and capital goods, and thus “tariff escalation” – what explains both the reverse pattern and the potentially widening gap for TTB protection over 2010-2016?

While it is beyond the scope of this paper to present a thorough investigation of the causes, the literature suggests several likely contributors worth discussing and pursuing through further analysis.

China's export-led growth model and its integration into the international trading system have impacted the pattern of TTB protection that has arisen globally. Initially, China was the primary export target of many of the new TTB restrictions imposed in the post-2001 period (see again Figures 3 and 4). Over time, for reasons such as slowing domestic growth, it has begun to export a larger share of domestic production in sectors like steel. For products like steel, aluminum, or even solar panels, initial imposition of TTBs by major importers such as the United States or European Union has likely led to trade diversion and trade deflection.¹⁴ Thus, some of the new TTBs on non-China have arisen against competing exporters in products where trade protection from China was already granted (see again Figure 4).

Nevertheless, the main questions remain regarding the determinants of TTB protection on intermediate inputs. Has the additional protection arisen from mostly political (redistributive) objectives? Is it also due to economic incentives, e.g., to address terms-of-trade motives?¹⁵ Another possible explanation that is motivated from the prior literature is that some of the increased TTB use during this period is consistent with trade policy substitution – countries sometimes switch to TTBs to offset their more comprehensive reductions in applied tariffs.¹⁶ As illustrated in Figure 2, G20 emerging economies did liberalize tariffs beginning in the early 1990s (if not earlier) and in many cases this

¹⁴ For earlier episodes of “trade deflection” resulting from US antidumping use, see Bown and Crowley (2007). Note that this phenomenon was well underway before the Trump administration imposed US tariffs on steel and aluminum for “national security” reasons in March 2018.

¹⁵ On the latter, Bown and Crowley (2013a) provide industry-level evidence from US use of antidumping and safeguards over 1997–2006 that new US tariffs are consistent with an increase in the incentive to raise “cooperative” tariffs as in the Bagwell and Staiger (1990) model of self-enforcing trade agreements.

¹⁶ See, for example, Limão and Tovar (2011) for Turkey as well as Bown and Tovar (2011) for India.

continued into the 2000s. Not only did countries cut their applied MFN import tariffs, but many implemented additional liberalization through preferential trade agreements. Yet, if trade policy substitution away from tariffs and toward TTBs is part of the explanation for intermediate inputs, an open question is why this was delayed until the post-2010 period when most of the applied MFN tariff liberalization appears to have been implemented by 2005 (Figure 2).

A final contributing explanation is that the macroeconomic environment during the period after the Great Recession was ripe for some additional protection to arise, and it happened to materialize over imports of intermediate inputs. An existing literature has found a relationship between countercyclical macroeconomic shocks and increased TTB use historically, including during the period of 1990-2010.¹⁷ The general evidence links a country-level increase in products that it covers with TTBs to negative shocks to its domestic economy – measured as increases in the domestic unemployment rate or slowdowns to domestic real GDP growth – as well as sharp real exchange rate appreciations. The slow economic growth during the 2010-2016 period (see again Figure 1) is thus an additional potential contributing factor.

7. Implications of increased protection on intermediate inputs

This paper has documented some evidence of a shift in how countries applied import protection under their temporary trade barrier policies of antidumping, countervailing duties, and safeguards over the period of 2010-2016. Countries have continued to impose new protection on imports from China, yet a new result is that increasing protection was also being applied to imports from other (non-China) foreign sources. Furthermore, countries have switched toward imposing such protection on intermediate inputs, and the TTB coverage of intermediate inputs relative to imports of final goods has

¹⁷ See Bown and Crowley (2013b, 2014), which builds from many earlier papers in the literature examining the relationships between macroeconomic shocks (changes to the unemployment rate, real GDP growth, real exchange rate appreciations) and antidumping import protection for periods mostly through the 1980s and 1990s, most notably Knetter and Prusa (2003).

widened over time. Finally, this is not limited to the metals sector (steel and aluminum) but it has become prevalent in sectors like wood products, food products, and electronics. These results are particularly poignant, given the possibility that more protection targeted at trade in intermediate inputs may be on the policy horizon given the political developments in the UK and United States in 2016.

