# Global Supply Chains and Trade Policy Responses to the 2008 Crisis

*Kishore Gawande, Bernard Hoekman, and Yue Cui**

The collapse in trade and the contraction of output that occurred during 2008–9 was comparable to, and in many countries more severe than, the Great Depression of the 1930s. However, it did not give rise to the rampant protectionism that followed the Great Crash. The idea that the rise in the fragmentation of production across global value chains – vertical specialization – may be a deterrent against protectionism is underappreciated in the literature. Institutions also played a role in limiting the extent of protectionist responses. World Trade Organization discipline raises the cost of using trade policies for member countries and has proved to be a stable foundation for the open multilateral trading system that has been built over the past 50 years. Using trade and protection data for seven large emerging market countries that have a history of active use of trade policy, the influence of these and other factors on trade policy responses to the 2008 crisis are empirically examined. An instrumental variables strategy is used to identify their impact. Participation in global value chains is found to be a powerful economic factor determining trade policy responses. JEL codes: F13, F5, L52

The contraction in output and collapse in trade that followed the 2008 financial crisis was comparable to what occurred in the early years of the Great Depression of 1930. Eichengreen and O'Rourke (2012, Figure 2) depict, in parallel, how far and how fast trade collapsed following the Great Depression and the

* Kishore Gawande (corresponding author) is the Helen and Roy Ryu Professor of Economics and Government, Bush School of Government and Public Service, Texas A&M University. His email address is kgawande@tamu.edu. Bernard Hoekman is the Director of the Global Economics Program, Robert Schuman Centre for Advanced Studies at the European University Institute. His email address is bernard.hoekman@eui.eu. Yue Cui is a Senior Transfer Pricing Analyst at Ernst & Young LLP. Her email is yue.cui@ey.com. She was a graduate student at the Bush School while co-authoring the paper. This paper is a contribution to the UK-supported Global Trade and Financial Architecture project. We thank Guillaume Daudin for very generously sharing data as well as seminar participants at CERDI, the European University Institute, the Peterson Institute for International Economics, Seoul National University, and the Bush School, Texas A&M University for helpful suggestions. The revised paper has benefitted greatly from comments made by reviewers and the editor. Responsibility for any errors is ours. A supplemental appendix to this article is available at http://wber.oxfordjournals.org/.

THE WORLD BANK ECONOMIC REVIEW, VOL. 29, NO. 1, pp. 102–128 doi:10.1093/wber/lht040
Advance Access Publication January 23, 2014

2008 crisis. In the two years following the 2008 crisis, trade fell faster than during the first two years of the Great Depression.[1] The trade collapse during the Great Depression coincided with walls of tariffs rising around the world as countries closed their economies to protect producers and to keep employment from falling even further. In contrast, the 2008 crisis and its recessionary aftermath did not fuel rampant protectionism.

Most developing and emerging market countries had substantial policy latitude to raise tariffs and still remain compliant with their WTO commitments. Table 1 presents the pre- and post-crisis averages of bilateral tariffs imposed by seven large emerging market nations on their imports. Of relevance are the simple and import-weighted averages of the actual applied rates ($t$).[2] Clearly, the Depression-era scenario did not materialize and has not as of this writing. Argentina, Brazil, and Turkey show a slight increase in weighted tariff averages, whereas both measures actually *dropped* after the crisis for the other four countries. Even where protectionism by means other than tariffs was perceived after the 2008 crisis, the share of trade affected was limited. Calculations of the Anderson-Neary trade restrictiveness index (Anderson and Neary 1994; Kee, Nicita, and Olarreaga 2009) by Kee, Neagu, and Nicita (2013) suggest that less than 2% of the trade collapse may be attributed to protectionism.

The primary objective of this paper is to unpack the reasons why the deep post-2008 recession was unaccompanied by widespread protectionism. One contrast with the Depression era is that the high tariffs of that time were due to the rigid adherence of countries to the gold standard and the associated unwillingness to allow their currencies to depreciate (Irwin 2012). This predominantly macroeconomic explanation for the rise in protectionism is consistent with the inexperience that countries had with Keynesian policies, which became known much later.[3] However, the scope for governments to undertake large-scale fiscal easing is limited by high debt and mounting deficits. When macroeconomic policy is thus constrained, will protectionism surge?

Trade theory suggests good reasons why this may not be the case. One-way trade flows that involve the exchange of final consumption goods in one sector for final consumption goods in another have gradually been replaced by two-way

1. There is an emerging consensus that a decrease in demand for investment goods and consumer durables was a major cause of the 2008 trade collapse and that this may have been compounded by trade finance liquidity constraints. See Eaton et al. (2011) and Levchenko, Lewis, and Tesar (2010) on the former and Chor and Manova (2012) and Ahn, Amiti, and Weinstein (2011) on the latter. A number of initial analyses of the great trade collapse are collected in Baldwin (2009).

2. For a country such as India, these are averages taken across the country's bilateral tariffs $t_{ip}$, which may vary across partners $p$ and commodities $i$. The simple average is taken only over non-zero imports. Weighted averages weight $t_{ip}$ with imports $m_{ip}$. Because tariffs lower imports, weighted averages understate tariffs, and because simple averages disregard commodity import volumes, they overstate tariffs.

3. In the 1930s, fixed exchange rates of countries remaining on the gold standard led to real exchange rate appreciation and reduced the competitiveness of their products. Today, few of the large trading countries maintain fixed exchange rates and are able to exercise monetary policy.

TABLE 1. Simple and Weighted Average, 6-Digit HS Bilateral Tariffs

| | | Simple Mean | | | Import-Weighted Mean | | |
|---|---|---|---|---|---|---|---|
| | | Applied tariff ($t$) | Bound tariff ($t_{BND}$) | MFN tariff ($t_{MFN}$) | Applied tariff ($t$) | Bound tariff ($t_{BND}$) | MFN tariff ($t_{MFN}$) |
| ARG | 2006–8 | 10.37 | 31.69 | 12.12 | 5.46 | 31.94 | 11.89 |
| | 2009 | 9.85 | 31.23 | 11.50 | 5.96 | 31.98 | 12.90 |
| BRA | 2006–8 | 12.51 | 30.67 | 13.76 | 7.16 | 30.23 | 9.35 |
| | 2009 | 13.31 | 30.69 | 14.75 | 7.83 | 30.49 | 10.61 |
| CHN | 2006–8 | 8.84 | 9.47 | 9.30 | 4.80 | 5.22 | 4.97 |
| | 2009 | 8.04 | 9.58 | 9.23 | 4.22 | 5.02 | 4.59 |
| IND | pre-2009 | 13.13 | 38.08 | 13.37 | 9.38 | 30.22 | 9.54 |
| | 2009 | 9.31 | 37.99 | 9.53 | 8.69 | 32.99 | 8.85 |
| MEX | pre-2009 | 7.23 | 34.97 | 14.07 | 2.66 | 35.61 | 12.54 |
| | 2009 | 4.78 | 34.97 | 11.11 | 1.81 | 35.41 | 8.36 |
| TUR | pre-2009 | 2.43 | 19.67 | 4.66 | 1.97 | 20.62 | 4.79 |
| | 2009 | 2.89 | 20.06 | 5.17 | 3.04 | 22.11 | 5.60 |
| ZAF | 2006–8 | 7.84 | 20.52 | 9.72 | 6.29 | 21.86 | 7.33 |
| | 2009 | 7.40 | 20.10 | 9.78 | 6.21 | 21.25 | 7.65 |

*Notes:* 1. The three pre-2009 years for the following countries are India: 2005, 2008; Mexico 2005–6, 2008; Turkey 2005–6, 2008.

2. The import-weighted applied rates are significantly lower for countries' trade agreements (ARG, BRA, MEX).

*Source:* Authors' analysis based on tariff data in WITS database (described in the text).

intermediate input trade within the same sector. Trade in intermediates intrinsically discourages protectionism because it penalizes downstream domestic firms that rely on these imports. This process has accelerated in the past two decades as specialization has increased because of the reduction in trade costs following trade reforms and technological advances. A second trend is in evidence over the past decade as rapidly declining transport and communication costs have allowed the stages of production for a good to be separated across different borders, creating international supply chains. The classic case of Mexican maquiladoras performing the labor-intensive stages of production of auto parts to be shipped back to the US for further processing is no longer exceptional. The iPhone's supply chain, which traverses more than ten countries for eventual assembly in China, is the new "new". Because a multinational firm and its network of affiliates and arms-length suppliers drive the supply chain on both sides of the border, it has every incentive to reduce protection to zero to implement activities along the chain at the least cost.[4]

4. Supply chains may also be more resilient to trade collapses. Altomonte and Ottaviano (2009) hypothesize that the sunk cost of setting up supply chains makes firms adjust the entire chain along the intensive margin (value per trader) rather than the extensive margin (number of traders), and they find evidence that supports this hypothesis. Large multinational corporations at the center of supply chains alleviate the liquidity constraints of suppliers, protecting their chains from finance shortages.

Although the growth in integrated supply chains may restrain protectionism, the role of GATT/WTO rules and discipline in containing protectionism may be as important. These institutions have proved to be stable foundations for building multilateral trading relations over the last 50 years. Indeed, the proliferation of global supply chains is due to that stability. High-income OECD countries have all made binding commitments to keep most of their tariffs at low levels, often approximately 5% or less. During the crisis, there were no instances in which OECD countries raised tariff levels; insofar as these countries used trade policy, it was through instruments of contingent protection such as antidumping and safeguards (Bown 2011a).

In contrast, developing countries have greater scope to raise tariffs because their WTO bindings are less complete and often involve ceilings that are far higher than applied tariffs. As Table 1 indicates, the bound rates ($t_{BND}$) substantially exceed the actual applied MFN rates ($t_{MFN}$) for most developing countries. This "water" in the tariff allows countries to raise levels of protection without fear of retaliation by OECD trading partners. Because OECD countries do not have this policy space for increasing their MFN tariffs, the focus of this paper is on the behavior of the seven large emerging markets listed in Table 1: Argentina, Brazil, China, India, Mexico, South Africa, and Turkey. We use pre- and post-crisis trade and protection data to investigate the different explanations for observed trade policy responses and find an important role for international specialization – participation in global value chains – in preventing protectionism.

