Does Antidumping Measures Increase Market Power? Evidence From Latin American Countries

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Abstract

This paper aims to provide empirical evidence regarding the adverse effects of antidumping measures on competitive market strategies. Our empirical model consists of estimating the Lerner index as a mark-up measure. To reach our goal, we use the Orbis database, with firm-level data between 2006 and 2014. We estimate the market power considering a time window in which industries achieved antidumping protection and had their exports punished in foreign markets. On average, our results suggest a positive relationship between antidumping barriers and the increase in firms' market power. This pattern proves to be especially greater for Latin America when compared to other emerging economies. Moreover, the effects on market power are more substantial in the long run and, depending on the specification of the country set, null in the short run.

Keywords: Antidumping, Lerner Index, market power

Resumo

O objetivo deste artigo é fornecer evidências empíricas dos efeitos adversos da imposição de medidas *antidumping* sobre a competitividade de diversos setores de atividade econômica. Para mapear o comportamento estratégico das firmas, bem como a evolução do poder de mercado, o modelo empírico consiste em estimar o índice de Lerner como uma medida de *mark-up*. Para tal, utilizamos a base da *Orbis*, com informações a nível de firma entre 2006 e 2014, em que as indústrias tenham logrado proteção *antidumping* em seu favor e outras tenham suas exportações punidas em mercados estrangeiros. Em média, os resultados sugerem uma relação positiva entre a imposição de barreiras *antidumping* e o aumento do poder de mercado. Essa evolução do *mark-up* se revela especialmente maior para as economias da América Latina quando comparada com os demais países emergentes e outras economias ao redor do mundo. Além disso, o efeito sobre o poder de mercado é maior no longo prazo e, dependendo da especificação do conjunto de países, nulo no curto prazo.

Palavras-chave: Antidumping, Índice de Lerner, poder de mercado.

Área ANPEC: Área 7 - Economia Internacional
JEL Classification: C33 · D22 · D43 · F12 · F13

1. Introduction

Throughout the last 25 years, several emerging and developing countries started to intensively adopt temporal trade barriers (TTB), especially in the form of antidumping measures. The so-called 'new users' contrast to the 'traditional users' as – since the WTO's Uruguay Round (1986-1994) – they have never summed up to less than half of the AD global activity (Prusa, 2001; Vandenbussche & Zanardi, 2008). Naturally, the growing activity of the new players intrigued a wave of studies in International Economics aiming at better understanding the economic outcomes

and repercussions of the soaring flow of AD protectionism in emerging markets. For example, the usage of TTB by non-developed economies brought forth the unusual pattern of south-south trade protections, in which emerging markets use AD against each other. The present work belongs to this inceptive literature and seeks to investigate how industries' market powers evolved after receiving AD protectionism in emerging and, more specifically, Latin-American countries. To achieve this goal, we use traditional techniques of treatment effects in a global data set entailing the period 2006-2014. The results show a positive relationship between market power and the imposition of AD barriers in all three scenarios – worldwide, in emerging markets, and in Latin-American countries.

The antidumping was designed in order to punish 'unfair' price policies practiced by foreign firms exporting to a given domestic economy. This practice can be challenged by the trade legislation if it is proven to be inflicting damage to the domestic companies. Thus, if a domestic firm believes it is being harmed by overly cheap imports, it can file a petition at the governmental agency for trade affairs and a thorough investigation will be carried out. If applied, it is expected that the AD tariff offsets the dumping and lead the petitioner to retrieve from the damage caused. However, a part of the literature has been investigating the possibility of a wide range of – direct and indirect – effects of the AD barriers.

Particularly, it has been notorious the research on specific sectors and industries, as better firm- and plant-level data have become frequent. Generally, this literature is concerned with two main effects of the antidumping policy: i) on firms productivity and the resulting reallocation of resources [1] and ii) on the market competition, as – both theory and practice – have been showing that mark-ups and firms' strategical behavior can alter with the existence, threat or imposition of antidumping laws [2]. Apparently, there is a consensus that just the existence of AD legislation affects the strategic behavior of both domestic and foreign firms. Therefore, there are scenarios that the domestic firm benefits and the exporter is injured, situations in which both end up better off (as in a case of collusion) and even contexts that both might be worse off (Hartigan, 2000). Which of these outcomes prevail has been an object of academics in the last three decades.

In the scope of the effects of AD on market competitiveness, it has been argued that the implementation of measures has been functioning as a tool of a broader industrial policy aimed at patronizing domestic manufacturers. Such usage of antidumping would be rather convenient since that the multilateralism fostered by GATT and WTO since the eighties hampered the usage of conventional measures of protectionism, such as tariffs and quotas, and led the countries to seek alternatives of protection (Nieberding, 1999; Rovegno, 2013). If such policies are indeed used as a device of protectionism, it is expected to have disruptive effects on domestic competitiveness, leading unproductive firms to benefit at the expense of consumers (Blonigen and Prusa, 2016). In the long run, the possibility of renewal of a particular AD duty causes some inertia to those industries, as many less productive companies would keep their market share and avoid the reallocation of resources towards more productive organizations. In this context, a bunch of studies sought to investigate the links between AD duties and firms' market power (Nieberding, 1999; Tybout, 2003; Konings & Vandenbussche, 2005; Pierce, 2011; Rovegno, 2013).

This paper uses firm-level data to build aggregate measures of price-cost margins (*PCM*) based on the Lerner index for around 13 thousand industries worldwide from the Orbis dataset. It then identifies the AD cases which ended up levying duties against foreign producers and estimates treatment effects in order to assess how price-cost margins evolved after the industries being granted AD protection, especially in emerging and Latin-American markets[3]. Our main contribution is the wide coverage in terms of sector and country. It is, to our knowledge, the first study to assess emerging economies at a multi-country level. Its conclusion may draw attention to the desired effects of TTB in these countries, especially in terms of its effectiveness and disruptive effects on competitiveness.

In section 2, we briefly introduce a part of the literature that intersects our study. Section 3 brings descriptive statistics, showing which players in emerging markets have been active relative to the global AD in the period. In section 4, we describe the historic and institutional background of AD legislation in the most important Latin-American economies. Section 5 brings the empirical techniques, the source of data, and the most important manipulations performed. We provide and discuss the results in section 6 and we conclude our study in section 7.

[1] See Konings & Vandenbussche (2008); Pierce (2011); Chandra & Long (2013); Lu et al. (2013).

[2] See Prusa (1992, 1994); Staiger & Wolak (1992); Nieberding (1999); Hartigan (2000); Konings & Vandenbussche (2005).

[3] We use both terms loosely. When we refer to emerging economies, we consider also the underdeveloped countries and when we refer to Latin-American countries, we encompass also the Caribbean nations.

2. Literature Review

Currently, countries have well-defined antidumping legislation. Besides, antidumping is legal under *WTO* rules and can be raised bilaterally. In that sense, it has a special status as an instrument of commercial policy. According to Prusa (2005), its popularity can be illustrated by the fact that the use of AD measures surpassed all other forms of contingent protection.

There is a vast literature that discusses the practice of antidumping, ranging from topics in International Economics to Economic Analysis of Law. An interesting topic is the deliberate use of AD as a commercial protection mechanism. Blonigen & Prusa (2016) argue that AD does not necessarily maintain fair trade. It reveals to be a useful tool to provide market advantages for the reporting firm. Therefore, instead of temporarily combating unfair price practices, they have served as efficient substitutes for the typically imposed commercial tariffs.

For this reason, Wruuck (2015) states that AD is said to create substantial impediments to trade. As well, it is responsible for frictions between trading partners and distortions in terms of market competitiveness and productivity. The use of AD raises some controversies. As its implementation takes place via a prompt administrative process that does not require action by the executive and legislative bodies, many believe that the AD easily suffers from political pressure (such as lobbying). Moreover, the AD investigation process gives speech space only to petitioners, leaving final consumers - who will potentially buy more expensive - out of discussions.

In this paper, we focus on the relationship between AD and market power. Thus, our research dialogues with the strand of literature that seeks to understand the reasons and the conditions in which an exporter firm practices dumping. Consequently, we are interested in understanding and measuring the strategic reaction of importing countries and firms to antidumping, respectively. Hence, several strategic aspects arise in relation to: the role of credible threats of retaliation, tacit strategic agreements, litigation, the commercial partner, relevance of the sector for bilateral relations (Prusa & Skeath, 2002, 2004; Blonigen & Bown, 2003; Bown, 2005; Feinberg & Reynolds, 2006; Busch et al., 2008).

