

Departamento de Economía
Facultad de Ciencias Sociales
Universidad de la República

Documentos de Trabajo

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Documento No. 07/11
Mayo 2011

ISSN 0797-7484

Micro and Macro Determinants of trade temporary barriers: the Brazilian case over the last two decades *

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Abstract: When the process of trade liberalisation started in Brazil in the late 1980s, a regime of temporary trade protection was put in place. This paper describes the use of TTB by Brazilian's authority over the last two decades. We found them to be highly concentrated in a few sectors and to heavily rely on antidumping measures, rather than countervailing or safeguards measures. We also develop a simple empirical model to explain the micro and macroeconomic determinants of TTBs in Brazil. After controlling for the political strength of each HS six-digit sector in Brazil, as well as the time invariant characteristic of each trading partner and the level of domestic economic activity using fixed effects, we found that low import prices are not an important determinant of TTB in Brazil even though more than ninety percent of TTB that were put in place over the last two decades were antidumping cases. TTBs are more likely to be observed when imports are large. But, perhaps more interestingly, in sectors with low MFN tariffs and where MFN tariffs are falling, which suggest that MFN tariffs and TTBs are substitutes. Finally, changes in the bilateral exchange rate are important determinants of TTBs, with appreciations of the domestic currency making the imposition of restrictive TTBs more likely.

Resumen: Asociado al inicio del proceso de liberalización comercial en Brasil sobre fines de los ochenta, un régimen de protección comercial temporaria fue instalado. Este artículo describe el uso de TTB por las autoridades de gobierno brasileras en las dos últimas décadas. Los resultados muestran que estas medidas están muy concentradas en unos pocos sectores y además que se basan fundamentalmente en medidas anti dumping, antes que en aranceles compensatorios de subsidios o en salvaguardas comerciales. Además, se desarrolla un modelo empírico sencillo que permite explicar los determinantes micro y macroeconómicos de las TTB en Brasil. Luego de controlar por la fortaleza política de cada sector (a seis dígitos del Sistema Armonizado), como de características que son invariantes en el tiempo, del nivel de actividad doméstica usando efectos fijos, se verifica que precios de importación reducidos no es un determinante importante de las TTB en Brasil. A pesar de ello más del 90% de las TTB aplicadas en las dos últimas décadas son medidas anti dumping. Las TTB son más probables de observar cuando las importaciones son grandes. Más interesante aún es que se asocian con sectores con aranceles NMF bajos o que se han reducido, lo que sugiere un rol sustituto de la TTB por los aranceles. Por último, los cambios en el tipo de cambio real bilateral son un determinante de las TTB, la apreciación de la moneda local hace más probable la aplicación de TTBs.

JEL: F10, F11

Keywords: Temporary Trade Barriers, Brazil, Exchange rate.

* We are grateful to Chad Bown, Lawrence Edwards and Hylke Vandenbussche for their comments and suggestions on an earlier draft, to Honorio Kume for many fruitful discussions on Brazil's trade policy and Aksel Erbahar for providing us with most of the data we used.

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1. INTRODUCTION

Temporary trade barriers (TTBs) such as antidumping (AD), countervailing duties (CVDs), and safeguards (SGs) affect a large and growing share of emerging economy imports. Bown (2010a) finds that in countries such as Argentina, Brazil, China, India, and Turkey, 1.5% to 4.5% of their (non-oil) annual imports are affected by TTBs.¹ Perhaps surprisingly, the increase in the use of TTBs occurred while most of these emerging countries were engaging in a process of broad trade reforms. Brazil is an interesting illustration. At the end of the 1980s, Brazil had a simple average tariff of 45%, but there were no TTBs. By 2010, the simple average tariff had fallen to 14%, but more than 100 products at the 6-digit Harmonised System (HS-06) level were affected by some form of TTB with a simple ad valorem average of 60%.²

The objective of this paper is twofold. First, we provide a description of the evolution in the use of TTBs in Brazil: what types of TTBs are more frequently used: antidumping duties, safeguards, or counter-vailing measures? And which are the sectors on which TTBs are more likely to be imposed, or partners that are more likely to be affected by Brazil's TTBs. Second, we explore the role played by microeconomic and macroeconomic determinants of TTBs. Indeed some TTBs, such as antidumping and counter-vailing duties, tend to be conceived to address microeconomic problems, whereas safeguard measures address larger macroeconomic problems. Moreover, in countries where macroeconomic imbalances are frequent, and in the presence of broad trade reforms, TTBs can be used to address microeconomic problems created by macroeconomic shocks.

Brazil is a country with a significant degree of macroeconomic volatility over 1990-2009. Figure 1 illustrates the evolution over the period 1995-2009 of Brazil's imports to GDP ratio, GNP per capita, real exchange rate (RER), and the number of new TTB measures imposed each year. The values of the four variables are set to 100 in 1995. Interestingly, the number of TTBs imposed each year seems to follow the ups and downs of Brazil's economic activity and the real exchange rate. However, contrary to what would be expected, the correlation between the number of TTBs imposed each year and GNP per

¹ In more developed economies (*eg* the US and the EU), the share of imports affected by TTBs has been declining over the last decade. While 3.5% to 5% of their imports were affected by TTBs during the 1997-2005 period, this has fallen to 1.5-3% of their annual imports during the 2006-9 period (Bown, 2010a).

² Note that the average TTB duty cannot be readily compared to the MFN tariff which is imposed (in principle) on all import sources, whereas the most common TTB (*eg* antidumping) is often only imposed on a few exporters from a few exporting countries.

capita is positive, suggesting that more TTBs are imposed when Brazil's economy is booming. This is somewhat counterintuitive and contradicts some of the early literature on macroeconomic determinants of TTBs, which tended to suggest that TTBs were more likely to be used in the presence of domestic macroeconomic weakness (see Takacs, 1981).³

(Include figure 1)

As also illustrated in Figure 8.1, the real exchange rate shows a negative correlation with the number of new TTB measures. There exists a small literature that focused on exchange rate as determinants of TTB, but there is no consensus in terms of the impact that exchange rate change have on TTB.⁴ As explained by Knetter and Prusa (2003) an appreciation of the domestic currency makes it less likely to be able to find sales below the price at which partners sell to other markets, but it makes it much easier to find injury on domestic firms. Whether the first or the second effect are more important in Brazil is an open question. In our econometric exercise we will move beyond earlier studies such as Feinberg (1989) or Knetter and Prusa (2003) by taking into account not only changes in bilateral exchange rates, but also exploring the variation across products (Harmonised System six-digit tariff lines).

Results reported in Section 8.3 below suggest that Brazil's TTBs affect a relatively small share of its imports (around 5%), but within sensitive sectors, 18% of imports are affected by some form of a TTB, and this figure reached 100% of imports in the footwear sector in 2009. Brazil's main TTB instrument is antidumping, which is responsible for 94% (see Table 8.2) of the total value of imports affected by some form of Brazilian TTB. The main targets of Brazil's TTBs are high income and upper middle income countries. However, the share targeted towards imports from China and lower middle income countries has been growing over the 2000s. Sectors affected by TTB investigations consistently have higher MFN tariffs than sectors where there have been no TTB investigations. Furthermore, sectors where the investigations end up with imposed measures have even higher MFN tariffs. This may suggest that MFN tariffs and TTBs are complements, but it can also simply signal that these are sectors that are politically strong.

³ See also Feigenbaum, Ortiz, and Willett (1985), Feigenbaum and Willett (1985), Salvatore (1987), Coughlin et al. (1989) and Leidy (1997).

⁴ A very interesting paper on exchange rates and TTB is Leidy and Hoekman (1990), but they do not focus on the determinants of TTBs, but rather their impact on trade in the presence of exchange rate risk. They consider an exporting firm facing random exchange rate shocks which needs to decide how much to export to an importing country which can impose antidumping duties as a reaction to an important exchange rate shock. They found that the mere presence of an antidumping mechanism reduces exports.

Finally, even though there is a significant amount of ‘water’ in Brazil’s MFN tariff structure, the levels of protection reached through TTBs are twice as large as what the water in the existing tariff structure would allow.

Interestingly, any acceleration of Brazilian TTBs during the international financial crisis of 2008-9 appears unrelated to the performance of Brazilian real economy. Even though GDP per capita growth slowed during the crisis, Brazil continued to grow quite significantly. An important force behind the increase in Brazil’s TTB activity is likely in the appreciation of the real with respect to the currency of Brazil’s trading partners. Indeed, Brazil experienced a significant strengthening of its currency that has reduced the international competitiveness of its firms. There were numerous calls for trade policy to limit the rapid increase in imports, and one of the mechanisms employed were TTBs, in particular AD procedures.⁵

Thus, the response of Brazil’s policy makers to a strong and wide increase in protectionist demands caused by the strong appreciation of the real has been an increase in the use of TTBs. But the import coverage of these TTBs remains limited, and arguably, within Brazil’s international obligations within Mercosur, the WTO and other trade agreements. Seen through this light the rapid increase in the use of TTBs may be a very moderate response to a very large increase in protectionist demand in recent years.

The results of the econometric exercise generally confirm some of the descriptive results described above. We found that indeed sectors with higher MFN tariffs are sectors where TTBs are more likely to be present. However, once we control for the political strength of producers using HS six-digit fixed effects, MFN tariffs become negatively correlated with the presence of TTBs. Moreover, changes in MFN tariffs are also negatively correlated with the presence of TTB. This suggests that controlling for the domestic political strength of the sector, as MFN tariffs declines the more likely it becomes to observe a TTB, which is consistent with findings of Bown and Tovar (2011) for India.

Interestingly, after controlling for product, year and partner country fixed effects, there is little evidence that low prices by export partners or large changes in imports are

⁵ By early 2011, protectionist pressure had strengthened with demands to generalise the use of import licenses and some arguing for the re-establishment of a mechanism of import controls. These recent calls led Jose Tavares, a well known Brazilian economist from CINDES (Rio de Janeiro) with academic and governmental background, to write in the press that it is not feasible to re-establish imports control in Brazil, partly because of its international commitments (Tavares, 2011). See Barral and Brogini (2010) for similar arguments.

more likely to lead to TTBs. On the other hand the bilateral real exchange rate has always a strong negative and statistically significant impact on the probability of observing a TTB. This means that when the domestic currency appreciates with respect to the currency of one trading partner, it becomes more likely to observe that a TTB is imposed on that particular trading partner.

The remainder of the paper is organised as follows. The first two sections are descriptive. Section 8.2 focuses on Brazil's trade liberalisation efforts in the 1990s. Section 8.3 describes the evolution in the use of temporary trade barriers during this period. Section 8.4 develops an empirical model to explore the macro and micro determinants of TTBs in Brazil and presents some econometric results. Section 8.5 concludes.

2. TRADE LIBERALISATION IN BRAZIL

Like many other Latin American countries, Brazil adopted import substitution policies in the 1960s and had a very restrictive trade policy regime for the following two decades. At the end of the 1980s, there was a gradual move towards a more open trade policy regime that was triggered by two complementary factors: the presence of very large economic distortions that required reform, and more importantly, exogenous changes in the political economy preferences of policymakers away from a view that development could flourish under import substitution policies.

This change in policy preferences led to two reforms during the Sarney Administration; these reforms were later deepened during the 1990s by the Collor de Mello government through four scheduled stages (1991-3).⁶ The Sarney Administration's reforms focused mainly on liberalizing imports of intermediate goods. The Collor de Mello Administration then pursued an important media campaign in favour of trade openness that led to an erosion of public support for protectionist policies. It also extended the Sarney

⁶ The Sarney Administration implemented two reforms: in June 1988 and September 1989. The first was a generalised reduction of import tariffs, and the second was concentrated on intermediate and capital goods. Both reforms reduced redundant protection. The average tariff fell by 26 percentage points between 1987 and 1989, but the structure of protection did not change significantly, the correlation between the tariff structure across sectors was 0.72 between 1987 and 1989. The government of Collor de Mello staged four tariff reductions: February 1992, January 1992, 1993, and 1994. After the first reduction superfluous protection persisted, this was almost completely absent after the second adjustment, though with the exception of some consumption goods. The projected targets were fully achieved. Between 1990 and 1993, the average tariff declined from 27.2% to 12.5%, the standard deviation fell from 14.9% to 6.7%, the minimum value from 3.3% to 0%, and the maximum from 78.7% to 34% (Kume *et al*, 2003).

Administration reforms to include capital goods. The economic rationale for these reforms was based on the idea that Brazil was lagging behind the technological frontier due to the high rate of protection in intermediate and capital goods.

