Elasticity of Substitution and Anti-Dumping Decisions

Jørgen Drud Hansen, University of Southern Denmark
Philipp Meinen, Aarhus University
Jørgen Ulff-Møller Nielsen, Aarhus University[*]

August 2012

This paper analyzes the role of the elasticity of substitution for anti-dumping decisions across countries. In monopolistic competition models with cost heterogeneous firms across countries, price differences vary inversely with the elasticity of substitution. Anti-dumping duties should therefore also vary inversely with the elasticity of substitution at least for countries which have a strong focus on prices in the determination of their anti-dumping measures. We test this for ten countries from 1990 to 2009 using data on anti-dumping from Chad Bown (2010) and US-data at 8-digit level for elasticity of substitution from Broda and Weinstein (2006). Applying the 'lesser duty rule' in duty determination indicates more attention to prices, and we therefore group the ten countries into those which use 'the lesser duty rule', such as the EU, and those which do not, such as the US. The results in our empirical investigation support the predicted role of the elasticity of substitution as we find a significant negative relation between the elasticity of substitution and the final anti-dumping duties for the 'lesser duty rule' group of countries. The countries which do not follow the 'lesser duty rule' seem to base their duty determination on a broader approach, and the elasticity of substitution is not found significant for the final anti-dumping duties for this group of countries.

Keywords: Anti-dumping, elasticity of substitution, 'lesser duty rule', injury margin, dumping margin, monopolistic competition.

JEL: F12, F13.

Corresponding author: Associate Professor, Department of Economics and Business, Aarhus University, Denmark. E-mail: jum@asb.dk
Acknowledgements: We are grateful for valuable discussions with Daniel Bernhofen and Christian Søgaard, the University of Nottingham, and Edwin Vermulst, Vermulst Verhaeghe Graafsma & Bronkers. We also thank participants at the Kiel-Aarhus Economics Workshop, December 2011; the CIE 2012 Conference on International Economics in Granada, June 2012; and 61st French Economic Association Annual Meeting, Paris, July 2012. All remaining errors are our own.

1. Introduction

The theory on optimal tariffs developed by Johnson (1953-54) shows in a neoclassical trade model that welfare-maximizing governments have an incentive to impose a tariff equal to the inverse of the export supply elasticity. By imposing such a tariff and assuming that the exporting country does not retaliate, a large country maximizes welfare by balancing the terms of trade gain to the importer against the costs of import protection. The theory has recently been examined empirically. Broda et al. (2008) show that countries which are not subject to WTO-constraints set higher tariffs on goods with lower export supply elasticities. Analyzing the question from a different angle, Bagwell and Staiger (2011) conclude that acceding countries to the WTO commit to reduce the tariffs most for products for which the terms of trade motive for unilateral tariffs is greatest, i.e. the role of export supply elasticities for tariffs weakens when new member countries of the WTO commit to the trade agreement. These analyses are all based on the assumption of perfect competition.

Gros (1987) analyzes theoretically the case of optimal tariffs on markets with imperfect competition and shows in a Krugman type of monopolistic competition model that a welfare-maximizing positive optimal tariff exists, even for a small economy where no terms of trade gain may be obtainable. The optimal tariff in his analysis ensures that the consumer prices of imported product variants exceed the import price by the same mark-up as the mark-up of domestically produced variants, and the level of the optimal tariff is therefore an increasing function of the degree of product differentiation, i.e. it varies inversely with the elasticity of substitution. Chang (2005) broadens the analysis of Gros (1987) by describing the determination of tariffs as the outcome of a 'protection for sale-game', as modeled by Grossman and Helpman (1995). The government is assumed to maximize its objective function, which includes concerns about both welfare and lobby contributions from industries. Basically, the model predicts that industries in which producers coordinate their lobby activities by paying contributions to the government, get higher protection compared with industries where no coordination takes place, but the elasticity of substitution also influences the outcome, although in a more complex way than in the analysis by Gros (1987).[1]

The above-mentioned literature on optimal tariffs deals with cases where countries exercise full autonomy in imposing tariffs. Most countries in the world economy are members of WTO, which nowadays commit member countries to keep most-favoured-nation tariffs at a quite low level. The tariffs in the various industries are for that reason probably below the levels of tariffs the governments would have imposed without WTO commitments. The empirical studies of Broda et al. (2008) and Bagwell and Staiger (2011) include data for tariffs for countries outside the WTO or for changes of tariffs for acceding countries to the WTO, and presumably these data provide information about the preferred tariffs for countries uncommitted by trade agreements.

Additionally, as dealt with in this paper, information about preferred tariffs may also be revealed for WTO members by investigating the countries' administration of the WTO contingency measures. The WTO obligations to bind tariffs are associated with 'flexibility rules', which allow member countries, in special circumstances, to impose protection in cases where imports have caused problems for specific industries. Most notably, if a country has been exposed to dumping from foreign producers, anti-dumping protective measures may be imposed temporarily to protect the injured industry. The country may also be entitled to

[1] The negative relation between the tariff and the elasticity of substitution only exists for elasticity of substitutions above some minimum level.

impose economic safeguards in the form of a duty if the country has been exposed to an unforeseen surge of imports. In such cases the member states of the WTO gain some autonomy in trade policy for the specific industry, and we may therefore expect that the country's administration of this limited autonomy provides information about its preferred level of tariffs. Bown and Crowley (2011) investigate time variation of US tariffs in case of anti-dumping and economic safeguards based on a theoretical model by Bagwell and Staiger (1990). The predictions from the Bagwell and Staiger model are substantiated by the fact that the tariffs increase with the increase of imports and the inverse of the sum of import demand and export supply elasticity.

The aim of this paper is to examine the role of the elasticity of substitution for the outcome of anti-dumping investigations. For two reasons the elasticity of substitution may influence the anti-dumping policy. First, the theory on optimal tariffs, or endogenous tariff formation, shows that the preferred tariff varies inversely with the elasticity of substitution as in Gros (1987). Secondly, as appears from the theoretical model in the present paper, the exposure to dumping varies inversely with the elasticity of substitution, and so do the possibilities of imposing anti-dumping measures without violating the WTO commitments.