Regarding the effects of AD on market power, Nieberding (1999) uses the empirical framework of the Lerner index to show that protected North American companies increase their domestic market power. On the other hand, companies whose petition has been rejected to experience a decrease in market power. The evidence is less clear for petitioners who withdraw their antidumping petition before its final resolution. Konings & Vandenbussche (2005) tested whether AD protection affected the market power of 4,000 European Union producers. The study concluded that AD protection has significant positive impacts on domestic markups[4]. Besides, the randomized control group not protected by AD did not achieve the same markup gain.

Using data from industries involved in AD measures, Tybout (2003) constructed an AD protection measure weighted by the share of imports directly affected by AD barriers. The empirical analysis found positive evidence of AD tariffs on *PCM* in the period of time prior to the Uruguay Round, but such evidence did not hold in the post-1995 time period. Using data from the industrial census, Pierce (2011) assessed the impact of AD measures on North American producers using differences in differences method. The findings indicated that the markups increased with the protection rate, however, there is no statistically significant mean effect of the mere presence of AD.

Even closer to our empirical approach, Rovegno (2013) investigated the effect of AD on *PCM* covering a 26-year period and using data from North American industries, the author provided evidence of a positive effect of antidumping and compensatory measures on the sectorial *PCM* in the pre-1995 time period. The author controlled the effects derived from potential problems of endogeneity through instrumental variables and propensity score matching. The results showed that – in periods when there was no evidence of a positive effect – trade diversion might have a relevant role.

In addition, the suppliers partially captured the gains of the domestic firms by increasing the price of their inputs. Thus, the buyer sector benefited from trade protection measures. Lastly, the author addressed a mechanism in which there is a possibility for foreign firms to 'jump over' the barrier constituted by AD by taking their production to the importing country via foreign direct investment.

There is also a growing field that discusses the effect of antidumping barriers on emerging economies. A natural focus is China. The increase in punishments on Chinese products occurred after its entry into the WTO in 2001. Zhang

[4]It does not hold when there is a strong deviation in the flow of imports. Deviation of imports refers to the situation in which - after the imposition of the AD measure - the flow of imports from the target country falls, but is replaced by partners not affected by antidumping. The AD literature in general finds support for the hypothesis of import deviation (Konings et al., 2001; Niels, 2003; Vandenbussche & Zanardi, 2008; Khatibi, 2009).

(2017) studied the impact of AD measures raised from Latin American (LA) countries against Chinese industries. Through differences in differences estimations, it finds a substantial negative effect of AD measures on Chinese exports[5] to LA, especially in its so-called intensive margin (i.e., in the volume exported per exporter). In terms of extensive margin (i.e., number of exporters) a substantial effect was not identified, but the exit of low-productive firms was identified after the imposition of antidumping. The measures taken by Mexico and Brazil were those that had the greatest impact on Chinese exports - on both the intensive and extensive margins. Finally, Zhang (2018) investigated the relationship between the lifting of AD measures and political connections in China, defined through the identification of state-owned companies. The results suggest that large companies with low productivity are more likely to be petitioners for antidumping.

Country	**N**	**%**	**Country**	**N**	**%**
India	623	23.75	Pakistan	94	3.58
Brazil	322	12.28	Malaysia	68	2.59
China	222	8.46	Colombia	65	2.48
Argentina	220	8.39	Thailand	64	2.44
Turkey	195	7.43	Peru	63	2.4
Mexico	131	4.99	Egypt	58	2.21
Indonesia	100	3.81	Russia	53	2.02
South Africa	99	3.77	*Others*	*112*	*4.27*
South Korea	97	3.7	*Latin America*	*860*	*32.79*

Source: Bown (2012).

Table 1: AD in emerging economies. N indicates the number of cases initiated between 2000 and 2015.

3. Antidumping in Emerging Market Economies

We emphasize the recent paradigm in the global antidumping activity. As Table 1 reveals, emerging economies are important players, both as petitioners and as target countries. From 2000 to 2015, we identified 3,788 cases and 71 petitioners for antidumping, and 69 % come from emerging economies. The frequency of cases refers to all petitions raised, and not only those that resulted in the application of a measure. We note that Latin America accounts for about a third of the cases, even though it represents approximately 17.5 % of the international trade of that group of countries during this time interval[6].

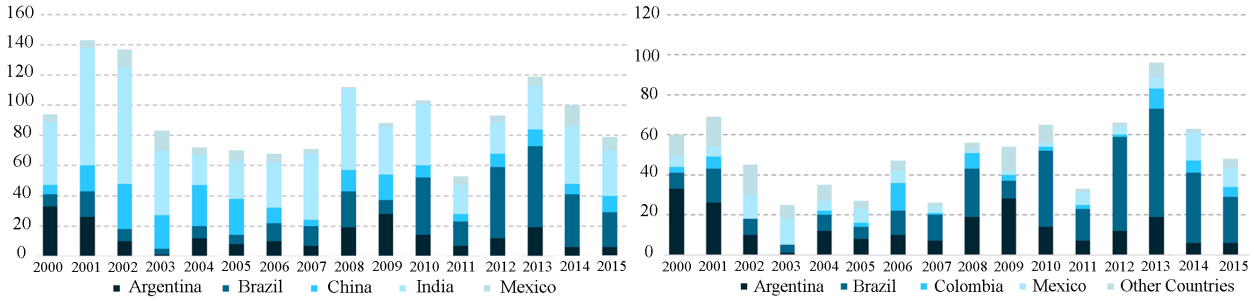

Figure 1: AD measures raised between 2000 and 2015. **Left**: Top-five emerging countries. **Right**: Latin American countries.

The left side of Figure 1 illustrates the performance of the main emerging and Latin American actors over time. There has been a considerable change in the activity of countries over the 16 years. Only in 2012 and 2013 were

[5] Lu et al. (2013) applied differences in differences methods to estimate the effect of AD on Chinese exports to the USA. As well, the results showed a strong negative effect on the volume of exports associated with the imposition of AD tariffs. Less productive firms tend to leave the export market.

[6] See the *UN comtrade* for details.

101 AD measures raised by Brazil, the same amount raised by Mexico over the entire period. The Indian economy had 359 cases in the first 8 years, against 264 in the last 8. On the right side of Figure 1, Argentina's performance in the set of Latin American economies is also clear. When faced with the top five emerging countries, the role of Latin American countries is clear. Our analysis shows that Brazil goes against the majority of WTO members, with a positive tendency to open new cases.

(a) - Emerging and Latin-American as domestic players

Emerging			*Latin America*		
Exporter	**Importer**	**N**	**Exporter**	**Importer**	**N**
India	China	154	Brazil	China	83
Brazil	China	83	Argentina	China	70
Turkey	China	81	Mexico	China	50
Argentina	China	70	Colombia	China	41
India	EU	51	Argentina	Brazil	33
Mexico	China	50	Brazil	United States	30
India	Taiwan	49	Mexico	United States	23
India	South Korea	44	Brazil	South Korea	22

(b) - Emerging and Latin-American as foreign players

Emerging			*Latin America*		
Exporter	**Importer**	**N**	**Exporter**	**Importer**	**N**
India	China	154	Argentina	Brazil	33
United States	China	116	United States	Mexico	18
EU	China	93	Brazil	Argentina	11
Brazil	China	83	Chile	Argentina	11
Turkey	China	81	Brazil	Mexico	10
Argentina	China	70	United States	Brazil	10
Mexico	China	50	Peru	Chile	8
India	Taiwan	49	Argentina	Chile	7

Source: Bown (2012).

Table 2: AD bilateral. N indicates the number of cases initiated between 2000 and 2015.

Analyzing the bilateral antidumping pattern, Table 2 shows the strong participation of China as a target country and India as the country that applies the AD measure. In cases where Latin America is the investigator of dumping, it is noted that the four main bilateral relations involve China. One involves two economies in the region: Argentina and Brazil, with 33 open petitions.

In fact, through panel B, we note that this relationship is the one that produces the most investigations among pairs of Latin American countries. In addition, Brazil has opened more cases against the United States than Mexico, even though American imports to Mexico represent 53% of the total imported, against only 16% of imports to Brazil. This is indicative of Brazilian prominence. Furthermore, it reveals a possible underutilization of AD measures, given the well-known cooperation between Mexico and the USA within the scope of NAFTA.