Brazil's unilateral tariff reforms led to drastic reductions in protection levels, as illustrated in Table 1. The nominal average MFN tariff was reduced from 32% in 1990 to 11% in 1994, and the effective rate of protection also fell from 45% to 14% during the period (Kume *et al*, 2003).

Nevertheless, Brazil's large tariff reductions did not lead to a substantial increase in imports. Imports did not respond to these tariff cuts because most of the very high levels of protection by the end of the 1980s had already been eroded through the existence of a multitude of special regimes that allowed producers to import at much lower levels of protection. The 'apparent' drastic liberalisation was therefore not one that had a real impact on the costs faced by importers. The unilateral reduction of these 'most favoured nation' (MFN) tariffs was combined with a simplification or elimination of many special trade regimes. The redundancy of the MFN tariffs also explains why the private sector did not oppose the trade reforms. The reforms simply led to a consolidation of trade legislation towards a similar level of protection within a much simpler regime. Thus, what seems to be a very large reduction in protection levels (66% reduction in nominal tariffs, 69% reduction in effective rates) during 1990-4 was in fact less dramatic due to the large number of special regimes in existence *prior* to the reforms.

With the implementation of the Real Plan during the Itamar Franco Administration, Brazil's policy of trade openness was deepened, though it later experienced a setback.⁷ During this period there was both a misalignment of relative prices and a resurgence of domestic demand that led to a large increase in imports. By 1994, Mexico's peso crisis had triggered a reduction in foreign financing, and in 1995 trade policy was used to help this adjustment, leading to a reversal of the movement towards lower tariffs.⁸ However, this reversal was not large enough to counteract the earlier tariff reductions so that average tariffs at the end of the 1990s were much lower than in the late 1980s. Figure 2 indicates that there was not much change in average tariff protection after 1993; *ie* the trend is a

⁷ In July 1994, during the Itamar Franco Administration and under the framework of the stabilisation plan known as Plan Real, all tariffs above 20% were reduced to this level.

⁸ In 1995, Brazil increased tariffs for some sectors: cars, consumption goods, etc. In 1996, non-automatic import licenses were reactivated, and there was limitation for the long-run financing of imports.

slow but relatively permanent reduction in the average MFN tariff. The exception is the small increase in average MFN tariffs observed during the crisis period of 2008-9.

(Include figure 2)

2.1 MERCOSUR and the South-South reciprocal liberalisation strategy

From the late 1990s, Brazil's trade reforms were undertaken through a series of discriminatory 'South-South' trade agreements. The most important objective of these agreements was to facilitate the access to foreign markets for Brazilian producers, but contrary to the reforms of the early 1990s, they were less likely to increase the competitive pressure on import-competing and inefficient Brazilian producers. Of all the preferential trade agreements (PTAs) that Brazil signed, MERCOSUR, which was signed in 1991, is by far the most important politically and economically. This bloc stands out as an ambitious agreement by four developing countries (Argentina, Brazil, Paraguay, and Uruguay) aiming towards deep economic integration.

The integration agreement was formulated around two major time lines: the Trade Liberalisation Program (TLP) and the Regime of Adaptation to MERCOSUR (RAM). These two instruments governed the process of trade integration and formed the linchpin of the agreement. The TLP dates back to the initial treaty of 1991 and was the basis for creating a 'free trade area' (FTA). Intra-regional tariffs were gradually eliminated using a linear and automatic reduction scheme. This liberalisation scheme was announced in advance by the member countries' governments and then carried out twice a year on a regular basis, as envisaged at the outset.

The second instrument, the RAM, emerged from the Ouro Preto summit of December 1994. It was established to finalise the FTA as the TLP was reaching completion. However, this new instrument broadened the terms of liberalisation, slowed down the construction process of the 'free trade zone', and defined a new list of products excluded from intra-regional free trade. After the schedule laid down for these RAM lists had been fulfilled, the integration agreement could be described as a universal, non-tariff, 'free trade zone' with some harmonisation of external trade policies vis-à-vis third parties.

Despite Brazil's broad regional trade agenda, just a few PTAs are actually in force (see Table A1). Most of these agreements were signed by the four MERCOSUR members.

Since only the agreements with Chile and Bolivia are to be harmonised with the other three MERCOSUR members, this presents a challenge to a *common* external trade policy. With the Andean countries, each MERCOSUR member follows its own bilateral framework. Most of Brazil's trade agreements have the objective of reaching free trade area status within ten years; the exceptions are the agreements with Mexico and Cuba. As a result, the existing degree of trade liberalisation varies across agreements. MERCOSUR is the oldest agreement and the one with the highest preference given and obtained by Brazil. Another interesting characteristic of MERCOSUR is that the four members share a common external tariff (CET), and therefore the level of preference is partly determined jointly by the four members as they have to agree on the CET.⁹

Evidence from the 2000s is that the trade policy preferences of both the private sector and the government in Brasilia are moving towards a more open trade regime once again. For example, the position adopted by the Brazilian government in the non-agricultural market access (NAMA) negotiations held in Geneva within the Doha Round is aligned with a Chairman Stephenson document and has a clear pro-trade orientation.¹⁰ Traditionally, Brazil has maintained a protectionist position in favour of its own industry in its trade agreements, partly owing to its strong import substitution policies of the 1960s and 1970s. Beginning in 2008, Brazil has adopted a different strategy in the most important forum for international trade negotiations.¹¹

3. TEMPORARY TRADE BARRIERS IN BRAZIL

When Brazil began its process of trade liberalisation at the end of the 1980s, it simultaneously introduced a domestic law for the use of TTBs. As the country engaged in a

⁹ Note that there are limits to this type of argument for MERCOSUR as the CET is not always 'common', given its numerous exceptions. There are sector exceptions (investment goods, informatics and telecommunications, automotive sector, and sensitive goods), and national exceptions lists. Also, countries' trade regimes and trade preferences have not been fully harmonised. The CET is the same as the collected tariffs (tariff revenues over imports) in a third of MERCOSUR imports from third parties. However, two-thirds of these imports are subject to a zero CET.

¹⁰ The key element in NAMA is the well known Swiss formula of tariff reductions. This trade liberalisation schedule has very important properties in the way it affects the tariff structure. It reduces tariff escalation, eliminates tariff peaks, and has a consequent reduction in tariff dispersion.

¹¹ Brazil announced another important change in early 2011 by initiating bilateral negotiations with Mexico with the objective of signing an FTA.

deep process of trade liberalisation, Brazil put in place a buffer mechanism to subsequently manage strong economic and political reactions to these policy changes.¹²

As expected, Brazil's trade liberalisation was accompanied by an increase in the use of TTBs. We begin with a discussion of TTB use by focusing on Brazil's sensitive industries and targeted markets. We then distinguish between different types of TTBs, starting with antidumping, which is by far the most frequently used TTB in Brazil. We then turn to countervailing duties and safeguard measures.

3.1 Sensitive industries and target markets

Some sectors and some origins of Brazil's imports are more likely to be affected by Brazil's use of TTBs. In this section we use different indicators to measure how likely TTB measures are to be imposed on certain sectors and countries. The formal definitions of the indicators are described in Methodological Appendix.

(Include table 2)

Temporary trade barriers are concentrated in 12 industries: footwear, plastics, rubber, food, other manufactures, chemicals, textiles, agriculture, steel, glass, metal products, and paper.¹³ In these sectors, an average of 18% of imports were covered by at least one investigation. The equivalent figure for overall imports is around 6% (see Table 2 and Figure 3). The evolution of this magnitude for sensitive sectors is increasing during the first episode of unilateral trade liberalisation (1989-1993). The trend begins to then decline until 2003 when it slowly and permanently increases until the end of the period.

(Include figure 3)

Table 2 reports that only 6% of Brazil's imports are affected by some form of TTB. However, for these most sensitive sectors—*ie* defined as a sector with an above average share of imports affected by TTBs—18% of sectoral imports are affected by some form of TTB. These sensitive sectors are also listed in Table 2. While sensitive sectors represent 31% of Brazil's imports, they represent 92% of imports affected by some form of TTB.

¹² Nelson (2006) points out that the academic literature on antidumping recognizes that antidumping law is often adopted as part of a strategy of tariff reduction or to resist protectionist pressures. Such policies may also serve as insurance for uncertain trade policy negotiators which allow them to take on deeper commitments in a trade agreement than they might otherwise undertake without access to such 'exceptions' (Fischer and Prusa, 2003).

¹³ These sectors have a share of imports affected by TTBs greater than the global average for 1989-2009.

Thus, these sectors are by far the main drivers of the 6% figure reported at the end of Table 2. The sectors with more exposure to TTB measures are: footwear, plastics, other manufactures, and rubber, where the share of imports affected by some form of TTB reaches 100%, 42%, 29%, and 35% respectively (see last column of Table 2).

The most commonly used TTB in Brazil is antidumping (AD), as 94% of imports affected by some form of TTB are subject to AD (see fourth column in Table 2). In six sectors—footwear, plastics, food, chemicals, glass, and metal products—this share reaches 100%. Take for example the case of footwear, in 2009 the amount of imports was \$157 million, all the HS-06 products imported in 2009 had some type of TTB investigations during 1989-2009, and each of the TTB investigations took place under AD.

Among sensitive sectors, the sector where AD seems to affect the smallest share of imports is ‘other manufacturing’, indicating that countervailing duties and safeguard measures play a more important role in this sector. All together, these sensitive sectors represent 92% of Brazil’s imports affected by some form of TTB.

Trading partners affected by Brazil’s TTBs tend to be high income or upper middle income countries, as well as China. Figure 4 shows the value of imports from different types of countries affected by a TTB during 1989-2009. Countries are divided into the four World Bank categories: high income; upper middle income; lower middle income; and low income; we consider China (CHN) separately from the lower middle income group given its importance as a source of imports affected by Brazil’s TTBs. The share of high income countries and upper middle income countries is slowly decreasing during the period, while lower middle income countries, and in particular China, have an increasing share of Brazil’s imports that are affected by TTBs. This phenomenon is magnified as we shift towards a more restrictive definition of products affected by TTBs from Panel a to Panel c.

(Include figure 4)

Products that have been under a TTB investigation tend to be highly protected goods. Figure 5 illustrates that the average MFN tariff for products under TTB investigations is always greater than the average MFN tariff. Also, among the products subject to TTB investigations, those with an imposed measure tend to have a higher MFN average tariff than the set of products for which there has been a TTB investigation, but no measure imposed. Interestingly, in 2009, for the set of products that have been investigated but which have no TTB in place, the increase in MFN tariffs has been stronger than for

other products. This suggests that there exists some degree of substitution between trade protection obtained through MFN tariffs and trade protection obtained through TTBs.

(Include figure 5)

It is important to distinguish products with TTB investigations and products where a TTB measure is in place. There are 212 products (at the 6-digit HS level) where some type of TTB investigation has taken place, which we refer to as products with TTB investigations.¹⁴ Brazil imposed a TTB in 48% of these products (102) during 1989-2009. Figure 6 presents Brazil's evolution of new products with TTB measures. The last year of the series established a record with the largest number of new products affected by a TTB measure (19).

(Include figure 6)

Figure 7a illustrates the number of products affected by a TTB measure in any given year and the average ad valorem duty associated with these TTBs. As a share of total imports or the total number of products, TTBs have been relatively stable since the end of the 1990s, but there has been a sharp increase in their importance since the beginning of the international crisis in 2008-9. Figure 7b shows an increase in the proportion of the number of products and the share of total imports affected by TTBs, which is additional evidence of acceleration during the international crisis. However, whether in terms of total imports or total number of products, TTBs represent only around 1% of the total by 2009.

(Include figure 7)

According to Global Trade Alert project (Evenett, 2009), Brazil implemented other adjustments in trade protection during the crisis through changes in MFN tariffs—both increases and reductions. In fact, MFN tariff changes represent 55% of the total number of policy changes that Global Trade Alert reports for Brazil. TTBs are the second most frequent type of policy change, representing around one-third of the total number.

The frequent increases in MFN tariffs to respond to stronger demands for protectionism are consistent with Brazil's obligations in the WTO due to the large amount of 'water' in its tariff structure.¹⁵ According to estimates by Foletti *et al* (2011), on

¹⁴ In terms of cases, the number is larger because some products appear in several cases.

¹⁵ Tariff water refers to the fact that WTO bound tariffs are above the MFN applied tariffs in Brazil, and therefore provide in principle some policy space for tariff increases.

average, Brazil could double its MFN tariffs without violating its WTO commitments.¹⁶ Half of this potential increase is what they call ‘smoke’ in the tariff water, as it would be impossible for Brazil to raise tariffs by that amount due to its preferential tariff commitments, notably within MERCOSUR, or due to the fact that the WTO tariff binding is above the prohibitive level and therefore irrelevant.¹⁷ Nevertheless, their results imply that Brazil could increase its average MFN tariff by 50% without violating its WTO commitments.