In recent years, the use of anti-dumping (AD) measures has been spreading across countries. Australia, Canada, the EU, New Zealand and the US were the traditional users of this type of contingency measure compatible with the WTO, but as shown among others by Prusa (2005), Vandenbussche and Zanardi (2008), and Bown (2011) many more countries have sought refuge in this instrument during the last three decades. The issue dealt with in this paper is therefore highly relevant in trade policy.

The basic conditions for the use of anti-dumping measures are given in Article VI in the General Agreement on Tariffs and Trade 1994 (GATT, 1994a). Three conditions have to be fulfilled before an importing country can implement anti-dumping measures towards a foreign firm. First, the importing country shall demonstrate that its industry has been exposed to dumping, which means that the foreign firm sells its product in the importing country at a price below what is perceived as a fair price. In the general case the benchmark for a fair price is the price at which the foreign firm sells its good in its own domestic market. Secondly, the complaining country shall demonstrate injury caused by the dumping behavior, i.e. that a loss has been inflicted on the import competing industry due to the dumping. Thirdly, both dumping and injury shall be non-negligible. This follows from the so-called 'de minimis rule', which says that weak indications of dumping with small injury effects does not allow for anti-dumping measures, see Articles 5 and 9 in the Agreement on Implementation of Article VI of GATT (1994b).

The competence to investigate petitions on dumping, and in case impose anti-dumping measures, is at the national level (or EU level), and as the GATT conditions listed above are vague, a quite large leeway exists for the dumping authorities for different interpretations and practices. Acknowledgement of the so-called 'lesser duty rule' (LDR) divides the countries into two groups: those which apply the LDR, and those which do not. The LDR says that the size of an anti-dumping duty must not exceed the smaller value of either the dumping margin or the injury margin. The *dumping margin* is defined as the difference between the normal value of the dumper's product (typically the home market price) and his export price, both measured at firm gate. The *injury margin* is a more complex concept with price-undercutting as an important dimension, i.e. the difference between the price the domestic firm charges and the lower price charged by the foreign

producer.[2] The 'lesser duty rule' is only recommended by GATT (Article 9.1 in the Agreement on Implementation of Article VI of GATT, 1994b). While the EU uses the 'lesser duty rule' consistently, the US does not.

Several empirical analyses have been devoted to identifying the determinants of decision making in the anti-dumping policies in the various countries or group of countries. The main issue in these analyses has been the role of 'rules versus discretion', i.e. whether the anti-dumping authorities follow strict rules in the decision-making or they make their decisions on a discretionary basis.

Reviewing the various contributions to this part of the dumping literature does not lead to a simple answer to the question of whether anti-dumping policy is explained by rules or by discretion. To illustrate the complexity of results, the seminal paper in this literature by Finger et al. (1982) on the US practice shows that the assessments on dumping behavior follow from rules, while decisions on injury follow from discretion. The majority of the later papers based on US data follow the conclusions from Finger et al. (1982), but few, such as Anderson (1993), emphasize statutory considerations to explain the injury decisions better than agency discretion. Bloningen (2006) concentrates on dumping decisions in the US in a dynamic perspective and explains the increasing reported dumping margins in the US over the period 1980-2000 by a shift towards discretionary practices. He also stresses that the widening room for discretion in the US is not connected with economic principles, but is to a great extent related to the authorities' use of 'facts available' or even 'adverse facts available' when the foreign firms are non-cooperating or non-responsive, respectively. Also the EU anti-dumping practice has been studied, primarily repeating the methodology of Finger et al. (1982). Both Tharakan and Waelbroeck (1994a,b) and Eymann and Schuknecht (1996) find results very similar to the US, with the big difference that the EU has applied political discretion leading to protection, while the US has formulated protectionistic rules.

The issue of the role of import demand and export supply elasticities for tariff formation in cases of dumping or safeguards has been analyzed in the paper of Bown and Crowley (2011) based on a perfect competition model. The analysis we develop below differs from the paper by Bown and Crowley (2011) in two ways. First, we investigate the role of elasticity of substitution for the anti-dumping policy in a monopolistic competition model. The model predicts that the dumping margin varies inversely with the elasticity of substitution, while the price injury margin is independent of the elasticity of substitution. The elasticity of substitution is therefore an important determinant of the outcome of anti-dumping petitions for countries which commit themselves strongly to rules related to the dumping margin. Thus, proving substantial dumping for large values of the elasticity of substitution becomes more difficult. If countries are more discretionary in their anti-dumping policy, the elasticity of substitution may have less or no relevance for the outcome of anti-dumping investigations. Secondly, our investigation is a multi-country study allowing us to identify country specific differences in anti-dumping policies.

[2] It may give serious problems and cause a lot of ambiguity to measure the dumping margin if the exporter's home market price does not exist, or if the exporting country is a non-market economy. It is not least problematic to define and measure the degree of injury. Some guidelines for the injury part of the investigation are given in Agreement on Implementation of Article VI of GATT (1994b). It is stated in article 3.1 that "A determination of injury [..] shall involve an objective examination of both (a) the volume of the dumped imports and the effect of the dumped imports on prices in the domestic market for like products, and (b) the consequent impact of these imports on domestic producers of such products". And in article 3.2 it is stated that "[..] With regard to the effect of the dumped imports on prices, the investigating authorities shall consider whether there has been a significant *price-undercutting* by the dumped imports as compared with the price of a like product of the importing Member [..]" (our italics). Injury elimination may therefore, among other factors, require price equalization in the importing market (Vandenbussche, 1995; Belderbos et al., 2004).