Finally, Table 3 exposes the main product lines to the 2 digits of the Harmonized System under investigation, both globally and in terms of emerging and Latin American countries. As highlighted in Blonigen & Prusa (2016), the metallurgical industry is the main target of petitions in the world, with approximately 26% of cases (HS codes 72 and 73). As well, the classification of goods with the highest number of cases from Latin America is related to plastic - with emphasis on PVC pipes. In comparison with other countries, inorganic chemicals are not relevant targets in LA, but they are important in global antidumping.

4. Latin America: historical background

We briefly show the process of strengthening the AD legislation in some of the most important economies in Latin America. Finger & Nogués (2005) and Zhang (2017) already offered a comprehensive historic-institutional guideline

on this theme. Thus, we only complement their discussion and highlight some important issues related to our study.

The creation and strengthening of antidumping and safeguards legislation in Latin America were similar across countries. Both time-wise and in terms of economic background. At least in the main cases, the process took place between 1987 and 1995, a time stretch marked by the enforcement of liberalizing policies. In this context, we observed a reduction in the high tariff and non-tariff barriers, a primordial rule of thumb in the so-called industrialization by import substitution. Besides, alternative policies such as the antidumping gained some popularity, especially after the WTO efforts to standardize its usage in the Uruguay Round. Here, we comment on the cases of Argentina, Brazil, Colombia, and Mexico.

HS−2	**Description**	**World**			**Emerging**			**Latin America**		
		#	*N*	*%*	*#*	*N*	*%*	*#*	*N*	*%*
72	Iron and steel	**(1)**	**599**	**15.71**	(2)	321	12.7	(2)	103	11.87
29	Organic chemicals	(2)	469	12.3	**(1)**	**392**	**15.51**	(5)	43	4.95
73	Iron or steel articles	(3)	381	9.99	(4)	138	5.46	(3)	67	7.72
39	Plastics and articles	(4)	363	9.52	(3)	275	10.88	**(1)**	**120**	**13.82**
28	Inorganic chemicals	(5)	175	4.59	(5)	117	4.63	(18)	11	1.27
85	Electrical machinery and equipment	(6)	159	4.17	(8)	106	4.19	(8)	32	3.69
48	Paper and paperboard	(7)	149	3.91	(7)	109	4.31	(10)	28	3.23
84	Machiney and mechanical appliances	(8)	126	3.31	(10)	87	3.44	(6)	39	4.49
40	Rubber and articles	(9)	116	3.04	(6)	109	4.31	(4)	51	5.88
54	Man-made filaments	(10)	105	2.75	(9)	95	3.76	(12)	25	2.88
70	Glass and glassware	(11)	93	2.44	(12)	72	2.85	(9)	31	3.57
55	Saple fibres	(12)	82	2.15	(11)	75	2.97	(7)	34	3.92

# indicates the ranking position. (1) represents the product with most AD cases for that particular group of countries.
The percentage was calculated by the ratio between the total cases of each HS−2 category and the total number of cases.
In total, 77 categories of products at the 2-digit level were investigated in the period.
Source: Bown (2012).

Table 3: AD measures by products (2000-2015).

At the beginning of the nineties, Argentina was in a series of liberalizing reforms that - alongside the important role played by the competition of imported goods to stabilize the price level in a context of high inflation - made necessary an enhanced and more modern regulation of antidumping and safeguards. In this sense, the National Foreign Trade Commission (CNCE), an independent agency responsible for executing the AD legislation clearly and transparently, operating alongside the Undersecretary of *Gestión Comercial Externa* (UGE), played a relevant role. Despite the liberalizing wave and the creation of a technical agency, the nineties saw a spread in the number of fillings of AD petitions, as well in the proportion of cases with duties levied. According to Nogués & Baracat (2005), what caused this movement was both the economic recession and currency appreciation. Such factors made the domestic industries more prone to suffer damage from cheap imports. From 2002 on, with the currency depreciation and recovery of the economic activity, the massive number of petitions ceased, as one can see in Figure 1.

In a similar fashion to Argentina, Colombia went through a process of liberalization in the dawn of the nineties. It demanded the development of legal tools to deal with foreign competition, which was until then neutralized by protectionist policies. As an outcome of the reforms introduced in 1991, the Colombian Institute of Foreign Trade (Income) became in charge of the investigation of unfair trade practices. According to Reina & Zuluaga (2005), the recent Colombian experience in terms of antidumping and safeguards differ from the international standard. On one side, the number of investigations conducted by Colombia is substantially lesser than the tally registered in most medium-large sized countries. On the other side, despite there being an increasing global trend in the usage of antidumping in detriment of safeguards, in Colombia the pattern is the opposite. Between 1990 and 2004, there were 37 AD petitions and 34 filled safeguards. Accordingly, the relatively low AD activity by Colombia is due to a certain lack of information on the private sector of the existence of such tools. Also, we must highlight the stability and consistency of the institutional arrangements concerning the investigations and acceptance of AD injuries, even it not being constituted of entirely independent agencies within the government structure.

Following the usual pattern mentioned above, the wide use of antidumping in Brazil started after trade liberalization. Before 1989, the high tariff and non-tariff barriers prevailed as main foreign trade policy tools. Until 1990,

the Foreign Trade Department (CACEX) from *Banco do Brasil* used to be the responsible agency in terms of implementation, inspection, and other foreign trade-related affairs. Between 1990 and 1993, the Ministers of Economics had several secretariats and departments responsible for driving the foreign trade policy. This institutional scheme triggered conflicts of power, as delimiting the jurisdiction of each agency was an issue. In 1995, the Foreign Trade Chamber of Commerce (CAMEX) implemented the Department of Trade Defence (DECOM), which is a proper agency focused on dealing with antidumping. Kume & Piani (2005) criticized the change on the institutions in charge of antidumping in Brazil - from the Minister of Finance to the Minister of Development, Industry and Foreign Trade (MDIC) – especially because the latter is closer to industrial sectors, which could lead to biased decisions. Similar to Argentina, the economic background in the nineties led to an increasing trend in the usage of antidumping, especially with the fixed exchange rate in parity with the U.S. Dollar, which made imports exceedingly competitive.

In Mexico, the foundation of a mechanism related to trade defense had as objective fostering the model of economic openness and avoiding protectionism. The General Trade Bureau (*Dirección General de Comercio*) is in charge of the investigations. This legislation took place when Mexico was about to entry at NAFTA (North American Free Trade Agreement). In this process, Mexico and Canada agreed with the extinction of antidumping duties among NAFTA members. On the other hand, the United States refused. Eventually, the core of the trilateral negotiation on unfair international trade actions was the incorporation of a system based on binational panels specifically engaged in reviewing final decisions on antidumping made by competent authorities in each member country (De la Torre & González, 2005).

Finally, it is worth mentioning the functioning of antidumping within MERCOSUR. Currently, MERCOSUR countries can levy AD duties upon each other, despite this practice being criticized in terms of regional integration. In 1996, the Common Market Council (CMC) established that the AD investigations would follow the national legislation up until the end of 2000. From this date, national authorities must declare how one's approach to the regulation of AD practices within MERCOSUR would be - especially in favor of a gradual eradication of the antidumping and safeguard measures within the trade bloc. However, in 2002, the members joined the Uruguay Round Antidumping Agreement and within-bloc duties prevail to this day.

5. Methodology and Data Description

We present the empirical approach to estimate market power in subsection 5.1. In subsection 5.2, we discuss relevant aspects of the formulation of the econometric model. To control the influence of specific factors in each sector on the degree of market power, as well as the chance of receiving antidumping protection, we address the selection bias in subsection 5.3. Finally, we describe the database in subsection 5.4.

5.1. Lerner Index and Price-Cost Margin

According to Tybout (2003), there are many alternative ways to estimate mark-ups. Accordingly, any choice between them involves trade-offs. Bresnahan (1989) introduced the classical structural approach used to estimate mark-ups. However, in order to estimate elasticity in the sector under consideration, a significant amount of information on prices and unit quantities is necessary. Unfortunately, they are not always available. Aware of this, we intend to estimate the impact of the application of AD measures on the market power of companies by the Lerner index.