Table 3 illustrates how similar increases in MFN tariffs are possible for products that have been under a TTB investigation, regardless of whether a measure was applied. MFN tariffs on these products could almost double on average without violating the average WTO commitment. But a doubling of MFN tariffs may not be enough in some sensitive sectors, where the ad valorem duty imposed through TTBs reaches on average 60%, *ie* four times the MFN level.

(Include table 3)

3.2 Antidumping, countervailing duties, and safeguards

There are two stages in an antidumping procedure: preliminary and final. In each stage it is necessary to establish evidence of dumping and injury to the domestic sector. It is also necessary to establish causality from dumping to injury to be able to apply antidumping measures. In the preliminary stage, the observed values of the decisions (dumping and injury) are the following: accepted (A); bypassed to the final decision (B); or denied (N). In the final stage, the observed values for the final decisions are the following: accepted (A); interrupted (withdrawn by private sector (W) or terminated by public authorities (T)); or denied (N). Table 4 presents results for Brazil (see also Appendix Table A2). The cases are divided in three main categories: without AD measures; with AD measures; and in process.

(Include table 4)

¹⁶ The fact that MFN tariffs could be doubled before reaching the level of bound tariffs corresponds to what is observed on average across all countries in Foletti *et al* (2011).

¹⁷ The average share of smoke in the tariff water across countries is 28%, so Brazil is among countries with a significant share of smoke in their tariff structure.

Approximately 58% of Brazil's 243 cases during 1988-2010 ended up with antidumping measures. Almost half of those cases had an antidumping duty imposed in the preliminary stage. In terms of products, there were 441 6-digit HS products affected, of which 63% ended up with an antidumping measure. More than 60% of those had an antidumping duty imposed in the preliminary stage.

Figure 8 presents the evolution in the number of AD cases initiated over 1988-2010. The figure distinguishes between cases that resulted in the imposition of an antidumping duty and those without antidumping duties, similar to Table 4 (see also Appendix Tables A2 and A3).

(Include figure 8)

An important observation is that the number of AD measures, whether measured in terms of cases or products, tends to spike in the early 1990s, then late 1990s, as well as late 2000s. This coincides with periods when Brazil's real exchange rate was undergoing a significant appreciation. Thus, this is consistent with the finding of Knetter and Prusa (2003) that exchange rate appreciation leads to increases in the number of antidumping cases. While the number of cases initiated each year oscillates, the number of antidumping cases in force in any given year has been systematically increasing throughout the period, except during the late 1990s. The rapid increase in the number of measures in place corresponds to the peaks in the number of cases initiated.

(Include table 5)

In terms of sector coverage there are clearly some industries that are more likely to benefit from antidumping duties than others. Table 5 shows the number of antidumping cases initiated by sector, and it disaggregates into those with and without antidumping duties, by case and by 6-digit HS product. Chemicals, textiles, and iron and steel represent more than 50% of cases initiated (or products covered in those cases) during 1988-2010. The footwear and food sectors follow. Agriculture, and sectors intensive in natural resources, such as minerals or wood, are less likely to be subject to antidumping. Figure 9 presents imports affected by AD investigations and applied measures. Chemicals, plastics, and textiles covered more than the 60% of imports with imposed measures by 2009. These results partly reflect the comparative advantage of Brazil but also the relative political strength of these sectors in Brazil's internal politics.

(Include figure 9)

The average duration of Brazil's imposed antidumping measures is not necessarily correlated with the number of cases brought by a sector. This is partly natural, because a sector may bring a large number of cases without much of a legal base to intimidate foreign exporters, so as to reduce their share of the domestic market.¹⁸ As shown in Table 8.6, sectors with the largest average duration of measures are the machinery and electric machinery sector, as well as the glass sector. Chemicals and footwear, which were the sectors with the largest number of cases, have an average duration that tends to be below the mean.

Figure 10 illustrates the value of imports and the share in the total value of imports by trading partner affected by Brazil's antidumping cases. The United States, the European Union, China, and Argentina are the principal targets of Brazil's antidumping measures. They jointly represent around 75% of Brazil's affected imports. They are followed by South Korea, Taiwan, Colombia, and Russia, but these four countries only represent around 10% of the value of imports affected by AD duties.

(Include figure 10)

Brazil has used countervailing measures much less frequently than antidumping. Brazil had 16 countervailing duty cases during the period 1989-2010, and it applied measures in only 10 of the 16 cases. These measures generally took the form of ad valorem tariffs. For one of these ten cases ('latex yarn' from Malaysia), we have no information regarding the type of duty applied. Appendix Table A4 summarises the number of cases and products affected by countervailing measures with and without duties.

Safeguard measures are even less commonly used in Brazil. During the period 1989-2010, Brazil initiated three safeguard investigations: one each in 1996, 2001, and 2008. In two of these cases, toys and coconuts, Brazil applied measures. For toys, Brazil applied the same ad valorem measures from 1997 until 2003 in 15 6-digit HS products. For coconuts, which started in 2002 and lasted until 2006, Brazil imposed quantitative restrictions. The last case resulted in a negative finding in 2009.

¹⁸ See Leidy and Hoekman (1990).

4. EMPIRICAL MODEL AND RESULTS

In order to understand the determinants of TTB in Brazil we will fully exploit the variation in the World Bank Temporary Barriers Data Base (Bown, 2010b). In other words, we will explain the presence and level of a TTB in a six digit product imported from a particular country in a given year. While working at a very disaggregated level, we will use both microeconomic and macroeconomic determinants of TTBs. The combination of these two is an important contribution of our approach.

Indeed, a problem with the early literature started by Takacs (1981) that is highlighted in Nelson's (2006) survey of the literature on antidumping is the fact that is undertaken at the aggregate level, giving no room for sectoral difference or differences in behavior across partner countries. An early literature that starts with Finger (1981) looks at the sectoral determinants of TTBs and finds that variables that capture international competitiveness, such as import penetration, play an important role in explaining differences in filing for protection across sectors. A large empirical literature on the sectoral determinants of trade protection exists confirming the importance of international competitiveness variables and it is nicely summarised in Gawande and Krishna (2006).

But the link between sectoral, and macroeconomic determinants on the one hand, and TTBs on the other hand, has not been explored until Bown and Tovar (2011) who study the determinants of India's TTBs during the 1990s using a protection for sale model a la Grossman and Helpman (1994). Their identification strategy relies on the fact an across the board trade liberalisation was imposed on India by an IMF structural adjustment program, and therefore could be considered as exogenous to India's political economy forces. On the other hand, political economy forces were leading to the more frequent use of TTBs to compensate for the exogenous trade liberalisation. Differences in frequency of the use of TTBs across sectors reflected quite well those predicted by a protection for sale model, suggesting that they were a natural endogenous response to the exogenously imposed trade reforms.

In this paper we build on Bown and Tovar (2011) by explicitly introducing macroeconomic variables to explain TTBs. Our identification strategy will take advantage of the fact that a large number of these TTBs do not only have sectoral variation, but also vary across partners. For example, antidumping duties are not imposed on all trading partners, but only some of them. This variation across trading partners will help us identify

the role played by international macroeconomic variables that have partner variation, such as the bilateral real exchange rate. This is important in the case of Brazil, because of the frequent episodes of strong appreciation and depreciation of its currency. Moreover, among Brazil's main trading partners there are countries such as Argentina, which are also frequently exposed to exchange rate shocks.

The main microeconomic determinants we will use the price and value of imports of a particular HS 6 digit line from a particular country. These two variables are in principle a particular important determinant in the case of Brazil because more than 90 percent of TTB cases in Brazil are related to antidumping, where you need to show dumping, and a casual effect from dumping to injury, which depends on the size of imports. Other microeconomic determinants include political economy variables, such as the concentration of the sector, output, or the extent to which workers are unionised. These are likely to be important determinants of TTBs at the sectoral level as shown in the early literature started by Finger (1981). We do not have information for these variables at the level of disaggregation at which the analysis is carried out, but we will control for their role in explaining the variation of TTB using six-digit HS fixed effects, or time varying six-digit HS effects in different robustness check specifications.

Among macroeconomic determinants of TTBs our focus will be in MFN tariffs and real bilateral exchange rates. The first will capture the extent to which TTB substitute for MFN tariffs (after controlling for the political strength of domestic producers of each six-digit HS product, which is likely to determine both). The latter captures changes in the bilateral competitiveness of Brazil with respect to each of its trading partners. Domestic macroeconomic determinants, such as the level of economic activity, unemployment, institutional changes are likely to be very important as the early literature started by Takacs (1981) has shown. In order to control for all these macroeconomic variables we will use year fixed effect.

The main data source is the World Bank Temporary Barriers Database which is described in Bown (2010). It provides data on whether a TTB is in place in a particular HS six-digit good imported from a given country, as well as the level of the tariff imposed on those imports. In the case of specific tariffs, we obtained the ad-valorem equivalent dividing the specific tariff by the unit price obtained using data on the value of imports and quantities imported. Data on the value of imports and quantities imported is from United Nations' Comtrade. We used information on the value of imports and quantities imported

to compute unit prices for each six digit HS good imported from each trading partner. MFN tariffs are from UNCTAD's TRAINS and they are available at the six digit of the HS. They have no partner variation as these are MFN tariffs. Information on bilateral real exchange rate is computed using the exchange rate with respect to the US dollar and inflation data in each country from the IMF's International Financial Statistics.

The empirical model is as follows:

$$ttb_{g,p,t} = \alpha_1 \ln(uv_{g,p,t-1}) + \alpha_2 \ln(m_{g,p,t-1}) + \alpha_3 \ln(1 + mfn_{g,t}) + \alpha_4 (\ln(1 + mfn_{g,t}) - \ln(1 + mfn_{g,t-1})) + \alpha_5 \ln(rer_{p,t}) + \alpha_g + \alpha_p + \alpha_t + \varepsilon_{g,p,t} \quad (1)$$

where $ttb_{g,p,t}$ is either a dummy variable indicating the presence of a TTB or the ad-valorem equivalent of the TTB on good g , imported from partner p at time t ; $uv_{g,p,t}$ is the unit value of good g , imported from partner p at time t ; $m_{g,p,t}$ is the value of imports of good g , imported from partner p at time t ; $mfn_{p,t}$ is the MFN tariff on good g at time t ; $rer_{p,t}$ is the real exchange rate with respect to partner's p currency at time t ; α_g is an HS six-digit fixed effect; α_p is a partner fixed effect, and α_t is a time fixed effect.

The year fixed effect controls for any domestic macroeconomic change such as the level of economic activity or unemployment in Brazil. The partner fixed effect controls for any particular determinant of protection towards that partner that is time-invariant, as for example distance, or institutional similarity, or comparative advantage similarities. The good fixed effect controls for any time invariant six-digit determinant of protection, such as the political strength of producers. As robustness checks we will also try different sets of dummies such as partner times goods fixed effects or goods times year fixed effects. When we do that some of the variables will have to be dropped as they will be perfectly collinear with the sets of more disaggregated fixed effects.

We expect $\alpha_1 < 0$ as higher unit prices are less likely to lead to finding dumping or injury from subsidies; $\alpha_2 > 0$ as larger imports make injury more likely; $\alpha_3 > 0$ as higher MFN tariffs capture the political strength of the sector beyond what is already explained by the six digit HS fixed effects (i.e., it acts as a proxy for the time variant aspects of the political strength of Brazilian producers of a given HS six digit good); $\alpha_4 < 0$ as reductions in MFN tariffs are more likely to lead to the use of TTB as in Bown and Tovar (2011).

The sign of the last coefficient, α_5 , is ambiguous as discussed in the introduction. Feinberg (1989) suggest that it should be positive as depreciations of the Brazilian real increase the probability of being able to find dumping by rest of the world exporters. Knetter and Prusa (2003) on the other hand suggest that the coefficient should be negative because a depreciation of the Brazilian real makes it more difficult to find injury.

When using the presence of a TTB as the left-hand-side variable in equation (1), the coefficients are estimated using a linear probability model, as well as a logit and probit model to account for the dichotomous nature of the left-hand-side variable. We also use a conditional logit model when we introduce partner times HS six-digit fixed effects to avoid the incidental parameter bias when the number of fixed effects is much larger than the number of time varying observations in non-linear models. When we use the ad-valorem equivalent of the TTB as the left-hand-side variable, the coefficients are estimated using a simple ordinary least square estimator.

