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Article

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Industrial determinants of anti-dumping in Brazil – Protection, competition and performance: An analysis with binary dependent variable and panel data[☆]

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Abstract

This article investigates how sectorial characteristics determine the probability of industries receiving an anti-dumping (AD) duty, delving into the economic literature on the political economy of protection, market competition and trade reform in Brazil. By focusing on when the AD was granted, the article concentrates on the objective economic motivations for an industry to claim protection and which are instrumental to the decision of the trade defense authority. The empirical strategy involves a panel of 93 industrial sectors from 1996 to 2007 to create four groups of explanatory variables (collective action/competition, economic performance, factors of production, trade coefficients), reflecting their structural characteristics, market competition, economic performance and political mobilization. The econometric specifications apply binary dependent variable models (*logit*) with cluster robust and population-averaged error correction. The results show that structure of trade (imports volume and tariffs), economic performance (productivity and investments), and factor content (labor and natural resources) influence the probability of the AD. Political economy characteristics (captured by interactive terms) are also influential in determining the measure.

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Resumo

Esse artigo investiga como características industriais afetam a probabilidade de indústrias receberem direitos anti-dumping (AD), relacionando literaturas de economia política da proteção, concorrência nos mercados e reforma comercial no Brasil. Ao focar nos casos em que o AD foi concedido, o artigo explica as motivações econômicas objetivas para uma indústria pleitear a proteção e que contribuem para a decisão favorável da autoridade de defesa comercial. A estratégia empírica envolve um painel de 93 setores industriais entre 1996 a 2007 para criar quatro grupos de variáveis explicativas (ação coletiva/concorrência, desempenho econômico, fatores de produção, coeficientes de comércio), refletindo as características estruturais, desempenho econômico e mobilização política. As especificações econométricas utilizam modelos de regressões de variável dependente binária (*logit*) com correção de erros por painel-robusto (*panel-robust*) e por ponderação por população (*population averaged*). Os resultados mostram

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que estrutura do comércio (volume de importações e tarifas), desempenho econômico (produtividade e investimentos), e conteúdo dos fatores (trabalho e recursos naturais) influenciam a probabilidade do AD. Características de economia política (capturados por termos de interação) são também importantes para a determinação da medida.

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Palavras chave: Economia política; Anti-dumping; Política comercial; Concorrência; Estudos industriais

1. Introduction

The international economic crisis of 2008/09 and the over-valuation of the Brazilian currency (R\$ Real) brought about, in the early 2010s, anti-dumping (AD) duties to the center of the Brazilian economic policy decisions. The adoption of trade defense measures aims to mitigate the damage caused to the domestic industry by the importation of competing products at artificially low prices. Such measures have been adopted in response to the recent international crisis because the Brazilian market has been, allegedly, invaded by international products at dumped prices. Low demand in international markets and in the domestic markets of the most affected countries also contributed to the flood of foreign goods. The real over-valuation of the currency has diminished the competitiveness of domestic manufactured products in the domestic market, making imported products cheaper, therefore, triggering the demand for this kind of administered protection.

This study focuses on an earlier time period and seeks to distance itself from the recent situation. Hence, it looks at the internal features of industries and at the industrial organization of markets that may act as determinants of AD duties. Although much influenced by business cycles, as the literature indicates (Prusa and Skeath, 2002; François and Niels, 2006; Kume and Piani, 2005; Bown, 2008; Vasconcelos and Firme, 2011), the AD is also determined by sectorial characteristics. For example, patterns of AD application are repeated in different countries: the measure is more common in products with increasing economies of scale in production and with industrial commodities features (e.g. chemicals and metals).

The conclusion of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) in 1994, and the creation of the International Trade Organization (WTO), approved an international anti-dumping regime. The WTO considers the AD a legitimate instrument against alleged international misconduct. Several countries, including Brazil, created domestic trade defense laws and investigation procedures based on the GATT/WTO regime (Zanardi, 2006; Niels and Kate, 2006; Bown, 2008).¹

On the other hand, the economic literature, in particular concerning the political economy of protection, considers anti-dumping measures, as well as import tariffs in general, as policies that generate concentrated gains (rents) and decrease overall economic welfare. The anti-dumping duties, by increasing the price of the imported product, can cause losses for consumers and, in the case of intermediate inputs, can also reduce the efficiency of the economy as a whole.

This work concentrates on sectorial characteristics – such as internal indicators (e.g. productivity, employment, profit margins, exposure to international trade, etc.) – that may influence the probability of an industry receiving the AD duty. It also attempts to measure the relationship between the structure of market competition in domestic industrial sectors and the AD. The restructuring of competition, and its impact on the sector's performance, is a function of the process of liberalization experienced in Brazil in the 1990s, which increased the contestability of the industrial markets. This work also explores the relationship between the political economy of protection and market competition in order to verify how the differences between the sector's indicators affect the likelihood of the AD.

By focusing only on the cases in which the AD claim was granted (assuming the existence of dumping, material injury and the causal link),² the article investigates the objective economic motivations for an industry to file for an AD, and which were instrumental to the favorable perception of the Brazilian Trade Defense investigating authority.

¹ Brazilian legislation on anti-dumping measures was consolidated by Decree N°. 1,602 of 23/5/1995, incorporating the conclusion of the Uruguay Round of the GATT multilateral trade negotiations to the Brazilian legal framework, via Legislative Decree N°. 30 of 12/15/1994. A novel AD legislation was recently enacted – Decree N°. 8058 of 26/7/2013 – in order to expedite and make the process more transparent.

² According to the Brazilian legislation, for AD duties to be imposed three criteria must be met: (1) the importing country must sell its product in the Brazilian market for a lower price than in its own home market or for less than the average cost of production (dumping); (2) there must be

That said, some of the variables reveal the political mobilization capacity of the sectors, since this is one of the main features of the economic literature on anti-dumping. The explanatory variables are constructed with data of 93 manufacturing industry sectors, covering 12 years (1996–2007), from an annual industrial survey (PIA/IBGE), and trade statistics from the Ministry of Industry and Trade. The variables are divided into four groups (collective action/competition, factors of production, economic performance and trade penetration), reflecting internal structural characteristics, economic indicators and the ability of political mobilization. I use logit regression models with pooled and population-averaged panel data, in order to account for the degree of time correlation and shared features among the sectors that may influence the composition of errors in the regressions. The empirical results show that the structure of foreign trade (imports volume and tariff level), factor content (labor content and natural resources intensity) and economic performance (productivity and investment intensity) influence the most the probability of the AD duty. Labor and productivity decrease the probability of receiving the AD. The other factors mentioned exert positive effect. Some qualifications, explained by political economy reasons, and captured by interactive terms in the regressions, are also considered.

The article is divided as follows: after this introduction, Section 2 reviews the economic theory and the recent AD literature with an emphasis on the political economy of protection. This section also refers to the literature on the impact of the liberalization process of the 1990s on the sectorial indicators and on the industrial organization of markets in Brazil. Section 3 presents the data and the assembling of dependent and explanatory variables. Section 4 discusses the empirical strategy and methodological issues of the panel binary (logit) dependent variable regression and introduces the model to be estimated. Section 5 discusses the empirical results and comments about the economic and political implications. Section 6 concludes.

2. Economic theory, political economy and the Brazilian case

2.1. Economic theory

The definition of dumping according to economic theory is straightforward. When there is a possibility of exporting, a domestic monopoly will make extensive use of the tariff to keep the marginal revenue equal to the marginal cost in the domestic market and then export at the lowest free-on-board price to equalize the marginal cost. This type of price discrimination was reviewed by Viner (1923), *apud* Ponfret (1992), in a classic study on dumping. Dumping, in practice, is a price discrimination strategy used by the producers, which charges consumers in domestic and international markets differently.

Fishelson and Hilman (1979) and Bhagwati (1988) developed the initial Vinerian argument. In Chart 1, which ignores transportation costs, the single domestic firm produces the units, in which the marginal cost of production (MC) equalizes to the world price (Pr_{world}). In free trade, domestic consumption is OB, and AB units are imported. With the prohibitive tariff, the domestic firm exercises its monopoly power and increases the domestic price (Pr_{dom}); domestic consumption drops to OC, and CA units are exported with world prices. If the demand and cost curves reflect the social costs and benefits, the net loss upon imposing a tariff is equal to the triangle EFG, namely, the *monopoly rent* minus the consumer surplus. In practice, the welfare effects are more complicated if the exchange rate is fixed or misaligned, as in many developing countries.

When the domestic consumer does not have access to imports, the discriminating monopolist maximizes its profits setting marginal revenue equal to marginal cost in both markets. The price will be lower in the market with more elastic demand. In foreign markets there is usually more competition; therefore, consumers will tend to respond to any increase in prices, decreasing a firm's demand and migrating to another supplier.

The economic theory vision of dumping involves a price differentiation strategy of a domestic monopolist in international markets. So, the domestic monopolist, charging more in the domestic and less in foreign markets, seeks to eliminate competition in foreign markets, which may allow it to increase prices in the medium term; the so-called *predatory dumping*. In this way, the domestic market power can be expanded to the international market.

"material injury" to the domestic industry caused by the imported good at "unfair" prices; (3) there is a causal link between dumping and material injury.