Besides, Elzinga & Mills (2011) highlight the difficulty in observing marginal costs. Assuming that the costs associated with labor and input are linear in the firms' production function, the Lerner index offers a measure of market power using *PCM*, as follows:

$$\frac{P_{it} - C_{it}}{P_{it}} = \frac{\mu - 1}{\mu} = \frac{1}{|\epsilon_d|}, \tag{1}$$

in which ϵ_d is the price elasticity of demand. Thus we have:

$$PCM_{it} = \frac{P_{it}Q_{it} - C_{it}Q_{it}}{P_{it}Q_{it}} = \frac{P_{it} - C_i t}{P_i t}, \tag{2}$$

and is equivalent to the following expression:

$$PCM_{it} = \frac{P_{it}Q_{it} - P_{M_{it}}M_{it} - W_{it}L_{it}}{P_{it}Q_{it}}. \tag{3}$$

Where $P_{it}Q_{it}$ is the total revenue of a given firm that operates in sector i at time t. The total cost is given by $C_{it}Q_{it}$, and comprises the total expenses with inputs ($P_{M_{it}}M_{it}$) and labor ($W_{it}L_{it}$). Rovegno (2013) argues that the main advantage of PCM is the fact that it is directly observable. Thus, we can measure both its temporal dynamics and its variation between sectors. One caveat to the PCM approach is that the effects of productivity on the mark-up are not separated. Thus, in order to better interpret the results, it is essential to understand how productivity can be affected by the imposition of AD tariffs. As discussed by Pierce (2011), *a priori*, the effects of contingent protection on productivity are quite ambiguous.

On the one hand, we find both theoretical and empirical evidence[7] indicating that there is a significant positive effect of trade liberalization on productivity. For this reason, on average, it would be expected that the restriction of imports resulting from the imposition of AD measures would harm productivity. On the other hand, Miyagiwa & Ohno (1995); Crowley et al. (2006) measured the impact of commercial policy on the technology of firms through dynamic models. The authors showed that import protection measures can increase their productivity.

Konings & Vandenbussche (2008), based on the average revenue of firms, present evidence that productivity improves moderately under the protection of AD. However, the authors also emphasize that this increase is driven by low productivity companies – and that in doing so, they are able to reduce this gap – while high productivity companies suffer productivity losses. For the United States, Pierce (2011) finds that the revenue-based productivity of protected firms increases with the imposition of AD measures. In another perspective, considering the quantities demanded, there is evidence that physical productivity decreases. Given these results, it is safe to assume that potential increases in the industry's average PCM under AD protection will reflect, to a greater extent, changes in mark-ups rather than productivity.

5.2. Empirical Model

Our empirical framework is in line with Tybout (2003); Konings & Vandenbussche (2005); Rovegno (2013) and is given by:

$$PCM_{it} = \alpha_1 PCM_{it-1} + \cdots + \beta AD_{it} + \delta X_{it} + \alpha_i + \alpha_t + \varepsilon_{it}. \tag{4}$$

PCM_{it} is the price-cost margin of industry i in time t. The X_{it} matrix is a group of control variables. In turn, the term α_i represents the fixed effect of sector i on the variable PCM_{it}, α_t captures the time effect controlled by a set of dummy variables for each year. The error term is given by ε_{it}. We interpret equation (4) as a difference in difference model with panel data. Therefore, sectors not protected by AD measures serve us as counterfactual.

As well, we follow the contributions given by Athey et al. (2018); Mora & Reggio (2019); Hansen (2007) on statistical inference procedures. Our focus is to deal with situations in which the division between treatment and control groups occurs at different times of time. Thus, we obtain the average effects of the treatment in an environment with panel data from a Generalized Differences in Differences model. The Generalized Least Squares (MQG) estimator is effective in exploring correlations at different time intervals and examining the likely bias that results from strict non-exogeneity. For the case assessed here, this is essential, especially since the imposition of AD tariffs is triggered at different periods. Besides, to assess and formulate appropriate trade policies following each evaluated sector, it is necessary to understand the relationship between AD measures and firms' performance over time.

5.3. Selection Bias

Antidumping protection is hardly an exogenous event. In other words, the specifics of each company and each sector influence both the degree of market power and the chance of antidumping protection. Specifically, in the case of treatment effects, we observe endogeneity through the sample selection bias (Heckman, 1976, 1977, 1979). The general idea is that the units observable in the sample have idiosyncratic characteristics that are good predictors of the probability of belonging to the treatment group. Thus, the estimation of treatment effects (ATT and ATE) must consider the endogenous selection of treaties, especially when it is inevitable, which is the case in observational (non-randomized) studies. Otherwise, there are biases in the estimates based on simple OLS models.

Rovegno (2013) provides clues about the ambiguity of the sign of treatment selection bias related to antidumping. In one scenario, a sector facing strong external competition and losing market shares may find itself in a declining

[7] See Melitz (2003); Bernard et al. (2010) for details.

trend in the *PCM* and, with this, be more likely to petition against cheap imports. This being the case, the estimation of equation (4) would be underestimating the effect of AD on the *PCM*. In another scenario, however, producers in more concentrated and strategically well-organized sectors may find it easier to coordinate a lobby in favor of accepting an AD measure. These sectors may have a high *PCM* even before the start of a process. In these scenarios, if the *PCM* has an upward (downward) trend over time, the estimates are likely to overestimate (underestimate) the effect of antidumping measures. As well, the use of antidumping as a deliberate protection measure by the government ends up favoring specific sectors. Therefore, the selection of companies and sectors to benefit from AD measures is not random.

Thus, in a first stage, we estimate the probability that 4-digit NACE sectors will receive the benefit. There are 57 countries (35% of WTO members) whose AD activities are reported in the Chad Bown report. Petitions from the United States, European Union, India, Australia, and Brazil represent almost 60% of AD activity reported since the 1980s. Thus, an intuitive predictor of the likelihood of an industry's participation would be the country's share in global AD. That is, the more active a country is in the use of antidumping, the greater the likelihood that a given industry will one day petition. To calculate the participation of each country in global antidumping activities, we used two methods. In the first one, we consider more than one occurrence whenever more than one HS code is investigated in this case. In the second one, we count the cases only once, no matter how many lines of HS code they have. Both methods follow Bown (2011). Also, each open investigation can target multiple product classifications.

For a country c of the European Union (EU), the index becomes the individual share of c plus the share of EU weighted by the share of c's GDP in the EU GDP:

$$\begin{aligned} Share_c &= \sum_{n=1}^{N} AD_{cn} \Big/ \sum_{\substack{c=1,N \\ n=1}}^{C,N} AD_{cn} + \left(\frac{Y_c}{Y_{EU}} \cdot Share_{EU}\right) \\ Share_{EU} &= \sum_{\substack{c=1,N \\ n=1}}^{C,N} AD_{cn}^{EU} \Big/ \sum_{\substack{c=1,N \\ n=1}}^{C,N} AD_{cn}. \end{aligned} \tag{5}$$

The same logic applies to the participation of sectors via NACE codes. As reported in Blonigen & Prusa (2016), the base metals industry (and other articles) is the protagonist of the global AD activity using HS codes. We found the same result in our correspondence to NACE codes: 58% of cases accepted in the 2000-2015 period are associated with code 24 (manufacture of basic metals). Formally, we have:

$$ADshare_n = \sum_{c=1}^{C} AD_{cn} \Big/ \sum_{\substack{c=1,N \\ n=1}}^{C,N} AD_{cn}, \tag{6}$$

in which n can correspond to the 4, 3 or 2 digit classification.

We also include the import penetration index m_c to measure how open a country is to imports. Since more open economies are more prone to unfair competition, they are more likely to petition. However, more closed economies can act similarly by raising tariff, non-tariff, and contingency protection measures. This makes the sign of the import penetration index ambiguous. Formally, the index is given by:

$$m_c = M_c / Y_c, \tag{7}$$

Finally, we built a measure of the sector's relative size in the economy by defining the ratio between the number of companies reported in that industry and the total number of companies in that particular country. The variable does not provide complete information, as it does not consider the size of the firm. However, it can indicate more or fewer oligopolies. As far as we know, once again the signal is ambiguous: sectors of broad economic activity may be strong AD petitioners. On the other hand, relatively small sectors can indicate oligopolies structures. This might favor strategic coordination and increase bargaining power. To estimate the probabilities of antidumping treatment, we use a binary logit model (Wooldridge, 2010). Our dependent variable is 0 for untreated sectors and 1 otherwise.