The plan of the paper is as follows. Section 2 presents statistics suggesting trends in protection in the seven countries that are the subject of the paper. Section 3 briefly describes forces based on both economic interest and institutions that may encourage or discourage protectionism and how they are measured in the econometric model. Section 4 reports the empirical results. An identification strategy allows causal inferences about the impact of these forces and how their impact after the crisis differed from that in period preceding the crisis. Section 5 concludes.

## I. Trends in Tariffs and Related Policies

As noted, trade protection data for Argentina, Brazil, China, India, Mexico, South Africa, and Turkey are analyzed in the paper. In addition to the fact that all of these countries are trade dependent, they were chosen because (i) their WTO bound rates exceed their actual applied MFN rates, allowing them trade policy space[5] and (ii) they are users of WTO-permitted instruments of contingent protection, such as antidumping and safeguard actions. These are disparate countries, which allow for a robust research design. Some are members of

5. The exception here is China, which bound its tariffs at applied rates upon joining the WTO in 2001. As noted, developed countries such as Canada, the EU, Japan, and the US are unable to raise tariffs because their applied tariffs have been bound.

customs unions, whereas others participate in shallower preferential trade agreements (PTAs); some keep their applied tariffs close to bound rates, whereas others apply tariffs far below their bound rates; some are large, open countries and are able to dictate terms of trade in specific goods, whereas others are small and have little market power; some are proximate to large markets, whereas others are geographically distant. All have a long history of trade policy activism driven by industrial policy, economic development, and non-economic objectives. Consistent inferences about protectionism across these heterogeneous countries would therefore suggest that such findings may be generalized.

The primary measure of protection used in the analysis, taken from the WITS database [http://wits.worldbank.org/wits/ (last accessed September, 2012)], is bilateral tariffs at the 6-digit level of the Harmonized System (HS). The disaggregate level is necessary because protection is determined at the product, not the sector, level. The MFN tariff $t_{i,\,\mathrm{MFN}}$ is the rate that a country decides to impose on imports of commodity $i$ regardless of which WTO member is the source. An exception to this non-discrimination occurs when a country enters a PTA with other countries and imposes a lower preferential tariff $t_{i,\,\mathrm{PRF}}$ ($\leq t_{i,\,\mathrm{MFN}}$) on imports from PTA partners. A country's actual applied tariff on imports of commodity $i$, $t_i$, is therefore equal to $t_{i,\,\mathrm{PRF}}$ or $t_{i,\,\mathrm{MFN}}$, depending on the source (possibly higher if the source is a non-WTO country). Appendix Table S.1 (in the supplemental appendix available at http://wber.oxfordjournals.org/) shows the average applied tariff $t$ that the seven countries impose on imports from their top 15 partners. For example, US exports to Argentina face a (trade-weighted) average tariff of 7.40%, whereas exports from Brazil are free. The average difference in post-crisis and pre-crisis applied tariffs ($\Delta t$) indicates little change except in these atypical cases: the weighted average of Argentina's applied tariffs on French imports rose by 3.04 percentage points (from 5.27% to 8.31% after the crisis); Brazil's applied tariffs on Korean imports rose by 4.12%; India's applied tariffs on imports from Hong Kong rose by 4.22%; Mexico's applied tariffs on Brazilian imports rose by 3.69%; and Turkey's applied tariffs on Russian and Uzbek imports rose by 2.89% and 3.89%, respectively (most likely as a revenue-raising device because these are primary commodity imports, mainly oil and gas). The $\Delta t$ column indicates these are clearly exceptions; increases in the average tariff were barely perceptible across partners, and in many cases, the average tariff was actually lower post-crisis.

Bound tariff rates ($t_{i,\,\mathrm{BND}}$) are what WTO members negotiate for each commodity $i$ during multilateral trade rounds. The bound rate is the maximum MFN tariff a country may levy on commodity $i$. WTO members can and do keep their applied MFN tariffs below bound levels. Those that do so have the flexibility to increase their applied tariffs while abiding by WTO rules. The commitment made by countries to these bound rates means that the bound rates are ceilings for actual applied rates. As shown in Table 1, the average bound tariffs in most

emerging countries are three times the average applied rates, implying the existence of significant water in the tariff. The last column in Table S.1 (online appendix) shows the average of the difference in difference $\Delta(t - t_{\mathrm{BND}}) = \Delta t - \Delta t_{\mathrm{BND}}$ between the actual and bound rates for important partners.[6] The $\Delta(t - t_{\mathrm{BND}})$ column indicates that, except for the few cases noted, the available policy latitude remained unused. Avenues other than tariffs – antidumping duties (AD), countervailing duties, safeguards, and other nontariff barriers (NTBs) – were not overly used, even though the seven countries have an active track record as users of such measures.[7] Bown (2011a) indicates no significant upsurge in contingent protection (temporary trade barriers such as AD) in these countries. Finally, according to the Global Trade Alert (GTA) database, which tracks the flow of non-tariff measures other than transparently documented NTBs such as AD and countervailing duties (CVD), the overall increase in protectionism has remained limited.[8] The following sections address the main question of why the trade shock did not translate into significant increases in tariffs.

## II. Econometric Model of Trade Policy and Identification

### *Model*

The empirical analysis is framed as a clash between two classes of explanations, interest-based and institutions-based. Both are clearly relevant, and the model attempts to quantify their influence. The following econometric model posits that a country's bilateral tariffs are formed as

$$t_{ip} = \mathrm{S}_{ip}\Delta + \mathrm{R}_{ip}\mathrm{B} + \mu_p + \mathrm{e}_{ip}, \tag{1}$$

where $t_{ip}$ is the country's applied tariff on commodity $i$ sourced from partner $p$, $\mathrm{S}_{ip}$ is a vector of variables that measures institutions, and $\mathrm{R}_{ip}$ is a vector of variables that measures interest. The vector of coefficients $\Delta$ and B measure their respective marginal impact on protection. Because the institution and interest

6. Because $(t - t_{\mathrm{BND}}) \leq 0$, if $\Delta(t - t_{\mathrm{BND}}) > 0$, it is implied that the applied tariffs approached their bounds from below; that is, the applied rates were closer to the bound rates in 2009 than in the years immediately before the crisis.

7. The Global Trade Alert (GTA) database (http://www.globaltradealert.org/) documents new non-tariff barriers (NTBs) after November 2008. Table S.2 in the (online) appendix indicates an assortment of measures designed to protect domestic producers (Evenett 2010). As of March 2011, there were 1,385 actions discriminating against foreign producers ("red" measures), including industry-specific guarantees, subsidies, tax relief, export credit insurance, and loans. Because the GTA starts in November 2008, it is not possible to assess whether measures increased in 2009. It appears that the number of new NTBs imposed in the period following the crisis was relatively stable, with little yearly variation.

8. See also Bown (2011b, Figure 2), who suggests that the trend toward greater NTB use started before the recession in 2007. In the same article, Table 2 indicates that only China showed any noticeable increase in the amount of imports on which temporary trade barriers were imposed after the crisis.

measures are sector specific (below), $\mu_p$ captures partner-fixed effects. The model's error term $e_{ip}$ is likely to be correlated with some regressors and may have within-commodity correlations. An effective instrumental variables (IV) strategy accounts for such endogeneity and a correction for clustering for such correlations. The model is extended to detect whether and how structural change in the post-crisis period affected tariffs in the seven countries.

INTEREST. This paper suggests a new interest-based explanation: vertical specialization. Among the major transformations that separate today from the Depression era are exponentially lower transport and communication costs. Not only has trade expanded substantially, but lower costs have also allowed stages of production to be separated without concern for geography in search of the production locations with the lowest cost. Global supply chains now enable multiple countries to contribute intermediate inputs to different stages before the final good is delivered to its destination.

Combining input-output data with bilateral trade data, Johnson and Noguera (2012) quantify the current extent of multi-country production sharing by computing the ratio of the domestic content of exports or *value added exports* to gross exports – the "VAX ratio". Without trade in intermediates, the VAX ratio equals one, whereas production sharing across borders lowers it.[9] The bilateral VAX ratio for the US varies between 0.57 with Canada (a large amount of production sharing) and 0.96 with Japan (little production sharing). The same ratio for imports varies between 0.62 (Canada) and 1.07 (Japan). In general, the US VAX ratio with EU partners France, UK, and Germany is around one; with geographically close partners such as Canada and Mexico and Asian partners such as Malaysia, Taiwan, China, and Korea, it drops to approximately 0.6. The same ratio for imports is of similar magnitude with these partners.

These findings have implications for the demand for protection. If output is falling, protectionism cannot shelter a domestic market. Protecting a stage of production is different from protecting the market for a good with no production sharing. Protecting a stage of production raises the cost of vertically specialized intermediates produced in that stage to the next user downstream, which may be

9. This also implies that gross bilateral exports incorrectly state the amount of *value added* by a country that is incorporated in its exports to a destination. A correct measure of domestic content embodied in a country's exports must take account of the production sharing across borders before these stages of production deliver a final good to a destination. If semi-processed Japanese goods enter Singapore, where a small amount of value is added before the good is shipped for consumption to India, then gross Singapore-India exports overstate the true domestic content (value added) of Singapore that is embodied in Singapore-to-India exports, and gross Japan-India exports understate Japan's true domestic content that is embodied in Japan-to-India exports. The VAX ratio is therefore much lower than one for Singapore's exports to India and greater than one for Japan's exports to India.

located in a partner country, lowering demand for the output from the protected stage. With cross-border production sharing, where stages alternate across borders (US-Canada trade in auto parts), there is even less incentive to demand protection because it raises the costs of intermediates to downstream producers within the protected country itself. With large vertically integrated enterprises, the same firm performs different stages of production. It makes little sense for a firm to take an action that ultimately raises its own costs. This situation suggests a simple maxim: the greater production-sharing (participation in international supply chains) is, the lower incentives are for local producers to demand import protection.[10]

To see whether the maxim is empirically true, two measures of vertical specialization are used. These measures, based on Hummels, Ishii, and Yi (2001) and Yi (2003),[11] have recently been constructed by Daudin, Rifflart, and Schweisguth (2011). The first measure, *VS,* is the share of imports in a sector that is used directly and indirectly—that is, embedded as intermediate inputs in the country's own exports. The second measure, *VS*1, is the proportion of a sector's exports that is used as intermediates by exporters in *other* countries. This measure captures the intensity of two sources of anti-protectionist pressure. High tariffs on imports in a sector undermine the competitiveness of the sector's exports that intensively use those imports. Input-output tables indicate that the same sector is the largest user of imports by that sector. Exporters of that sector are therefore a source of anti-protectionism because they will lobby against tariffs that raise their input costs, making them uncompetitive. The second source of anti-protectionism is foreign lobbying (e.g., Gawande, Krishna, and Robbins 2006) by exporters in countries that are dependent on the source country to supply them with the intermediate inputs. Low or zero tariffs in the source country are desirable for keeping their input costs down. In industries that are less linked, *VS* and *VS*1 are low, and incentives to restrict trade remain.