The results of the estimation of equation (1) without fixed effects are reported in Table 9. The first three columns explain the presence of TTB, whereas the last column explains the level of the ad-valorem equivalent of the TTB. All coefficients have the expected sign, and are highly statistically significant. Lower prices for products imported from the partner are more likely to lead to TTBs being imposed on those imports. A higher level of imports makes a TTB more likely. A higher MFN also makes TTB more likely, but this is a proxy for the political strength of the sector rather than a sign of complementarity between MFN tariffs and TTBs. It simply signals that both MFN tariffs and TTBs are jointly determined by producers with a strong political clout. The sign on the MFN tariff or its statistical significance is likely to change when we introduce six-digit HS fixed effects. A decrease in the MFN tariff is on the other hand very likely to lead to a TTB being imposed on these goods as in Bown and Tovar (2011).

(Include table 7)

The coefficient on the bilateral real exchange rate has a negative and statistically significant coefficient, which is consistent with the results of Knetter and Prusa (2003), and with the descriptive evidence provided in section 8.3. Indeed, as Brazil's real appreciates against the currency of its trading partners this makes TTB more likely to occur.

Table 8.10 reports the same specification as in Table 8.9, but with the set of fixed effects described in equation (8.1) to control for missing variables that may be biasing the

estimates in Table 8. The number of observations drops when we use the non-linear probit and logit estimators because some of the fixed effects can perfectly predict the absence of a TTB and therefore all observations corresponding to that fixed effect are dropped from the estimation.

(Include table 8)

The coefficient on unit values is no longer significant after we control for six-digit HS, partner and year fixed effects. Thus low prices do not seem to be an important determinant of TTB. All other coefficients keep their sign and statistical significance, except for the MFN tariff. It becomes negative and statistically significant. This was expected as discussed earlier, as the introduction of six-digit HS fixed effects would capture the time invariant determinants of the political strength of domestic producers of those goods. The fact that the MFN tariff becomes negative and statistically significant suggest that once this is controlled, then sectors with high MFN tariff are less likely to get protected through TTB, unless they have experienced an important drop in their MFN tariff, as indicated by the negative coefficient on the change in MFN tariffs.

Finally, the bilateral real exchange rate is once again negative and statistically significant at the 1 percent level in all specifications suggesting that an appreciation of the exchange rate makes more likely to observe a TTB imposed on imports from that partner. The fact that the sign is negative suggests that the mechanisms through which this operates is the “injury” mechanism, rather than the “dumping” mechanism. Indeed, when the domestic currency appreciates the likelihood of observing a TTB depends on the relative size of the “injury” and “dumping” effects. The “injury” effect as put forward by Knetter and Prusa (2003) suggests that as the domestic currency appreciates it becomes easier to find injury on domestic firms which are losing competitiveness. The “dumping” effect as put forward by Feinberg (1989) suggests that as the domestic currency appreciates it becomes more difficult to find “dumping” as the price at which foreign firms sell in the domestic market is likely to be above the price at which they sell in other markets. The fact that the coefficient on unit values is not statistically significant, but the coefficient on import values is highly significant and positive suggest that the “injury” effect is likely to dominate the “dumping” effect when it comes to the effect of the bilateral real exchange rate on TTBs. This is indeed what is found in the results reported in Table 9.

We finally perform a final set of estimates where we use country times HS six-digit fixed effects. Given that the number of fixed effect is extremely large, which would lead to the incidental parameter bias problem of non-linear regression, we do not report probit estimates, but rather estimates obtained using a linear regression and a conditional logit estimator. The results are reported in Table 8.11. They tend to confirm the earlier results reported in Table 8.10 with the exception that when explaining the level of the TTB restriction in the last column, the coefficient on imports is now positive and statistically significant as expected. Also, the coefficient on unit values is positive and statistically significant. The positive coefficient on unit prices after controlling for HS six-digit times partner fixed effects could be explained by the fact that products subject to TTBs tend to be time invariant, and that TTBs are more likely to be applied on goods for which domestic demand is growing and this implies higher prices from these partners.

(Include table 9)

Results on the macroeconomic variables are again consistent with the results previously found where the level of the MFN tariff and the changes in MFN tariff tend to be negatively correlated with the presence of a TTB or its level of restrictiveness. Similarly, appreciations of the bilateral real exchange rate are again more likely to lead to the imposition of a TTB, as well as a more restrictive TTB.

4 CONCLUSIONS

As Brazil's trade liberalisation intensified in the late 1980s and early 1990s, it put in place a regime of temporary trade protection. This chapter describes the Brazilian authority's use of TTBs over 1990-2009. Brazil's TTBs have been highly concentrated in a few sectors (chemicals, plastics, and textiles). When the whole set of TTB investigations are considered, Brazilian TTBs mainly target high and middle income trading partners. If the sample of imports is restricted to products where TTBs are imposed, the likelihood of observing a middle and low income country being affected by Brazil's TTB increases considerably, with China becoming more important in the late 2000s.

The vast majority of Brazil's TTBs are in antidumping. Over the 1990-2009 period, Brazil had only 3 safeguard cases and 16 countervailing cases, compared to 243 AD cases. The number of imposed AD measures accelerated in the early 1990s, then again in the late 1990s, and in the late 2000s. This coincides with periods when Brazil's real exchange rate was significantly appreciating. This is consistent with the finding of Knetter and Prusa (2003) that exchange rate appreciations lead to increases in the number of antidumping cases when it becomes easier to find evidence of injury.

We then develop a simple empirical model that looks at the determinants of TTBs that Brazil imposes on different trading partners at the six-digit level of the Harmonised System (HS) over the 1989-2009 period. Results suggest that sectors with higher MFN tariffs are sectors where TTBs are more likely to be present. But the MFN tariff is mainly a proxy for the political strength of an HS six-digit sector. Once we control for this using HS six-digit fixed effects, MFN tariffs are negatively correlated with the presence of TTBs. This suggests that controlling for the domestic political strength of the sector, sectors with low MFN tariffs are more likely to be protected through TTB. This could be explained because of constraints on MFN tariffs through the GATT/WTO system or the common external tariff of Mercosur. This is also confirmed by the fact that reductions in MFN tariffs seem to lead to the imposition of TTB, which is consistent with the findings of Bown and Tovar (2011) for India.

Interestingly, after controlling for product, year and partner fixed effects, there is little evidence that low prices by export partners are more likely to lead to TTBs, even though most of Brazil's TTBs take the form of antidumping duties. The same is true for changes in imports from a particular trading partner on a particular good. On the other

hand the bilateral real exchange rate has always a strong negative and statistically significant impact on the probability of observing a TTB. That is episodes of appreciation of the bilateral exchange rate are more likely to lead to TTBs being imposed on those trading partners.

Thus, after controlling for the political strength of domestic sectors (using good-specific fixed effects), and changes in domestic macroeconomic conditions in Brazil (using year fixed effects), there is little to be explained by international microeconomic variables, such as prices and quantities imported of each good from each trading partner. But there is a strong important role played by international macroeconomic variables such as the exchange rate, as well as MFN tariffs or changes in the MFN tariffs.

This suggests that Brazil is using TTBs, and particularly antidumping measures, which account for more than 90 percent of TTB cases in Brazil, to correct for changes in international competitiveness or constraints imposed on Brazil by its multilateral or regional commitments. This is highly inefficient as it does not target the source of the problem. In the case of constraints imposed by multilateral or regional commitments, this suggests that Brazil should be using much more safeguard measures than antidumping duties. To allow for a more flexible used of safeguard measures when multilateral or regional constraints become more binding may be one way of solving the problem. The other one is to have antidumping rules that make it more difficult to legally impose antidumping duties. In the case of changes in bilateral real exchange rates, there is no existing TTB that addresses this type of problems. Indeed, the TTB would need to be imposed by trading partner and there is nothing in today's arsenal of TTB that would allow for this. The use of either antidumping measures or safeguard measures would be inefficient. A probably more efficient solution would involve the creation of a TTB that is linked to the evolution of the bilateral real exchange rate.

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METHODOLOGICAL APPENDIX

In Figure 3 we define coverage of imports using the followings definitions:

$$CO_t^{TTB} = \frac{\sum_i b_i vm_{it}}{\sum_i vm_{it}} \quad (A1)$$

With $b_i = 1$ if i has a TTB investigation in $t \in [1989, 2009]$ and $b_i = 0$ otherwise; vm_{it} - value of imports of product i (HS-06) in period t ; $i \in I$ such that $vm_{it} > 0$ in some $t \in [1989, 2009]$.

By analogy we define import coverage by sector:

$$CO_{st}^{TTB} = \frac{\sum_{i_s} b_{i_s} vm_{i_s t}}{\sum_{i_s} vm_{i_s t}} \quad (A2)$$

We choose the set of products in sectors where coverage of imports under investigations is higher than average coverage. If $CO_{st}^{TTB} > CO_t^{TTB}$ then $s \in \bar{S}$ (sensitive sectors)

$$CO_{\bar{S}t}^{TTB} = \frac{\sum_{i \in \bar{S}} b_i vm_{it}}{\sum_{i \in \bar{S}} vm_{it}} \quad (A3)$$

In Table 2 in column (1) we compute:

$$vm_{st} = \sum_{i_s} vm_{i_s t} \text{ if } s \in \bar{S} \quad (A4)$$

In Table 2 in column (2):

$$vm_{st}^{TTB} = \sum_{i_s} b_{i_s} vm_{i_s t} \text{ if } s \in \bar{S} \quad (A5)$$

In Table 2 in column (3):

$$vm_{st}^{AD} = \sum_{i_s} a_{i_s} vm_{i_s t} \text{ if } s \in \bar{S} \quad (A6)$$

With $a_i = 1$ if i has a AD investigation in $t \in [1989, 2009]$ and $a_i = 0$ otherwise.

In Figure 4 the magnitudes computed are:

$$vm_{jt}^{TTB} = \sum_i b_i vm_{ijt} \quad (A7)$$

$$vm_{jt}^{TTBm} = \sum_i b_i^m vm_{ijt} \quad (A8)$$

$$vm_{jt}^{TTBmf} = \sum_i b_i^{mf} vm_{ijt} \quad (A9)$$

Where: j = high income; lower income; lower middle income; China and upper middle income; $b_i^m = 1$ if i has a TTB measure in $t \in [1989, 2009]$ and $b_i^m = 0$ otherwise; $b_{it}^{mf} = 1$ if i has a TTB measure in force in the current period, $b_{it}^{mf} = 0$ otherwise.

In Figure 5 three different averages of MFN tariff are presented:

$$t_{it}^{mf,NOTTB} = \frac{\sum_i (1-b_i) t_{it}^{mf}}{\sum_i (1-b_i)} \quad (A10)$$

$$t_{it}^{mf,TTBwm} = \frac{\sum_i b_i^{wm} t_{it}^{mf}}{\sum_i b_i^{wm}} \quad (A11)$$

$$t_{it}^{mf,TTBm} = \frac{\sum_i b_i^m t_{it}^{mf}}{\sum_i b_i^m} \quad (A12)$$

Where: with $b_i^{wm} = 1$ if i has a TTB investigation but without a measure in $t \in [1989, 2009]$ and $b_i^{wm} = 0$ otherwise. See that $b_i^{wm} = b_i - b_i^m$.

In Figure 6 the evolution of the number of new products with TTB measures are computed:

$$n_t^{TTBnm} = \sum_i b_{it}^{nm} \quad (A13)$$

$$an_t^{TTBnm} = \sum_{z=0}^t \sum_i b_{iz}^{nm} \quad (A14)$$

Where: with $b_{it}^{nm} = 1$ if i has a TTB measure in the current period t and not in any period $t-z$, $b_{it}^{nm} = 0$ otherwise.

In Figure 7a products with TTB measure and the average level of the measure by year are computed

$$n_t^{TTBmf} = \sum_i b_{it}^{mf} \quad (A15)$$

$$ttb_t = \frac{\sum_i b_{it}^{mf} ttb_{it}}{\sum_i b_{it}^{mf}} \quad (A16)$$

Where: ttb_{it} - is the ttb measure in ad valorem terms.

In Figure 7b the shares of the count of products and imports with measures in the current year are computed.

$$sh_t^{pro} = \frac{\sum_i b_{it}^m}{I_t} \quad (A17)$$

$$sh_t^{vm} = \frac{\sum_i b_{it}^m vm_{it}}{\sum_i vm_{it}} \quad (A18)$$

Where: I_t - is the number of products such that import are greater than zero in the current year t.

These last two measures are similar to those computed in the Introduction (Bown, this volume); see equations (1) and (2). In the shares of imports we did not correct for the effect of the TTB measure on the level of imports as it is done in equation (2).