5.4. Database

To estimate the effect of antidumping on *PCM*, we use the *Orbis* database, which is a compilation of firm-level information extracted from accounting reports. Our sample has 512 thousand companies belonging to 339 sectors in 154 countries between 2006 and 2014. We combine this information with the Global Antidumping Database (GAD), which reports details of the antidumping processes from the 80s to 2015. First, we crossed the information between GAD and *Orbis* to identify the petitioned and investigated antidumping firms. However, we noted that, at the firm-level, it would be hard to establish a time consistency analysis due to a large amount of missing data.

Given this limitation, we decided to aggregate the data by sectors. Thus, we define a sector or industry by the country-NACE code pair. By doing so, we used the correspondence tables based on information from Kim & Feng (2016) and from the Eurostat's guideline RAMON (Reference and Management of Nomenclatures) in order to identify antidumping activity. Hence, to achieve and discuss our results in the following section, we are assuming that i) the petitioner / investigated firm is correctly identified and ii) the antidumping protection granted on a given asset has effects of gaining market power over the entire industry. The 4-digit sectoral aggregation resulted in 13,049 sectors from 154 countries. Altogether, there are 5,281 industries in emerging countries and 1,042 in Latin America. Finally, for the construction of import penetration indices and shares of European countries, we used data from the United Nations (UNdata). As well, we created some price-cost margin measures based on data imputation techniques. The technique consists of observing the data correlation matrix to extract the variable (s) most correlated with the cost variables necessary to estimate the *PCM*. To replace the missing data, we used the ratio between the absent and a high-correlated observable variable, controlling for country, year, and industry. We performed this procedure to gain observations in the material costs ($P_{M_{it}} M_{it}$) and costs of employees ($W_{it} L_{it}$).

6. Results

In Table 4, we show the results of six different specifications of logit models. The specifications (1) - (3) have only the variables related to the activity of the sector/country in antidumping, in line with equations (5) - (7) and the relative size of the sector. The specifications (4) - (6) also include the stock of physical assets as a sector-specific covariate. In all models, we include the classification of countries, which assumes three states, as follows: developed economy, in transition (former Soviet republics), or emerging economy.

The results demonstrate significance for most specifications. As expected, sectoral and national shares have positive coefficients, that is, they increase the likelihood of treatment. The negative sign of the sector's relative size variable reveals that more concentrated sectors are more likely to be selected. In turn, the import penetration index shows that more closed economies are more likely to lift AD measures.[8] The classification of countries was not significant, especially due to the fact that there was a reasonable balance between cases raised by developed economies (357 cases) and emerging ones (284). Finally, the physical capital stock proved to be significant and positive, indicating that capital-intensive industries are more likely to be petitioners. This is expected, given the strong performance of the metallurgical industry.

Applications of logistic regression in contexts with one or more continuous, asymmetric, and not exclusively linear predictors deserve attention. More precisely, Pearson and Hosmer-Lemeshow statistics end up producing p-values that can be inaccurate. We emphasize item (d) in Table 4, where the specification would not be the most appropriate. Possibly, our model did not adequately address the issue of non-linearities. However, according to Allison (2012), it does not compromise our purpose, which is the proper balance of the treatment and control groups, through the propensity score weighting.

Furthermore, the calculation of propensity scores serves to correct the problem of selection bias (Guo & Fraser, 2014). Here, we follow three distinct frameworks. The benchmark is the sample weights technique, in which we use the probability of undergoing treatment to obtain the weights of the second stage of the regressions. In the next step, we estimate the treatment effects. The main advantage of this framework is that it does not lose any observable units of the database. To check robustness, we use matching techniques - in which we associate a treated unit with one (or several) control units according to the degree of similarity between them. However, under certain specifications, this technique results in a loss of observations.

[8] This result was naturally drawn by the United States and India, two of the most closed economies in the sample and foremost petitioners of antidumping.

Model	(1)	(2)	(3)	(4)	(5)	(6)
(a) Specification						
NACE industry share	2	3	4	2	3	4
Sector-specific covariate	-	-	-	Fixed assets	Fixed assets	Fixed assets
(b) Coefficients						
NACE industry share	1.478***	4.788***	4.231***	1.446***	5.001***	4.477***
	(5.72)	(7.81)	(6.73)	(5.33)	(7.35)	(6.46)
Country share	6.003***	6.055***	6.035***	5.272***	5.399***	5.338***
	(8.61)	(8.75)	(8.73)	(7.00)	(7.21)	(7.14)
Sector size	-0.0684**	-0.0907**	-0.0887**	-0.0570*	-0.0767*	-0.0769**
	(-2.60)	(-3.17)	(-3.13)	(-2.13)	(-2.57)	(-2.61)
2.Country classification	-0.341	-0.352	-0.345	-0.221	-0.241	-0.230
	(-1.59)	(-1.63)	(-1.60)	(-1.01)	(-1.10)	(-1.05)
3.Country classification	0.192	0.200	0.197	0.0771	0.0991	0.0912
	(1.84)	(1.91)	(1.89)	(0.71)	(0.91)	(0.84)
Import index	-1.882***	-1.966***	-1.947***	-1.693***	-1.802***	-1.774***
	(-6.78)	(-6.96)	(-6.92)	(-6.13)	(-6.39)	(-6.32)
Fixed Assets	-	-	-	0.119***	0.109***	0.114***
				(5.34)	(4.82)	(5.09)
Constant	-2.422***	-2.331***	-2.296***	-3.940***	-3.628***	-3.662***
	(-17.89)	(-17.22)	(-16.99)	(-16.26)	(-14.75)	(-14.94)
(c) Diagnostics						
Number of observations	13019	13019	13019	11697	11697	11697
Chi-squared Likelihood Ratio	1317.58	1346.17	1332.66	1276.54	1303.73	1292.72
Pseudo R^2	0.2501	0.2555	0.2529	0.2599	0.2654	0.2632
(d) Goodness-of-fit						
Pearson	10232.42	10895.71	11464.32	10326.59	10243.83	10278.12
Hosmer-Lemeshow	36.32	32.45	36.48	23.96	26.25	29.58

Table 4: Binary Logistic regressions.

Using propensity scores as sample weights consist of calculating the inverse of the probability of treatment. The weights balance the data between the treated and control groups. Hirano & Imbens (2001); Hirano et al. (2003); McCaffrey et al. (2004) provides a detailed description of the crucial steps of such a methodology. The calculation of the weights follows the following expression:

$$\omega(T, x) = \frac{T}{\hat{e}(x)} + \frac{1 - T}{1 - \hat{e}(x)}, \tag{8}$$

in which T indicates the treatment group and $\hat{e}(\cdot)$ is the propensity score computed for each observation.

Panel (a) of Table 5 demonstrates the balancing properties of the groups with and without weighting. The first statistic is the likelihood ratio that tests for the joint significance of all regressors. After weighting, it is expected that the explanatory variables are not jointly significant. In all specifications, there was a sharp reduction in the ratio, but we continue to reject the null hypothesis of joint non-significance. Despite this, when re-estimating the logit models reported in Table 4, we observed that the coefficients become partly not significant. There is also a strong reduction in mean and median biases. The fourth statistic is the standardized difference of the mean linear propensity score

index. We noticed an equalization trend. The last criterion is the ratio between the variances of the propensity scores in the groups. The weighting with propensity scores meets the criteria of Rubin (2001), which states that the variance ratio should approximate to 1 after weighting. Finally, in panels (b) and (c), we present the descriptive statistics of the propensity scores between the control and treated groups. As expected, the treatment group has the highest average score. In addition, models 04-06, which incorporate physical capital, on average, assign higher weights to non-treated units. In what follows, we hold models (1) and (4) - which are the best among the groups (1) to (3) and (4) to (6), respectively - for our baseline estimations and keep the other four specifications to perform robustness tests.