More generally, any interest-based source for trade policy should account for the fact that trade in intermediates comprises two-thirds of world trade. The explosion in intermediate trade appears to verify the large gains from trade demonstrated in Ethier (1982), affirming Ethier's idea that trade expands production possibilities by widening the range of intermediates that can be used. This is potentially a source of strong anti-protectionist pressure. Downstream users of intermediate goods are natural lobbyists against border tariffs on such goods because tariffs only increase their input costs. Car producers, for example, want low or no tariffs on steel. Gawande, Krishna, and Olarreaga (2012) show how lobbying by downstream industries may counter the demand for protection by

10. The collapse in trade, triggered by the collapse of output during the US financial crisis, was amplified by the linkage effects of international supply chains (Bems, Johnson and Yi 2009). The reverse implication is that as output picks up, trade should rapidly increase, as has occurred after 2011.

11. Guillaume Daudin generously provided the disaggregated measures, for which we are very grateful. Vertical specialization measures are constructed at the GTAP level of aggregation of 57 sectors, which are mapped to the HS6 level according to a concordance provided by GTAP.

upstream producers that compete with imports. In their model, all else held constant, tariffs should vary inversely with the intermediate use-to-gross output ratio across commodities.[12] Intermediate use-to-gross output ratio is used to capture the intensity of counter-lobbying by downstream users against protection to upstream industries. This variable (*%IntermediateUse*) is constructed by aggregating the proportions across sectors (columns) in input-output use matrices from the OECD.[13]

A different logic was advanced in the "new" trade theory originating in the 1980s to explain two-way intra-industry trade. For such trade in finished goods, Krugman's (1981) model with different countries specializing in different *varieties* of similar products demonstrated large gains from trade. However, models featuring domestic and foreign duopolies indicated that – unlike models assuming zero-profit monopolistic or perfect competition – intra-industry trade does not necessarily mean freer trade because these market structures allow rents to be shifted from foreign to home firms through strategic tariff policy. Although the optimal action for both countries is to reduce tariffs, the unilateral incentive is for governments to use tariffs to play zero-sum games. If tariffs are strategic, a positive correlation between intra-industry trade and rents imply that tariffs should be positively associated with intra-industry trade.[14]

Intra-industry trade in goods is proxied using the Grubel-Lloyd (1971) measure, defined at the HS 6 digit level as $IIT = 1 - |\text{Imports-Exports}|/(\text{Imports} + \text{Exports})$. *IIT* lies between 0 (no intra-industry trade) and 1 (two-way trade in equal amounts). Measuring *IIT* at a higher level of aggregation (say the 4-digit ISIC level, as is current practice) captures both horizontal and vertical *IIT* because higher levels of aggregation involves trade in intermediates as well as more processed goods that constitute a specific 4-digit sector. Disaggregating at the 6-digit HS allows *IIT* to better capture two-way trade in differentiated products. To the extent that *IIT* is correlated with *VS* measures and *%IntermediatesUse*,

12. Gawande, Krishna, and Olarreaga (2012) extend Grossman and Helpman (1994) to generate the following counter-lobbying model: $\frac{t_i}{1+t_i} = \frac{1}{a}\left[\frac{z_i}{e_i} - \frac{z_i}{e_i}\sum_{j=1}^{\infty}\frac{a_{ij}\cdot y_i}{y_i}\right]$, where $z_i$ is sector $i$'s inverse import-to-gross output ratio, $e_i$ is the absolute import demand elasticity in sector $i$, $a$ is the political economy parameter indicating the relative weight government puts on a dollar of welfare relative to a dollar of contributions from industry lobbies, and $\sum_{j=1}^{\infty}\frac{a_{ij}\cdot y_i}{y_i}$ is the intermediate use for good $i$, where $a_{ij}$ units of good $i$ are used to produce one unit of good $j$ and $y_j$ is the gross output of good $j$. When there is no intermediate use ($a_{ij} = 0$), the model reverts to that of Grossman and Helpman (1994).

13. *%IntermediateUse* for good $i$ is defined as $\sum_{j=1}^{\infty}\frac{a_{ij}\cdot y_i}{y_i}$; see the previous footnote. It is calculated using OECD input-output (I-O) tables, available at http://www.oecd.org/sti/inputoutput/. The tables are constructed for 48 sectors (OECD's STAN system), which are first mapped into ISIC rev. 3 according to the concordance in De Backer and Yamano (2008, Table 2) and then mapped into HS6. The I-O tables are chosen, based upon availability, from the years closest to 2005. For the seven countries, the I-O matrices are for the following years: ARG 1997; BRA 2005; CHN 2005; IND 2003-04; MEX 2003; TUR 2002; and ZAF 2005.

14. Jorgensen and Schroder (2006) show that an optimal tariff exists below which welfare is reduced because there are too few domestic varieties and beyond which there are too many inefficiently produced, costly domestic varieties.

conditioning on these should separate incentives for and against protection in each measure.

INSTITUTIONS. Institutions such as the WTO and PTAs constrain the scope for tariffs to be increased when producers are faced with shocks that shrink their export markets and intensify competition at home. Mechanisms by which these institutions overcome negative externalities, described below, are a dominant theme in explaining their emergence and endurance.

The ability of the GATT/WTO to solve the terms of trade (TOT) externality, without which countries would impose optimal tariffs against each other, is a prevailing explanation for these institutions (Bagwell and Staiger 1999; Johnson 1954). Ossa (2011) advances the idea that, in addition to TOT externalities, the WTO allows governments to internalize production-location externalities.[15] This argument is in line with the role of the WTO in quelling protectionism because of countries' desires to use policy to shift production to domestic locations – a major reason why tariffs exploded in the 1930s – rather than for optimal tariff (i.e., TOT) reasons. The WTO principles of reciprocity and nondiscrimination enable governments to internalize this externality by allowing them to negotiate rules that restrict their ability to engage in production-relocation efforts.

Membership in the WTO provides a mechanism for governments to deflect protectionist pressures from domestic special interests. The need to abide by WTO commitments and rules can be invoked by a government as a valid reason for telling lobbies that adherence to those rules as a signatory to the WTO limits its policy latitude. The same is true for PTAs (Ethier 1998). This role of trade agreements as a commitment device is a core element of the policy literature (Hoekman and Kostecki 2009) and has been theoretically examined by Staiger and Tabellini (1999), Maggi (1999), and, in the context of regional trade agreements, Maggi and Rodriguez-Clare (1998). Empirical support for this idea has been presented in Bown (2004).

Whether WTO rules and PTAs eliminate some type of externality or provide a commitment device to governments seeking to escape the influence of powerful lobbies, they may prevent trade wars. This is another potential reason why the large trade and output collapses following the 2008 crisis were not accompanied by an outbreak of protectionism.

To measure the influence of these institutions on tariffs, this paper takes a grassroots approach. A strategic reason for a country to negotiate high bound rates in multilateral negotiations is to give it the policy space to raise tariffs in the

15. By making a foreign product more expensive in the domestic market, a tariff shifts consumer expenditure toward domestic output. The greater profitability for domestic producers induces entry into the home market and exit out of the foreign market. Because of trade costs due to geography, this relocation of production increases domestic welfare and reduces foreign welfare. The share of goods consumed by domestic consumers that is subject to trade costs is reduced, whereas the share of goods consumed by foreign consumers that is subject to trade costs increases.

future. Therefore, the measure of the influence of institutions is based on $t_{i,\mathrm{BND}}$ (as amended below). A political economy basis for this measure is that bound rates are largely determined by a tariff-cutting formula referenced to a previous unilaterally determined structure. Because the structure of bound rates reflects the historical structure and the political economy embedded in that structure, it may be expected that applied rates are scaled down similarly so that the political status quo is maintained in the new structure of applied tariffs. In the extreme case that the applied rate structure is simply the result of a linear formula applied to the bound rates, the regression (1) should indicate the formula for each country, with nothing left for other variables to explain.

Deviations from the bound (and MFN) rate obviously occur.[16] The primary example of this is preferential tariffs and reciprocal concessions by trading partners in PTAs. Foletti et al. (2011) note that PTAs are a primary reason why the level of the tariff binding exaggerates the amount of policy latitude. Preferential tariffs among PTA partners lower the level of "water" in the tariff by constraining the scope to increase tariffs on PTA partners.[17] The influence of institutions is represented by the variable $t_{ip,\ \mathrm{BNDPRF}}$, equal to a country's WTO bound on commodity $i$ ($t_{i,\ \mathrm{BND}}$), but it is replaced by the PTA tariff ($t_{ip,\ \mathrm{PRF}}$) whenever it applies.[18]

For each of the seven countries, the 6-digit HS level data are pooled across partner countries. Table 2 reports descriptive statistics for the variables used in the analysis.