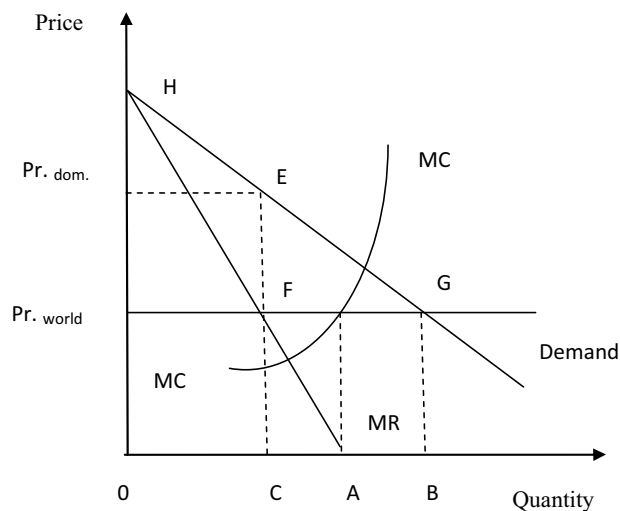


Chart 1.

Anti-dumping affects other trade issues of the country which is imposing the measure. From the perspective of the domestic monopolist, if the marginal cost curve (MC) in [Chart 1](#) is superior to the line Pr_{world} , protection from imports can induce domestic production or, alternatively, encourage investment which would not exist in a situation of free trade. From the point of view of the domestic complainer for an AD duty, it is indifferent if the exporter is a domestic monopoly. But, in theory, this affects the ability of that exporter to price discriminate in different markets. Such a situation, in accordance with the objective terms, should be part of the analysis of the trade defense authority.³

The reality is more complex than the theory when one realizes that, in many cases, the AD complainer is also a monopolist in the home market. In this sense, one may assume that the AD duty may generate inefficiencies in both importer and exporter markets. In the former, the partial equilibrium analysis of loss of efficiency due to protection applies with the imposition of an AD duty, which is equivalent to a tariff. The nascent industry protection argument, very common to justify the application of import taxes, has also been used by domestic industries, including monopolies, in the case of AD complaints. In fact, they also serve the purpose of shielding domestic industries against international competition.⁴ Unless there are externalities and economies of scale, the neoclassical economic theory is skeptical about such arguments.

The hypothesis raised in this subsection shall be verified empirically: to what extent might market power and the presence of economies of scale/externalities increase the probability that an industrial sector receives the AD? Is the AD more likely to appear in investment-intensive industrial sectors, whose investments would not be viable without the extra protection? What is the relationship between the import tariffs received by the industry, domestic taxation and the probability of the AD?

2.2. The political economy of anti-dumping duties

Models of political economy of protection – also known as *endogenous protection* – perceive the policy of AD application as a very specialized type of lobbying, which allows interest groups to influence the administrative/government decision-making system. The outcomes of these decisions are rarely beneficial to the entire economy (Nelson, 2006). The literature of political economy of protection (*Protection for Sale*) interprets the AD as a result of the calculation

³ International practice shows that the sectors with frequent AD cases are also characterized by international oligopolies, which eventually lead to unfair trade practices through international cartels (Hoekeman and Martin, 2012).

⁴ The *safeguard regime* was also approved with the creation of the WTO and allows temporary compensation to national industries due to disruptive effects caused by international competition. Arguments of “infant industries protection” are also used to justify safeguards. These arguments, however, are not uncommon in AD.

of the policymaker, who weighs collective welfare losses vis-à-vis the benefit of the government while promoting the narrow interests of a given economic sector (Grossman and Helpman, 1994).

The political economy of protection has a microeconomic view: rational agents seek to maximize their well-being and to influence the state decision-making apparatus. The action of the firms on the political system is determined by a series of sectorial characteristics, such as: content of factors of production; domestic and international competitiveness; structure of the market and the exposure to international trade, among others. For example, export-oriented and import competing sectors have distinct visions about trade policy: the former favor greater integration with the international economy and the latter seek protection from competition after trade liberalization. Similarly, in a country like Brazil, labor-intensive sectors (e.g. clothing), or capital (e.g. chemicals) have different trade preferences vis-à-vis natural resource-intensive industries (e.g. iron ore, non-metallic minerals), industries in which the country has comparative advantage.

Therefore, this paper interprets lobbying as a function of sector characteristics. Interest groups linked to economic groups seek to influence public policy. Recent studies indicate that lobbying spending exerts an important role in explaining patterns of protection between economic sectors (Tovar, 2011), acting upon both tariff and non-tariff measures, such as AD. In this literature, the lobby is classified as DUP – *direct unproductive rent seeking activity*. (Baghwati, 1982). As the AD investigation targets a specific product, the lobby for protection tends to be more concentrated than in the case of tariffs, because these include several products in a harmonized schedule classification (HS) generally characterized by tariff levels.⁵

The lobby for the AD, however, also occurs in an indirect way. The existence of oligopolistic structures increases the likelihood of an AD and, once imposed, AD limits international trade overall (Vandenbussche and Zanardi, 2011). Thus, if a certain company petitions for and is contemplated with the AD duty in a given country, this indirectly benefits companies of the same sector in different countries, which trade in world markets. Additionally, AD duties are complements to actions of “Voluntary Export Restraints” (VER), usually a collusive behavior of domestic and international firms sanctioned by governments. In the absence of a VER, the company petitions an AD. In an oligopolistic scenario, even if an isolated company adopts a “free rider” behavior and decides not to petition in its domestic jurisdiction, the AD duty somewhere else may distort the structure of international markets, making them less competitive and favoring a possible domestic monopoly. Additionally, Bloningen and Prusa (2001) state that the AD generates inflationary effects on the products, accruing mainly on targeted origins. However, effects may spillover to companies in non-targeted countries due to a substitution effect, which may increase the demand for alternative import sources.

The models featured in Nelson (2006) show the sequence by which firms, given an institutional environment and a market structure, act rationally in order to influence politicians. According to that author, independent of the existence of a VER, firms tend to file for the AD.

Eq. (1), based on Rosendorff (1999), states that a government maximizes social welfare G^S , according to the degree of proclivity of that government toward the interests of industries, regarding the interests of consumers, in accordance with the following:

$$G^S(t) = CS(X) + s\pi + tx^* \quad (1)$$

where $X = x + x^*$ is the total consumption of imported goods (star denotes the foreign good), $s \geq 0$ is the politically determined weight of the profits of the domestic firms. CS is the consumer surplus, depending on the amount of X consumed. The objective function also depends on the government revenue (π) multiplied by s , and on the amount collected by imports (x^*), given a certain tariff level (t). In Eq. (1), (t) may also be an AD duty, which increases government revenue as well.

The VER is part of this equilibrium – it is a plausible final point in the administered protection in which consumers end up with smaller amounts, higher prices and shared profits between engaging firms are higher. However, the majority of investigations does not lead to a VER, but end up in a decision of the trade defense authority to raise prices at a level that eliminates the dumping or in an agreement with the companies in the foreign market. Thus, similarly to the VER, the AD potentially tends to promote collusion between domestic and foreign companies, via *price undertaking*, with the

⁵ The principle of escalating tariff levels states that basic products must have lower rates than intermediary goods, and these, in turn, must have lower tariffs than final products.

consent of the trade policy authorities of the countries. By this means, the AD may have some welfare improving effect because, in theory, it limits the likelihood of collusive behavior of the involved firms, which, otherwise, would engage in a VER. However, empirical evidence shows that only 20% AD investigations result in withdrawal and agreement between domestic and foreign firms. Regardless, the AD could lead to collusion between domestic petitioners and foreign firms (Nelson, 2006).

Another vein of the literature recognizes the growing adoption of AD, particularly by a developing country, as a defense mechanism and retaliation. This is a setting that leads to the prisoner's dilemma in international trade, in which; the Nash equilibrium is inferior to the Pareto optimum. So, adopting the AD as a retaliation device, countries support their local producers but decrease the world welfare by lessening world trade levels. In this sense, repeated games can bring about a cooperative equilibrium. The GATT/WTO regime has played an important role in providing stability of rules and mechanisms of information for the world trade system, facilitating the overcoming of the dilemma (Bagwell and Staiger, 1990, 1999).

In the empirical part of the literature, the more traditional line points to AD as a function of macroeconomic problems (overvalued real exchange rate, inflation, trade balance) and the pressure of international competition. According to studies, economic activity is inversely related to AD determinations, while real exchange rate appreciation and imports penetration are positively related. Macroeconomic imbalances, overall, are associated with positive AD decisions (Prusa and Skeath, 2002; François and Niels, 2006; Bown, 2008; Vasconcelos and Firme, 2011).

Other empirical contributions show the negative impact of AD legislation on world trade: it declines and experiences “chilling” effects. Vandenbussche and Zanardi (2011) contradict the proponents of AD measures. According to these proponents the outcome on trade flows are negligible because AD involves very specific products, small volumes and values. Their study shows that, in the aggregate, there is a considerable declining effect. The measures adopted by new users – who created laws after 1994 – took a toll of 14 billion dollars in losses in their foreign trade (or 5.9%). In the opinion of the authors, in countries such as Mexico and India, the negative impact of AD offsets the increased volumes reached after the commercial liberalizations of the previous decades.

It should be mentioned that since the mid-20th century AD measures have been traditionally employed by developed countries, but developing countries have been increasingly embracing them (Niels and Kate, 2006). Thus, the empirical literature also checks the adoption of AD measures by the so-called *non-traditional* users after the processes of trade liberalization and accession to the GATT/WTO rules. Non-traditional users apply AD measures as a retaliation mechanism against developed countries and as compensation against the trade liberalization of the 1980s and 1990s. AD can also be understood as a trade policy generally related to the stage of development of the country. Industrializing, less-developed countries will tend to have more protectionist policies (Feiberg, 2011).