Model		**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
(a) Balancing Groups							
Chi-squared Likelihood Ratio	*Unweighted*	4799.05	6137.41	5851.65	5025.54	6283.26	6054.41
	Weighted	9.25*	33.08	14.34	21.36	44.76	22.96
Mean Bias	*Unweighted*	32.3	34.1	33.4	35.9	37.4	36.8
	Weighted	2.1	3.3	2.3	3.5	4.7	3.8
Median Bias	*Unweighted*	25.7	31.3	29.2	29.7	40.8	36.6
	Weighted	1.4	0.7	0.6*	3.7	1.8	3.7
Mean Difference	*Unweighted*	89	94.8	92.7	96.1	99.1	97.7
	Weighted	5.5	10.4	6.9	8.6	12.4	8.9
Variance Ratio	*Unweighted*	1.22	1.75	1.67	1.3	2.21	2.11
	Weighted	0.66	0.59	0.71*	0.59	0.6	0.69
(b) Propensity Scores							
Control	Min	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Max	0.6360	0.7930	0.7553	0.7298	0.8420	0.8147
	Mean	0.0484	0.0471	0.0473	0.0505	0.0488	0.0490
Treated	Min	0.0019	0.0017	0.0018	0.0032	0.0024	0.0026
	Max	0.6359	0.9696	0.9625	0.7642	0.9808	0.9764
	Mean	0.1042	0.1299	0.1257	0.1140	0.1443	0.1400
(c) Weights							
Control	Mean	0.0549	0.0561	0.0555	0.0585	0.0597	0.0591
	Min	0.0000	0.0000	0.0000	0.0004	0.0000	0.0000
	Max	1.7472	3.8307	3.0872	2.7008	5.3280	4.3976
Treated	Mean	1.0	1.0	1.0	1.0	1.0	1.0
	Min						
	Max						

Table 5: Propensity Scores as weights.
* indicates the best model according to the criteria specified in the first column.

6.1. Impact of antidumping on PCM

In addition to the results of the estimates from equation (4), Table 6 shows the average of some key variables between the periods before and after the imposition of antidumping. For the three groups of countries, the PCM showed an average increase over the period among the treated. In the case of emerging and Latin American economies, it is interesting to note that the PCM of protected industries was on average lower than that of untreated before the imposition of AD. On average, it has become considerably larger afterward. For the other variables, it is observed that the average value - both treated and untreated units - is higher for Latin America. This might be correlated with the

representativeness in the database, as Orbis encompass more Europeans firms in comparison to the rest of the world, which makes small and medium-sized firms better represented on developed countries. In other words, there might be a positive correlation between sample selection and company size in non-European countries. In calculating the propensity scores, we partially control this factor by including physical capital in our logit models.

Given the logit specifications above, we selected models (1) and (4) as a benchmark and estimated equation (4) by fixed effects. In the first block of results in Table 7, we propose four specifications for each weighting of the control group. Such specifications vary according to the inclusion of the physical capital of the sectors and an identifier for the metal and steel producing industries, representing 12% of the global AD activity. The coefficients of the antidumping effect are statistically significant. Despite the small magnitude, the confidence interval does not include zero. Thus, it appears that in the periods after the imposition of AD measures, the 668 sectors of the 52 countries that we allocate in the control group show PCM gains in the range of 0.04 to 0.055. For an average PCM pre-treatment value of 0.233, the impact is approximately 21.5%.

Variable	**World**			**Emerging**			**Latin America**		
	Control	Treated		Control	Treated		Control	Treated	
		Before	*After*		*Before*	*After*		*Before*	*After*
Price-cost margin	0.302	0.314	0.346	0.314	0.257	0.350	0.408	0.309	0.424
Capital stock	152861	268363	222123	112885	218007	207624	672387	301625	301199
Value added	110996	157640	196991	142971	127061	137609	245951	200621	136239
Number of workers	1225	2433	2646	2373	3203	4282	4534	3933	3449

Table 6: Descriptive statistics by groups of countries and treatment

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Control	Logit 1	Logit 1	Logit 1	Logit 1	Logit 4	Logit 4	Logit 4	Logit 4
AD	0.0522***	0.0539***	0.0431***	0.0476***	0.0533***	0.0547***	0.0441***	0.0485***
	(0.0157)	(0.0159)	(0.0154)	(0.0163)	(0.0156)	(0.0157)	(0.0156)	(0.0164)
PCM (t-1)	0.3928***	0.3856***	0.3922***	0.3852***	0.3910***	0.3832***	0.3904***	0.3828***
	(0.0343)	(0.0352)	(0.0345)	(0.0353)	(0.0325)	(0.0334)	(0.0326)	(0.0335)
Capital		-0.0834***		-0.0832***		-0.0896***		-0.0892
		(0.0162)		(0.0163)		(0.0163)		(0.0164)
AD * metal			0.0594***	0.0407***			0.0605***	0.0405***
			(0.0131)	(0.0142)			(0.0132)	(0.0143)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	60375	60268	60397	60268	60375	60268	60375	60268
R^2	0.6022	0.3601	0.6019	0.3608	0.6001	0.3371	0.5998	0.3377

Table 7: Effect of the antidumping over the PCM - World. Standard errors in parentheses. Significance levels: *** 1%; ** 5%; * 10%.

Controlling by emerging economies, we evaluated 284 industries from 24 countries. The results in Table 8 show considerably higher coefficients when compared to global antidumping. On average, there is an increase of 59% over the pre-treatment PCM. On the one hand, since this increase is not visible in the control group, we have some evidence that it is related to antidumping measures. On the other hand, we are aware that part of this magnitude may be due to productivity shocks. We tested the model with the other PCM specifications to check if the result remains. Using the original PCM, the number of observations drops from 58 thousand to 40 thousand and the effect of AD is on average 0.097, 33% less than the coefficients in Table 7. Anyway, the results suggest an increase of 40 to 60% of the PCM of industrial activity in emerging countries.

When controlling for Latin American countries, we estimate the result for 102 industries in 9 countries. $PCMs$ are even higher than in the case of emerging countries. On average, for a PCM equal to 0.309 before the imposition of antidumping, Table 9 points to increments of about 80 %. Still, outside the dimension of the results usually found

in the literature, our findings are improving the descriptive analysis reported in Table 6. In other words, the Latin American sectors that have undergone AD suffer a vertiginous average growth of the *PCM* after the imposition of the measures - the same does not happen with the control group. Despite being too daring to assume that such effects entail a clear causal relationship between trade protection and market power, at least some of this time-wise variation is being engendered by the reduction of foreign competition.

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Control	Logit 1	Logit 1	Logit 1	Logit 1	Logit 4	Logit 4	Logit 4	Logit 4
AD	0.1385***	0.1601***	0.1229***	0.1499***	0.1411***	0.1632***	0.1256***	0.1536***
	(0.0273)	(0.0306)	(0.0303)	(0.0390)	(0.0277)	(0.0342)	(0.0307)	(0.0403)
PCM (t-1)	0.3311***	0.3187***	0.3302***	0.3181***	0.3360***	0.3227***	0.3352***	0.3222***
	(0.0280)	(0.0272)	(0.0279)	(0.0271)	(0.0239)	(0.0233)	(0.0238)	(0.0233)
Capital		-0.1163***		-0.1161***		-0.1244***		-0.1243
		(0.0162)		(0.0189)		(0.0182)		(0.0183)
AD * metal			0.0894**	0.0572			0.0883**	0.0543
			(0.0360)	(0.0421)			(0.0352)	(0.0424)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	58191	58064	58191	58064	58169	58064	58169	58064
R^2	0.5968	0.2116	0.5969	0.2115	0.5934	0.1971	0.5935	0.197

Table 8: Effect of the antidumping over the PCM - Emerging Economies. Standard errors in parentheses. Significance levels: *** 1%; ** 5%; * 10%.

Model	(1)	(2)	(3)	(4)
Control	Logit 1	Logit 1	Logit 4	Logit 4
AD	0.2270**	0.2626***	0.2293**	0.2650***
	(0.0876)	(0.0902)	(0.0890)	(0.0923)
PCM (t-1)	0.3817***	0.3707***	0.3755***	0.3627***
	(0.0196)	(0.0204)	(0.0279)	(0.0212)
Capital	-	-0.0515***	-	-0.0586***
		(0.007)		(0.0082)
Year fixed effect	Yes	Yes	Yes	Yes
Observations	54678	54559	54659	54559
R^2	0.6447	0.3158	0.6434	0.2645

Table 9: Effect of the antidumping over the PCM - Latin-American Economies. Standard errors in parentheses. Significance levels: *** 1%; ** 5%; * 10%.