We test the predictions of our model about the role of the elasticity of substitution for the outcome of anti-dumping petitions on data of anti-dumping cases for ten countries. We indeed find the expected inverse relation between the elasticity of substitution and the final anti-dumping duties, but only for the sub-group of seven countries which apply 'the lesser duty rule'. This asymmetry might be related to the fact that the choice of the 'lesser duty rule' helps the governments to live up to a more liberal and rule oriented anti-dumping policy with more emphasize on prices in determination of duties. Arguments of the advantage of commitments have e.g. been used by Staiger and Tabellini (1987, 1999), Matsuyama (1990) and Amin (2003) to explain how GATT rules help governments to make trade policy commitments to their private sectors. For the other sub-group, consisting of three countries, a more protectionist and discretionary approach in duty determination is chosen, including a potential for measurement of large injury effects also in cases where price-undercutting is modest. These results therefore indicate that the LDR countries exercise less discretion in setting anti-dumping measures relative to the 'non-lesser duty rule' countries (non-LDR), as already shown by Belderbos et al. (2004) in an EU context.

The paper is structured as follows. Section 2 presents the basic theoretical model, and derives the predicted negative relationship between the elasticity of substitution and the dumping margin. Section 3 outlines the empirical model. Section 4 provides information on the data. In the estimations we combine data on anti-dumping measures from 10 countries from Bown (2010) with data on elasticity of substitution from Broda and Weinstein (2006). The empirical results follow in Section 5, where the dependent variable is the level of final ad valorem anti-dumping duties. Section 6 concludes.

2. The model

In this Section we establish a two-country model in which the dumping margin is related to the size of elasticity of substitution in a given industry. The theoretical model is based on monopolistic competition, asymmetric market access between the domestic and the foreign country, and asymmetric cost efficiencies between countries. The model provides a simple framework for an analysis of the government's decision making in its dumping investigation. The companies' initial decision making regarding whether to file a dumping case or not is not dealt with.

2.1. The basic model

Two countries are considered, home (*h*) and foreign (*f*), respectively. The home market is provided with differentiated goods from domestic as well as foreign producers, while the foreign market, because of strong regulation, is only supplied by *f* producers. This assumption of strong asymmetry in market supply is to allow for dumping.[3] In both markets firms compete in a monopolistic competitive way. The products are horizontally differentiated and demand is symmetrical for all producers in each market. We assume cost asymmetries between producers in home and foreign country, i.e. producers located in a given country are equally cost efficient. We disregard entry and exit of firms in both markets based on the time limitations of anti-dumping measures.[4] The model is partial, in that it only looks at one industry and disregards factor markets. So the following model is an adaptation of the monopolistic competition model of Krugman (1979, 1980) to a short run situation with asymmetrical market segmentation and asymmetrical producers across

[3] In a recent paper Collie and Le (2010) demonstrate that anti-dumping regulation in some cases can be strategically exploited by the producer in the home country not to export to the foreign market.
[4] Anti-dumping measures last five years with the possibility of extension to another five years ('review investigations').

countries. More general models with monopolistic competition and dumping can be found in the literature, see e.g. Ottaviano et al. (2002) and Melitz and Ottaviano (2008). But for the purpose of this paper, the simple model below is sufficient.

The consumers in the home market are offered $n+n^*$ differentiated variants, where n is supplied by domestic producers and n^* by foreign producers (* indicates the foreign producers). We index the individual variants i from 1 to $n+n^*$ by ranking the domestic variants from 1 to n and the foreign variants from n+1 to $n+n^*$. Assume that consumers have devoted the amount Y in their budget to buying differentiated products. The number of consumers is normalized to 1 and the consumers' utility U from consuming differentiated products Q_i is given by a generalized Dixit-Stiglitz specification (see Dixit and Stiglitz, 1977):

$$U = \left(\sum_{i=1}^{(n+n^*)} Q_i^{(\sigma^h-1)/\sigma^h}\right)^{\sigma^h/(\sigma^h-1)}; \quad i = 1,2,..(n+n^*) \tag{1}$$

where the elasticity of substitution in the home market σ^h>1, as suggested by Blanchard and Giavazzi (2003), varies positively with the number of variants $n+n^*$. The utility function thus also includes a Hotelling-Lancaster element, where an increase in the number of variants eases the consumers' possibility to substitute between variants. To formalize this we assume that:

$$\sigma^h = \bar{\sigma}(n+n^*)^{\alpha}; \;\; o < \alpha < 1, \tag{2}$$

where the parameter $\overline{\sigma} \geq 1$ describes the basic industry specific elasticity of substitution and $(n+n^*)^{\alpha}$ indicates the sensitivity of the elasticity of substitution with respect to number of variants.

Optimizing the consumer's utility for a given budget Y gives the demand functions:

$$Q_i = \frac{Y}{(n+n^*)} \frac{p_i^{-\sigma^h}}{P^{1-\sigma^h}} \tag{3}$$

where p_i is the price of the variety i and P is the ideal price index given by:

$$P = \left(\frac{1}{(n+n^*)} \sum_{i=1}^{(n+n^*)} p_i^{1-\sigma^h}\right)^{\frac{1}{1-\sigma^h}}; i = 1,2,..,(n+n^*). \tag{4}$$

Similar expressions for demand exist for consumers in the foreign country, but due to the asymmetric market access, fewer variants are traded in this market, and hence the elasticity of substitution differs between the two markets. To be more specific, fewer variants are supplied in country f compared with h, i.e. $n^*<(n+n^*)$, so the elasticity of substitution in this market, $\sigma^f = \bar{\sigma}(n^*)^{\alpha}$, is smaller than in h. The domestic firms produce at marginal costs c, while the marginal production costs for the foreign firms are c^*. When exporting, the foreign producer incurs transport costs of the iceberg-type at g, where g describes the share of produced exports which arrives in the importing country, i.e. $0<g<1$. The marginal production plus export costs is thus c^*/g. We assume the foreign producer to have a costs advantage, $c>c^*/g$. Finally, as we only look at the short run, the number of firms in both markets is assumed to be fixed. No attention is therefore paid below to fixed costs, i.e. prices and outputs are derived from maximizing operating profit.