Furthermore, studies with a broad focus on the causes of the AD tendency generally omit economic sector heterogeneity. There are sectorial variations in at least three different channels: (a) the sectors respond differently to business cycles and economic shocks; (b) there are different incentives to become involved with politics – which tend to be functions of the concentration of industries; (c) according to Olson (1967), the organization capacity of a sector (collective action) varies and the effective demand for protection is a function of the lobbying ability. The industries facing international competition and competitiveness problems are more prone to seek administered protection. Similarly, the appreciated exchange rate does not equally affect all groups in the economy: imported inputs users may even benefit from this situation. In this study, sectorial characteristics (ability to organize or collective action; use of factors of production), as well as the different reactions of the sectors to the economic environment – expressed in terms of productivity, profit-margin ratio, revenue, investment propensity, export and import coefficients – will be tested as explanatory variables.

As stated by public choice literature, protection also comprises institutional aspects in the relationship between politicians and bureaucrats. Mechanisms such as the AD allow adjustments in public policies without jeopardizing previous reforms. Thus, protectionist pressures coming from the Congress or from politicians are processed in due course by the Executive branch. Those demands tend to be larger after macroeconomic shocks and/or financial upheavals, as the recent 2008 international crisis indicates (Evenett, 2011). In short, proponents of the AD understand it as an escape valve, shielding the bureaucrats and avoiding the “politicization” of trade policy. In practice, the “politicization” is expressed by the fact that sectors with greater economic and political weight tend to exert higher pressure for the AD. This assertion will be empirically verified in this work.

In summary, the literature of political economy considers any protectionist instrument as the prevalence of particularistic benefits over public well-being. However, to some extent, the AD restricts the demand for protection, because

the costs of a petition are not negligible. The commercial protection system is designed to accommodate different interests, small or large, and the AD tends to address the latter.⁶

2.3. *The Brazilian trade liberalization experience, competition impacts and anti-dumping*

It is a consensus in academic and public policies circles in Brazil that the 1990s trade liberalization has increased competition in the manufacturing industry. The relationship between trade liberalization and concentration/market power influenced the demand for trade defense. Brazil and other emerging market countries adopted AD legislations and became frequent users of such measures after trade liberalization reforms of the late 1980s and 1994, which slashed tariff levels. As a reaction, special interest groups (many of which represented monopolies and oligopolies) who felt threatened by competition with imports in an environment with lower tariffs, became frequent users of recently enacted domestic AD legislation.

However, the relationship between trade liberalization, increased competition and market concentration is not obvious from an economic point of view. [Amann and Baer \(2008\)](#) realized that the economic reforms (liberalization/privatization) of the 1990s, under the aegis of neoliberal policies, allowed the exposure of the Brazilian economy to domestic and international market forces, but paradoxically increased the concentration of the ownership of the firms. Using a database and a similar period to that of this work, [Rocha \(2010\)](#) studied the concentration of Brazilian industrial markets between 1996 and 2003, using the decomposition of the Herfindahl–Hirschman Index (HHI), concerning size and the number of companies. On the average, the industries suffered little variation. However, changes in concentration were substantial in a group of industries. The changes were related to inequalities in industry size, despite the entrance of new firms in various sectors. In the current study, I use the HHI of sales as an explanatory variable.

[Ferreira and Facchini \(2005\)](#), in turn, claim that in an environment with an important regime change (trade liberalization), concentrated sectors have been able to obtain political advantages that lead to less international competition. The importance of the industrial structure is dominant: in their basic specification, the authors find that the expansion of 20% in concentration leads to an increase of 5–7% in the protection.

A strand of the economic literature has examined the impacts of trade opening on the internal indicators of firms – in particular, on productivity. [Ferreira and Guillén \(2004\)](#) find positive impacts of trade liberalization on sectorial productivity. However, the results are ambiguous in relation to profit margins and industrial concentration, indicating that there is no drop in market power after trade liberalization. [Lisboa et al. \(2010\)](#) examine how openness in inputs markets is more important than competition effects to explain the growth of productivity in Brazil. They also verify that the drop in intermediary and input tariffs increases profit margins, whereas reducing final-product tariffs has an opposite effect.

Other studies with the structure-conduct-performance (SCD) approach have verified the importance of variables related to barriers of entry and profitability on the market structure. In a study with simultaneous equations, [Resende \(2007\)](#) notes the significant and positive impact of concentration on the sector's profitability. In this work, imports, expressed in terms of percentage of imports to apparent consumption, has a negative, but non-significant, effect on profits. In a dynamic panel, [Resende and Lima \(2005\)](#) indicate that one cannot reject the hypothesis of the instability of the market share. They also emphasize the increase in rivalry in the manufacturing industry in the period 1986–1998, after trade liberalization. In a slightly different line, with a Schumpeterian approach, [Carvalho Junior and Ruiz \(2008\)](#) affirm that the percentage of imports was not relevant to explain differences in profitability; however this variable helps to explain differences in productivity and size, possibly a consequence of the larger firms' better access to foreign markets.

Recent studies seek to relate the provision of AD to sectorial internal variables such as profit margins. [Konings and Vandebussche \(2005\)](#), using panel data of 4000 European firms and controlling for firms that did not receive AD protection, study the change in EU firm markups. They find a positive effect of AD duties on markups, but they find no effect for sectors where an AD petition has been filed without a duty being levied. Observing the Indian case, [Baruah \(2007\)](#) indicates that imports and performance indicators (e.g. use of installed capacity) do not affect the affirmative

⁶ The current format of the AD laws is less permissive on demands for protection than tariff measures, such as those adopted in the period of import substitution industrialization in Latin America or in the case of the U.S. Smooth-Halley Law of the 30s.

determination of the AD, but less concentrated domestic industries are more likely to receive a favorable verdict. This suggests a compensation effect due to a possible existence of damage. This result contrasts with the conclusions pointed out by analysts of the Brazilian experience. Araújo and Miranda (2008) argue that, in addition to the bias in favor of manufacturers of basic inputs (e.g. chemicals), the Brazilian experience comprises a high degree of concentration of petitioning firms. The authors also suggest that losses in national market share, due to competitive pressure from imported goods, and the fall of profitability influence filing for AD protection. Castilho et al. (2009), corroborating the assertion about concentration, also emphasized by Ferreira and Facchini (2005), claim that the firms which produced the investigated goods are highly representative of the sector, suggesting, further, the potential impact of the positive determination on production chains.⁷

In summary, the empirical literature on Brazil indicates that trade liberalization increased contestability and rivalry and decreased barriers for entering domestic markets, even though the effects on sectorial indicators, such as productivity and profit margins are not so straightforward. In the manufacturing industry, imports are one of the mechanism by which competition is exercised and there was a general increase in this condition in recent decades. However, earlier tariff cuts triggered a backlash by organized interest groups toward ADs. In this study I verify some of the issues discussed by this literature, namely, the importance of some sectorial variables and discuss the industry competition structure, regarding the probability of AD determination.

3. Data and construction of variables

This paper uses data from several sources, such as: the annual industrial survey (PIA) of the Brazilian Institute of Geography and Statistics (IBGE); the Brazilian Ministry of Development, Industry and Foreign trade (MDIC); the World International Trade Statistic (WITS) of the World Bank and the United Nations Conference on Trade and Development (UNCTAD). The dependent variable is built with information from the World Bank and Bown (2010) and from the Department of Trade Defense (DECOM/MDIC).⁸ The explanatory variables are built with data from PIA (manufacturing industry), Aliceweb (foreign trade indicators) and WITS (import tariffs). A balanced panel of 93 industrial sectors ranging from 1996 to 2007 (12 years) was assembled, allowing a potential sample of 1116 observations.

Trade defense measures are applied on the 8 digit product level, classified in the MERCOSUR Common Nomenclature (NCM), which is equivalent to the Harmonized Schedule (HS) adopted by the WTO. In order to match the anti-dumping measures, the foreign trade and the industrial survey data, I used the IBGE translator (NCM 2007xCNAE 1.0).⁹

3.1. Dependent variable

According to data of the World Bank and the DECOM/MDIC, out of 136 investigations initiated between 1996 and 2007, the Brazilian Government concluded with a positive application of AD duties on 74 occasions, involving 52 products, classified in 77 different NCN positions. The measures affected the imports of 29 countries (Tables A1 and A2, in the statistical annex). In order to build the dependent variable, I used the IBGE translator to convert the eight-digit NCM classification to the three-digit CNAE classification (the Brazilian National Classification of Economic Activities based on Industrial Standard International Classification – ISIC). Hence, 29 CNAE sectors experienced at least one AD measure in the period. In Table A1, one can see these equivalences and the products. It is important to note that in several cases, different NCMs are equivalent to just a single product or class of products. Hence, that explains the discrepancy between the applied AD measures (74) and the number of products subject to the duty (52). The DECOM classifies products investigated in one or more NCMs, generally following the instruction of the complaining firms.

⁷ In a detailed study of trade liberalization, tariff structure and protection, Castilho et al. (2009) affirm that, in a universe of 142 AD actions initiated between 1995 and 2007, with 72 applied AD measures, from 46 petitioning companies, 33 accounted for more than 90% of the domestic production of the investigated good. In addition to that, some petitioning companies produce more than one product investigated in the period in question.

⁸ Report N° 12/2008 of the DECOM/MDIC was also used to match the products with the respective classification of the MERCOSUR Common Nomenclature (NCM), complementing the information of the World Bank and Bown (2010).

⁹ The conversion of foreign trade data to the CNAE system was possible with the valuable assistance of Guilherme Oliveira Pires from the Secretariat for Economic Monitoring of the Ministry of Finance.