In Figure 8 the flow of cases and products with AD initiated investigations and measures by year are computed:

$$nc_t^{AD} = \sum_c b_{ct}^{AD} \quad (A19)$$

$$np_t^{AD} = \sum_i b_{it}^{AD} \quad (A20)$$

$$nc_t^{ADm} = \sum_c b_{ct}^{ADm} \quad (A21)$$

$$np_t^{ADm} = \sum_i b_{it}^{ADm} \quad (A22)$$

Where: with $b_{ct}^{AD} = 1$ if the case c has initiated an AD investigation in the current period, $b_{ct}^{AD} = 0$ otherwise; with $b_{it}^{AD} = 1$ if the product i is in an AD investigation initiated in the current period, $b_{it}^{AD} = 0$ otherwise; with $b_{ct}^{ADm} = 1$ if the case c has an AD measure in the current period, $b_{ct}^{ADm} = 0$ otherwise; with $b_{it}^{ADm} = 1$ if the product i has an AD measure in the current period, $b_{it}^{ADm} = 0$ otherwise.

In Figure 9 the structure of imports by sector with some AD investigations during the period is presented:

$$vm_{st}^{AD} = \sum_{i_s} b_{i_s}^{AD} vm_{i_s,t} \quad (A23)$$

$$vm_{st}^{ADm} = \sum_{i_s} b_{i_s}^{ADm} vm_{i_s,t} \quad (A24)$$

$$vm_{st}^{ADmf} = \sum_{i_s} b_{i_s}^{ADmf} vm_{i_s,t} \quad (A25)$$

Where definitions of dummies are similar to equations A7-A.9 but restricted to AD.

In Figure 10 the structure of imports by country with some AD investigations during the period is presented:

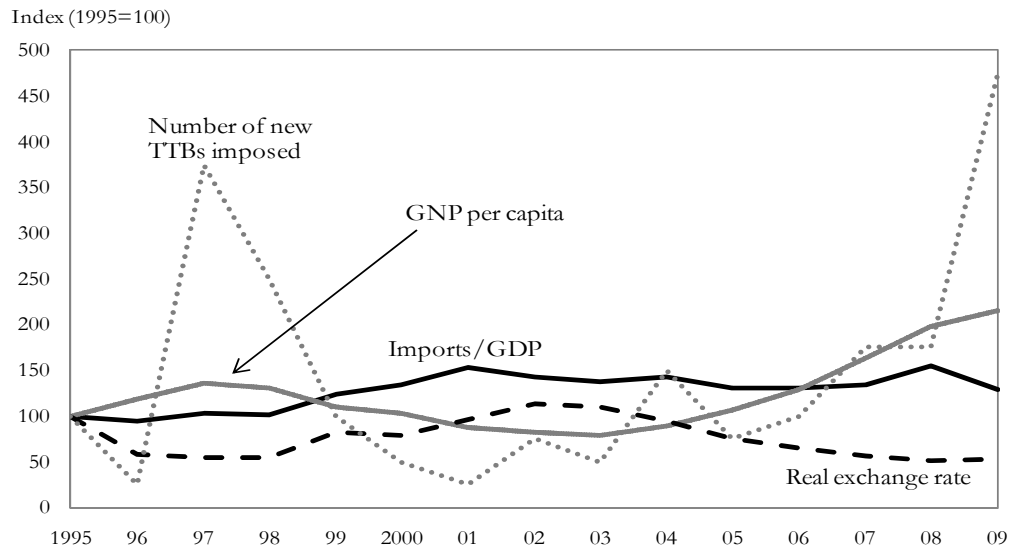
$$vm_{jt}^{AD} = \sum_i b_i^{AD} vm_{ijt} \quad (A26)$$

$$vm_{jt}^{ADm} = \sum_i b_i^{ADm} vm_{ijt} \quad (A27)$$

$$vm_{jt}^{ADmf} = \sum_i b_i^{ADmf} vm_{ijt} \quad (A28)$$

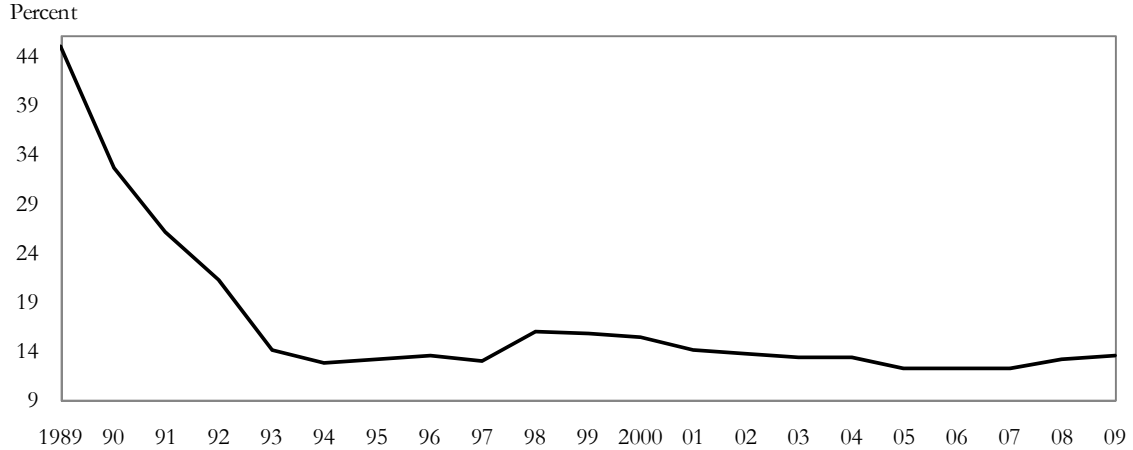
Where definitions of dummies is similar to equations A7-A.9 but restricted to AD.

Figure 1
Macroeconomic variables and TTBs in Brazil, 1995-2009



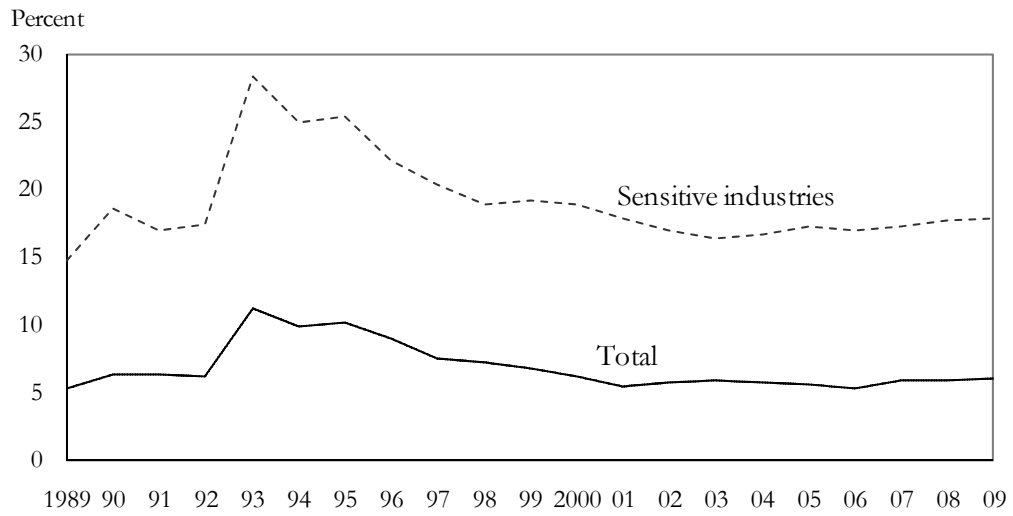
Source: Authors' calculations from The World Bank's World Development Indicators, 2010, and Temporary Trade Barriers Database (Bown, 2010b).

Figure 2
Brazil's MFN ad valorem tariff, 1989-2009



Source: Authors' calculations with data from TRAINS at the 6-digit HS level.

Figure 3
Brazil's coverage of imports with TTB investigations, 1989-2009



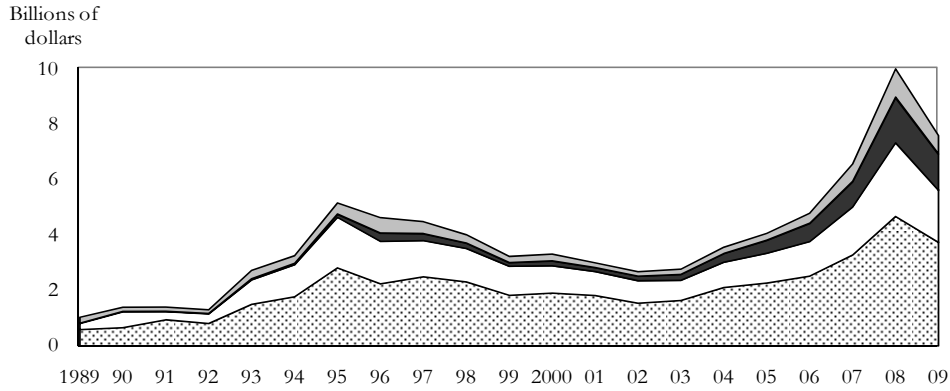
Note: See definition of both variables in Methodological Appendix (equations 8.A1 and 8.A3).

Source: Authors' calculations using the Temporary Trade Barriers Database (Bown, 2010b).

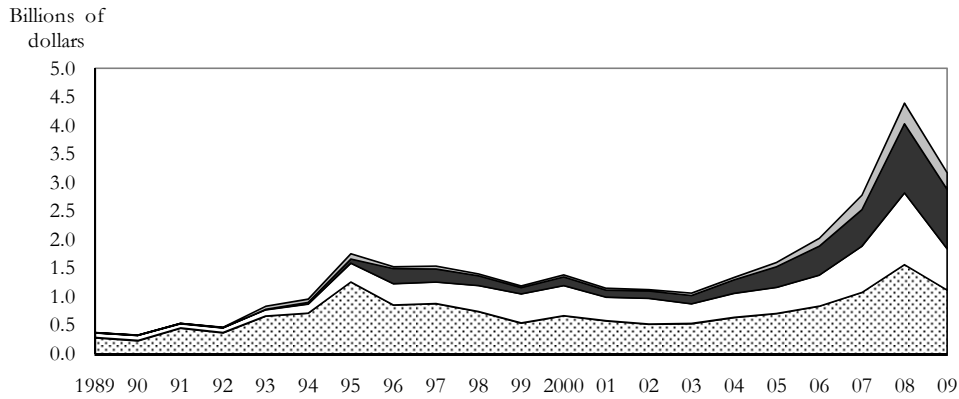
Figure 4

Brazil's imports affected by TTB investigations in 1989-2009, by type of country

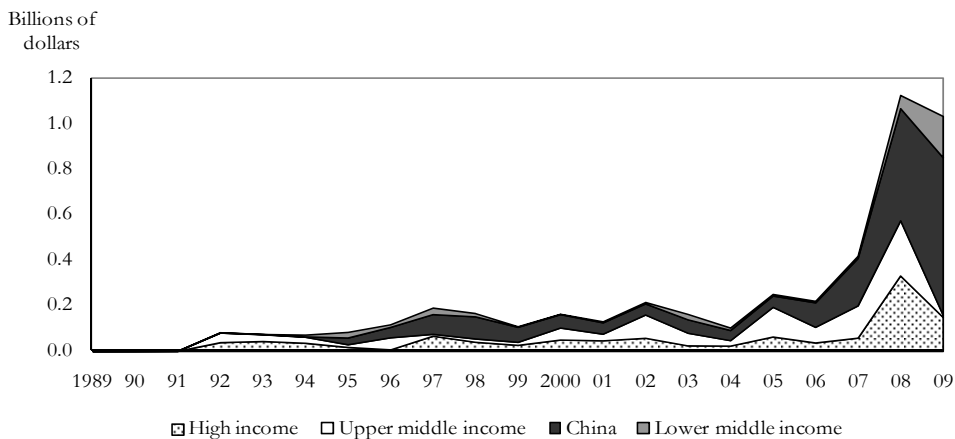
a. Entire sample: products under investigation during the period



b. Imports of products with TTB measure during the period



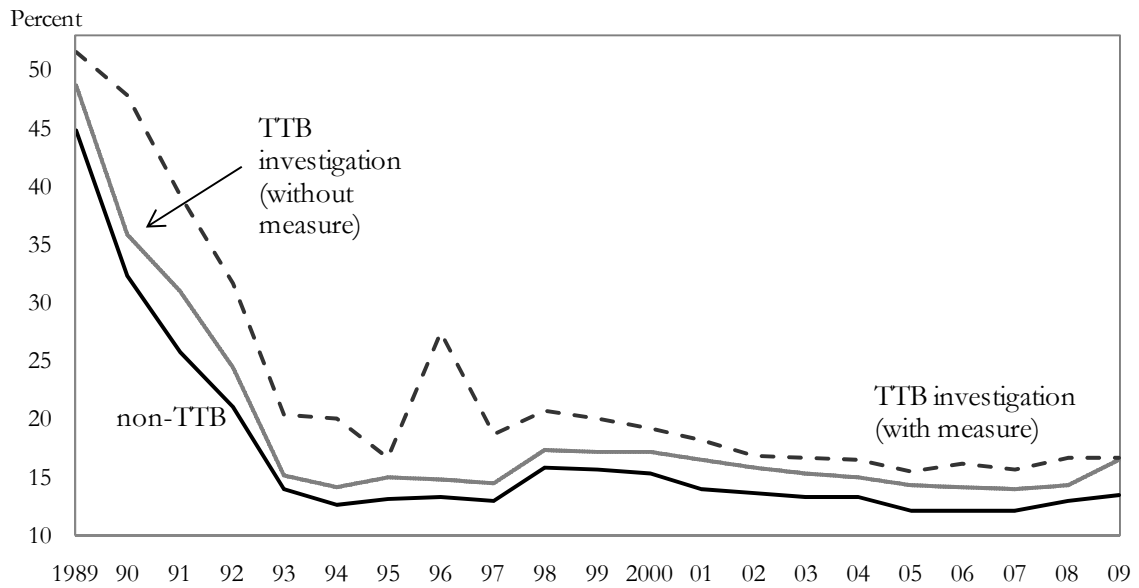
c. Imports of products with measure in the current year



Note: See definition of variables in Methodological Appendix (equations 8.A7, 8.A8 and 8.A9). Source: Authors' calculations using the Temporary Trade Barriers Database (Bown, 2010b).