For a large number of variants the elasticity of demand facing the individual firm is approximately equal to σ^h and σ^f for selling in the home country and the foreign country, respectively. Optimizing profits gives the solution for prices of the two producers in the home market:

$$p_i = p = \frac{\sigma^h}{(\sigma^h-1)} c; \qquad i = 1,2,..,n.$$

$$p_i^* = p^* = \frac{\sigma^h}{(\sigma^h-1)} (c^*/g); \qquad i = (n+1),\ldots(n+n^*). \tag{5}$$

and the price the foreign firms charge in the foreign market:

$$p_i^f = p^f = \frac{\sigma^f}{(\sigma^f - 1)} c^*; \qquad i = (n+1), \ldots, (n+n^*).$$

2.2. Dumping and injury

The foreign firm dumps its product in the home country's market when it charges a lower price net of transport costs in exporting market compared to sales in its domestic market. The export price net of transport costs is given by $\frac{\sigma^h}{(\sigma^h - 1)} c^*$, which is independent of the size of transport costs. The dumping margin relative to the dumper's export price net of transport costs is given by:

$$DM = \frac{p^f}{p^* g} - 1 = \frac{\sigma^f(\sigma^h - 1)}{\sigma^h(\sigma^f - 1)} - 1 = \frac{(\sigma^h - \sigma^f)}{\sigma^h(\sigma^f - 1)}. \qquad (6)$$

From (6) it follows straightforwardly that:

$$DM = \left(\frac{(n+n^*)^\alpha - n^{*\alpha}}{(n+n^*)^\alpha (\bar{\sigma} n^{*\alpha} - 1)} \right) = \frac{(1 - (\frac{n^*}{(n+n^*)})^\alpha}{(\bar{\sigma}\, n^{*\alpha} - 1)} \qquad (7)$$

For $\bar{\sigma} = 1$, $DM > 0$. Furthermore $DM \to 0$ for $\bar{\sigma} \to \infty$. Finally, $\frac{\partial DM}{\partial \bar{\sigma}} < 0$, i.e. *DM* is monotonically decreasing for $\bar{\sigma} \to \infty$ from $\bar{\sigma} = 1$.

The dumping margin reflects the stronger market power of the foreign firm in its domestic market (*f*) compared with the tough competition in the export market (*h*). Formally, the dumping margin depends on the intrinsic elasticity of substitution, $\bar{\sigma}$, and the number of variants in each of the two markets, i.e. $n+n^*$ and n^*, respectively. For increasing $n+n^*$ or decreasing n^* the asymmetry in market power between the two markets increases and the dumping margin increases. The intrinsic elasticity of substitution $\bar{\sigma}$ is a preference parameter related to substitution within variants in a specific industry. Values of $\bar{\sigma}$ above but close to one indicate a strong desire for many varieties, while large values of $\bar{\sigma}$ basically indicate a high degree of substitutability between variants. Low values of $\bar{\sigma}$ are thus associated with more market power, and the pass through of $\bar{\sigma}$ on market power is especially strong in the foreign country due to relatively fewer producers. The dumping margin thus varies negatively with respect to $\bar{\sigma}$.

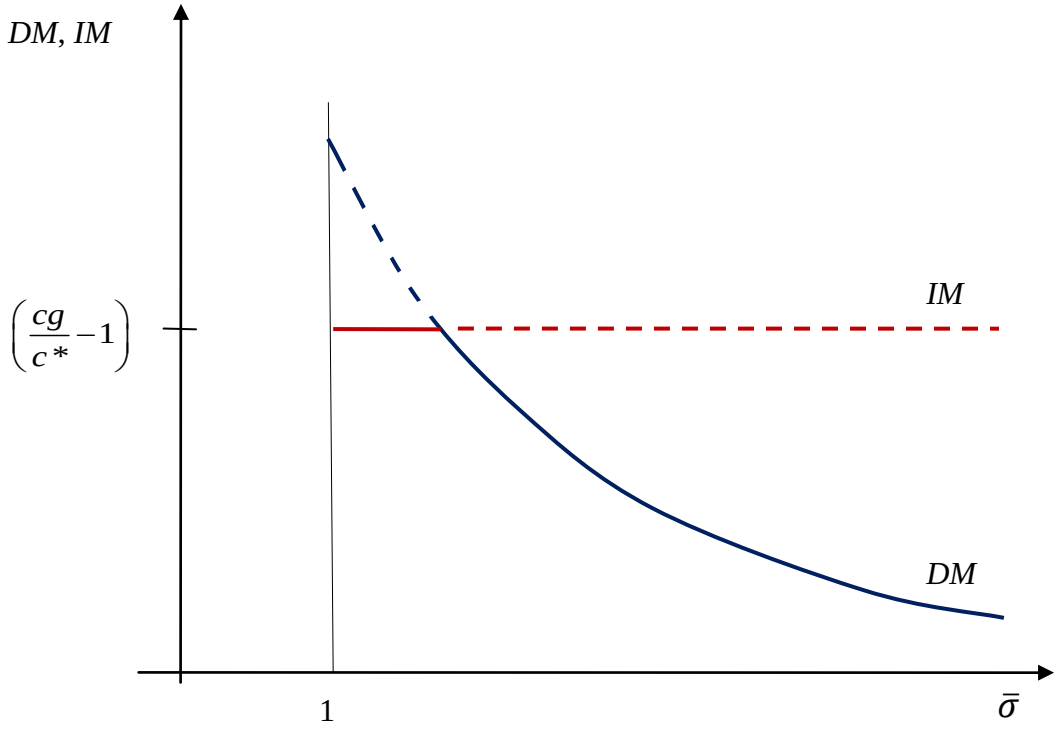
The dumping margin as a function of $\bar{\sigma}$ is, for a given number of variants in the *h* and *f* markets, illustrated by the *DM* curve in *Figure 1*.

For the price injury margin relative to the price the foreign producer charges in the home market, we have:

$$IM = \frac{p}{p^*} - 1 = \frac{cg}{c^*} - 1 > 0. \qquad (8)$$

The producers from the two countries have the home market in common and, hence, apply the same mark-up of costs in their price formation. The relative injury margin (for given country and industry specific costs) is therefore independent of the elasticity of substitution, i.e. a costs-specific *IM* curve in Figure 1 is horizontal at the level equal to the cost disadvantage of the producers in the home country relative to the foreign producers.