There are at least two channels through which increasing the cost of intermediate inputs could negatively impact other economic activity. Higher input costs would have a negative immediate impact on productivity, growth and trade in downstream products. Even if the TTBs were not a cause of the trade slowdown documented in Figure 1 (IMF 2016), the newly arising pattern of protection on intermediates may not bode well for trade growth after 2016. Second, it could also fuel a cycle of additional downstream demands for new trade barriers, or what is referred to in the literature as “cascading protectionism.”¹⁸

There are two additional potential implications of this result worth highlighting. First, it is also worth recalling that while these policies are referred to as *temporary* trade barriers for convenience, in many instances they are not removed “on time”; as such, they can become quasi-permanent forms of trade protection. Second, there may also be important institutional tradeoffs associated with the existence of TTBs. On one hand, a cooperative trade regime that faces periodically sizeable economic and trade shocks may need to allow for policies like TTBs as an ‘escape’ to keep overall import tariffs low (Bagwell and Staiger 1990; Bown and Crowley 2013a). Yet, welfare losses of trade protection can be magnified in the face of sequential production (Melitz and Redding, 2014). And allowing for TTB protection may also undermine some of the welfare gains arising from the elimination of uncertainty when countries adopt trade agreements in the first place (Handley and Limão 2015, 2017).

¹⁸ See Hoekman and Leidy (1992) for theory. For recent evidence linking upstream and downstream TTB import protection for the United States, see Erbahar and Zi (2017).