### *Identification*

An instrumental variables (IV) strategy is used to address the endogeneity of the three variables *VS*, *VS1*, and %*IntermediatesUse*. The endogeneity is because shocks to tariffs in sector *i* make imports in sector *i* costlier. Input-output tables use data at the ISIC 4-digit level and indicate that the largest using sector is usually the *same* sector. An increase in tariffs reduces the competitiveness of the sector's output by raising its cost to using sectors and enhances the competitiveness of global suppliers of the same product. Because manufacturing sectors are their own largest users, as the output of a sector shrinks, so does the demand for the output from users in the same sector. Therefore, %*IntermediatesUse* is affected by tariff shocks. Further, the loss of competitiveness means that demand from

16. By placing an upper bound on the cost of accessing a market, tariff bindings reduce uncertainty facing exporters. Because this uncertainty deters investments to produce in or for a market, reductions in policy uncertainty will increase the risk-adjusted rate of return and spur greater entry, raising welfare (Francois and Martin 2004; Handley and Limão 2012).

17. Another reason that Foletti et al. offer is that if the bound rate is too high, it exceeds the prohibitive tariff at which imports fall to zero. Then, the prohibitive tariff defines the effective bound. Nevertheless, they conclude that most countries still have substantial leeway to increase their applied tariffs; the policy space remains, on average, at more than 60% of the "water" (i.e., the difference between applied and bound rate).

18. More precisely, for imports from WTO member countries, $t_{ip,\ \mathrm{BNDPRF}} = t_{i,\ \mathrm{BND}}$ for non-PTA partners and $t_{ip,\ \mathrm{BNDPRF}} = t_{ip,\ \mathrm{PRF}}$ for PTA partner $p$. Note that $t_{i,\ \mathrm{BND}}$ is the same across WTO members (hence the absence of subscript $p$), but it may be different for non-member country partners.

TABLE 2. Descriptive Statistics

| | ARG | | BRA | | CHN | | IND | | MEX | | TUR | | ZAF | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mean | sd | mean | sd | mean | sd | mean | sd | mean | sd | mean | sd | mean | sd |
| $t$ | 10.185 | 7.253 | 12.734 | 7.471 | 8.786 | 6.069 | 11.889 | 12.085 | 7.114 | 9.721 | 2.660 | 11.266 | 12.605 | 12.639 |
| $t_{BND}$ | 31.601 | 6.228 | 30.631 | 6.865 | 9.665 | 6.130 | 38.052 | 26.123 | 35.023 | 3.514 | 20.212 | 20.069 | 27.652 | 24.119 |
| $t_{BNDPRF}$ | 26.990 | 12.324 | 27.706 | 10.831 | 8.964 | 6.136 | 36.594 | 26.312 | 16.475 | 17.002 | 8.372 | 18.610 | 21.887 | 24.342 |
| IIT | 0.075 | 0.196 | 0.104 | 0.223 | 0.197 | 0.276 | 0.181 | 0.274 | 0.079 | 0.198 | 0.132 | 0.243 | 0.085 | 0.206 |
| %IntermediatesUse | 0.774 | 0.263 | 0.638 | 0.268 | 0.771 | 0.278 | 0.604 | 0.282 | 0.777 | 0.294 | 0.757 | 0.317 | 0.684 | 0.311 |
| *VS* | 0.290 | 0.085 | 0.166 | 0.054 | 0.266 | 0.059 | 0.257 | 0.075 | 0.266 | 0.138 | 0.291 | 0.077 | 0.192 | 0.049 |
| *VS*1 | 0.206 | 0.090 | 0.210 | 0.097 | 0.226 | 0.097 | 0.236 | 0.082 | 0.125 | 0.076 | 0.220 | 0.068 | 0.206 | 0.111 |

*Notes:* 1. The sample is organized bilaterally for each country. Only large partners are included (imports from partner >$750 Mn. in 2009).

2. Data for all countries pooled across 2006–9, except India: 2005, 2008, 2009; Mexico 2005–6, 2008, 2009; Turkey 2005–6, 2008, 2009. Sample size: ARG: 145642; BRA: 199533; CHN: 275344; IND: 75930; MEX: 232019; TUR: 91401; ZAF: 119400.

3. Agriculture, Mining, Manufacturing sectors included in analysis.

Variable

$t$ Applied Tariff at HS-6 digits. Percentage points. *Source:* WITS database.

$t_{BND}$ Bound Tariff Rate at HS-6 digits. Percentage points. *Source:* WITS.

$t_{BNDPRF}$ Bound Tariff Rate, replaced by Preferential rate at HS-6 digits. $t_{BNDPRF} = t_{BND}$, but replaced by $t_{PRF}$ where applicable. *Source:* WITS.

IIT Bilateral intra-industry trade: IIT = 1 − |Imports-Exports|/(Imports + Exports). HS 6 digits. *Source:* WITS database.

%IntermediatesUse Fraction of output used as intermediates inputs by all other sectors. (See eq. (1)) *Source:* UNCTAD Input-output data (aggregated at 48 sectors).

*VS* Vertical Specialization Measure 1: % of output used as intermediates by exporters in the same country *(Source:* VS in Daudin et al. 2011). Contructed at GTAP aggregation of 55 input-output sectors, then mapped into HS 6 digits.

*VS*1 Vertical Specialization Measure 2: % of output used as intermediates by exporters in all countries (*Source:* VS1 in Daudin et al. 2011). Contructed at GTAP aggregation of 55 input-output sectors, then mapped into HS 6 digits.

users outside the sector drops. Because the drop in demand includes using sectors located in other countries, *VS* and *VS1* are also affected. Not accounting for this endogeneity induces downward bias in the coefficients of the three variables.

The IV strategy is simple: variables for the US are used to instrument for the corresponding variables for the sample countries. Thus, the *VS, VS1,* and *%IntermediatesUse* measures for the United States are used to instrument India's *VS, VS1,* and *%IntermediatesUse* measures. Using India as an example clarifies why this IV strategy is effective. Shocks to India's tariffs in sector *i* affect Indian users of the output of that sector as intermediate inputs much more than American users of (sector *i*'s) Indian output. Even if American users were dependent on imports from India, they could search the world for the next lowest cost producer of good *i*. In general, input-output tables indicate that using sectors are more dependent on domestic producers than imports, reflecting trade costs due to geography and other factors. Thus, *%IntermediatesUse* in sector *i* in the US is more immune to an Indian tariff increase in sector *i* than is India's *%IntermediatesUse* in the sector.

Similarly, *VS* for sector *i* in the US is immune to an Indian tariff increase in sector *i* because the tariff increase lowers the Indian competitiveness of that sector's output in the world export market more than it lowers the American competitiveness of that sector's output (unless the sector is heavily dependent on imports of *i* from India). The same argument applies for *VS1*. The US is relatively inward looking in the sense that American users source a greater proportion of their goods and services domestically compared with most other open countries. Its large size creates a home bias, as gravity models have affirmed. In that sense, the US variables are more immune to tariff shocks in other countries, making them appropriate instruments. The empirical relevance of the instruments comes from matching cross-sectional variation in the US variables with those of the corresponding variables in the countries in the sample. Because the structure of production in terms of intermediate use is not dissimilar across countries, the US variables are not expected to suffer from the weak instruments problem.

The exogeneity of $t_{\mathrm{BNDPRF}}$ is maintained. Bound rates are set via a multilateral bargaining process that determines actual tariffs but is not determined by them. In a dynamic sense, actual tariffs and the water in the tariffs may allow bound rates to decrease during the subsequent bargaining process, but these changes are infrequent and determined by a process that is exogenous in the short run, certainly over the duration of the data used here. For similar reasons, preferential rates are taken to be determined exogenously. Intra-industry trade is also considered exogenous in the analysis, although it is possible that shocks to tariffs may inhibit *IIT*. The coefficient on *IIT* is therefore biased downwards. Empirically, *IIT* correlates poorly with the other variables, so any bias in the coefficient on *IIT* does not affect other coefficients.

## III. Results

### *Baseline IV Model*

A baseline set of results from (1) is first presented in Table 3. These results are intended to demonstrate that the cross-sectional pattern of bilateral tariffs at the HS6-digit level accords with the "interest and institutions" specification in the seven countries. Although the interest variables *VS, VS1,* and *%IntermediatesUse* distinguish the use of a sector's output by different users, they remain correlated.[19] For India and South Africa, for example, collinearity requires that the variables be included one at a time. In Table 3, the results from three models are presented with different combinations of interest variables. Partner fixed effects are included. Standard errors are corrected for clustering on HS6 products; otherwise, the standard errors are underestimated.

There are four main results:[20]

(i) The coefficients on the bound rates are sharply estimated. However, with the exception of China, they are not close to unity, indicating the availability of substantial policy space. In other countries, $t_{\text{BNDPRF}}$ is not the sole, or even the most important, determinant of the applied tariff structure. Although Argentina and Brazil belong to the Mercosur agreement, the coefficient on $t_{\text{BNDPRF}}$ is far below 1, and interest plays a large role in determining which sectors may or may not receive protection.[21] The same is true for India, Mexico, South Africa, and Turkey.

(ii) Intermediate use of a country's output by *foreign* exporters (*VS1*) is a powerful force against protectionism in *all* country samples. The negative coefficients on *VS1* suggest that home governments are keen to advance the interests of their exporters by reducing tariffs on the inputs used by (upstream) home exporters to enhance their competitive position with foreign users. That these supply chains crisscross the home country a number of times is an added reason to keep tariffs down. The negative coefficients on *VS1* may also be taken as evidence for the idea that exporters in *foreign* countries may politically influence home tariffs because their competitiveness depends on the supply of cheap inputs from home producers. One mechanism to achieve this is to press their own governments

19. The data sets are appropriately constructed at HS6 because the tariff policy (the dependent variable) is formulated at that level of disaggregation. The variables *VS, VS1,* and *%IntermediatesUse* are constructed a higher level of aggregation and are replicated at the HS6 level. This is one reason for the strong correlations among them. See also the robustness-for-clustering discussion at the end of Section 4.