The binary response is the variable to be explained: the industrial sectors which received anti-dumping measures in the period are coded with the value 1; those with no measure are coded 0. Thus, there are 29 CNAE sectors with an application of an AD measure in the period and 64 without it. It is important to emphasize that in some cases the conclusion of the investigation and the adoption of the AD measure happened after 2007. This does not create problems in the empirical exercise because the decision to file a petition with the investigating authorities was motivated by the economic situation, based on the industrial data from 1996 to 2007. The literature mentions that trade defense is *backward looking*, i.e. the positive decision by the investigating authority is determined by the economic explanation of an earlier period (François and Niels, 2006).

The conversion to the CNAE system shows how some industrial sectors stand out in the number of AD measures: chemicals and related by-products (organic, inorganic, elastomers), classified in chapter 24 of CNAE, are responsible for 19 products affected by AD duties; metal and steel, chapters 27 and 28 of the CNAE classification, comprise 10 products. These segments are responsible for more than 50% of products, or 46% of the affected NCMs. Table A1 in the annex also shows, in column 05, a ranking with the number of products per CNAE group, with 05 categories. In order to assess the weight of chemicals on the probability of the AD a dummy variable is created, coding 1 if the good belongs to chapter 24 and 0, otherwise.

3.2. Explanatory variables

Trade protection benefits both firms and industries whose value to owners and employees is greater than average industries, and also benefits those which are most vulnerable to external competition. This work assumes that the probability of the AD is a function of sectorial characteristics, expressed in variables such as: industrial concentration, union coverage, capital intensity, level of employment, profitability, productivity, and import penetration, among others.

To explain the determinants of the AD application, four groups of explanatory variables were created (collective action/competition, factors of production, economic performance, and trade coefficients). The construction of explanatory variables uses data from PIA/IBGE Industrial Survey, Ministry of Industry and Trade, and WITS/UNCTAD. We now describe characteristics of each group of explanatory variables.

Variables of collective action or competition. To the extent that the concentration makes above normal profits possible, one must expect greater vulnerability to imports and thus greater incentive to seek protection in concentrated sectors. However, the relationship between concentration and profitability is not obvious, as mentioned in the literature review. Moreover, considering the greater capacity of concentrated companies to channel and express their interests to the authorities, due to better ability to organize (collective action), one can affirm that the concentration increases the probability of the AD. The concentration variables adopted in this study are the ratio of the number of firms in the sector and the total amount of firms (CONC), and the Herfindhal–Hirschman Index (HHI) of sales, built using the squared sales of i divided by the sum of sales of all sectors ($HHI = (s_i / \sum s_i)^2$). Collective action is also expressed in greater ability to mobilize a sector – via trade unions, for example. Therefore, a proxy for the mobilization is the employment in industry i divided by the firms in industry i , called EMP-UN. This variable, naturally, also expresses the level of sector employment.

The higher the absolute number of CONC, the greater the number of companies in a sector (bigger numerator over stable denominator) and less concentrated the industry. Therefore, this variable should have an inverse effect on the probability of the AD. Conversely, the higher the absolute number of the HHI, the more concentrated is the sector, hence, exerting positive effects on the probability of the AD. Finally, EMP-UN tends to exert a positive effect on the AD, because the higher the absolute number of the ratio, the greater the employment/mobilization and, thus, the increase in the ability/capacity of political mobilization and influence on the government.

Factors of production variables. These variables are associated with the relative content of factors of production (e.g. capital/labor/natural resources) in the total output of the goods of a sector i . A preliminary analysis suggests that the higher the rents linked to factors of production, the greater the likelihood of protection. Competition with imported goods decreases the rates of return of domestic capital factor r , and domestic labor factor w , tending to equalize them to world returns in wages and rents, respectively, w^* and r^* . Revenue loss has a propensity to be greater if the domestic industries operate in an imperfect market structure (oligopolies/monopolies) (Vasconcelos and Firme, 2011). Therefore, the higher the content of factors of production (whatever they are), the greater the probability that an industry receive an AD. Furthermore, as mentioned, dumping is more common in capital intensive industries and these seek to protect the rents that compose competitive long-term capital returns (Feinberg and Hirsch, 1989).

Additionally, this work applies the Heckscher–Ohlin/Stolper–Samuelson theorem (H–O/S–S) to the trade structure of a country, i.e. the scarce factor in a given national economy tends to be relatively less competitive than the abundant factor, therefore, the scarce factor may have less market share relative to imports if compared to the more competitive abundant factor. Thus, in an open economy, or after an event of trade liberalization, the owners of the scarce factor are prone to seek and may receive protection from a policymaker (Oliveira, 2011).¹⁰ According to generalizations of the theorem of H–O/S–S, in a country such as Brazil, in which the structure of the economy, “capital” is relatively scarcer than “labor” and “natural resources”, capital-intensive industries may receive more protection than labor-intensive and natural resource-intensive industries. To address these issues, for each of the 93 sectors, I created the following variables: “capital” (KAP), dividing fixed assets by industrial production; the variable “labor” (LAB), dividing salaries by value added; “skilled labor” (SKILL), the ratio between wages and employment; “natural resources” (NAT/EN), the ratio of industrial production and expenses with energy consumption; “inputs use” (INPUT) the ratio between industrial production and raw material spending. I also built the variable “capital-work” (KAP-LAB), the ratio of value added and employment.

The effect of these variables on the likelihood of receiving an AD is direct – the relatively scarcer factor in the country increases the probability of the duty, hence, KAP and SKILL exert a positive effect and NAT and LAB exert a negative effect. The smaller the ratio KAP-LAB, the lesser the content of “capital” in relation to “labor” in an industry. Therefore, the variable exerts an inverse effect on the probability of the AD. INPT has an inverse effect on the likelihood of AD – industries with an intensive use of raw materials might be adversely affected by measures that limit access to imported inputs. INPT is included in the specifications only when interacting with a variable of foreign trade exports share. Finally, an alternative interpretation in relation to the variable LAB is the following: currently, the main target of AD investigations in Brazil is China, whose industries utilize the abundant factor in that economy – “labor”. Therefore, vis-à-vis China, Brazil is scarce in the “labor” factor, so its industries would tend to push for protection using the AD.¹¹

Trade variables. According to the literature on the political economy of protection, sectors experiencing a loss of domestic market to imports are potential candidates to lobby the government for protection measures. In order to assess this assumption, I use variables of foreign trade of the 93 sectors from 1996 to 2007.

The import coefficient (IMSH) is assembled according to the methodology of Funcex (Ribeiro et al., 2008), in which industry imports are divided by their output. Nominal exchange rate variations influence the numbers: devaluation lowers the value of domestic production in dollars. In contrast, exchange rate appreciation has an opposite effect. To tackle this problem, I deflate the industrial output by an aggregated price index of industrial prices (IPA) (1996 = 100), and inflate it by a price index of the Brazilian imports from Funcex, in order to get a real exchange rate correction. IMSH and the volume of imports (lnIMP) – the natural logarithm of imports in dollars deflated by the price index of imports – increase the probability of the AD.

Similarly, the export coefficient (EXSH) – the ratio between exports and industrial production – is built using the same methodology previously described: correcting production by IPA industrial prices and inflating it by the price index of Brazilian exports from Funcex. The interaction between INPUT and EXSH is tested and might exert negative effect on the probability of the AD, assuming that exporters and users of raw materials are harmed by the imposition of the measures raising the prices of imported inputs.¹²

An additional consideration involves the degree of substitution and complementarity between the AD and tariff protection. Thus, the tariff level (TAR) of each sector is used as an explanatory variable. Tariff data is from UNCTAD/TRAINS, classified in the *International Standard Industrial Classification* (ISIC-Rev.3) and converted to CNAE 1.0 by an IBGE translator. The effect of tariffs on the likelihood of an AD is ambiguous: sectors with declining import taxes may experience higher imports, leading to a search for additional protection measures. On the other hand, according to the lobbying capacity, a sector may have relatively high tariffs and still be able to influence an AD decision. Domestic tariffs after 1994 reflect the country’s commitment to the tariff levels set by the GATT/WTO agreement,

¹⁰ To Magee et al. (1989), the Heckscher–Ohlin hypothesis (H–O)/Stolper–Samuelson (S–S) (hereinafter referred to as “H–O/S–S”) suggests that lobbying activity will occur given the intensity of use of factors of production by sector (e.g. capital vs. work vs. natural resources). The mobility of factors also influence the results: the H–O/S–S model asserts that, in a world of two factors with full mobility, liberalization will reduce the real income of the scarce factor and increase that of the abundant factor.

¹¹ In our database, China is the country with the highest incidence of AD measures – 25.7% out of the total of 74 cases. See Table A2, in the annex.

¹² IMPSH and EXPSH may reflect, respectively, the *import penetration* or the *export orientation* of a given sector, and they could be called, alternatively, as so.

which established ceilings for sectors and products. Thus, TAR may be considered exogenous and, as discussed in the previous section, express a shift in the domestic trade regime of Brazil. By signing international agreements, Brazil committed itself to a more open tariff policy. From 1996 to 2007, there were small variations in some sectorial tariff levels. The variations were mainly due to macroeconomic shocks which obliged the government to temporarily raise tariffs within the range established by WTO.