Figure 1: Dumping and injury margins and the intrinsic elasticity of substitution for given number of variants in the two markets



Note: While the dumping margins (*DM*) are across products/industries, the injury margin (*IM*) is for a specific industry with specific marginal costs c and c^*, respectively.

2.3. Anti-dumping duties

For countries that are unbounded by the 'lesser duty rule', the maximum level of rule based duties is shown by the full extent of the *DM* curve in Figure 1. For countries voluntary following the 'lesser duty rules', the duties are the lower value of the *DM* and the observations of *IM*, i.e. the duties are also a decreasing function of $\bar{\sigma}$, but always (equal to or) below the duties in case of the 'non-lesser duty rule' countries. Since the duties in case of LDR are *min*(*DM*, *IM*), the expected inverse relation between the anti-dumping duties and the elasticity of substitution, in case of a full rule-based system, is below *DM*, but more stochastic.[5]

We expect that anti-dumping duties are small in markets where the products are relatively homogenous (large intrinsic elasticity of substitution), especially if the number of variants in the home market is large compared with the number of variants in the foreign market. It may be difficult to prove substantial dumping, and the authorities may reject opening an anti-dumping investigation or, if they do so, reject to impose a sanction. The likelihood of this abortive outcome of a petition is increased by the '*de minimis rule*', which commits the authority to only impose anti-dumping measures if substantial dumping and injury take place. However, these prospects for an anti-dumping case may not deter companies across industries from making petitions partly because the outcome of a petition is always uncertain and the costs of making the petition is limited compared with the extra profits which are on stake. We therefore expect the level of final anti-

[5] The uncertainty is related to the unknown distribution of $\left(\frac{cg}{c^*}-1\right)$ with respect to $\bar{\sigma}$.

dumping duties in a rule based system to be inversely related to $\bar{\sigma}$, both for countries that follow the 'lesser duty rule' and countries that do not.

Policy discretion might, however, disturb the expected negative relation between the elasticity of substitution and anti-dumping duties. A country's choice not to use the 'lesser duty rule' may indicate more discretion in anti-dumping practice. A priori, it is therefore uncertain if, in such cases, we empirically find support for a negative relation between anti-dumping duties and the elasticity of substitution or not. We therefore bring the simple theoretical model above to the data, by focusing on product and industry heterogeneity through the parameter $\bar{\sigma}$, assumed to give condensed basic industry information. This is done in the following sections.

3. The empirical model

We formulate the following empirical model to test the predictions presented in Section 2.

$$y_{hft} = \beta_0 + \beta_1 \bar{\sigma} + \beta_2 LDR_h + \beta_3 (\bar{\sigma} * LDR_h) + \beta_4 DIST_{hf} + \beta_5 \frac{Open_{ht}}{Open_{ft}} + \beta_6 LEGAL_{ht} + \beta_7 NME_f + \gamma_t + \varepsilon_{hft}, \quad (9)$$

where the subscripts *h*, *f*, and *t* indicate home country, foreign country, and time. The theoretical model suggests a relationship between the level of anti-dumping protection and the elasticity of substitution. Our preferred measure of anti-dumping protection is the final ad valorem duty which will act as the dependent variable in the following analysis. To be precise, the variable gives the log of the level of the final duty of a given case (one product, one dumper country) in year *t* from firms petitioning in country *h* against firms in country *f*.

The independent variables included in equation (9) are motivated by the theoretical model in Section 2 as well as previous studies on anti-dumping protection focusing on political economy arguments. According to the model above, the elasticity of substitution ($\bar{\sigma}$) is decisive for the size of the dumping margin and therefore indirectly for the level of duties. In a rule-based system, the expected sign of $\bar{\sigma}$ is negative, i.e. $\beta_1 < 0$. However, since the elasticity of substitution is primarily assumed to influence the level of anti-dumping measures for countries in which prices play a prominent role in the dumping and injury determination, we include a dummy variable (LDR_h) indicating whether the home country has voluntarily implemented the 'lesser duty rule' or not. We expect the level of duties to be lower for countries following the 'lesser duty rule', i.e. $\beta_2 < 0$. We also expect the influence of $\bar{\sigma}$ on the level of duties to be larger for countries following the 'lesser duty rule', since the voluntary choice of the LDR system signals a preference for a more ruled-based system. We control for that by interacting $\bar{\sigma}$ with the LDR_h dummy in some specifications. We expect the sign of the coefficient to be negative, i.e. $\beta_3 < 0$.

We add the bilateral distance ($DIST_{hf}$) between home and foreign to the regression equation. The extensive literature on gravity equations (see Piermartini and The (2005) for an overview) shows that bilateral distance is a valid proxy for trade costs and hence market segmentation in our context. It follows from our theoretical model that the injury margin is negatively related to trade costs ($1/g$), since higher trade costs reduce the possibility for the exporter to undercut prices in the import market. Given the assumption of fixed asymmetrical market segmentation, the dumping margin, on the other hand, is not directly associated with trade costs. We therefore expect $\beta_4 \leq 0$.

As also follows from the theoretical model, variables for the number of variants should be included to capture differences of the producer's market power in the two markets. Unfortunately, such data do not exist so that proxy variables have to be used in the estimations. Below we use a measure of a country's openness to proxy for the number of potential variants in a market assuming the same degree of openness in different industries. More open markets have access to a larger pool of variants available on the international market which is why we believe the proxy is adequate in this context. According to the model, the difference in the number of variants in home and foreign matters for the elasticity of substitution, so we use relative openness between the two countries in equation (9). In particular, the model suggests that a relatively more open petitioning country has access to more variants implying a higher elasticity of substitution and lower mark-ups relative to the exporting country, which therefore leads to larger dumping margins. Remember that only the dumping margin is affected by the relative openness measure, while the injury margin is not. Thus, we expect for non-LDR countries a positive sign on the coefficient of the relative openness measure, while the coefficient is smaller (and might be zero) for the 'lesser duty rule' countries. So, generally we expect $\beta_5 \geq 0$. Note that we do not have information on industry specific relative production costs ($\frac{c}{c^*}$), which is why we cannot control for this part of our theoretical model.[6]