20. OLS estimates from the same model with partner fixed effects are reported in the online appendix (Table S.3). The models fit the data well. Although many OLS inferences hold up in the IV models, differences remain. Our working paper, Gawande et al. (2011), provides details.

21. If the GATT/WTO rules kept applied tariffs in check, then the small coefficient on $t_{\text{BNDPRF}}$ should not necessarily be a feature of belonging to PTAs (Argentina and Brazil). The row of coefficients on $t_{\text{BNDPRF}}$ indicates that this is indeed the case: the small coefficient on $t_{\text{BNDPRF}}$ is the rule, not the exception, even for countries that trade actively outside regional blocs.

TABLE 3. Baseline Models of Applied Bilateral Tariffs Instrumental Variables with Partner Fixed-Effects and Errors Clustered on HS6-digit Products

| | ARG | | | BRA | | | CHN | | | IND | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $t_{BNDPRF}$ (+) | 0.143*** | 0.225*** | 0.152*** | 0.277*** | 0.315*** | 0.275*** | 0.965*** | 0.968*** | 0.962*** | 0.212*** | 0.260*** | 0.253*** |
| *Bound or Preferential Rate* | [0.015] | [0.015] | [0.016] | [0.015] | [0.014] | [0.014] | [0.006] | [0.005] | [0.006] | [0.038] | [0.025] | [0.024] |
| IIT (−) | 1.757*** | 1.869*** | 1.207*** | 1.128*** | 1.573*** | 1.137*** | −0.067*** | −0.0486** | −0.069** | −0.228 | −1.072*** | −1.073*** |
| *Intra-industry Trade* | [0.203] | [0.206] | [0.243] | [0.164] | [0.166] | [0.163] | [0.024] | [0.0236] | [0.028] | [0.293] | [0.238] | [0.234] |
| VS (−) | 17.99*** | | | 28.18*** | | | 1.961*** | | | −40.09** | | |
| *% used by domestic X* | [2.621] | | | [5.467] | | | [0.560] | | | [16.59] | | |
| VS1 (−) | −8.583*** | | −34.40*** | −28.34*** | | −25.68*** | −0.883*** | | −4.323*** | − | | −27.55*** |
| *% used by dom + foreign X* | [1.472] | | [4.111] | [1.933] | | [2.260] | [0.198] | | [1.074] | − | | [3.775] |
| %IntermediateUse (−) | | 4.469*** | 13.57*** | | −3.185*** | 3.699*** | | 0.303** | 2.012*** | | −5.928*** | − |
| *% used by all domestic users* | | [0.695] | [1.668] | | [0.464] | [0.934] | | [0.151] | [0.565] | | [1.278] | − |
| *N* | 145228 | 144033 | 144033 | 199776 | 197671 | 197671 | 285365 | 271125 | 271125 | 75424 | 75259 | 75259 |
| partner FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| #Instruments | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 1 | 1 | 1 |
| # clusters | 3823 | 3768 | 3768 | 4033 | 3980 | 3980 | 4122 | 3877 | 3877 | 2596 | 2593 | 2596 |
| Kleibergen-Paap WI stat. | 1231 | 106526 | 6814 | 5192 | 165149 | 21191 | 7769 | 48239 | 2336 | 844.8 | 17198 | 368418 |
| Anderson-Rubin (*F*) | 16.74 | 43.33 | 51.94 | 165.9 | 47.96 | 140 | 12.71 | 4.069 | 12.76 | 6.681 | 21.71 | 53.96 |
| Anderson-Rubin (*p*-val) | 0.000 | 0.000 | 0.000 | 0.000 | 0 | 0.000 | 0.000 | 0.043 | 0.000 | 0.010 | 0.000 | 0.000 |

TABLE 3. Continued.

| | MEX | | | TUR | | | ZAF | | |
|---|---|---|---|---|---|---|---|---|---|
| $t_{BNDPRF}$ (+) | 0.227*** | 0.237*** | 0.236*** | 0.398*** | 0.400*** | 0.392*** | 0.268*** | 0.135** | 0.201*** |
| *Bound Rate (= Preferential if applicable)* | [0.014] | [0.015] | [0.015] | [0.051] | [0.050] | [0.0474] | [0.071] | [0.060] | [0.062] |
| IIT (−) | 0.14 | −0.478*** | −1.166*** | −1.086*** | −1.155*** | −1.071*** | 0.682* | 0.674 | 0.216 |
| *Intra-industry Trade* | [0.304] | [0.141] | [0.154] | [0.318] | [0.334] | [0.333] | [0.376] | [0.413] | [0.307] |
| VS (−) | −37.72*** | | | 5.114 | | | 104.6*** | | |
| *% used by domestic X* | [7.904] | | | [4.018] | | | [13.87] | | |
| VS1 (−) | −59.11*** | | −37.83*** | −24.16*** | | −34.08*** | − | | −25.64*** |
| *% used by dom + foreign X* | [7.799] | | [2.583] | [3.713] | | [12.18] | − | | [3.242] |
| %IntermediateUse (−) | | −0.984*** | 4.988*** | | −3.708*** | 2.288 | | −13.55*** | − |
| *% used by all domestic users* | | [0.337] | [0.654] | | [1.031] | [2.868] | | [1.962] | − |
| *N* | 261343 | 228664 | 228664 | 94983 | 90294 | 90294 | 239796 | 117107 | 239796 |
| partner FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| #Instruments | 2 | 1 | 2 | 2 | 1 | 2 | 1 | 1 | 1 |
| # clusters | 4181 | 3712 | 3712 | 1990 | 1868 | 1868 | 3880 | 1921 | 3880 |
| Kleibergen-Paap WI stat. | 1319 | 153039 | 24090 | 7916 | 51662 | 3123 | 7899 | 43987 | 383549 |
| Anderson-Rubin (*F*) | 184.8 | 8.526 | 164.8 | 26.55 | 12.69 | 26.56 | 65.11 | 48.47 | 24.73 |
| Anderson-Rubin (*p*-val) | 0.000 | 0.00352 | 0.000 | 0.000 | 0.000376 | 0.000 | 0.000 | 0 | 0.000 |

*Notes:* 1. Standard errors in brackets; ***p < 0.01, **p < 0.05, *p < 0.10

2. Corresponding US variables used as instruments.

*Source:* Authors' analysis based on data described in the text.

to bargain with the home government to reduce their tariffs; another mechanism involves directly lobbying the home government. Because *VS1* is closely related to multinational activity with their affiliates and the foreign direct investment (FDI) undertaken by these multinational enterprises (MNEs) (Hummels, Ishii, and Yi. 2001; Alfaro and Charlton 2009), it may well proxy those influences. The quantitative impact of *VS1* is striking. For example, as the share of output of Brazilian exporters that is used by exporting firms in partner countries increases from 0 to the country mean of 0.21, Brazil's tariffs are lowered by 5.95 percentage points (model 1). Across the board, countries in the sample have similarly large estimates on *VS*1. It may be surmised that China's would be similar if its tariff bindings were less constraining.

(iii) Intermediate use of a sector's output by domestic users (%*IntermediatesUse*) is a deterrent force against tariff increases only in models where the effect of *VS1* is not conditioned out. After accounting for *VS*1, it does not appear that intermediate use by domestic sectors is a source of anti-protectionism. A possible reason in this sample of emerging countries may be that taxing %*IntermediateUse* in sectors whose output is not heavily used by foreign processors (which is conditioned out by *VS1*) is an effective revenue raiser.

(iv) In all countries except Argentina and Brazil, intra-industry trade (*IIT*) has a negative coefficient, in line with the Krugman (1981) gains from variety in differentiated final goods. The gains from trade in these countries appear to overwhelm the incentives to use tariffs for other motives. The positive coefficients on *IIT* for Argentina and Brazil indicate that intra-industry trade is associated with an increase in their tariffs. This may reflect profit-shifting motives, industrial policy, or simply the use of tariffs to raise revenue.

Finally, diagnostics reported at the bottom of the table indicate no weak instruments problem. The Kleibergen-Paap weak instrument (WI) statistics are uniformly large, indicating that the small sample bias in the coefficients on the endogenous variables is very small compared to the ordinary least squares (OLS) bias. The large WI statistics are a consequence of the large sample size. They mainly indicate that the bias in the 2SLS instrumented coefficient is less than 5% of the bias in the OLS estimate of the coefficient. The Anderson-Rubin (weak-instrument robust) statistic rejects the hypothesis that the coefficients on the endogenous variables are all zero. Because the number of instruments is equal to the number of endogenous variables, the coefficients on the endogenous variables are exactly identified. The main results of the paper are presented next.