The last set of explanatory variables is the indicators of economic performance. The first variable of that group is *profitability*, or price-cost margin (PCM), built with the ratio between revenue minus expenses over revenues. Smaller profit margins may suggest sectors in difficulty which are adversely affected by imports, and therefore willing to exert greater pressure for administered trade protection, and receive this protection as a compensatory effect from the government. Thus, this variable would have an inverse relationship with AD duties. On the other hand, companies with higher profit margins may have greater ability to influence policies in general, particularly, in concentrated industries. Hence, it is believed that this last feature may be predominant and that the variable PCM exerts a positive effect on the AD. An interactive variable PCM*CONC is also tested which may also exert a positive effect. Productivity (PROD) is built with the ratio of value-added and the number of employees.¹³ As emphasized by the literature mentioned above, productivity is an important by-product of the experience of trade liberalization. It is assumed that sectors with productivity gains are more able to compete with the imports, indicating a possible inverse relationship with the AD. One of the frequent arguments of the petitioners of AD measures is the difficulty to undertake investments due to the damage generated by unfair competition. The ratio between fixed assets and improvements in assets creates the propensity of investment (INV). This variable has a positive relationship on the AD and also reflects the intensity of return of the capital factor. Note that, according to [Feinberg and Hirsch \(1989\)](#), the return of capital is not necessarily raised by monopoly profits, but by normal returns on investment. Finally, the variable expressed in the ratio between taxes paid over the sales revenue (TAX) aims to measure the difference of treatment and the economic weight of the sectors that pay more taxes. It is suggested that the sectors responsible for higher revenues are compensated by the policymakers in the competition with imports. Thus, this variable exerts an opposite effect on the likelihood of an AD.

In addition to the variables previously described, the regressions include a dummy for the chemical sector (*dumCHE*), due to the ubiquity of this sector in AD cases; and a dummy for each year (1996–2007), aimed at capturing the effects of the macroeconomic environment on all sectors. For example, this period was characterized by several macroeconomic shocks such as an overvalued real exchange rate after the Real Plan (which pegged the \$Real to the US\$) and the financial crises (Asian crisis 1997/98), and the Brazilian crisis (1998/1999) which culminated with the adoption of the floating exchange rate in 1999. Finally, in order to isolate the effects of exchange rates in the probability of the AD, a dummy (*EXCH*) for the years in which the exchange rate was fixed (1996, 1997 and 1998) was also created and tested on alternative specifications (not reported). In an exchange rate appreciation scenario, there would be a higher probability that the investigation authority would confirm the argument of material damage/injury, because of the loss of external competitiveness of the domestic industry due to the increased exposure of the internal market to the imported competitors, as the literature on the macroeconomic causes of the AD may indicate ([Prusa and Skeath, 2002](#); [François and Niels, 2006](#); [Bown, 2008](#); [Vasconcelos and Firme, 2011](#)).

[Table 1](#) portrays the descriptive statistics of the variables used in the regressions. [Table 2](#) depicts the correlation matrix of the variables.

4. Econometric specification and estimation¹⁴

The binary response models, also known as “qualitative” or “binary limited variable”, present a particular formulation in non-linear models. The binary choice models with panel data *logit* and *probit* are formulated in terms of an underlying latent model with the following format:

$$y_{it}^* = x'_{it}\beta + \alpha_i + \varepsilon_{it} \quad (2)$$

¹³ It is worth mentioning here that in the variables constructed with monetary over non-monetary data, e.g. such as productivity (PROD) and employment/mobilization (EMP/UN) which use the number of employees as the denominator, the numerator is deflated by the industrial price index (IPA).

¹⁴ This section is based on [Verbeek \(2000\)](#) and [Cameron and Trivedi \(2009\)](#).

Table 1
Descriptive statistics.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
KAP/LAB	1116	6.59	13.20	0.12	147.03
KAP	1116	0.06	0.05	0.01	0.74
LAB	1116	0.28	0.09	0.03	0.59
SKILL	1116	9.37	5.78	2.29	40.16
NAT	1116	0.03	0.02	0.00	0.18
PCM	1115	0.36	0.09	0.00	0.75
PROD	1116	44.90	63.46	4.75	614.65
INV	1116	0.00	0.00	0.00	0.03
TAX	1116	0.22	0.12	0.01	1.67
CONC	1116	0.01	0.02	0.00	0.15
HHI	1116	0.00	0.00	0.00	0.01
EMP/UN	1116	194.29	560.93	13.47	7230.69
IMPSH	1116	0.14	0.27	0.00	3.89
LnIMP	1116	12.23	1.78	4.54	15.75
TAR	1116	15.26	5.01	0.00	45.62
EXSH	1116	0.11	0.14	0.00	1.46
INPT	1116	0.49	0.12	0.13	0.83

in which $y_{it} = 1$ if $y_{it}^* > 0$ and $y_{it} = 0$ otherwise. A nonlinear panel data model is considered for the dependent variable y_{it} , with regressors x_{it} , in which i denotes the individual and t denotes time. In this study, for example, y_{it} indicates if sector i had a positive determination of anti-dumping in the period t or not. A full parametric model might be specified with the following conditional density:

$$f(y_{it}|\alpha_i, x_{it}) = f(y_{it}, \alpha_i + x'_{it}\beta, \gamma), \quad t = 1, \dots, T_i; \quad i = 1, \dots, N, \quad (3)$$

in which γ denotes additional parameters, such as the variance, and α_i is the individual effect.¹⁵

The binary variable models, however, have an operational inconsistency. Even assuming that the idiosyncratic error term ε_{it} in (2) has a symmetric distribution in individual and time dimensions, and that it is independent of all x_{it} , the presence of α_i complicates the estimation, when the α_i is treated as an unknown fixed effect, and when the α_i is treated as a random error term. In panel data models with fixed effects (FE), the α_i is treated as a non-observable random variable which can be correlated with the regressors x_{it} . In short panels in the time dimension, like studies of political economy, the fixed effects estimation (FE) may lead to parameter inconsistency. This is because the N incidental parameters and the individual intercepts α_i may not be consistently estimated if T_i is small. This inconsistent estimation of α_i may turn the estimation of the β_s inconsistent as well.

The standard deviation of the mean of variables in our sample of 93 sectors in 12 years indicates that the temporal variation (*within*) is, in most of the variables, considerably smaller than the transversal variation (*between*). Hence, it is not expected that the FE estimators are very efficient, since these depend on the temporal variation in the sector.

Binary panel models can be estimated by the random effects methods (RE), in which the specific effect of the individual α_i is treated as a random variable with distribution $g(\alpha_i|\gamma)$, in which γ denotes additional parameters. Frequently, this is a normal distribution. Thus, the α_i is eliminated by integrating it into the distribution. In nonlinear models, the integration usually does not have an analytical solution and requires high computational effort, especially when the approach is generalized to the slope parameters, and not only the intercept effects. Numerical integration is used in these cases.

¹⁵ In the probit panel data model the estimation involves the following integral, expressing the normal distribution:

$$f(x'_{it}\beta) = \int_{-\infty}^{x'_{it}\beta} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{1}{2}t^2\right) dt$$

In the logit panel models, $f(x'_{it}\beta)$ is specified as follows: $f(x'_{it}\beta) = e^{x'_{it}\beta} / (1 + e^{x'_{it}\beta})$

Table 2
Correlation matrix.

	KAP/LAB	KAP	LAB	SKILL	NAT	PCM	PROD	INV	TAX	CONC	HHI	EMP/UN	IMPSH	LnIMP	TAR	EXPSH	INPT
KAP/LAB	1.00																
KAP	0.65	1.00															
LAB	-0.43	-0.15	1.00														
SKILL	0.62	0.22	-0.33	1.00													
NAT	0.09	0.25	-0.07	-0.15	1.00												
PCM	0.40	0.21	-0.39	0.35	-0.04	1.00											
PROD	0.83	0.28	-0.57	0.72	-0.04	0.52	1.00										
INV	0.17	0.13	-0.21	0.22	0.16	-0.01	0.14	1.00									
TAX	0.08	0.00	-0.14	0.14	-0.04	0.27	0.11	0.05	1.00								
CONC	-0.18	-0.10	0.30	-0.34	0.01	-0.14	-0.22	-0.02	-0.03	1.00							
HHI	0.64	0.14	-0.31	0.48	-0.09	0.25	0.68	0.19	0.15	0.00	1.00						
EMP/UN	0.28	0.19	-0.11	0.38	-0.03	0.01	0.21	0.23	0.05	-0.15	0.38	1.00					
IMPSH	-0.04	0.00	0.14	0.09	-0.11	0.06	-0.05	-0.08	-0.05	-0.17	-0.09	-0.08	1.00				
LnIMP	0.19	0.01	-0.10	0.40	-0.12	-0.02	0.22	0.14	0.06	-0.07	0.27	0.01	0.31	1.00			
TAR	-0.21	-0.05	0.22	-0.15	-0.28	-0.18	-0.28	-0.13	0.11	0.11	-0.12	0.33	-0.06	-0.18	1.00		
EXPSH	0.06	0.12	-0.02	0.04	0.07	-0.07	0.06	-0.02	-0.14	-0.16	-0.08	0.03	0.22	0.02	-0.15	1.00	
INPT	-0.22	-0.25	-0.06	-0.08	-0.28	-0.70	-0.23	0.03	-0.10	-0.04	-0.05	0.06	0.00	0.22	0.19	0.01	1.00

Alternatively, some methods are more feasible for the purposes of this work. Models with grouped data (pooled) identify $\alpha_i = \alpha$. For parametric models, it is assumed that the marginal density of a single pair (i, t) ,

$$f(y_{it}|x_{it}) = f(\alpha_i + x'_{it}\beta, \gamma) \quad (4)$$

is correctly specified, regardless of the form of the joint density $f(y_{it}, \dots, y_{iT}|x_{it}, \dots, x_{iT}, \beta, \gamma)$. The model parameters are estimated by clustered regression methods of cross-section for the appropriate parametric model, which implicitly assumes independence of i and t . Error correction methods by *panel robust* or *cluster-robust*, with the grouping in the sector dimension i , estimate a variance and covariance matrix (VCE) of the estimator, which can be used to correct standard errors of any temporal dependency of a given individual. This method is analogous to the grouped ordinary least squares (*pooled OLS*) of linear models.