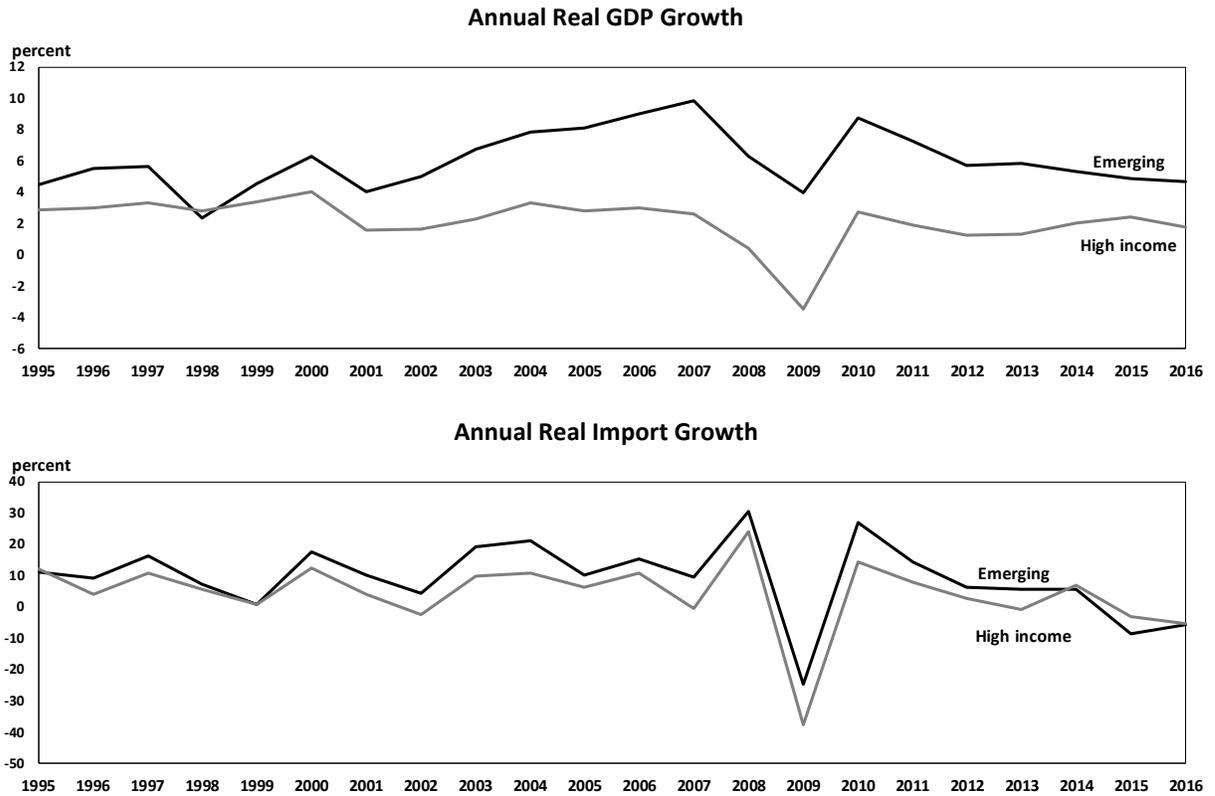
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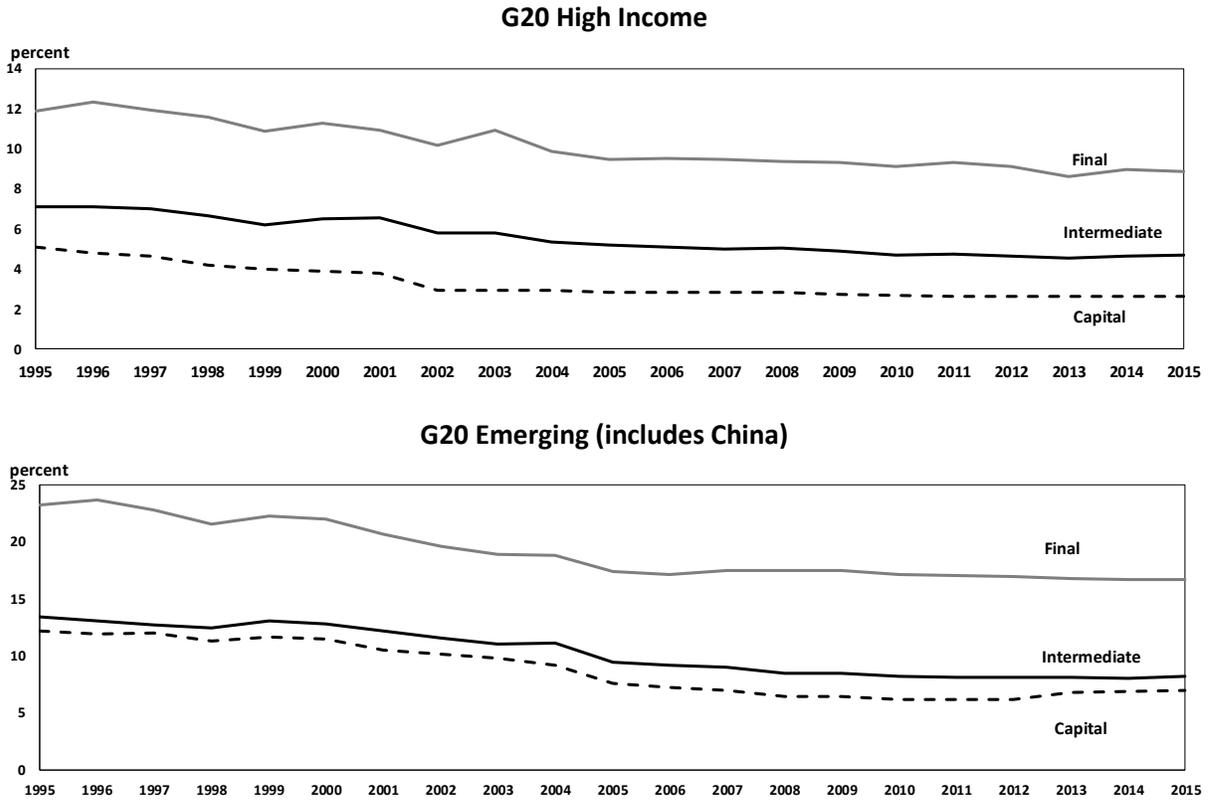
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Figure 1. G20 Economies' Real GDP and Trade Growth, 1995-2016