Figure 5

Brazil's MFN tariffs in products with TTB investigation (with and without measures) and without TTBs, 1989-2009

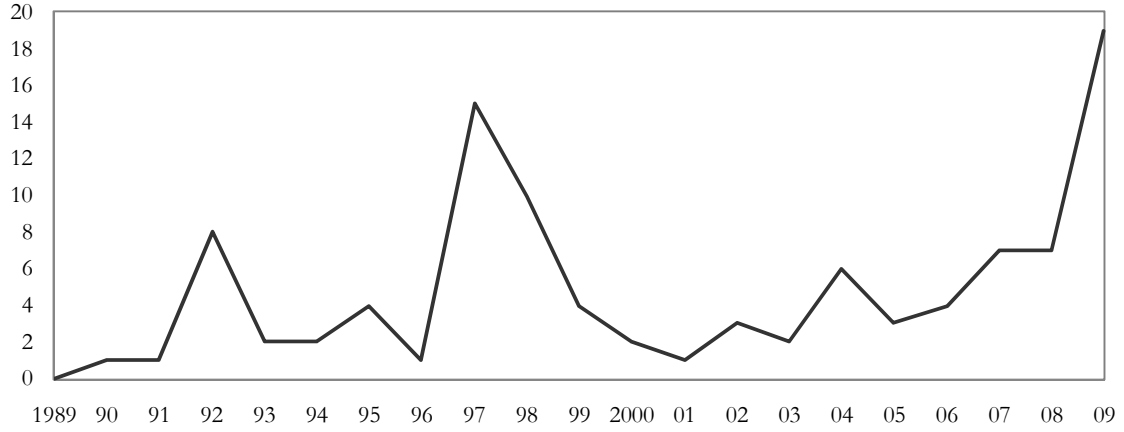


Note: See definition of variables in Methodological Appendix (equations 8.A10, 8.A11 and 8.A12).
Source: Authors' calculations using TRAINS and Temporary Trade Barriers Database (Bown, 2010b).

Figure 6
New HS-06 products with TTB measures, 1989-2009

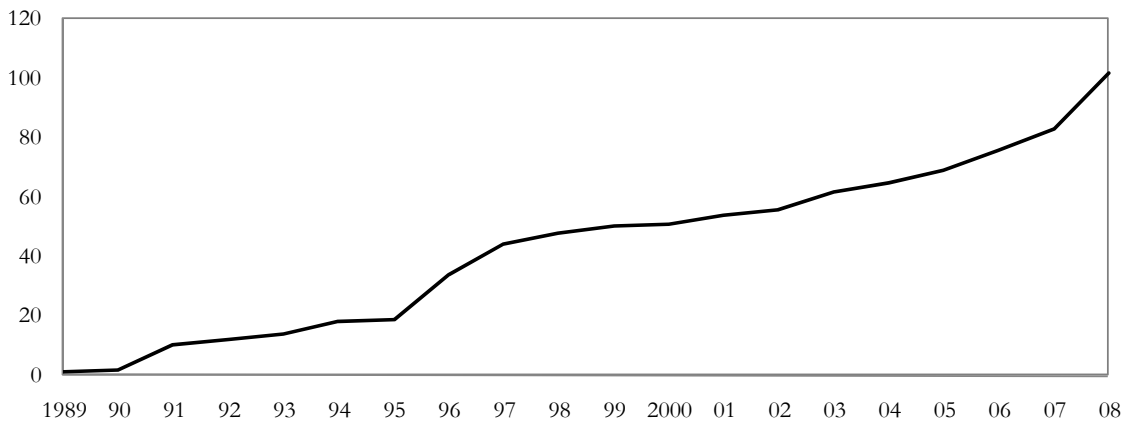
a. New products with TTB measures by year

Number of 6-digit
 HS products



b. Accumulated series of new products

Number of 6-digit
 HS products

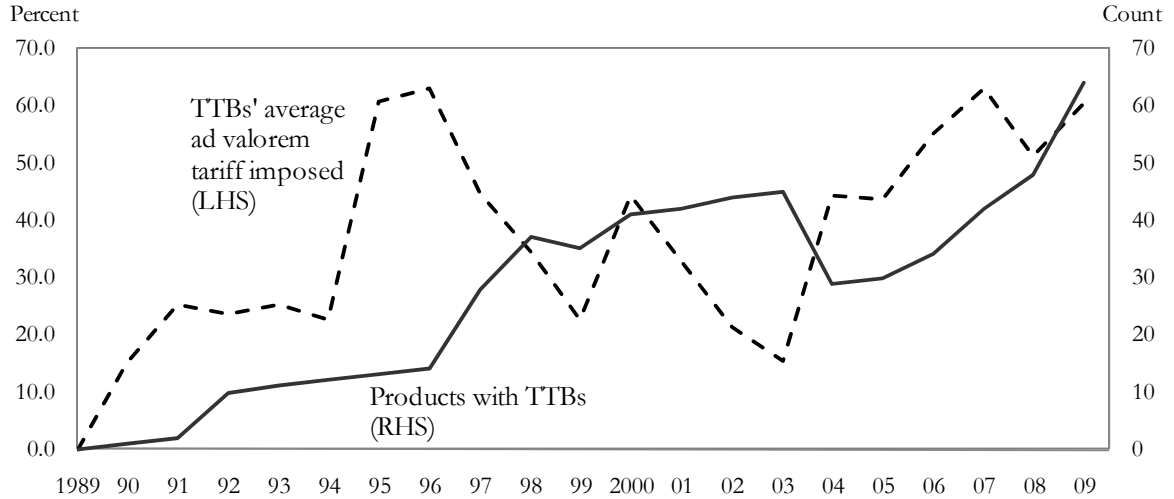


Note: See definition of variables in Methodological Appendix (equations 8.A13 and 8.A14).
 Source: Authors' calculations using the Temporary Trade Barriers Database (Bown, 2010b).

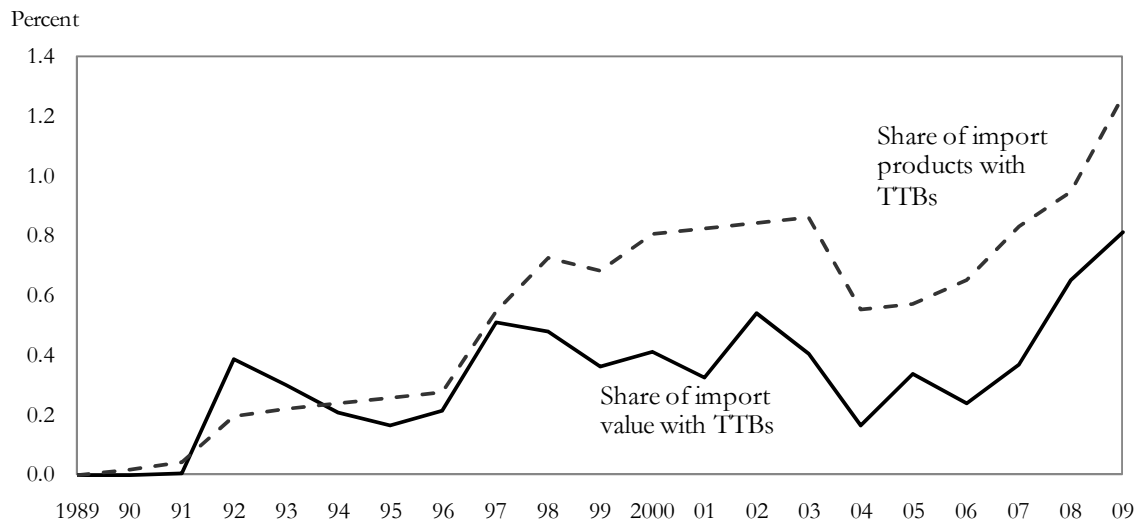
Figure 7

TTB with measure, ad valorem tariff, products and imports coverage, 1989-2009

a. Ad valorem TTB measure (%) and products (HS-06) in number

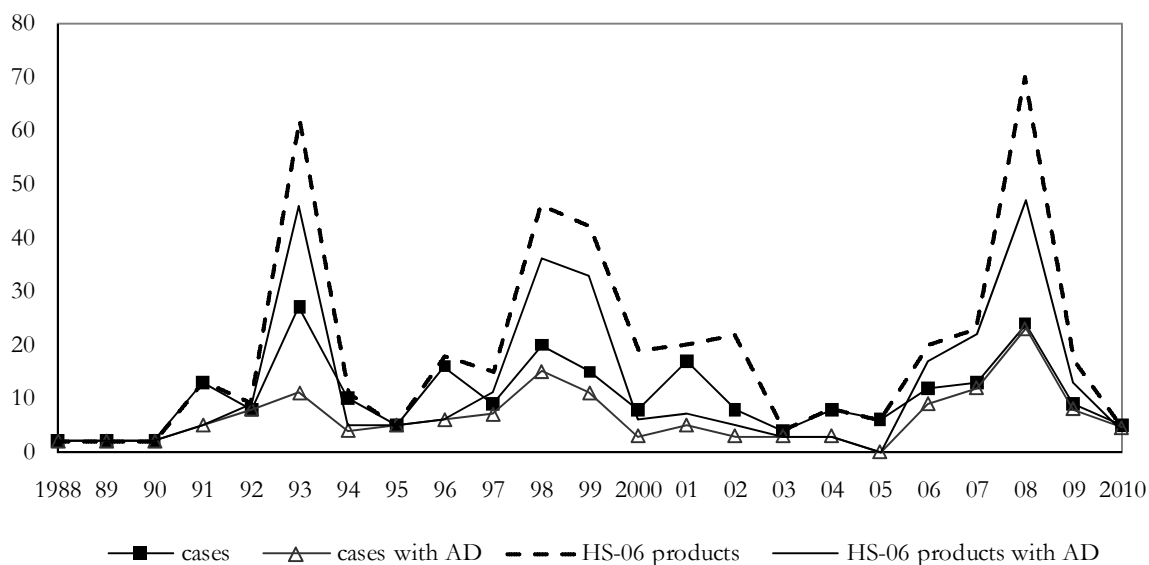


b. Shares of imports subject to TTBS



Note: See definition of variables in Methodological Appendix (equations 8.A15-8.A18).
 Source: Authors' calculations using the Temporary Trade Barriers Database (Bown, 2010b).