Efficiency gains might occur if the estimation accounts for the temporal dependency that is inherent to panel data. This is likely for generalized linear models, where it is possible to consider the first order conditions in the estimations to account for the time correlation of a given individual, and still have a consistent estimator, provided the conditional mean is correctly specified as $E(y_{it}|x_{it}) = g(\alpha + x'_{it}\beta)$, in the specific function $g(\cdot)$. This approach is called weighted by population (*population averaged – PA*), or the generalized estimable equations approach, and is analogous to the grouped feasible generalized least squares (FGLS pooled) of linear models.

Hence, the estimations in this work use both methodologies: logit models with *pooled* panel data and logit models with *population-averaged* panel data. Therefore, the model to be estimated, with their respective variables and their effects, is the following:

$$\begin{aligned} DUMP_{it} = & \alpha_i - \frac{KAP}{LAB_{it}} + KAP_{it} \mp LAB_{it} + SKILL_{it} - NAT_{it} \mp PCM_{it} - PROD_{it} + INV_{it} - TAX_{it} \\ & - CONC_{it} - HHI_{it} + \frac{EMP}{UN_{it}} + IMSH_{it} \ln IMSH_{it} \mp TAR_{it} + dumCHE_t + \varepsilon_{it} \end{aligned} \quad (5)$$

5. Discussion of the results

Overall, in terms of the global adjustment of the model, Wald statistical tests for the validity of regressors feature well. Results of all regressions reported in [Table 3](#) include the dummy variables for each year. The dummy variables seek to identify the macroeconomic factors (e.g. exchange rate appreciation) on the decision of the AD. The results (not reported in the table) indicate that the years of fixed exchange rates (1996–1998) exert a significant and positive effect on the likelihood of an AD in both the pooled logit and the PA logit (this last one, only for 1996 and 1997) specifications. The year 2005 has a significant and positive effect on the AD in both specifications. In an alternative specification, instead of a dummy for each year, a dummy for the years of fixed exchange rates is added and tested in the basic model. This variable has a significant positive effect only in the pooled logit specification.

It is also important to mention the importance of the variable *dumCHEM* as a determinant of the likelihood of the AD, in specifications across the board, with statistical significance of 5% and 1% in the pooled logit and PA logit, respectively. As pointed out in previous sections, the chemical sector has the largest number of NCMs covered by measures.

The variables of interest for this study are those related to structural differences among the 93 manufacturing sectors. The discussion of the results is based on the basic specification, but the specifications that test the interactive variables are also referred to as appropriate.

The variables relating to collective action/competition showed relatively weak and non-expected results, though the specifications with interaction terms improved the statistical significance of some of them. The variable *CONC* presented the expected negative sign but only in model 8, in which it interacts with the tariff level (*TAR*). *CONC* is significant at the 10% level in the PA logit specification. The interaction term *TAR*CONC* presents a positive sign and significance at the 10% level in both specifications, suggesting that less concentrated sectors with higher tariff protection increase the likelihood of the AD duty (taking into account that the smaller *CONC* is, the more concentrated the sector is). Some sectors of the sample have this characteristic: they are not concentrated, but receive considerable tariff protection – textiles and apparel are examples of this. On the other hand, the interaction between concentration and profitability, *PCM*CONC*, exerts no statistical effect whatsoever in regressions 5 and 6. The variable *HHI* presents

Table 3
Impact of sector variables on the likelihood of the AD.

Specifications Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Basic		Int. EXSH*IMPT		Int. PMC*CONC		Int. TAR*CONC		Int. TAR*EMP/UN.		Int. LAB*EMP/UN.	
	Pooled	PA	Pooled	PA	Pooled	PA	Pooled	PA	Pooled	PA	Pooled	PA
KAP/LAB	0.0293 (0.0311)	0.00402 (0.00406)	0.0330 (0.0346)	0.00374 (0.00401)	0.0286 (0.0321)	0.00376 (0.00411)	0.0247 (0.0335)	0.00301 (0.00390)	0.0278 (0.0354)	0.00298 (0.00382)	0.0410 (0.0382)	0.00354 (0.00413)
KAP	-2.422 (4.891)	-0.116 (0.617)	-2.648 (5.325)	-0.0828 (0.601)	-2.342 (4.997)	-0.0873 (0.618)	-1.873 (5.194)	0.0112 (0.608)	-2.303 (5.589)	-0.0930 (0.597)	-3.611 (5.967)	-0.00590 (0.606)
LAB	-10.88*** (4.115)	-0.945** (0.429)	-11.53*** (4.139)	-0.987** (0.432)	-11.25*** (4.191)	-0.981** (0.435)	-11.25*** (4.151)	-0.959** (0.425)	-11.00** (4.325)	-0.963** (0.425)	-9.582** (4.317)	-0.785* (0.438)
SKILL	-0.0215 (0.0835)	-0.000485 (0.0108)	-0.0314 (0.0850)	-0.000341 (0.0107)	-0.0189 (0.0837)	-0.000427 (0.0105)	-0.00992 (0.0806)	-0.00104 (0.0101)	0.0293 (0.101)	-0.00138 (0.0106)	0.0731 (0.103)	0.00328 (0.0104)
NAT	41.35*** (13.59)	5.798*** (1.672)	42.42*** (14.74)	5.752*** (1.662)	41.36*** (13.60)	5.787*** (1.648)	45.56*** (12.17)	6.045*** (1.491)	46.66*** (12.79)	6.074*** (1.635)	44.53*** (13.67)	5.803*** (1.648)
PCM	5.912* (3.330)	0.691 (0.444)	5.071 (3.506)	0.564 (0.473)	7.577** (3.278)	0.889* (0.446)	6.571* (3.396)	0.767* (0.447)	6.919** (3.314)	0.746* (0.437)	6.114* (3.412)	0.671 (0.445)
PROD	-0.0195** (0.00810)	-0.00151* (0.00893)	-0.0193** (0.00825)	-0.00139 (0.00881)	-0.0220*** (0.00850)	-0.00174* (0.00903)	-0.0227*** (0.00849)	-0.00170** (0.00842)	-0.0264*** (0.00974)	-0.00169** (0.00844)	-0.0325*** (0.0117)	-0.00179** (0.00841)
INV	425.0** (192.5)	32.99*** (10.11)	448.3** (194.2)	32.43*** (10.16)	426.0** (193.9)	32.86*** (9.986)	404.8** (192.4)	30.67*** (9.410)	385.2 (247.9)	22.77** (9.545)	518.4* (275.8)	34.39*** (10.39)
TAX	-2.076 (2.487)	-0.223 (0.218)	-3.233 (3.562)	-0.236 (0.208)	-2.300 (2.499)	-0.254 (0.214)	-2.188 (2.745)	-0.236 (0.215)	-3.773 (3.715)	-0.288 (0.212)	-2.788 (2.768)	-0.253 (0.213)
CONC	-2.545 (14.89)	-1.046 (1.404)	-6.462 (15.21)	-1.195 (1.378)	63.39 (65.97)	6.713 (7.022)	-110.7 (70.95)	-14.01* (7.729)	-2.976 (13.40)	-1.103 (1.400)	-4.004 (14.53)	-1.176 (1.378)
HHI	-2026** (901.3)	-54.17 (70.17)	-2165** (912.9)	-60.61 (68.71)	-2013** (892.4)	-46.70 (70.87)	-1965** (838.1)	-41.63 (66.29)	-1920** (916.5)	-35.33 (60.56)	-2177** (874.1)	-53.18 (66.32)
EMP/UN	4.57e-05 (0.000841)	-7.39e-05 (9.36e-05)	0.000132 (0.000773)	-6.77e-05 (9.06e-05)	5.81e-05 (0.000829)	-7.40e-05 (9.33e-05)	0.000126 (0.000737)	-6.15e-05 (8.91e-05)	0.00848** (0.00398)	0.000259** (0.000117)	0.00490** (0.00226)	0.000199 (0.000209)
IMPSH	-1.921 (1.449)	-0.153* (0.0900)	-1.908 (1.435)	-0.131 (0.0933)	-2.132 (1.437)	-0.168** (0.0849)	-2.218 (1.554)	-0.175** (0.0879)	-2.135 (1.663)	-0.158* (0.0888)	-2.113 (1.645)	-0.159* (0.0904)
LnIMP	1.108*** (0.252)	0.0945*** (0.0200)	1.161*** (0.263)	0.0942*** (0.0201)	1.130*** (0.254)	0.0965*** (0.0200)	1.141*** (0.263)	0.0939*** (0.0200)	1.231*** (0.278)	1.106*** (0.0205)	1.140*** (0.257)	0.0943*** (0.0198)
TAR	0.173*** (0.0661)	0.0191** (0.00858)	0.169*** (0.0635)	0.0178** (0.00833)	0.171** (0.0663)	0.0185** (0.00862)	0.136** (0.0634)	0.0136 (0.00910)	0.344*** (0.0997)	0.0271*** (0.00880)	0.242*** (0.0752)	0.0218*** (0.00819)
DumCHEM	2.424** (0.954)	0.387** (0.130)	2.314** (0.993)	0.366*** (0.134)	2.470** (0.959)	0.388*** (0.129)	2.347** (0.922)	0.381*** (0.128)	3.042*** (1.020)	0.434*** (0.126)	2.612** (0.931)	0.394*** (0.128)

Table 3 (Continued)

Specifications	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Variables	Basic		Int. EXSH*IMPT		Int. PMC*CONC		Int. TAR*CONC		Int. TAR*EMP/UN.		Int. LAB*EMP/UN.	
	Pooled	PA	Pooled	PA	Pooled	PA	Pooled	PA	Pooled	PA	Pooled	PA
Interactions												
EXSH*IMPT			-7.770 (5.396)	-0.464 (0.335)								
PCM*CONC					-207.4 (210.7)	-25.09 (22.55)						
TAR*CONC							5.741* (3.474)	0.689* (0.402)				
TAR*EMP/UN									-0.000489* (0.000260)	-1.21e-05*** (4.17e-06)		
LAB*EMP/UN											-0.0228* (0.0136)	-0.00109* (0.000640)
Dummy years	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1115	1115	1115	1115	1115	1115	1115	1115	1115	1115	1115	1115
Sectors	93	93	93	93	93	93	93	93	93	93	93	93
Wald statistics	115.78	343.08	120.40	419.98	119.13	348.84	113.04	368.23	100.69	399.36	115.96	364.17

Standard errors in parentheses. $DUMP_{it} = \alpha_i - \frac{KAP}{LAB_{it}} + KAP_{it} \mp LAB_{it} + SKILL_{it} - NAT_{it} \mp PCM_{it} - PROD_{it} + INV_{it} - TAX_{it} - CONC_{it} - HHI_{it} + \frac{EMP}{UN_{it}} + IMSH_{it} \ln IMSH_{it} \mp TAR_{it} + dumCHE_t + \varepsilon_{it}$

* $p < 0.1$.