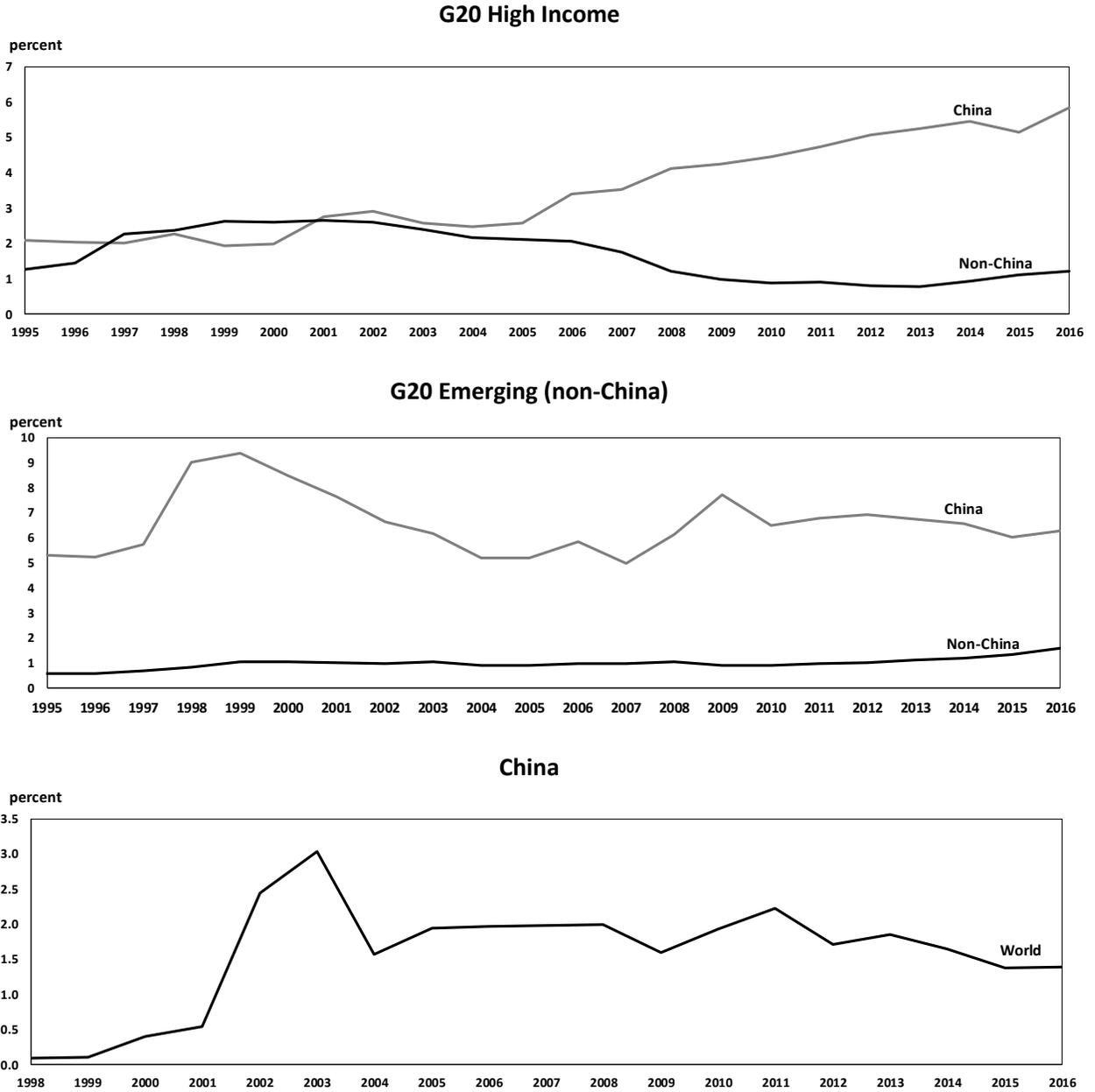
Source: constructed by the author with data from IMF (IFS and DOTS).