### *Pre- and Post-Crisis*

Table 4 considers models in which each variable is interacted with a post-crisis dummy. This approach allows us to ascertain whether the relationships observed

TABLE 4. Difference-in-differences: Before and After 2009. Instrumental Variables with Partner Fixed-Effects and Errors Clustered on HS6-digit Products

| | ARG | ARG | BRA | BRA | CHN | CHN | IND | IND |
|---|---|---|---|---|---|---|---|---|
| $t_{BNDPRF}$ | 0.142*** | 0.154*** | 0.266*** | 0.264*** | 0.973*** | 0.970*** | 0.233*** | 0.271*** |
| *Bound Rate (= Preferential if applicable)* | [0.015] | [0.016] | [0.016] | [0.014] | [0.005] | [0.005] | [0.038] | [0.025] |
| $t_{BNDPRF} \times I_{2009}$ | 0.006*** | −0.008** | 0.045*** | 0.044*** | −0.032*** | −0.032*** | −0.0831*** | −0.037*** |
| | [0.002] | [0.003] | [0.003] | [0.003] | [0.006] | [0.006] | [0.027] | [0.012] |
| IIT | 1.770*** | 1.164*** | 1.201*** | 1.223*** | −0.088*** | −0.085*** | −0.540* | −1.290*** |
| *Intra − industry Trade* | [0.205] | [0.248] | [0.158] | [0.157] | [0.022] | [0.025] | [0.303] | [0.243] |
| IIT × $I_{2009}$ | 0.037 | 0.338* | −0.179 | −0.262* | 0.069*** | 0.052* | 1.402*** | 0.984*** |
| | [0.167] | [0.191] | [0.130] | [0.134] | [0.027] | [0.032] | [0.266] | [0.209] |
| *VS* | 19.61*** | | 22.19*** | | 1.887*** | | −31.81* | |
| *% used by domestic exporters* | [2.573] | | [5.049] | | [0.511] | | [16.33] | |
| *VS* × $I_{2009}$ | −10.23*** | | 24.19*** | | 0.307 | | −35.18** | |
| | [1.500] | | [2.637] | | [0.490] | | [15.44] | |
| *VS1* | −10.08*** | −36.46*** | −24.27*** | −23.14*** | −0.808*** | −3.237*** | − | − |
| *% used by domestic + foreign exporters* | [1.418] | [4.153] | [1.791] | [2.169] | [0.180] | [0.898] | − | − |
| *VS1* × $I_{2009}$ | 9.409*** | 12.32*** | −16.25*** | −10.27*** | −0.373* | −4.753*** | − | − |
| | [0.864] | [1.473] | [1.063] | [1.112] | [0.194] | [1.254] | − | − |
| %IntermediateUse | | 13.64*** | | 3.381*** | | 1.450*** | | −5.365*** |
| *% used by all domestic users* | | [1.672] | | [0.899] | | [0.467] | | [1.274] |
| %IntermediateUse × $I_{2009}$ | | −0.847 | | 1.378*** | | 2.417*** | | −2.127*** |
| | | [0.527] | | [0.423] | | [0.667] | | [0.652] |
| $I_{2009}$ | 0.453 | −2.498*** | −0.971*** | 0.956*** | 0.0494 | −0.757*** | 8.630* | −1.025** |
| | [0.314] | [0.248] | [0.300] | [0.150] | [0.125] | [0.248] | [4.842] | [0.403] |
| *N* | 145228 | 144033 | 199776 | 197671 | 285365 | 271125 | 75424 | 75259 |
| partner FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| #Instruments | 4 | 4 | 4 | 4 | 4 | 4 | 2 | 2 |
| # clusters | 3823 | 3768 | 4033 | 3980 | 4122 | 3877 | 2596 | 2593 |
| K-P (Weak Instr.) | 503.2 | 3002 | 669.2 | 3106 | 1055 | 262 | 400.1 | 5719 |

*(Continued)*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| A-R (*F*) | 69.84 | 73.94 | 104.4 | 87.93 | 7.299 | 8.359 | 8.135 | 15.55 |
| A-R (*p*-val) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **MEX** | **MEX** | **TUR** | **TUR** | **ZAF** | **ZAF** | | |
| $t_{BNDPRF}$ | 0.238*** | 0.244*** | 0.381*** | 0.376*** | 0.197*** | 0.119** | | |
| *Bound Rate (= Preferential if applicable)* | [0.014] | [0.015] | [0.052] | [0.048] | [0.063] | [0.056] | | |
| $t_{BNDPRF} \times I_{2009}$ | −0.070*** | −0.068*** | 0.049*** | 0.047*** | 0.153** | 0.184*** | | |
| | [0.003] | [0.003] | [0.015] | [0.014] | [0.065] | [0.056] | | |
| IIT | 0.307 | −1.028*** | −1.043*** | −1.041*** | −0.371 | 0.493 | | |
| *Intra-industry Trade* | [0.321] | [0.162] | [0.323] | [0.337] | [0.446] | [0.431] | | |
| IIT × $I_{2009}$ | −0.400** | −0.176 | −0.112 | −0.0685 | 0.231 | 0.833** | | |
| | [0.165] | [0.132] | [0.174] | [0.179] | [0.325] | [0.407] | | |
| *VS* | −38.47*** | | 4.45 | | 123.7*** | | | |
| *% used by domestic exporters* | [8.035] | | [3.929] | | [16.90] | | | |
| *VS* × $I_{2009}$ | 4.638* | | 2.082 | | −20.43*** | | | |
| | [2.711] | | [1.625] | | [7.886] | | | |
| *VS1* | −59.35*** | −39.47*** | −22.92*** | −31.96*** | −47.20*** | − | | |
| *% used by domestic + foreign exporters* | [7.849] | [2.632] | [3.615] | [11.49] | [5.074] | − | | |
| *VS1* × $I_{2009}$ | 2.623 | 8.199*** | −3.905*** | −6.412 | 7.755* | − | | |
| | [2.659] | [1.270] | [1.420] | [4.265] | [4.154] | − | | |
| %IntermediateUse | | 5.655*** | | 2.001 | | −13.55*** | | |
| *% used by all domestic users* | | [0.667] | | [2.700] | | [1.965] | | |
| %IntermediateUse × $I_{2009}$ | | −3.167*** | | 0.852 | | 2.391 | | |
| | | [0.397] | | [1.082] | | [1.459] | | |
| $I_{2009}$ | −2.326** | 0.473** | 0.221 | 0.701*** | −0.487 | −5.646*** | | |
| | [1.041] | [0.196] | [0.371] | [0.271] | [0.901] | [2.130] | | |
| *N* | 261343 | 228664 | 94983 | 90294 | 239796 | 117107 | | |
| partner FE | Yes | Yes | Yes | Yes | Yes | Yes | | |
| #Instruments | 4 | 4 | 4 | 4 | 4 | 2 | | |
| # clusters | 4181 | 3712 | 1990 | 1868 | 3880 | 6136 | | |
| K-P (Weak Instr.) | 203.9 | 4661 | 3498 | 479 | 3383 | 141.3 | | |
| A-R (*F*) | 95.95 | 91.86 | 13.81 | 13.32 | 37.1 | 30.89 | | |
| A-R (*p*-val) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | |

*Notes:* 1. Standard errors in brackets; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

2. $I_{2009} = 1$ if year = 2009, and zero if year ≤ 2008.

*Source:* Authors' Analysis Based on Data Described in the Text.

in Table 3 remained unaltered through the crisis or were fundamentally changed by it. These difference-in-differences indicate the *source* of the change (if any) in protectionism following the crisis.[22] Inference about %*IntermediateUse* is made conditionally on *VS1*. Where collinearity does not allow the full set of variables (India, South Africa), *VS1* is dropped.

Consider the coefficient on the interaction term $t_{\text{BNDPRF}} \times \text{I}_{2009}$. The negative and statistically significant coefficients for China, India, and Mexico indicate that although tariff water allowed policy discretion, those countries instead *lowered* their tariffs on average in 2009. Conversely, Brazil, South Africa, and Turkey responded to pressures to raise tariffs where $t_{\text{BNDPRF}}$ allowed them the latitude. In the case of South Africa, for example, the coefficient on $t_{\text{BNDPRF}}$ increased by 0.184 (second model) in 2009 over a pre-crisis coefficient of 0.12, signaling a readiness to increase tariffs up to bound levels.

The coefficient on $\%IntermediateUse \times I_{2009}$ is positive and significant for Brazil and China and negative and significant for India and Mexico. There is no change in the influence of this variable in South Africa and Turkey. The estimates for Brazil and China indicate that post-crisis, other forces, such as revenue objectives, trump the incentives to provide domestic downstream sectors with cheaper intermediate inputs. Heavy downstream users of intermediate inputs whose final output primarily supplies the domestic market (e.g., utilities, construction) do not deter governments from taxing upstream sectors producing these intermediates. Because these sectors are captive and may even be regulated, they may not have the bargaining or lobbying power of other downstream users that compete in the export markets.

In contrast, users who are part of global supply chains face greater competition, and the quantity of use is far more price sensitive. This is evident from the vertical specialization difference-in-differences $VS \times I_{2009}$ and $VS1 \times I_{2009}$ : either one or the other shows a tariff-reducing effect. $VS1 \times I_{2009}$ has a large negative coefficient for Brazil, indicating that in the post-crisis period, exporting sectors in Brazil's partner countries appear to have had a strong influence on lowering Brazilian tariffs specifically on products they import from Brazil for their own intermediate use. Keeping the cost of those inputs down makes them more competitive, in turn increasing their purchases from Brazilian suppliers and expanding Brazil's exports. This source of anti-protectionism is also evident for China and Turkey. In the case of Argentina, India, and South Africa, *VS* is the main source of anti-protectionism after the crisis; domestic exporters are the prime movers in demanding lower protection on the imported goods that they use intensively. In India's case, there is no discernible change in the influence of *VS* and *VS1* on tariffs in 2009.

A country-by-country summary highlights the heterogeneity in the sources of economic and political pressure on trade policy in 2009. Although Argentina

22. The results corresponding to the second model in Table 3 are not reported for brevity but are available from the authors.

and Brazil are Mercosur partners, Argentina further liberalized intermediate use by domestic exporters (*VS*), whereas Brazil responded only to intermediate use by *foreign* exporters. In fact, Brazil stepped up the taxation of domestic users and domestic exporters after the crisis: $I_{2009} \times IntermediateUse$ and $I_{2009} \times VS$ both have positive statistically significant coefficients. China raised import taxes on domestic users of intermediates (*IntermediateUse*), whereas Mexico did the same on intermediate use by domestic exporters (*VS*). Although China's WTO commitments kept tariffs at already low levels, the liberalizing influence of foreign exporters that use Chinese output (via *VS*1) is in evidence after the crisis. The liberalizing influence of *VS1* and *IIT* is evident in Turkey, where proximity to the EU markets provides opportunities for producers to participate in European supply chains. South Africa appears to have become more responsive to its domestic exporters after the crisis.

In sum, three new findings from tariffs at the HS commodity level are in evidence. First, conditional on institutionally determined upper bounds on tariffs and despite the fact that most countries had significant policy space to raise tariffs, only a small subset revealed a desire to use the policy space after the crisis. Second, the difference-in-differences indicates that vertical specialization can strongly deter tariffs. In Argentina, India, and South Africa, the post-crisis period saw further liberalization in sectors whose output was used as intermediate inputs by domestic exporters. In Brazil, China, and Turkey, the post-crisis period saw liberalization in sectors whose output was used as intermediate inputs by domestic *and* foreign exporters.