Additionally, we include a proxy for the legal structure and property rights in the importing countries ($LEGAL_{ht}$) in the regression equation. This variable ranges from 1 to 10, 10 indicating a sound legal structure. It accounts for the political economy argument (outside our theoretical model) that anti-dumping protection is mainly a result of lobbying. We assume that countries with good legal structures are less prone to lobbying or bribery (and therefore also to a greater extent follow the 'rules'), so we expect the sign to be negative ($\beta_6 < 0$). Similarly, the NME_f dummy captures political economy considerations, as it controls for whether the dumping country is treated as a non-market economy or not. We expect that this variable exhibits a positive effect on the level of protection, as anti-dumping legislation generally treats these countries differently from market economies ($\beta_7 > 0$). This implies mainly that the home market price in the dumper country is found irrelevant as an indicator of the normal value, and hence in calculating the dumping margin the normal value is assessed by market prices (or production unit costs) in a so-called 'analogue market economy country'. As shown e.g. among others by Nielsen and Rutkowski (2005) this may lead to an upward biased dumping margin calculation and therefore to higher duties.

γ_t are time fixed effects which account for yearly shocks common to all countries, which may affect anti-dumping protection (e.g. business cycle movements), and ε_{hft} is the error term. The counting unit in the anti-dumping database as well as the observational unit for our empirical analysis is the case-dumping-country pair. As one case can involve several dumping countries, we allow for correlation between the decisions involving firms from different countries, but belonging to the same case by clustering our standard errors at the case level. Further note that we use two alternative variables as a proxy for the elasticity of substitution to assess the robustness of our results. One of these variables is an estimated regressor making the calculation of appropriate standard errors more cumbersome. We therefore bootstrap the standard errors when this proxy for the elasticity of substitution is used. Note that we log transform our independent variables to reduce possible skewness of the data. We estimate equation (9) by ordinary least squares. Finally, to assess the robustness of our estimation results, we supplement the regression equation by foreign country dummies and 2-digit ISIC industry dummies. These dummies further account for the industry-country specificity of (c/c^*) and capture other unobserved factors which may influence the effect of $\bar{\sigma}$.

[6] We have tried using the relative GDP/capita of the two countries as a proxy for the relative cost levels, but this variable is in principle a combination of industry and country-specific factors, and does not directly fit into our theoretical model.

4. Data

We combine two main types of data for our empirical analysis: data on anti-dumping cases and data on the elasticity of substitution.

The anti-dumping data is sourced from Bown's (2010) "Global Antidumping Database". A case (the counting unit) in this database is defined as a 'product' plus a dumping-country. A 'product' might include more than one HS code. The database contains anti-dumping information for 31 countries, while we restrict our attention to those 10 countries for which we can find at sufficient matches between the product codes of the elasticity of substitution and those from the anti-dumping data. *Table 1* lists these countries and the number of dumping initiations. In our empirical analysis we consider those cases for which sufficient information is available in the database; i.e. at least 8-digit HS product code, initiation date, the dumping country and anti-dumping decision. Further note that in cases where different firms in one country were charged different ad valorem duties, we calculate the average of these duties.

The data on the elasticity of substitution are taken from Broda and Weinstein (2006). They estimate the elasticity of substitutions at the 10-digit HTS product level for the US. The anti-dumping data is commonly available at the 8-digit product level. The harmonized system (HS) product codes are internationally standardized for the first six digits only. Therefore, a natural way to proceed would be to aggregate the elasticities at the 6-digit level and then merge them to the anti-dumping data. However, a problem of this approach is that the elasticities have a large variance within the 6-digit categories. This is a problem for our analysis, which requires detailed product-specific elasticities.[7] We therefore proceed by aggregating the elasticities at the 8-digit HS level and then merge them with the anti-dumping data. Random checks for the EU and US show that when the 8-digit codes are similar, they refer to the same product in the large majority of the cases. However, it does happen frequently that 8-digit product codes exist in the US but not in the EU or vice versa. Hence, we lose these cases in the merging process. We use the median of the 10-digit elasticities grouped into one 8-digit category in the estimations.

As we find it important to exploit detailed product information to have meaningful elasticities of substitutions, we use the elasticities estimated by Broda and Weinstein for the US for all 10 selected countries; i.e. in terms of our model we assume that these elasticities proxy $\bar{\sigma}$. This can be problematic because smaller and less open countries import fewer varieties and for that reason have lower levels of elasticity of substitutions. Also differences in preference and production structure (intermediate goods) relative to the US can be a factor of importance for differences in the estimated elasticity of substitutions. We address these potential problems via the following arguments. First, the problem is of minor concern if we assume that the ranking of the elasticities of substitution in the US is similar in the other countries. Second, we control for the importance of relative openness on elasticities of substitution.[8] Similarly, we add country dummies to our regression equation to assess the robustness of our results. Finally, we re-estimate our models based on an alternative measure for the elasticity of substitution, which does not depend on the relation between the intrinsic elasticity of substitution and the country specific elasticity of substitution, see equation (2). In particular, we use the measure provided by Rauch (1999) who groups goods into three

[7] According to Broda and Weinstein (2006:548) a good constitutes a particular product, such as red wine, while a variety is a particular good in a particular country, such as French red wine.

[8] The empirical relevance of making a correction for the relative country size also follows from Broda and Weinstein (2006:556): "holding fixed a country's share of exports to the United States, a 1 percent increase in trading partner's size is associated with a 32 percent increase in the number of varieties exported to the United States."

categories indicating whether a product is homogenous, reference priced, or differentiated. Commodities traded on organized exchanges are considered as homogenous, while reference priced goods are not traded on organized exchanges, but possess reference prices. Differentiated goods include all other commodities. This indicator variable is a rather crude proxy for the elasticity of substitution, but it has the advantage of measuring $\bar{\sigma}$.[9]

The used elasticities of substitution from Broda and Weinstein (2006) are averages for 1990-2001 while we use information on anti-dumping cases for the period 1990-2009. If the elasticities of substitution were unchanged over this latter period, the lacking overlap in periods would not pose a specific problem. From Broda and Weinstein (2006) we know, however, that there is a secular trend in the elasticities.[10] We hope to capture such trend effects by including time fixed effects in all regressions.