** $p < 0.05$.

*** $p < 0.01$.

a non-expected negative sign in all specifications and it is significant at the 5% level in the basic specifications and in all alternative pooled logit specifications, meaning that more concentrated sectors reduce the probability of the AD. This variable is much influenced by industries such as oil and automobile manufacturing, both of which have a high HHI and were not subject to AD measures in the period. Nonetheless, the pooled panel specifications presented very high standard deviations.

The variable EMP/UN, a proxy for employment and unionization, was also non-significant and presented shifting signals (negative in the pooled logit and positive in the PA logit) up to specification 8. Yet, in specifications 9 and 10, interacting EMP/UN with TAR (tariffs), the EMP/UN presents the expected positive sign. It is significant at the 5% level in both models. The positive sign of EMP/UN would reflect the *collective action* ability of sectors able to influence the policy. The negative sign of TAR*EMP/UN, on the other hand, may indicate that sectors with a high level of unionization and high tariffs do not require the use of additional mechanisms of protection. Sectors with higher tariffs are capital-intensive manufactured goods, such as automobiles and electronics, but also labor intensive industries, such as shoes and apparels, which have low levels of unionization. These contrasting signs may indicate that the highly significant and positive effect of TAR across the board predominates and influences these results.

In order to clarify this contradiction, in specifications 11 and 12, EMP/UN is interacted with labor content (LAB). EMP/UN depicts positive, but statistical significance at the 5% level in the PA logit model, while the interaction term (EMP/UN*LAB) is negative and significant at the 10% level in both models. These results suggest that higher employment/unionization and labor content decrease the likelihood of the AD. These somewhat mixed results suggest that variables that could more precisely express the ability of the organization/concentration of the sectors are necessary. Meanwhile, the interaction terms among EMP/UN, CONC, TAR and LAB help to elucidate the nature of political economy cleavages. In other words, employment/unionization is significant only when controlling the level of tariffs and labor content in the sectors.

Trade related variables are significant and have expected signs, with the exception of IMSH – the coefficient of imports. The logarithm of the imports in IMP has highly statistical significance and has the expected positive effect. The lack of significance of IMSH shows that sectors with a high degree of import penetration does not influence the probability of an AD. The sectors with the highest IMPSH are “textile fibers processing” and more value-added industrial product sectors such as electronics and precision instruments. For example, the sector with the largest number of AD measures “organic chemicals manufacturing” (CNAE code 24.2) has an average import coefficient IMPSH of just 21% and experienced a 44% drop of this ratio in the period from 1996 to 2007, indicating that domestic production is still predominant and imports have, in fact, decreased its participation relative to the domestic output. On the other hand, the dollar value of imports of sector CNAE 24.2 is expressive and grew considerably (74% in real values) in the period. This same pattern repeats for other chemicals, with the exception of synthetic yarns and filaments (CNAE 24.4) and pharmaceuticals (CNAE 24.5): these were characterized by a real increase in imports and an increase of the import share in relation to the domestic output.

The level of tariffs TAR has the expected positive sign and statistical effects in all but specification 06. This result shows that the sectors with the highest degree of tariff protection are also given the additional protection of commercial defense, indicating an ability to lobby for more specific products. Two variables of interaction between the tariff level and the industry concentration (TAR*CONC) and the degree of employment/mobilization (TAR*EMP/UN) were tested separately. The first exerts a positive effect and is statistically significant at 10% in both specifications, as discussed before. However, the second has a significant and negative effect of 5% and 1% in the likelihood of receiving AD, contradictorily indicating that the most organized sectors and with high tariff protection do not use the trade defense. It is important to mention that sectors with higher employment/unionization are those of more elaborated industrial products, such as automobiles. Thus, one may suggest that these sectors are sufficiently protected by tariffs. The interaction between the export coefficient and the use of inputs (EXSH*IMPT) presented the expected positive sign, but it is statistically insignificant. Therefore, it weakens the argument that sectors with high export participation and consumption of inputs would lobby against the application of AD measures. Alternatively, one should attempt to quantify the share of *imported* inputs consumed by exporting industries in order to capture their possible interest to maintain the domestic market more accessible.

The variables involving human and physical capital – SKILL and KAP – and the ratio capital to labor KAP/LAB – depicted no statistical relevance. The variables of factors of production proved insignificant, with the exception of LAB – the content of the labor factor – and NAT/EN – the content of natural resources factor measured by energy

consumption, though this one presented the opposite of the expected negative sign.¹⁶ The intensity of labor content LAB decreases the likelihood of a positive determination of anti-dumping. According to the H–O theorem, industries with high use of the relatively abundant factor in the country would have more ability to keep market shares after trade liberalization and, therefore, would have fewer inclinations to lobby for an AD. On the other hand, the negative sign can indicate only the difficulty of political mobilization of labor-intensive sectors. The interaction between the LAB and the variable EMP/UN (LAB*EMP/UN), tested in specifications 09 and 10, was significant at 10% level in both models (logit pooled and PA logit), with negative signs, implying a difficulty of labor-intensive sectors to mobilize. It is important to remember that the sectors with the highest level of this factor are “manufacturing of leather articles” (CNAE 19.2), “clothing garments” (CNAE 18.1), “manufacturing of shoes” (CNAE 19.3). All of these are fragmented sectors without strong unions.

Another point to be stressed concerns the competitiveness of labor-intensive sectors, which would be generating a reaction against unfair imports, thus, increasing the likelihood of AD. Despite the widespread idea of an invasion of Chinese products, whose industries have lower labor costs compared to Brazil, the data shows a different portrait. Notwithstanding China being the country with the highest percentage of positive determinations in our sample of 74 NCMs (25.68% of the total), the Chinese products affected are not formed exclusively by labor-intensive industries: Chinese imports affected by AD do include labor-intensive products, such as spectacle frames and pencils, but also several chemical and metal products, such as glyphosate, magnesium and industrial parts products, with high economies of scale in production (see annex, [Table A2](#)). In this sense, this may also explain the positive and highly significant statistical value of NAT/EN. This variable reflects the energy consumption in proportion to production, and is also a proxy for industries with higher scales of production. Among the 10 industries with the largest values of NAT/EN, there are “production of pig iron and iron-alloys” (CNAE 27.1), “Metallurgy of non-ferrous metals” (CNAE 27.4), “the manufacture of paper, cardboard, cardboard and paperboard” (CNAE 21.2).- all of which are typical industries with high economies of scale affected by AD measures in the period.

Finally, the variables related to economic performance: the variable PCM, the profit margin, exerts a positive effect on the likelihood of anti-dumping in the pooled logit model of the basic specification, and in all specifications with interactions, with statistical significance of 10% and 5%, with the exception of regressions 03, 04 and 12. Thus, this result suggests that industries with higher profit margins may have more capacity to influence the decision for administered protection. This outcome confronts the alleged claim of *injury* suffered by domestic industries due to dumping, which, among other consequences, causes a decrease in profit margins as a result of predatory competition from imported goods. Another important argument is the fact that this variable may also reflect market power across sectors: higher profit sectors are more apt to persuade policymakers. To clarify the market power hypothesis, PCM is tested interacting with the concentration levels, with the variable PCM*CONC although it proves to exert no statistical significant effect.

The variable PROD – the sectorial productivity – exerts negative and significant effect at the 5% and 10% levels in the pooled logit and PA logit models, respectively, in the basic specification. Significant statistical results of 1% and 5%, also hold for the interactive regressions, but for model 04. The explanation behind these robust results suggests that sectors with productivity gains would be more competitive and able to sustain competition with imports, and therefore, less likely to seek AD measures. Recent economic literature points to the positive effects of economic openness on the productivity of firms. This means that these sectors would need less trade defense mechanisms.

The variable INV, a proxy for the level of investment – the ratio of capital improvements to fixed capital – exerts a positive and statistical significant effect on the likelihood of anti-dumping in all specifications, with the exception of 09. One of the main arguments of the claimants for trade defense is an alleged difficulty to undertake investments given a situation of unfair trade competition. The level of investment is objectively measured by the Brazilian trade defense authority as a determinant of the causal link between the dumping and the injury suffered by domestic industry. The positive and significant coefficient of this variable suggests that sectors with a higher level of investment would still require protection against unfair competition, thus increasing the probability of the AD. This result could indicate a positive dynamic in the economy: sectors with comparatively more investments in the period used the additional

¹⁶ In future research, one should come up with better variables to account for the use of the factor of “land” production. Manufacturing industries related to agricultural consumption, such as food production, could be used as dummy variables expressing this factor content, but were not used in this exercise.

commercial protection to maintain or increase domestic productive capacity. However, these results should be evaluated with caution. The variable INV reflects only the ratio of capital improvements to fixed capital, a ratio that depends on other sector characteristics, such as the cost of capital (i.e. machinery) and the technologies used by the industry. The variable does not reflect if the economic sectors have, in fact, increased the productive capacity in the period due to investments. For example, among the ten sectors with a higher average level of INV between 1996 and 2007, there are some in which there was a drop of the ratio. This fact may also indicate a fall in the cost of capital improvements in the period, a consequence of the liberalization of the economy. Lastly, the variable indicating the level of taxes paid by sectors (TAX) presented no effect on the dependent variable.