Less auspiciously, evidence also indicates that revenue needs or industrial policy motivations may undermine incentives to liberalize. Countries appear to choose to raise tax revenue though tariffs in sectors where intermediate use by domestic users is heavy. In 2009, Brazil, China, and Mexico stepped up tariffs in sectors whose output was heavily used by domestic users.

### *Robustness: Incidence of Antidumping Investigations*

In the first of three robustness checks, the model is estimated using a non-tariff measure. Countries use instruments of contingent protection as a complement or alternative to increasing statutory tariffs. For countries such as China, whose tariffs are bound at applied rates, these non-tariff instruments may be used to protect domestic firms and industries. Here, the WITS data are combined with Chad Bown's temporary trade restrictions database at the 6-digit HS level to examine whether contingent protection instruments, such as antidumping (AD) investigations, increased after the crisis in the sample of countries.[23] The dependent variable is the incidence of antidumping investigations that were initiated, regardless of whether these led to a favorable judgment, were dropped, or were overturned.

23. Available at http://econ.worldbank.org/ttbd/.

Table 5 uses linear probability models to show whether the incidence of AD investigations changed in 2009 in the five countries – Argentina, Brazil, China, India, and Turkey – for which data are available. Here, HS6-digit commodities for which investigations occurred are compared with the (overwhelming) number of cases in which there were no such investigations. The main characteristic of the data on contingent protection is that they are sparse, which is one reason why empirical investigations of AD actions in the literature restrict their samples to cases where investigations were conducted.[24] In the country samples, the model coefficients are small in magnitude because of the overwhelming number of zeros.

The positive coefficients on the applied tariff interactions $t \times I_{2009}$ in Table 5 indicate that after the crisis, the incidence of AD investigations was increased (in all countries except Brazil) for commodities for which applied tariffs are high. Thus, a country's AD investigations complemented its tariffs. In China's case, the results indicate that the restricted tariff policy space was expanded through the use of AD. The magnitudes indicate that although the estimated probability of increasing AD investigations was positive in four countries, it was still low.

Vertical specialization failed to deter AD investigations in 2009, but the low estimated probabilities indicate that in the absence of their anti-protectionist influence, more AD investigations might have been undertaken than actually occurred. In India, the coefficient on $VS1 \times I_{2009}$ is 0.114, the highest among the five countries. That is, a one standard deviation increase in *VS1* of 0.08 raised the estimated probability of an AD investigation by $0.114 \times 0.08$, or less than 1%, over the pre-crisis period. The fact that the coefficient on *VS1* was not statistically significantly different from zero before the crisis period but became positive in 2009 is cause for concern. Looking at just the number of new AD investigations would overstate the amount of protectionism, but these results indicate that the (unconditional) propensity to protect remains small.[25]

### *Robustness: Additional Instruments*

As an IV robustness check, the set of US instruments is augmented with the same variables from Germany, France, the Japan, and UK. Each endogenous variable can therefore instrumented using five IVs. The results are qualitatively similar to those reported in Tables 3 and 4. The validity of instruments is also confirmed

24. Linear probability is more easily estimable than nonlinear logit models due to the sparseness in the data. Instrumenting adds to the problem with estimating nonlinear models.

25. Conditioning the sample to only imported goods, or to only specific partners, will probably increase these probability estimates, but there is no good reason to exclude some partners and keep others in the context of this study. Parallel results, in which the set of observations with no within variation for a specific partner is dropped, are available from the authors. The logic for dropping those observations is that they provide no discriminating information. These results may be missing a sample selection model of characteristics of commodities that make them prone to AD investigations. This is a topic for further research. The results from this abridged sample (reported in Table S.4 in the online Appendix) qualitatively affirm the inferences from the full sample in Table 5. Quantitatively, the results are not very different.

TABLE 5: Difference-in-differences: Incidence of Antidumping Investigations Before and After 2009 Instrumental Variables with Partner Fixed Effects and Errors Clustered on HS6-digit Products

| | ARG | ARG | BRA | BRA | CHN | CHN | IND | IND | TUR | TUR |
|---|---|---|---|---|---|---|---|---|---|---|
| *t* | 2.8e − 05** | 2.4e − 05* | 6.3e − 05*** | 7.0e − 05*** | −1.5e − 05*** | −1.0e − 05** | −0.028 | −1.3e − 05* | 2.55E-06 | −5.3e − 06* |
| *Applied tariff* | [1.4e − 05] | [1.4e − 05] | [1.6e − 05] | [1.7e − 05] | [5.9e − 06] | [5.2e − 06] | [2.4e − 05] | [7.6e − 06] | [3.8e − 06] | [2.8e − 06] |
| $t \times I_{2009}$ | 0.0001*** | 0.0001*** | −5.5e − 05*** | −5.7e − 05*** | 5.4e − 05*** | 5.07e − 05** | 4.87E-05 | 1.94e − 05* | 1.85e − 05* | 1.9e − 05*** |
| | [4.6e − 05] | [4.7e − 05] | [1.4e − 05] | [1.5e − 05] | [2.0e − 05] | [2.0e − 05] | [3.0e − 05] | [1.1e − 05] | [1.0e − 05] | [7.1e − 06] |
| IIT | 9.95E-05 | 9.58E-05 | −0.0001 | −0.00005 | −0.0003* | −0.0002 | −0.0004 | −0.0001 | 0.0003** | 0.0003*** |
| *Intra-industry trade* | [0.0004] | [0.0004] | [0.0003] | [0.0003] | [0.00016] | [0.0002] | [0.0004] | [0.0005] | [0.0001] | [0.0001] |
| $IIT \times I_{2009}$ | 0.0001 | 9.50E-05 | 4.21E-04 | 4.42E-04 | −0.0002 | −0.00008 | 2.23E-04 | −0.0003 | 0.0005 | 0.0004 |
| | [0.001] | [0.001] | [0.0004] | [0.0004] | [0.0003] | [0.0003] | [0.0006] | [0.0007] | [0.0005] | [0.0004] |
| *VS* | −0.003*** | | 0.0045*** | | 0.001 | | −0.007 | | −0.0006 | |
| *% used by dom. exporters* | [0.001] | | [0.0014] | | [0.001] | | [0.011] | | [0.001] | |
| $VS \times I_{2009}$ | 0.0076** | | −0.005*** | | 0.005** | | 0.020 | | 0.0035** | |
| | [0.0038] | | [0.0016] | | [0.002] | | [0.012] | | [0.0018] | |
| *VS1* | | −0.003 | | 0.003*** | | 0.006*** | | −0.066 | | −0.009** |
| *% used by domestic + foreign exporters* | | [0.003] | | [0.001] | | [0.002] | | [0.041] | | [0.004] |
| $VS1 \times I_{2009}$ | | 0.00896 | | −0.00127 | | 0.00953* | | 0.114** | | 0.009* |
| | | [0.00552] | | [0.00209] | | [0.00568] | | [0.0487] | | [0.005] |
| %IntermediateUse | 0.0005 | 0.0015 | −0.0001 | −0.0008* | −0.0000 | −0.002*** | 0.007** | 0.027* | 0.002*** | 0.004** |
| *% used by all domestic users* | [0.0005] | [0.001] | [0.0003] | [0.0004] | [0.0002] | [0.0009] | [0.003] | [0.016] | [0.0006] | [0.001] |
| $\%IntermediateUse \times I_{2009}$ | −0.003* | −0.005* | 0.0005 | 0.0005 | 0.0002 | −0.004 | −0.007*** | −0.043** | −0.002*** | −0.004** |
| | [0.001] | [0.0028] | [0.0003] | [0.0006] | [0.0003] | [0.0025] | [0.0027] | [0.018] | [0.0008] | [0.0018] |
| $I_{2009}$ | −0.0009 | 0.001 | 0.0009** | 0.0002 | −0.002*** | 0.0006 | −0.002 | −0.0016* | 0.0006 | 0.0009*** |
| | [0.001] | [0.001] | [0.0003] | [0.0002] | [0.0006] | [0.0007] | [0.002] | [0.001] | [0.0006] | [0.0003] |
| *N* | 144033 | 144033 | 197671 | 197671 | 271125 | 271125 | 106423 | 106423 | 185864 | 185864 |
| #Instruments | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| # clusters | 3768 | 3768 | 3980 | 3980 | 3877 | 3877 | 3432 | 3432 | 3742 | 3742 |
| K-P (Weak Instr.) | 663.8 | 1677 | 20170 | 1993 | 4905 | 264.6 | 74.82 | 76.55 | 5260 | 493 |
| A-R (*F*) | 2.417 | 1.181 | 3.636 | 2.938 | 2.968 | 3.455 | 5.68 | 5.627 | 3.261 | 2.871 |
| A-R (*p*-val) | 0.05 | 0.32 | 0.01 | 0.02 | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.02 |

*Note*: Standard errors in brackets; ***p < 0.01, **p < 0.05, *p < 0.10

*Source:* Authors' analysis based on AD data from Bown's database at http://econ.worldbank.org/ttbd

from weak-instrument diagnostics. The logic that the variables from these countries are uncorrelated with shocks to the endogenous variables (the same variable in India, for example) is most likely weaker in the case of these countries than it is for the US. These countries are all more trade dependent than is the US and have less of a home bias. Perhaps for that reason, the Hansen test does not always validate the exclusion restrictions presumed in the use of the five instruments. These results are available from the authors.