Figure 2. Simple average MFN applied tariffs 1995-2015, by Import product category



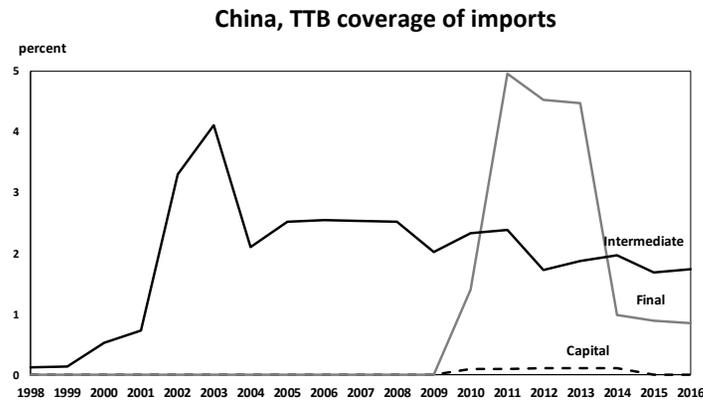
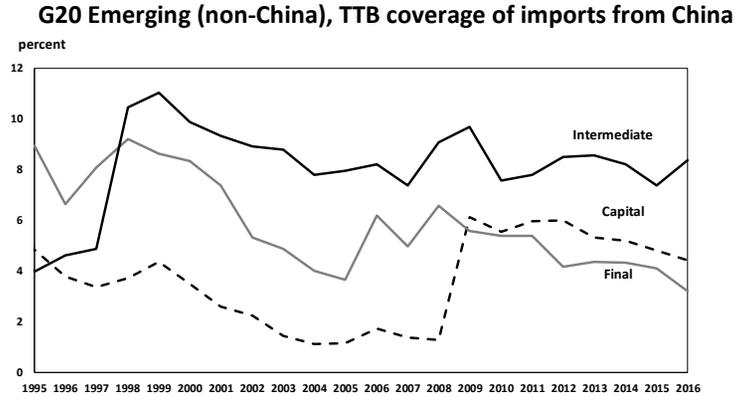
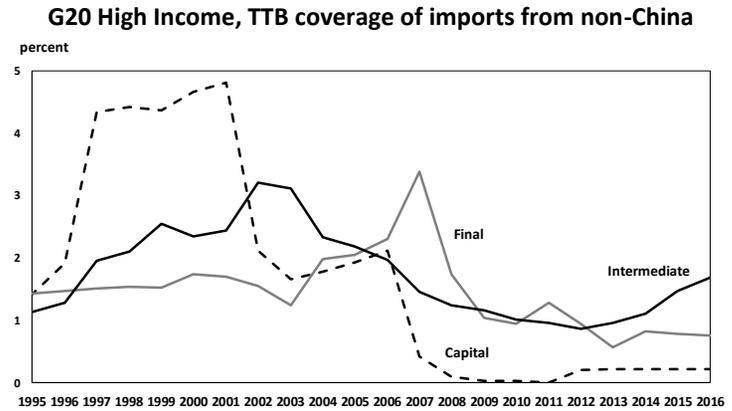
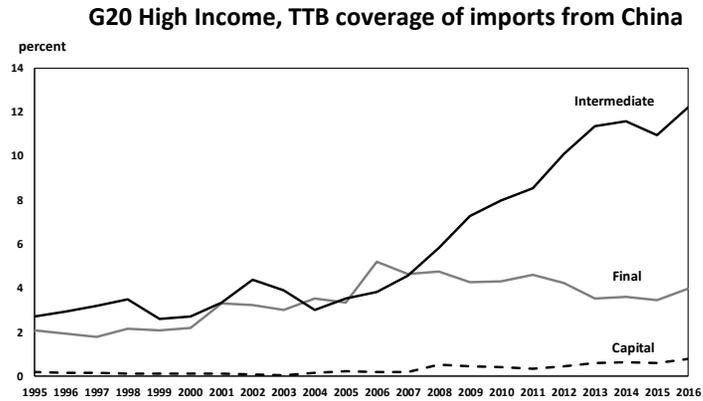
Source: simple average applied MFN tariffs at the 6-digit Harmonized System from UNCTAD TRAINS made available through WITS. Final, intermediate, and capital goods are taken from BEC concordance files.