In summary, results expressing economic performance do require some consideration regarding the causality and endogeneity of the explanatory variables. I am looking at broad sectors with highly aggregate data, whereas AD duties are imposed on specific products. Hence, it is arguable if an imposition of an AD would be able to increase *markups*, or the level of productivity and sectorial investments, in a given sector. For instance, PCM attempts to show the effects of profits on the probability of receiving the duty, comparing across sectors. However, the historical evidence in Brazil indicates that some products have been subject to AD duties since the early 1990s, after tariff reforms. For this reason, the continuity of this trade policy may impact the performance of the industries, especially if one considers the degree of concentration of petitioning firms.¹⁷ Having mentioned that, further research should use an instrumental variables methodology to disentangle the possible reverse causality effects.

6. Conclusion

This work proposed an explanation for the determinants of AD enforcement in Brazil based on sector indicators. Studies on the Brazilian experience are relatively scarce and there is great emphasis on macroeconomic explanations in the international literature. This work applied explanations from the political economy of protection, which emphasize the importance of oligopolistic structures in domestic and international markets as determinants of the likelihood of petitioning and receiving trade defense measures. Results support that labor content and productivity decrease the propensity of receiving protection, while the structure of foreign trade (import volume and tariff level), factor content (natural resource intensity) and economic performance (investment intensity) influence the probability of an AD duty most. Sectorial *markups* (profits over costs) also exert positive effects, but these results should be taken cautiously, suggesting that alternative econometric methodologies and explanatory variables to account for the degree of concentration/market power of sectors should be considered in future studies.

The literature review sought to combine the contribution of the political economy of protection and the analysis about the economic and competitive impact of international trade liberalization on manufacturing industry sectors in Brazil. This latter issue attracted several studies, in light of the recent experience of trade reform in the country. Thus, the granting of AD in Brazil can be interpreted as a response to changes in the domestic and international economic structure toward increased competition in markets, with consequences over the internal figures of the firms. The final decision also reflects the perception of the government and the ability of the political mobilization of an industry. That said, alternative variables which more effectively reflect the political leverage of sectors are needed in order to elucidate the problem in future studies.

This work used an extensive data base, with an unprecedented approach: although widely used for studies of industrial economy, the PIA/IBGE data was applied to a problem of international trade. In light of the characteristics of panel data, changes of variables over time, (not only their levels), suggest that models with dynamic econometric specifications could be tested in future research. In addition to that, the existence of AD rankings among the industrial sectors indicates that models with limited dependent variables (Tobit) or distribution by counting (Poisson) are feasible estimation alternatives. Finally, although panel models account for the problem of endogenous variables and reverse causality, future studies may consider these issues and look for instrumental variables. The conclusions reached herein provide a contribution to the literature of international trade and of industrial studies in Brazil.

¹⁷ Castilho et al. (2009) and Araújo and Miranda (2008).

Appendix.**Tables A1 and A2.**

Table A1
CNAE sectors, NCMs, number and ranking of products with AD – 1996–2007.

Sectors – CNAE (groups)	NCMs	Products	Number	Rank
24.2 Manufacture of organic chemicals	7	Cellulose ethers, Ethers of methacrylic acid, phenol, glyphosate (composite), ethers of ethylene glycol, Synthetic indigo dye, butyl acrylate.	7	1
24.3 Manufacture of resins and elastomers	4	Polycarbonate resin, pet resins, Polyvinyl chloride (Pvc), polycarbonate.	4	2
24.9 Manufacture of various chemical products and preparations	4	Sodium tripolyphosphate, laboratory and diagnostic reagents, aluminum plates for photography.	3	3
27.2 Steel	6	Seamless steel tubes, plates of cold steel laminates, plates of hot steel laminates.	3	3
36.9 Manufacture of miscellaneous products	3	Pencil, vacuum flasks, hair brushes.	3	3
15.2 Processing, preservation and production of canned fruits, vegetables and other vegetables	4	Mushrooms, canned peach.	2	4
24.1 Manufacture of inorganic chemicals	2	Ammonium nitrate, calcium phosphate.	2	4
25.2 Ammonium nitrate, calcium phosphate	6	Pet films and sheets, laboratory plastic products.	2	4
26.1 Manufacture of glass and glass products	2	Glass laboratory artifacts, glass ampoules for vacuum flasks.	2	4
27.4 Metallurgy of non-ferrous metals	2	Unwrought magnesium, magnesium powder.	2	4
28.4 Manufacture of cutlery, locksmiths and hand tools	3	Iron blades for saws and knives, steel drills.	2	4
29.1 Manufacture of motors, pumps, compressors, and transmission equipment	2	Steel pumps and excavators for the oil industry.	2	4
33.4 Manufacture of instruments and appliances of optical, photographic and cinematographic materials.	5	Spectacles and spectacle frames of metal and plastic.	2	4
15.4 Manufacturing of dairy products	6	Milk (milk powder).	1	5
17.2 Manufacture of other textiles	2	Simple and twisted yarn of jute	1	5
21.2 Manufacture of paper, cardboard, cardboard and paperboard	1	Glassine papers	1	5
24.4 Manufacture of fibers, wires, cables and artificial and synthetic continuous filament	1	Nylon cord	1	5
24.5 Manufacture of pharmaceutical products	1	Medicines of insulin	1	5
24.6 Manufacture of agrochemicals	2	Defensive of glyphosate (formulated and intermediary)	1	5
25.1 Manufacture of rubber	1	Bike tires	1	5
26.2 Manufacture of cement	2	Portland cement.	1	5
27.1 Production of pig iron and iron-alloys	1	Ferchromium containing carbon	1	5
28.3 Forging, stamping, powder metallurgy and metal processing services	2	Parts of iron and steel for industrial mills.	1	5
28.9 Miscellaneous metal products manufacturing	1	Iron nails	1	5
29.2 Manufacture of general-purpose machinery and equipment	1	Industrial pulleys	1	5
29.8 Manufacture of electric appliances	1	Electric smoothing irons	1	5
31.9 Manufacture of other electrical equipment	1	Magnets and magnetic component	1	5
32.3 Manufacture of television and radio receivers for sound and video amplification	3	Loudspeakers and components	1	5
35.9 Manufacture of other transport equipment	1	Bicycle parts	1	5
29 Sectors	77	52 products		

Source: DECOM and World Bank.

Table A2
Countries with AD, number and percentage of measures and products – 1996–2007.

Countries	AD measures	%	Products
Argentina	2	2.70	Phosphate of calcium
Bangladesh	1	1.35	Yarn of jute
Chile	1	1.35	Grinding balls and similar forged or stamped articles for mills
China	19	25.68	Pencils and crayons with leads encased in a rigid sheath; bicycle tires; mushrooms; other permanent magnets and magnetized articles; steel drills; glass inners for vacuum flasks; vacuum flasks; glyphosate; magnesium powder; unwrought magnesium electric smoothing irons; photographic plates; frames and mountings; hair brushes; loudspeakers; pulley tackles; steel drills; bicycle crank arms; Pvc-S
Denmark	1	1.35	Medicine containing insulin
European Union	3	4.05	Milk Phenol (hydroxybenzene) and its Salts Polycarbonates
Finland	2	2.70	Iron nails Glassine paper
France	2	2.70	Cold rolled stainless steel Esters of methacrylic acid
Germany	3	4.05	Polycarbonate resin Esters of methacrylic acid Synthetic indigo dye
Greece	1	1.35	Peaches in syrup
India	4	5.41	Pet resin Iron nails Pet film Yarn of jute
Italy	1	1.35	Stone cutting plates
Japan	1	1.35	Cold rolled stainless steel
Kazakhstan	1	1.35	Ferrochromium containing by weight more than 4% carbon
Mexico	2	2.70	Cold rolled stainless steel Other portland cement
Netherlands	1	1.35	Cellulose ethers
New Zealand	1	1.35	Milk
Romania	2	2.70	Petroleum pump Steel Line pipe
Russia	2	2.70	Ferrochromium containing carbon Ammonium nitrate
South Africa	2	2.70	Ferrochromium containing carbon Plates of cold steel laminates
South Korea	2	2.70	Nylon cord Pvc-S
Spain	2	2.70	Cold rolled stainless steel Ethers of methacrylic acid
Taiwan	1	1.35	Bicycle tires
Thailand	2	2.70	Bicycle tires Pet film
Ukraine	1	1.35	Amonium nitrate
United Kingdom	2	2.70	Sodium tripolyphosphate Ethers of methacrylic acid
Uruguay	1	1.35	Milk
United States	10	13.51	Composite diagnostic or laboratory reagents; polycarbonate resin; other cellulose ethers; phenol (hydroxybenzene) and its salts; monobutyl ethers of ethylene glycol or of diethylene glycol; pet resin; photographic plates; polycarbonates glassine papers; butyl acrylate Portland cement
Venezuela	1	1.35	
29 countries	74 measures	100	52 products

Source: DECOM and World Bank.

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