To better understand what happens to the dynamics of the *PCM* after the imposition of antidumping measures, we built an alternative treatment variable. For this purpose, we consider a five-year window in which trade protection will result in gains in market power. A reasonable motivation for this stems from the fact that punitive antidumping measures generally last five years. The measures can indeed be renewed, however, using the database provided by Bown (2010), we do not confirm the consistency of this information concerning each country. Table 10 summarizes the results of the short-term effect of antidumping on the global, emerging, and Latin American countries. For global and emerging economies, the results indicate a dissipation of the aggregate effect of the *PCM*. However, a considerably high effect remains for the first five years in the case of Latin American economies. This, in some way, reinforces our previous results.

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
World	0.0207	0.0246*	0.0141	0.0196	0.0204	0.0246*	0.0136	0.0195
	(0.0132)	(0.0134)	(0.0124)	(0.0126)	(0.0126)	(0.0134)	(0.0124)	(0.0126)
Emerging	0.0272	0.0363	0.0121	0.0224	0.0261	0.0358	0.0108	0.0218
	(0.0228)	(0.0258)	(0.0189)	(0.0231)	(0.0228)	(0.0262)	(0.0186)	(0.0233)
Latin America	0.1733**	0.1869**	-	-	0.1734**	0.1875**	-	-
	(0.0758)	(0.0725)			(0.0758)	(0.0715)		

Table 10: Effect of the antidumping over the PCM - five-year window. Standard errors in parentheses. Significance levels: *** 1%; ** 5%; * 10%.

By definition, the PCM from equation (3) belongs to the range $(-\infty, 1]$. The Orbis database has two crucial limitations that deserve attention. The first relates to the large companies/corporations, which have revenue, profit, cost, and physical capital values unrealistically higher than most of the median firms, leading all distributions to positive asymmetry (right-tail skewness). This pattern is repeated frequently in the other variables. The second characteristic that we highlight is the unrealistically low values in several variables without any reasonable explanation. Given the above, the estimation of the PCM leads to an accumulation of extreme values. In other words, we have a mass of highly negative PCM cases, which would indicate a cost structure much higher than revenue. At the other extreme, we have numerous cases of $PCMs$ very close to 1, which would point to costs that represent a negligible fraction of operating revenue. As a way of dealing with these issues, we despise such values in our approach. Thus, in the estimates reported in Tables 7 - 10, we assess the PCM without the last percentile of the distribution (i.e., the 1% of extreme negative values). For robustness tests, we allow the PCM: i) to vary only in the range $[-1, 1]$ and ii) to vary between the range $[p1, p99]$, i.e., without their extreme negative and positive values. We estimate all possible combinations considering also the sample weights of the logit (1) - (6) models. Finally, in addition to physical capital, we also use the number of employees and value-added as control variables. The results are found in Table A.11 of the Appendix A. and indicate some consistency with what we presented in the previous section.

7. Conclusion

This research examined if AD petitions impact firms' market power. AD legislation might favor the coordination of collusive agreements between domestic and foreign firms. In particular, in the face of the growing number of antidumping barriers imposed - especially by emerging economies in recent decades - there is a suspicion that devices created for defensive reasons are now serving different purposes. Based on firm-level data aggregated into sectors, we present an empirical model based on the Lerner index. Our approach, therefore, enhances previous studies, such as Prusa (2001); Zanardi (2004); Vasconcelos & Firme (2011); Rovegno (2013) insofar as it explicitly identifies the increase in market power - both in the short and long of the sectors benefiting from antidumping.

We also show that this effect is even greater in Latin American economies. The group created to assess the evolution of PCM in Latin American economies included 102 industries from 9 countries. The analysis indicates, on average, an increase of 80%. This result differs from that found in the literature, which we attribute to either lack of representativeness - i.e., Orbis reports only larger companies in non-European economies - and some bias in terms of omitted variable, namely productivity shocks. Nevertheless, our results show an increase, on average, of the PCM after the imposition of AD measures. Regarding the short term effects, when considering a five-year time window, we observed that our result is this result is less prominent. This analysis is maintained for models containing countries around the world and also for those that consider only the classification of emerging economies. On the other hand, we found a considerably persistent effect when considering only Latin American economies, especially in the long-term.

Our approach has some imperfections. The limitations of our database and methods can compromise the magnitude of the AD effects on the PCM. As well, building data from accounting reports deserves extra attention, as it is not an industrial census, and the data may be misreported. Also, the low frequency of data - both in terms of variables and in the temporal dimension - might impose some restrictions regarding our empirical approach. In this sense, it may be difficult to identify structural shocks in our estimates (Rovegno, 2013). Despite that, regardless of the price-cost margin specifications, control groups, time windows, and independent of specific effects over industries and years,

which are well controlled by fixed effects, the Latin American sectors benefiting from antidumping go through an increase in their market power both in the short and long term.

Finally, there are some ways in which this research can extend. We believe that this work is pioneer by its broadness on incorporating thousands of industries worldwide. In this context, a lot of work is yet to be done. Firstly, wider databases with a proper sample design are important in order to balance sector's representativeness across countries. Secondly, observing more covariates can be helpful on estimating more robust models, especially when dealing with productivity (De Loecker & Warzynski, 2012). With our data limitations, the farthest we could go was estimating price-cost margins, as revenues and costs were the only variables with less than 40% of missing values in our database. Lastly, a promising approach would be to deepen the discussion about the increase in the mark-up and possible collusive agreements between domestic and foreign firms involved in antidumping cases. Besides, a greater desegregation of the data combined with international trade data (volume and price of imports), would allow the introduction of structural econometric models for demand estimation, capable of identifying anti-competitive practices over time.

References

Allison, P. D. (2012). *Logistic regression using SAS: Theory and application*. SAS Institute.

Athey, S., Imbens, G. W., & Wager, S. (2018). Approximate residual balancing: debiased inference of average treatment effects in high dimensions. *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, *80*, 597–623.

Bernard, A. B., Redding, S. J., & Schott, P. K. (2010). Multiple-product firms and product switching. *American Economic Review*, *100*, 70–97.

Blonigen, B. A., & Bown, C. P. (2003). Antidumping and retaliation threats. *Journal of International Economics*, *60*, 249–273.

Blonigen, B. A., & Prusa, T. J. (2016). Dumping and antidumping duties. In *Handbook of commercial policy* (pp. 107–159). Elsevier volume 1.

Bown, C. P. (2005). *Trade remedies and World Trade Organization dispute settlement: why are so few challenged?*. The World Bank.

Bown, C. P. (2010). Global anti-dumping database, version 6.0, march.

Bown, C. P. (2011). *The great recession and import protection: the role of temporary trade barriers*. London: Centre for Economic Policy Research and the World Bank.

Bown, C. P. (2012). *Emerging economies and the emergence of south-south protectionism*. The World Bank.

Bresnahan, T. F. (1989). Empirical studies of industries with market power. *Handbook of industrial organization*, *2*, 1011–1057.

Busch, M. L., Reinhardt, E., & Shaffer, G. C. (2008). *Does Legal Capacity Matter?: Explaining Dispute Initiation and Antidumping Actions in the WTO*. International Centre for Trade and Sustainable Development (ICTSD).

Chandra, P., & Long, C. (2013). Anti-dumping duties and their impact on exporters: Firm level evidence from china. *World development*, *51*, 169–186.

Crowley, P. M., Mayes, D., & Maraun, D. (2006). Analysing productivity cycles in the euro area, us and uk using wavelet analysis.

De Loecker, J., & Warzynski, F. (2012). Markups and firm-level export status. *American economic review*, *102*, 2437–71.

Elzinga, K. G., & Mills, D. E. (2011). The lerner index of monopoly power: origins and uses. *American Economic Review*, *101*, 558–64.

Feinberg, R. M., & Reynolds, K. M. (2006). The spread of antidumping regimes and the role of retaliation in filings. *Southern Economic Journal*, (pp. 877–890).

Finger, J. M., & Nogués, J. J. (2005). *Safeguards and Antidumping in Latin American Trade Liberalization: Fighting Fire with Fire*. The World Bank.

Guo, S., & Fraser, M. W. (2014). *Propensity score analysis: Statistical methods and applications* volume 11. SAGE publications.

Hansen, C. B. (2007). Generalized least squares inference in panel and multilevel models with serial correlation and fixed effects. *Journal of econometrics*, *140*, 670–694.

Hartigan, J. C. (2000). An antidumping law can be procompetitive. *Pacific Economic Review*, *5*, 5–14.

Heckman, J. J. (1976). Simultaneous equation models with both continuous and discrete endogenous variables with and without structural shift in the equations. *Studies in Nonlinear Estimation, Ballinger*, .