Figure 3. G20 TTB coverage of Imports from China and non-China 1995-2016, by Policy-imposing economy



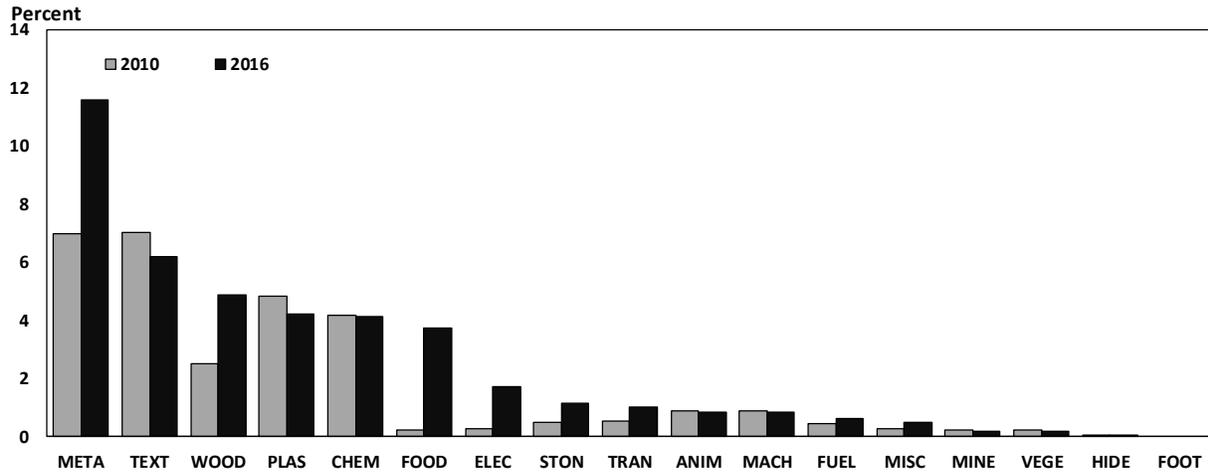
Source: Shares are trade-weighted import coverage ratios following the methodology presented in Bown (2011). Constructed by the author, computed from updated data provided in Bown (2016) and 6-digit Harmonized System trade data from UN Comtrade made available through WITS. Does not include Saudi Arabia.

Figure 4. TTB import coverage 1995-2016, by Policy-imposing economy and import product category



Source: Shares are trade-weighted import coverage ratios following the methodology presented in Bown (2011). Constructed by the author, computed from updated data provided in Bown (2016) and 6-digit Harmonized System trade data from UN Comtrade made available through WITS. Final, intermediate, and capital goods are taken from BEC concordance files. Does not include Saudi Arabia.

Figure 5. Share of G20 intermediate imports covered by TTBs by Sector, 2010 versus 2016



Notes: Shares are trade-weighted import coverage ratios following the methodology presented in Bown (2011). Constructed by the author, computed from updated data provided in Bown (2016) and 6-digit Harmonized System trade data from UN Comtrade made available through WITS. BEC concordance used to define intermediate inputs. Industry definitions found in a Table in the Appendix. Does not include Saudi Arabia.

Appendix Table: Industry classification used in the analysis

Acronym	Industry	Harmonized System 2-digit (HS02) Sections
ANIM	Animal products, live animals	01-05
VEGE	Vegetable products	06-15
FOOD	Prepared foodstuffs, beverages, spirits, vinegar, tobacco products, edible fats	16-24
MINE	Mineral products	25-26
FUEL	Mineral fuels	27
CHEM	Chemicals	28-38
PLAS	Plastics and rubber	39-40
HIDE	Hides, skins, leather, etc.	41-43
WOOD	Wood and articles of wood, pulp and paper	44-49
TEXT	Textiles, fibers, apparel, etc.	50-63
FOOT	Footwear, headgear, umbrellas, feathers, etc.	64-67
STON	Stone, cement, plaster, ceramics, glassware, pearls, etc.	68-71
META	Base metals and articles of base metal	72-83
MACH	Machinery, mechanical appliances, electrical equipment	84-85
TRAN	Transportation: vehicles, aircraft, vessels	86-89
MISC	Miscellaneous	90-97