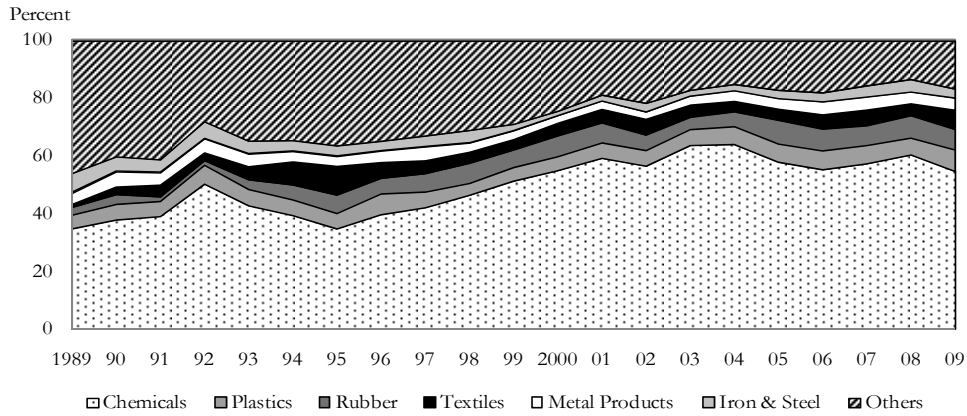
Figure 8
Evolution of AD initiated cases and AD measures in Brazil, 1988-2010



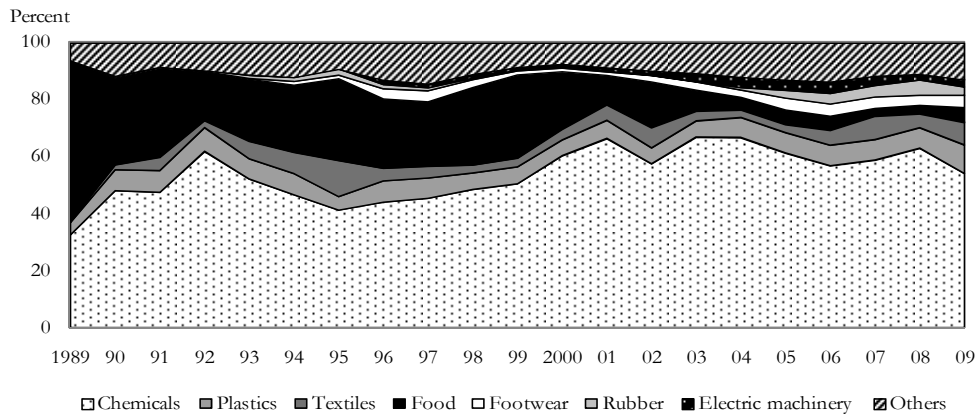
Note: See definition of variables in Methodological Appendix (equations 8.A19-8.A22). For the last two years the cases in process are divided between failed and not failed using the average success of the last three years with complete information (2006-8). Source: Authors' calculations using the Temporary Trade Barriers Database (Bown, 2010b).

Figure 9
Evolution of the structure of imports in products affected by Brazil's AD by industry,
1989-2009

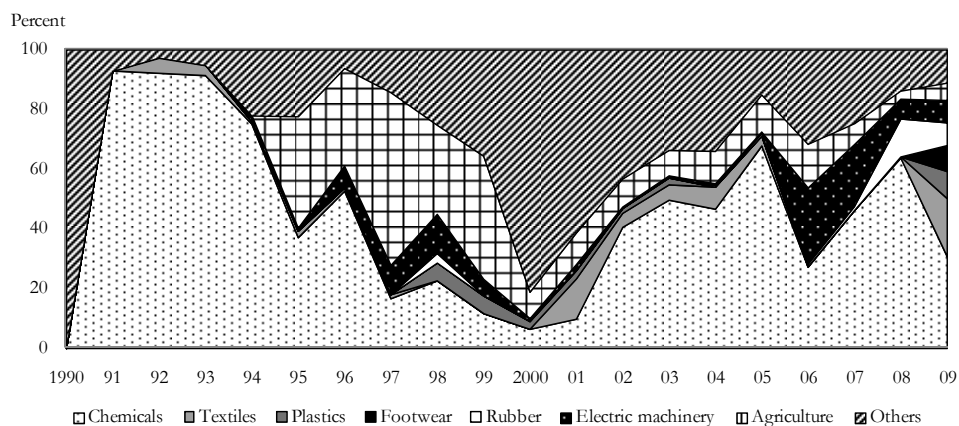
a. Whole sample products under AD investigation during the period



b. Structure of imports of products with AD measure during the period



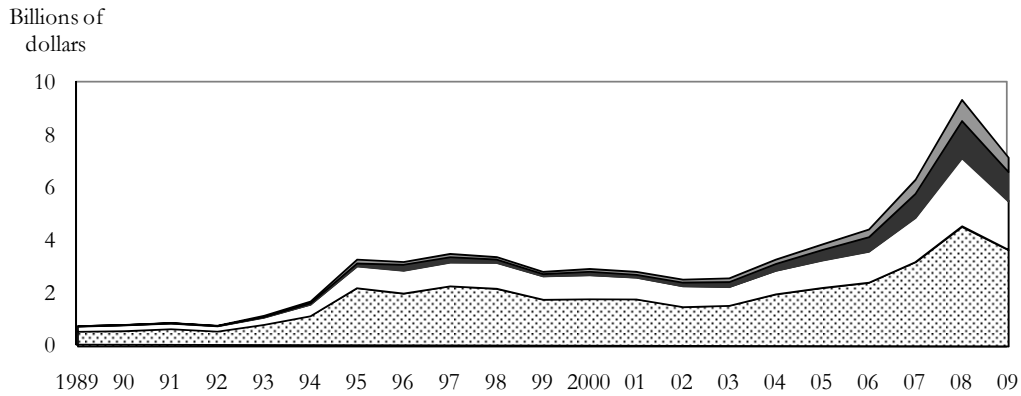
c. Imports of products with AD measure in the current year



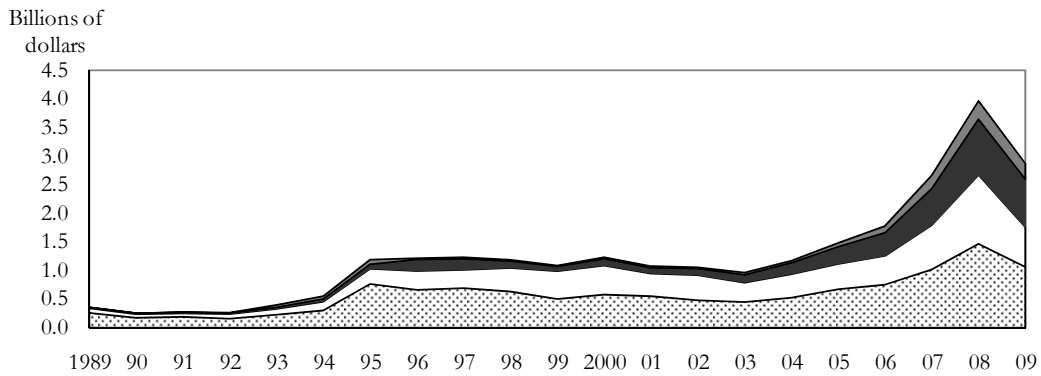
Note: See definition of variables in Methodological Appendix (equation 8.A23-8.A25). Source: Authors' calculations using the Temporary Trade Barriers Database (Bown, 2010b).

Figure 10
Imports in products affected by Brazil's AD investigations, by partner, 1989-2009

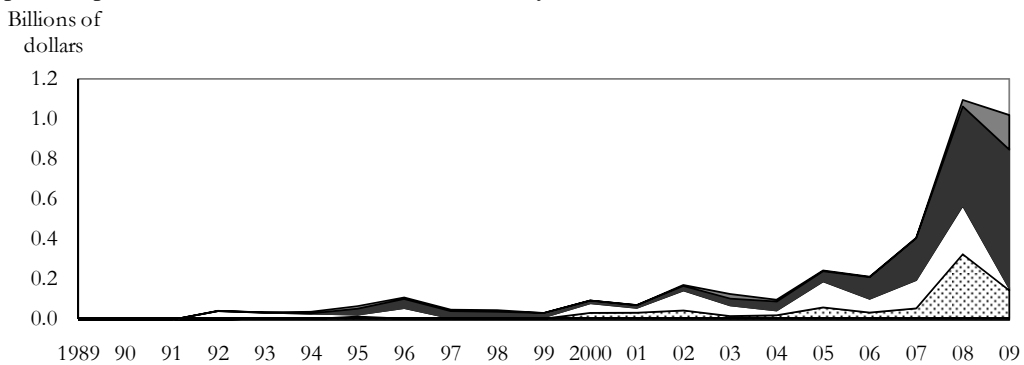
a. Whole sample products under AD investigation during the period



b. Imports of products with AD measure during the period



c. Imports of products with AD measure in the current year



■ High income □ Upper middle income ■ China ■ Lower middle income

Note: See definition of variables in Methodological Appendix (equation 8.A26-8.A28).
 Source: Authors' calculations using the Temporary Trade Barriers Database (Bown, 2010b).

Table 1
**Tariff trade policy in Brazil weighted by value added in free trade
by sector, 1987-98 (%)**

a. Nominal MFN Tariff												
	1987	88	89	90	91	92	93	94	95	96	97	98
Simple average	57.5	39.6	32.1	30.5	23.6	15.7	13.5	11.2	12.8	13.0	15.6	15.5
Weighted average	54.9	37.7	29.4	27.2	20.9	14.1	12.5	10.2	10.8	10.8	13.4	13.4
Standard deviation	21.3	14.6	15.8	14.9	12.7	8.2	6.7	5.9	7.4	8.7	7.6	6.6
Maximum	102.7	76.0	75.0	78.7	58.7	39.0	34.0	23.5	41.0	52.4	47.1	38.1
Minimum	15.6	5.6	1.9	3.3	1.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0

b. Effective Protection												
	1987	88	89	90	91	92	93	94	95	96	97	98
Simple average	77.1	52.1	46.5	47.7	34.8	20.3	16.7	13.6	17.1	19.9	21.6	20.2
Weighted average	67.8	46.8	38.8	37.0	28.6	17.7	15.2	12.3	10.4	14.3	16.6	16.2
Standard deviation	53.8	36.6	44.5	60.6	36.5	17.2	13.5	8.4	19.5	37.2	29.6	21.3
Maximum	308.1	201.3	244.3	351.1	198.3	93.5	76.5	27.7	113.8	217.5	177.0	129.2
Minimum	8.3	-2.9	-5.4	-3.4	-4.0	-4.0	-5.0	-4.9	-2.4	-1.8	-2.2	-2.2

Source: Kume *et al*, 2003.

Table 2
2009 Imports of Brazil's sensitive industries with TTB investigations in 1989-2009

3- digit ISIC industry	Total Imports (millions of dollars)	Imports covered by TTBS (millions of dollars)	Imports covered by AD only (millions of dollars)	AD/TTB* (%)	TTB/Total** (%)
	(1)	(2)	(3)		
Footwear	157	157	157	100.0	100.0
Plastic	1,307	550	550	100.0	42.1
Other Manufacturing	1,138	324	56	17.2	28.5
Rubber	1,521	527	511	96.9	34.7
Food	2,678	168	168	100.0	6.3
Chemicals	18,600	3,927	3,927	100.0	21.1
Textiles	2,516	574	472	82.1	22.8
Agriculture	3,861	144	125	86.4	3.7
Steel	3,357	251	226	90.3	7.5
Glass	423	47	47	100.0	11.0
Metal Products	2,630	308	308	100.0	11.7
Paper	1,355	81	63	78.2	6.0
Sensitive Sectors (a)	39,545	7,058	6,610	93.6	17.8
Total (b)	127,348	7,637	7,189	94.1	6.0
Share (%)=(a)/(b).100	31.1	92.4	91.9		

Note: See definition of (1), (2) and (3) in Methodological Appendix (equations 8.A4, 8.A5 and 8.A6). * AD/TTB defined as column (3)/(2)*100. ** TTB/Total defined as column (2)/(1)*100.

Source: Authors' calculations using the Temporary Trade Barriers Database (Bown, 2010b).

Table 3

MFN tariffs and WTO bindings for products with TTB investigations, 2006-9

Type of TTB product	Average tariff	2006 (%)	2007 (%)	2008 (%)	2009 (%)	Total (%)
With measures	WTO binding	31.8	31.7	31.6	31.7	31.7
	MFN applied	16.2	15.7	16.8	16.7	16.3
Without measures	WTO binding	30.5	30.3	30.3	30.6	30.4
	MFN applied	14.1	14.1	14.4	16.7	14.9
	WTO binding	31.3	31.3	31.1	31.0	31.2
	MFN applied	15.3	15.0	15.7	16.7	15.7

Source: Authors' calculations using TRAINS, WTO, and Temporary Trade Barriers Database (Bown, 2010b).

Table 4

Typology of AD cases in Brazil during 1988-2010
(cases and products at HS-06 level)

	Cases	Products
Without AD measures	90	147
With AD measure	140	273
• in preliminary stage	11	56
• in final stage	75	98
• in two stages	54	119
AD in process	13	21
Total	243	441

Source: Authors' calculations using Appendix Table 8.A2.