Table 1. Descriptive statistics of anti-dumping cases and the elasticity of substitutions

Countries with anti-dumping initiations	(1) Number of anti-dumping initiations in the Anti-dumping database (different periods between 1979 and 2010)	(2) Number of observations in estimation sample	(3) Final anti-dumping ad-valorem tariffs (%)	(4) Median Elasticity of substitution (US data)	(5) Mean elasticity of substitution (US data)
Argentina (1995-2009)	252	28	65.86	6.98	7.37
Brazil (1988-2009)	263	28	41.11	4.90	6.91
Canada (1985-2009)	366	72	48.18	6.15	6.28
China (2006-2009)	184	11	26.37	22.69	22.70
EU (1987-2009)	715	106	30.85	6.14	7.75
South Korea (1989-2008)	144	40	24.70	4.87	4.87
Peru (1992-2009)	123	27	27.53	5.89	6.96
South Africa (1992-2005)	289	3	36.75	6.73	6.97
Turkey (1989-2009)	235	29	41.89	4.43	5.14
USA (1987-2009)	1178	302	65.41	7.05	9.51
All above countries pooled (1990-2009) (used in regressions)		646	50.83	6.67	8.28

Notes: A case (the counting unit) is defined as a product plus a dumping country as found in Bown (2010). The difference in the number of observations in columns (1) and (2) is that column (1) presents all anti-dumping cases in Bown (2010), while column (2) only provides information on anti-dumping cases with final duties in Bown (2010) that matches product codes in Broda and Weinstein (2006). Furthermore, in column (2) the end year is 2009, while in column (1) it is 2010.
Sources: Own calculations based on Bown (2010) and Broda and Weinstein (2006).

[9] Note that the Rauch data are available at 4-digit SITC rev. 2 level. To merge them with the product data, we use a concordance provided by the UN between 5-digit SITC rev. 2 and 5-digit SITC rev. 3. We delete those cases where 4-digit sub-groupings of the 5-digit SITC rev. 2 and 5-digit SITC rev. 3 do not match in terms of the measure of product differentiation. We then use a concordance from the UN between HS and 5-digit SITC rev. 3 to merge the Rauch measure to the anti-dumping data based on the 4-digit SITC rev. 3 level.

[10] They find that "the median elasticity of substitution has fallen over time indicating that traded goods have become more differentiated" (Broda and Weinstein, 2006:542).

Table 1 provides some descriptive statistics. The level of tariff protection varies significantly across countries and therefore institutional systems. The mean and median elasticity of substitution also varies much across countries. As mentioned before, when grouping the elasticities into 6-digit categories, the variance is fairly large. Even though this issue is less severe when grouping them into 8-digit categories, an average standard deviation of 14.9 of the 10-digit level elasticities aggregated to the 8-digit level is still high. To reduce potential outlier problems we therefore use the median of the elasticities in the econometric analysis.

The total number of observations amounts to 646. We supplement this data set with information on countries' openness based on the KOF Index on Globalization (Dreher, 2006)[11], bilateral distance from CEPII (Mayer and Zignago, 2011), and the legal environment in the initiation countries from the Economic Freedom of the World 2010 Annual Report (Gwartney et al., 2011). For details on the dummies for the 'lesser duty rule's' countries, the non-market economy countries, the industries, and summary statistics of all variables, see Appendix A.

5. Empirical results

In the following three sub-sections we present the results based on the Broda-Weinstein elasticity as well as the Rauch elasticity and we have a general discussion of the results relative to the theoretical model and the related literature.

5.1. The Broda-Weinstein elasticity

Table 2 presents estimation results where the Broda-Weinstein measure is used as a proxy for the elasticity of substitution. In the first six columns the estimations are based on the sample containing all countries, while columns seven to ten contain sub-sample estimations.

In column (i), we include the elasticity of substitution without interacting it with the 'lesser duty rule'. The variable has the expected negative sign, but is insignificant. The LDR-dummy is significant with a negative sign, suggesting that in countries which apply this rule, anti-dumping cases are indeed associated with lower anti-dumping duties.

The other control variables in column (i) are also significant. Distance is positive and highly significant suggesting that anti-dumping initiations against firms in more distant markets lead to higher duties. This is not quite as expected according to the theoretical model of Section 2, in line with which we expect a negative sign. But if we lift the strict assumption of fixed asymmetrical market segmentation, and assume the degree of asymmetrical market segmentation is increasing with distance to the exporters market, the mark-up in the dumper's market may increase with distance, and so may the dumping margin. The political economy provides an additional explanation for the significant positive effect of distance. Imposing duties involves a risk of retaliation from the harmed country, and due to larger trade intensities with "neighboring" countries the risk of retaliation is more imminent from nearby countries and, hence, "neighboring" countries are treated more leniently. So generally, a positive sign $(\beta_4 > 0)$ is plausible. The openness ratio has the expected positive sign but it is only weakly significant. Adding the political economy variables in column (ii) renders the coefficients on openness insignificant. The two added variables are significant and have the

[11] We use the index on economic globalization in all estimations. The economic openness ranges from 1 to 100 where higher values indicate more openness.

expected effects; i.e. lobbying or bribing is more difficult in countries with sound legal systems, and anti-dumping investigations against non-market economies are related to higher duties.

To test the assumption that trade policy authorities using the 'lesser duty rule' pay more attention to prices in their investigation, we interact in column (iii) the 'lesser duty rule' dummy with $\bar{\sigma}$. The interaction term is negative and significant indicating that this assumption seems warranted. We mean center $\bar{\sigma}$ in the regression involving interaction terms. Thus, the results suggest that for a value of sigma equal to the sample mean, anti-dumping cases initiated in countries implementing the 'lesser duty rule' lead to significantly lower final ad valorem duties. In columns (iv) and (v) we add industry and export market dummies[12], respectively, to the regression and do not find any changes in our results. In column (vi) we add both types of dummies simultaneously; while the coefficient on the interaction term becomes less significant, the overall results still hold.