Heckman, J. J. (1977). *Dummy endogenous variables in a simultaneous equation system*. Technical Report National Bureau of Economic Research.

Heckman, J. J. (1979). Sample selection as a specification error. *Econometrica*, *47*, 153–161.

Hirano, K., & Imbens, G. W. (2001). Estimation of causal effects using propensity score weighting: An application to data on right heart catheterization. *Health Services and Outcomes research methodology*, *2*, 259–278.

Hirano, K., Imbens, G. W., & Ridder, G. (2003). Efficient estimation of average treatment effects using the estimated propensity score. *Econometrica*, *71*, 1161–1189.

Khatibi, A. (2009). *The trade effects of European antidumping policy*. Technical Report ECIPE working paper.

Kim, I.-S., & Feng, Z. (2016). Concordance utilities for international trade research. *the Comprehensive R Archive Network*, .

Konings, J., & Vandenbussche, H. (2005). Antidumping protection and markups of domestic firms. *Journal of International Economics*, *65*, 151–165.

Konings, J., & Vandenbussche, H. (2008). Heterogeneous responses of firms to trade protection. *Journal of International Economics*, *76*, 371–383.

Konings, J., Vandenbussche, H., & Springael, L. (2001). Import diversion under european antidumping policy. *Journal of Industry, Competition and Trade*, *1*, 283–299.

Kume, H., & Piani, G. (2005). *Antidumping and Safeguard Mechanisms: The Brazilian Experience, 1988-2003*. The World Bank.

Lu, Y., Tao, Z., & Zhang, Y. (2013). How do exporters respond to antidumping investigations? *Journal of International Economics*, *91*, 290–300.

McCaffrey, D. F., Ridgeway, G., & Morral, A. R. (2004). Propensity score estimation with boosted regression for evaluating causal effects in observational studies. *Psychological methods*, *9*, 403.
Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *econometrica*, *71*, 1695–1725.
Miyagiwa, K., & Ohno, Y. (1995). Closing the technology gap under protection. *The American Economic Review*, (pp. 755–770).
Mora, R., & Reggio, I. (2019). Alternative diff-in-diffs estimators with several pretreatment periods. *Econometric Reviews*, *38*, 465–486.
Nieberding, J. F. (1999). The effect of us antidumping law on firms' market power: An empirical test. *Review of Industrial Organization*, *14*, 65–84.
Niels, G. (2003). Trade diversion and destruction effects of antidumping policy: empirical evidence from mexico. *Rotterdam: OXERA and Erasmus University Rotterdam. Unpublished paper*, .
Nogués, J. J., & Baracat, E. (2005). *Political economy of antidumping and safeguards in Argentina*. The World Bank.
Pierce, J. R. (2011). Plant-level responses to antidumping duties: Evidence from us manufacturers. *Journal of International Economics*, *85*, 222–233.
Prusa, T. J. (1992). Why are so many antidumping petitions withdrawn? *Journal of International Economics*, *33*, 1–20.
Prusa, T. J. (1994). Pricing behavior in the presence of antidumping law. *Journal of Economic Integration*, (pp. 260–289).
Prusa, T. J. (2001). On the spread and impact of anti-dumping. *Canadian Journal of Economics/Revue canadienne d'économique*, *34*, 591–611.
Prusa, T. J. (2005). Anti-dumping: A growing problem in international trade. *World Economy*, *28*, 683–700.
Prusa, T. J., & Skeath, S. (2002). The economic and strategic motives for antidumping filings. *Weltwirtschaftliches Archiv*, *138*, 389–413.
Prusa, T. J., & Skeath, S. (2004). Modern commercial policy: managed trade or retaliation? *The Handbook of International Trade. Economic and Legal Analysis of Trade Policy and Institutions*, *2*, 358–382.
Reina, M., & Zuluaga, S. (2005). *Application of safeguards and anti-dumping duties in Colombia*. The World Bank.
Rovegno, L. (2013). Trade protection and market power: evidence from us antidumping and countervailing duties. *Review of World Economics*, *149*, 443–476.
Rubin, D. B. (2001). Using propensity scores to help design observational studies: application to the tobacco litigation. *Health Services and Outcomes Research Methodology*, *2*, 169–188.
Staiger, R. W., & Wolak, F. A. (1992). The effect of domestic antidumping law in the presence of foreign monopoly. *Journal of International Economics*, *32*, 265–287.
De la Torre, L. E. R., & González, J. G. (2005). Antidumping and safeguard measures in the political economy of liberalization: the mexican case. *World Bank Policy Research Working Paper*, .
Tybout, J. R. (2003). Plant-and firm-level evidence on 'new'trade theories. *Handbook of international trade*, *1*, 388–415.
Vandenbussche, H., & Zanardi, M. (2008). What explains the proliferation of antidumping laws? *Economic Policy*, *23*, 94–138.
Vasconcelos, C. R., & Firme, V. A. (2011). Efetividade do instrumento antidumping no brasil entre 1990 e 2007. *Revista EconomiA*, *12*, 165–citation_lastpage.
Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT press.
Wruuck, P. (2015). *The Political Economy of Anti-dumping Protection*. Springer.
Zanardi, M. (2004). Antidumping law as a collusive device. *Canadian Journal of Economics/Revue canadienne d'économique*, *37*, 95–122.
Zhang, H. (2018). Political connections and antidumping investigations: Evidence from china. *China Economic Review*, *50*, 34–41.
Zhang, Y. (2017). *Impact of Latin-American and Caribbean antidumping measures on Chinese exports*. Technical Report IDB Working Paper Series.

Appendix A. Robustness Check

Effect of the antidumping over the PCM - Robustness												
(a) World	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
PCM	1	1	1	1	1	1	1	1	1	1	1	1
Logit	2	2	2	3	3	3	5	5	5	6	6	6
Number of employees		x			x			x			x	
Value added			x			x			x			x
Metal		x	x		x	x		x	x		x	x
AD	0.0317**	0.0290**	0.0181	0.0318**	0.0294*	0.0183	0.0322**	0.0290*	0.0186	0.0324**	0.0296*	0.0189
PCM	2	2	2	2	2	2	2	2	2	2	2	2
Logit	2	2	2	3	3	3	5	5	5	6	6	6
Number of employees		x			x			x			x	
Value added			x			x			x			x
Metal		x	x		x	x		x	x		x	x
AD	0.0491***	0.0413**	0.0219	0.0501***	0.0426**	0.0226	0.0487***	0.0392**	0.0214	0.0500***	0.0409**	0.0225
(b) Emerging economies	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
PCM	1	1	1	1	1	1	1	1	1	1	1	1
Logit	2	2	2	3	3	3	5	5	5	6	6	6
Number of employees		x			x			x			x	
Value added			x			x			x			x
Metal		x	x		x	x		x	x		x	x
AD	0.0925***	0.0881**	0.0922***	0.0927***	0.0887**	0.0926***	0.0931***	0.0885**	0.0935***	0.0935***	0.0895**	0.0941***
PCM	2	2	2	2	2	2	2	2	2	2	2	2
Logit	2	2	2	3	3	3	5	5	5	6	6	6
Number of employees		x			x			x			x	
Value added			x			x			x			x
Metal		x	x		x	x		x	x		x	x
AD	0.1348***	0.1490***	0.1158***	0.1360***	0.1509***	0.1169***	0.1353***	0.1477***	0.1172***	0.1370***	0.1502***	0.1188***
(c) Latin America	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
PCM	1	1	1	1	1	1	1	1	1	1	1	1
Logit	2	2	2	3	3	3	5	5	5	6	6	6
Number of employees		x			x			x			x	
Value added			x			x			x			x
Metal		x	x		x	x		x	x		x	x
AD	0.2304**	-	0.2667***	0.2304**	-	0.2672***	0.2321**	-	0.2686***	0.2322**	-	0.2697***
PCM	2	2	2	2	2	2	2	2	2	2	2	2
Logit	2	2	2	3	3	3	5	5	5	6	6	6
Number of employees		x			x			x			x	
Value added			x			x			x			x
Metal		x	x		x	x		x	x		x	x
AD	0.3711***	-	0.2964***	0.3714***	-	0.2980***	0.3752***	-	0.2994***	0.3757***	-	0.3015***

Table .11: Appendix: Robustness Check. Significance levels: *** 1%; ** 5%; * 10%.