Table 5
**Stock of AD initiated cases, without and with AD measures in Brazil by industry
 (ISIC 3), 1988-2010 (cases and products at HS-06 level)**

Sectors		Cases			Products HS-06		
Name	ISIC3	Without AD	With AD	Total	Without AD	With AD	Total
Agriculture	111	0	5	5	0	6	6
Agriculture	111-311/12	0	1	1	0	2	2
Minerals	200	1	0	1	1	0	1
Food	311/12	1	7	8	6	30	36
Textiles	321	7	13	20	13	48	61
Footwear	324-356	1	1	2	23	23	46
Wood	331	1	0	1	1	0	1
Paper	341	4	3	7	4	5	9
Chemicals	351	45	46	91	61	56	117
Other Chemicals	352	2	4	6	2	6	8
Rubber	355	1	6	7	1	6	7
Plastics	356	2	0	2	2	0	2
Glass	362	4	1	5	4	1	5
Glass	362-351	0	1	1	0	2	2
Glass	362-351-356	5	2	7	15	6	21
Other non metallic	369	2	4	6	2	6	8
Iron & steel	371	9	19	28	15	37	52
Non ferrous metal	372	10	1	11	10	1	11
Metal products	381	2	11	13	2	11	13
Metal products	381-371	0	2	2	0	5	5
Machinery	382	0	2	2	0	3	3
Electric machinery	383	0	3	3	0	5	5
Electric machinery	383-351	0	1	1	0	2	2
Transport	384	0	2	2	0	2	2
Professional & scientific...	385	2	2	4	2	7	9
Other manufactured...	390	4	3	7	4	3	7
Total		103	140	243	168	273	441

Note: Some sectors appear twice because some cases cover several sectors simultaneously.

Source: Authors' calculations using the Temporary Trade Barriers Database (Bown, 2010b).

Table 6
Average duration of AD measures in Brazil by industry (ISIC 3), 1988-2010

Name	Sectors	Average duration (years)	
	ISIC3	With AD	Total
Agriculture	111	4.6	4.6
Agriculture	111-311/12	2.0	2.0
Minerals	200	a)	a)
Food	311/12	7.6	6.6
Textiles	321	4.0	2.6
Footwear	324-356	1.0	0.5
Wood	331	0.0	0.0
Paper	341	7.6	3.3
Chemicals	351	5.2	2.6
Chemicals	352	5.3	3.5
Rubber	355	5.8	5.0
Plastics	356	0.0	0.0
Glass	362	30.0	6.0
Glass	362-351	5.3	5.3
Glass	362-351-356	5.0	1.4
Other non metallic	369	7.5	5.0
Iron & steel	371	7.1	4.8
Non ferrous metal	372	6.0	0.5
Metal products	381	7.7	6.5
Metal products	381-371	5.0	5.0
Machinery	382	7.5	7.5
Electric machinery	383	7.7	7.7
Electric machinery	383-351	1.0	1.0
Transport	384	3.5	3.5
Professional & scientific equipment	385	2.0	1.0
Other manufactured products	390	6.0	2.6
Total		5.9	3.4

a) No data available.

Source: Authors' calculations using the Temporary Trade Barriers Database (Bown, 2010b).

Table 7
Explaining TTBs in Brazil

	Linear Probability Model	Logit	Probit	OLS
Unit Values	-0.014*** (0.0006)	-0.443*** (0.018)	-0.207*** (0.009)	-0.003*** (0.0002)
Imports	0.001*** (0.0003)	0.030*** (0.009)	0.014*** (0.004)	0.001*** (0.0001)
MFN	0.284*** (0.012)	6.970*** (0.294)	3.393*** (0.155)	0.073*** (0.004)
ΔMFN	-0.725*** (0.039)	-11.197*** (0.307)	-5.486*** (0.194)	-0.253*** (0.014)
Real Exchange Rate	-0.027*** (0.001)	-0.838*** (0.044)	-0.369*** (0.021)	-0.010*** (0.0004)
Fixed Effects	No	No	No	No
R-squared	0.19	0.12	0.12	0.03
# observations	41439	41439	41439	41439

Notes: In the first three columns the left-hand side variable takes the value 1 if there is a TTB and is zero otherwise. In the fourth column the left-hand-side variable is the ad-valorem equivalent of the TTB. All right-hand-side variables are in logs. White robust standard errors are given in parenthesis. * stands for statistical

significance at the 10 percent level, ** for statistical significance at the 5 percent level and *** for statistical significance at the 1 percent level.

Table 8
Explaining TTBs in Brazil and controlling for missing variables

	Linear Probability Model	Logit	Probit	OLS
Unit Values	0.001 (0.001)	-0.019 (0.037)	-0.006 (0.019)	-0.0004 (0.0003)
Imports	0.003*** (0.0003)	0.141*** (0.019)	0.079*** (0.009)	0.001*** (0.0001)
MFN	-0.735*** (0.031)	-9.406*** (1.281)	-5.030*** (0.541)	-0.129*** (0.009)
Δ MFN	-0.244*** (0.034)	-5.129*** (0.758)	-2.640*** (0.360)	-0.161*** (0.013)
Real Exchange Rate	-0.014*** (0.002)	-0.672*** (0.123)	-0.327*** (0.053)	-0.003*** (0.0009)
Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.36	0.57	0.57	0.17
# observations	41439	20723	20723	41439

Notes: In the first three columns the left-hand side variable takes the value 1 if there is a TTB and is zero otherwise. In the fourth column the left-hand-side variable is the ad-valorem equivalent of the TTB. The number of observation changes for the logit and probit estimators as some of the fixed effect predict the absence of TTB perfectly and are therefore dropped from the regression. All right-hand-side variables are in logs. All four regressions have a set of fixed effects that control for time-invariant HS six-digit effects, partner fixed effects and year fixed effects. White robust standard errors are given in parenthesis. * stands for statistical significance at the 10 percent level, ** for statistical significance at the 5 percent level and *** for statistical significance at the 1 percent level.

Table 9
Explaining TTBs in Brazil and controlling for (more) missing variables

	Linear Probability Model	Conditional Logit	OLS
Unit Values	0.001 (0.001)	0.077 (0.062)	0.002*** (0.0004)
Imports	0.0003 (0.0004)	0.061 (0.038)	0.001*** (0.0002)
MFN	-0.430*** (0.022)	-7.813*** (0.886)	-0.077*** (0.006)
Δ MFN	-0.367*** (0.032)	-1.197*** (0.386)	-0.177*** (0.012)
Real Exchange Rate	-0.013*** (0.001)	-0.612*** (0.088)	-0.006*** (0.0004)
Fixed Effects	Yes	Yes	Yes
R-squared	0.45	0.57	0.28
# observations	41439	3915	41439

Notes: In the first two columns the left-hand side variable takes the value 1 if there is a TTB and is zero otherwise. In the third column the left-hand-side variable is the ad-valorem equivalent of the TTB. The number of observation changes for the logit and probit estimators as some of the fixed effect predict the absence of TTB perfectly and are therefore dropped from the regression. All right-hand-side variables are in logs. All three regressions have a set of fixed effects that control for time-invariant HS six-digit effects times partner fixed effects. White robust standard errors are given in parenthesis. * stands for statistical significance at the 10 percent level, ** for statistical significance at the 5 percent level and *** for statistical significance at the 1 percent level.

STATISTICAL APPENDIX

Table A1

Brazil's PTAs in force with third countries, 1991-2008

Partner	Year	Type of agreement	
Argentina, Paraguay and Uruguay (ACE ^a , 18)	1991	Plurilateral	FTA (2001) and CU (in construction)
Chile (ACE, 35)	1996	Common with MECOSUR countries	FTA in goods
Bolivia	1997	Common with MERCOSUR countries	FTA in goods
México (ACE 53 and 55)	2003	Bilateral	Trade rules and automotive sector
Cuba	2000	Bilateral	Partial preference
Peru (ACE, 58)	2005	Common with MERCOSUR but different bilateral preference	FTA in goods (2014)
Ecuador, Colombia and Venezuela (ACE, 59)	2005	Common with MERCOSUR but different bilateral preference	FTA in goods (2018)

^a Acuerdo de Complementación Económica (Economic Complementation Agreement).

Source: Moncarz, Olarreaga, and Vaillant (2010).

Table A2

Typology of AD cases in Brazil for 1988-2010, combinations of decisions at the preliminary and final stages of the procedure (cases and products at HS-06)

	Cases	Products	Calculation of interval period of AD measures	Average interval in years
Without AD	90	147		0.0
...-	1	23		0.0
AA-.N	1	1		0.0
BB-.N	1	1		0.0
BB-AN	19	25		0.0
BB-NN	49	63		0.0
BB-TT	10	16	Revoke-Final	0.8 ^{a)}
BB-WW	8	12		0.0
NN-NN	1	6		0.0
AD in process of study	13	21		0.0
MIMI-MIMI	13	21		0.0
AD in preliminary stage	11	56		
AA-NN	8	46	Final-Preliminary	1.5
AA-TT	2	9	Final-Preliminary	8.5
AA-WW	1	1	Final-Preliminary	1.0
AD in final stage	75	98		
BB-AA	66	89	Revoke-Final	5.3 ^{b)}
BB-OTHOTH	2	2	Revoke-Final	5.0
MIMI-AA	5	5	Revoke-Final	6.2
NN-AA	2	2	Revoke-Final	1.0
AD in two stages	54	119	Revoke-Preliminary	
AA-AA	54	119	Revoke-Preliminary	6.4
Total	243	441		3.4

^{a)} There are two cases where the final decisions are T but the revoke year is not immediate.

^{b)} There is one case where we do not have information about the revoke year and thus we use the average to perform calculations.

Source: Authors' calculations using the Temporary Trade Barriers Database (Bown, 2010b).

Notes: For example, an investigation with bypassed preliminary stage and final affirmative dumping but final negative injury finding will show up as BB-AN. More specifically, A: accepted; N: denied; B: bypassed; T: terminated; W: withdrawn; MI: missing; OTH: other.

Table A3
Brazil's AD initiations in 1988-2010, with and without AD measures

	Cases			Products (HS-06)		
	Total	Without AD	With AD	Total	Without AD	With AD
1988	2	0	2	2	0	2
1989	2	0	2	2	0	2
1990	2	0	2	2	0	2
1991	13	8	5	13	8	5
1992	8	0	8	9	0	9
1993	27	16	11	62	16	46
1994	10	6	4	11	6	5
1995	5	0	5	5	0	5
1996	16	10	6	18	12	6
1997	9	2	7	15	4	11
1998	20	5	15	46	10	36
1999	15	4	11	42	9	33
2000	8	5	3	19	13	6
2001	17	12	5	20	13	7
2002	8	5	3	22	17	5
2003	4	1	3	4	1	3
2004	8	5	3	8	5	3
2005	6	6	0	6	6	0
2006	12	3	9	20	3	17
2007	13	1	12	23	1	22
2008	24	1	23	70	23	47
2009 ^{a)}	9	1	8	17	4	13
2010 ^{a)}	5	1	4	5	1	4
Stock	243	91	152	441	152	289

^{a)} In 2009 and 2010, cases (8 and 4) and products (13 and 4) with AD measures are estimated due to lack of information. The observed figures for cases (products) are 1 (1) with AD measure in 2009 and 0 (0) in 2010.

Source: Authors' calculations using the Temporary Trade Barriers Database (Bown, 2010b).

Table A4
Brazil's Countervailing duties

Country	Products	Dates			Measure	
		Initiation year of the investigation	Start of measure	Duration in years	Type	Level
Argentina	Disposable Diapers	1991		0	.	
Malaysia	Latex Yarn	1991	1991	6	missing	missing
European Union	Milk Products	1992	1992	3	ad valorem	20.7
USA	Wheat	1992			.	
Pakistan	Cotton Yarn	1993		0	.	
Canada	Wheat	1993		0	.	
Cote d'Ivoire	Grated Coconut - Dehydrated	1994	1995	7	ad valorem	87.9
Indonesia	Grated Coconut - Dehydrated	1994	1995	7	ad valorem	155.7
Malaysia	Grated Coconut - Dehydrated	1994	1995	7	ad valorem	196.5
Philippines	Grated Coconut - Dehydrated	1994	1995	7	ad valorem	121.5
Sri Lanka	Grated Coconut - Dehydrated	1994	1995	7	ad valorem	81.4
Sri Lanka	Coconut Milk - Powdered	1994	1995	7	ad valorem	175.8
USA	Cotton (not Carded or Combed)	1994		0	.	
India	Polyethylene Terephthalate Films (PET Films)	2001		0	.	
India	Stainless Steel Bars	2003	2004	6	specific duty	\$172.00/t
India	Polyethylene Terephthalate Films (PET Films)	2007	2008	3	specific duty	\$165.08/t

Source: Authors' calculations using the Temporary Trade Barriers Database (Bown, 2010b).