### *Robustness: Clustering of Data*

In the results reported, statistical significance is based on error clustering at the HS6-digit level on the logic that adherence to MFN will cause within-commodity clustering across partners. Indeed, the *t*-values reported are lower than without the clustering correction by a magnitude of three or four. Another source of clustering may be due to the aggregate measurement of the three interest variables at the ISIC or I-O levels. Mapping them into the finer HS6-digit level replicates their values. The recent literature suggests error cluster correction at the highest level of the aggregation (Cameron and Miller 2011). Doing this at the ISIC level reduces the statistical significance of the interest variables and overly penalizes the use of IVs at the more aggregate level. A truer test of the economic and statistical significance of these interest variables requires their measurement at the finer commodity level. It is hoped that the results of this paper will encourage work in this direction.[26]

## IV. Conclusion

WTO and PTA commitments constrain the policy space of member governments to varying degrees depending on the depth of the commitments. With the exception of China (and other countries that acceded to the WTO after 1995), most developing countries and emerging markets have substantial freedom to raise tariffs. In practice, however, most countries did not resort to this policy space following the 2008 financial crisis. This paper's analysis suggests a new explanation for countries' limited use of the significant headroom available, one that involves the changing structure of global trade and production. The regressions indicate that the position of domestic and foreign exporters in the global supply chain exerted offsetting forces in many countries. The demand for cheap inputs by downstream users, both domestic suppliers and exporters, and the demand for a country's exports by vertically specialized producers in partner countries exerted countervailing pressure against protectionist pressure from domestic lobbies. Thus, the economic interest of users and vertically specialized firms that has been a factor driving unilateral liberalization in recent decades (Baldwin 2010) helped keep protectionism in check globally during the crisis. The tariff structures of the

26. An example is the study by Jensen, Quinn, and Weymouth (2013), of which we have recently become aware. It uses firm- and transaction-level micro-data to assess the determinants of trade disputes.

seven large emerging countries examined in the paper are influenced by the demands of vertically specialized foreign exporters that depend on home exporters for their inputs. In Argentina, India, and South Africa, the demand of vertically specialized domestic exporters restrained protectionism after 2008. In Brazil, China, and Turkey, the demand of vertically specialized foreign exporters is the more important factor supporting tariff reductions and market openness.

Different countries behave differently in their trade policies. Although this heterogeneity is an important finding, the main message of the paper's results is that the nature of trade today produces powerful incentives against protectionism. Certainly, institutions such as the WTO and PTAs have contributed to the prevalence of open markets. However, negotiated reciprocal agreements to internalize terms of trade externalities and address the economy forces that generate pressure for trade barriers are just one factor undermining protectionism. The results presented in the paper suggest that a more powerful force is the increase in specialization brought about by both the large reductions in trade costs and the integration of populous countries that has multiplied the scale of global trade. The greatest benefit of the WTO may well be that by reducing trade policy uncertainty and supporting a decades-long process of multilateral liberalization of trade, it has facilitated the greater specialization manifested in global supply chains and the associated profusion of FDI that is now a potent force for maintaining open markets.

Based on the heterogeneity of policy responses across countries, the results of this paper provide a longer-term view of the forces at work and depict more than just a snapshot; the immediate post-crisis change in the coefficients contains important information about future trends. Whether this new constellation of trade interests will be able to withstand a sluggish world economy and high unemployment in addition to inflation and currency appreciation, which only increase pressure on governments to promote domestic economic activity, will most likely be the ultimate test of these new results.

## References

Ahn, J.B., M. Amiti, and D. Weinstein. 2011. "Trade Finance and the Great Trade Collapse." *American Economic Review: Papers & Proceedings* 101 (3): 298–302.

Alfaro, L., and A. Charlton. 2009. "Intra-industry Foreign Direct Investment." *American Economic Review* 99 (5): 2096–119.

Altomonte, C., and G. Ottaviano. 2009. "Resilient to the Crisis? Global Supply Chains and Trade Flows." In R. Baldwin, ed., *The Great Trade Collapse: Causes, Consequences and Prospects*, 95–100. London: CEPR.

Anderson, J. E., and J. P. Neary. 1994. "Measuring the Restrictiveness of Trade Policy." *World Bank Economic Review* 8 (2): 151–69.

Bagwell, K., and R. W. Staiger. 1999. "An Economic Theory of GATT." *American Economic Review* 89 (1): 215–48.

Baldwin, R., ed. 2009. *The Great Trade Collapse: Causes, Consequences and Prospects*, London: CEPR.

———. 2010. "Unilateral Tariff Liberalization." *The International Economy* 14: 10–43.

Bems, R., R. C. Johnston, and K.-M. Yi. 2009. "The Collapse of Global Trade: Update on the Role of Vertical Links." In R. Baldwin, ed., *The Great Trade Collapse: Causes, Consequences and Prospects*, 79–86. London: CEPR.

Bown, C. 2004. "On the Economic Success of GATT/WTO Dispute Settlement." *Review of Economics and Statistics* 86: 811–23.

———. ed. 2011a. *The Great Recession and Import Protection: The Role of Temporary Trade Barriers*. Washington DC: CEPR and World Bank.

———. 2011b. "Import protection and the Great Recession." (12/2012) http://www.voxeu.org/article/import-protection-and-great-recession.

Cameron, A. C., and D. L. Miller. 2011. "Robust Inference with Clustered Data." In A. Ullah, and D. E. Giles, eds., *Handbook of Empirical Economics and Finance*, 1–28. Boca Raton: CRC Press.

Chor, D., and K. Manova. 2012. "Off the Cliff and Back: Credit Conditions and International Trade during the Global Financial Crisis." *Journal of International Economics* 87 (1): 117–33.

Daudin, G., C. Rifflart, and D. Schweisguth. 2011. "Who Produces for Whom in the World Economy?" *Canadian Journal of Economics* 44 (4): 1403–37.

De Backer, K., and N. Yamano. 2008. "The Measurement of Globalization using International Input-Output Tables." STI, OECD Working Paper 2007/8.

Eaton, J., S. Kortum, B. Neiman, and J. Romalis. 2011. "Trade and the Global Recession." NBER Working Paper No. 16666, January 2011.

Eichengreen, B., and K. O'Rourke 2012. "A Tale of Two Depressions Redux." (12/2012) at http://www.voxeu.org/article/tale-two-depressions-redux.

Ethier, W. J. 1982. "National and International Returns to Scale in the Modern Theory of International Trade." *American Economic Review* 72 (3), 389–405.

———. 1998. "Regionalism in a Multilateral World." *Journal of Political Economy* 106 (6): 1214–45.

Evenett, S. J., ed. 2010. *Tensions Contained . . . For Now: The 8th GTA Report*. London: Centre for Economic Policy Research.

Foletti, L., M. Fugazza, A. Nicita, and M. Olarreaga. 2011. "Smoke in the (Tariff) Water." *The World Economy* 34 (2): 248–64.

Francois, J., and W. Martin. 2004. "Commercial Policy, Bindings and Market Access." *European Economic Review* 48: 665–79.

Gawande, K., B. Hoekman, and Y. Cui. 2011. "Global Supply Chains and Trade Policy Responses to the 2008 Crisis." World Bank Policy Research Working Paper *No. 5862*.

Gawande, K., P. Krishna, and M. Olarreaga. 2012. "Lobbying Competition and US Trade Policy." *International Economic Review* 53: 115–32.

Gawande, K., P. Krishna, and M.J. Robbins. 2006. "Foreign Lobbying and U.S. Trade Policy." *Review of Economics and Statistics* 88 (3): 563–71.

Grossman, G., and E. Helpman. 1994. "Protection for Sale." *American Economic Review* 84 (4): 833–50.

Grubel, H., and P. Lloyd. 1971. "The Empirical Measurement of Intra-Industry Trade." *Economic Record* 47 (4): 494–517.

Handley, K., and N. Limão. 2012. "Trade and Investment under Policy Uncertainty: Theory and Firm Evidence." NBER Working Paper 17790.

Hoekman, B., and M. Kostecki. 2009. *The Political Economy of the World Trading System*. Oxford: Oxford University Press.

Hummels, D., J. Ishii, and K.-M. Yi. 2001. "The Nature and Growth of Vertical Specialization in World Trade." *Journal of International Economics* 54 (1): 75–96.

Irwin, D. 2012. *Trade Policy Disaster: Lessons from the 1930s*. Cambridge: MIT Press.

Jensen, J. B., D. Quinn, and S. Weymouth. 2013. "Why Currency Undervaluation Provokes Trade Disputes in Some Settings But Not Others." Manuscript.

Johnson, H. 1953–4. "Optimum Tariffs and Retaliation." *Review of Economic Studies* 21 (2): 142–53.

Johnson, R. C., and G. Noguera. 2012. "Accounting for Intermediates: Production Sharing and Trade in Value-Added." *Journal of International Economics* 86: 224–36.

Jorgensen, J., and P. Schroder. 2006. "Tariffs and Firm-Level Heterogeneous Fixed Export Costs." *Contributions to Economic Analysis & Policy* 5 (1): Article 18.

Kee, H. L., A. Nicita, and M. Olarreaga. 2009. "Estimating Trade Restrictiveness Indices." *Economic Journal* 119 (534): 172–99.

Kee, H. L., C. Neagu, and A. Nicita. 2013. "Is Protectionism on the Rise? Assessing National Trade Policies during the Crisis of 2008." *Review of Economics and Statistics* 95 (1): 342–6.

Krugman, P. R. 1981. "Intra-industry Specialization and the Gains from Trade." *Journal of Political Economy* 89 (5): 959–73.

Levchenko, A., L. Lewis, and L. Tesar. 2010. "The Collapse of International Trade during the 2008-2009 Crisis: In Search of the Smoking Gun." *IMF Economic Review* 58 (2): 214–53.

Maggi, G. 1999. "The Role of Multilateral Institutions in International Trade Cooperation." *American Economic Review* 89 (1): 190–214.

Maggi, G., and A. Rodriguez-Clare. 1998. "The Value of Trade Agreements in the Presence of Political Pressures." *Journal of Political Economy* 106 (3): 574–601.

Ossa, R. 2011. "A 'New Trade' Theory of GATT/WTO Negotiations." *Journal of Political Economy* 119 (1): 122–52.

Staiger, R. W., and G. Tabellini. 1999. "Do GATT Rules Help Governments Make Domestic Commitments?" *Economics and Politics* 11 (2): 109–44.

Yi, K.-M. 2003. "Can Vertical Specialization Explain the Growth of World Trade?" *Journal of Political Economy* 111 (1): 52–102.