Table 2. Final ad valorem anti-dumping duties (*Broda-Weinstein elasticity*)

	FULL SAMPLE						COUNTRIES WITH LDR		COUNTRIES WITHOUT LDR	
							All	No EU	All	No US
	i	ii	iii	iv	v	vi	vii	viii	ix	x
LOG_SIGMA	-0.092	-0.094	0.032	0.035	0.043	0.040	-0.278***	-0.349***	0.071	-0.131
	(0.070)	(0.067)	(0.091)	(0.102)	(0.092)	(0.097)	(0.087)	(0.111)	(0.102)	(0.229)
LDR	-0.242**	-0.477***	-0.519***	-0.578***	-0.480***	-0.513***				
	(0.100)	(0.136)	(0.144)	(0.127)	(0.145)	(0.151)				
C_INT_SIGMA_LDR			-0.272**	-0.275*	-0.283**	-0.271*				
			(0.127)	(0.142)	(0.133)	(0.142)				
LOG_DISTANCE	0.249***	0.189***	0.186***	0.194***	0.214***	0.230***	0.183**	0.226***	0.065	0.137
	(0.053)	(0.051)	(0.050)	(0.055)	(0.059)	(0.060)	(0.073)	(0.074)	(0.082)	(0.108)
LOG_OPEN	0.258*	0.067	0.086	0.136	0.171	0.248	0.041	0.095	0.103	0.159
	(0.146)	(0.168)	(0.165)	(0.167)	(0.290)	(0.313)	(0.172)	(0.219)	(0.273)	(0.301)
LOG_LEGAL		-0.536*	-0.629*	-0.820***	-0.665*	-0.841**	-0.302	-1.141**	2.423	-0.248
		(0.313)	(0.329)	(0.312)	(0.363)	(0.390)	(0.332)	(0.479)	(1.551)	(1.522)
NME		0.665***	0.666***	0.654***	0.533*	0.465	0.169*	0.108	1.094***	0.229
		(0.100)	(0.092)	(0.096)	(0.311)	(0.299)	(0.089)	(0.101)	(0.156)	(0.248)
Year dummies	yes	yes	yes	yes	yes	yes	yes		yes	
Industry dummies				yes		yes				
Country dummies					yes	yes				
Number of observations	646	628	628	602	628	602	258	153	370	77
Adjusted R2	0.095	0.164	0.172	0.182	0.202	0.209	0.196	0.194	0.225	0.020

Note: clustered standard errors (bootstrapped, 500 repl.) in parantheses; *** p<0.01, ** p<0.05, * p<0.1; interaction effects based on mean centered variables

The results so far suggest that the effect of the elasticity of substitution, as a parameter for the influence of prices in anti-dumping policies, depends on whether the country has implemented the 'lesser duty rule' or not. We further investigate this issue by running our estimations on sub-samples for countries which have implemented the 'lesser duty rule' and those which have not. As expected from the theoretical model, the elasticity of substitution has a negative and significant effect in column (vii) where we restrict the sample to

[12] As we bootstrap the standard errors in regressions with the Broda-Weinstein elasticities, dummy variables for dumping countries which are only rarely involved in anti-dumping investigations are difficult to handle. Therefore, in regressions with bootstrapped standard errors, we assign individual country dummies only to those countries which are involved in at least ten investigations. The other countries are grouped together in continent-specific categories (see Table A5 in the appendix for these dummies).

countries with LDR. From *Table 1* it is obvious that the EU and the US account for an important amount of observations in our data set. Remember that the EU is a LDR country while the US is not. To see whether the effect in column (vii) is driven by the EU, we additionally exclude observations where EU firms petition for anti-dumping measures. As can be seen from column (viii), our results remain robust.

Finally, in columns (ix) and (x) we estimate the models on a sample excluding countries with 'lesser duty rule'. In column (x) we additionally exclude the US as the largest non-LDR country from the sample. We find that the elasticity of substitution no longer has a significant effect. These results for the non-LDR countries therefore largely confirm the predictions that countries' choice not to use the 'lesser duty rule' is an indication of more discretion in decisions on anti-dumping measures. In contrast, the results for the 'lesser duty rule' countries indicate that these countries have chosen to 'tie their hands' to a less discretionary anti-dumping policy system.

5.2. The Rauch elasticity

We repeat the estimations from *Table 2* in *Table 3* where we now use the Rauch measure instead of the Broda-Weinstein elasticity. The estimations presented in this sub-section should act as a robustness check given the problems related to the concordance between the Broda-Weinstein elasticities and the anti-dumping data. Remember that the Rauch measure is a categorical variable taking the values 1, 2, or 3 depending on whether a product is differentiated, reference priced, or homogenous. We do not log-transform this variable given its categorical nature. As reported in the table, the results are qualitatively similar to before. The elasticity of substitution has the expected negative and significant effect on the level of final anti-dumping duties only when firms from 'lesser duty rule' countries petition for protection. As before, this finding is robust to including industry and exporting country dummies as well as dropping the EU and the US from the subsamples for LDR and non-LDR countries respectively.

Table 3. Final ad valorem anti-dumping duties (Rauch elasticity)

	FULL SAMPLE						COUNTRIES WITH LDR		COUNTRIES WITHOUT LDR	
							All	No EU	All	No US
	i	ii	iii	iv	v	vi	vii	viii	ix	x
SIGMA_RAUCH	-0.022	-0.007	0.026	0.059**	0.035	0.062**	-0.454***	-0.621***	0.030	0.037
	(0.018)	(0.025)	(0.028)	(0.029)	(0.026)	(0.027)	(0.087)	(0.135)	(0.032)	(0.024)
LDR	-0.324***	-0.446***	-0.592***	-0.583***	-0.670***	-0.655***				
	(0.082)	(0.091)	(0.094)	(0.095)	(0.101)	(0.105)				
C_INT_SIGMA_LDR			-0.484***	-0.480***	-0.448***	-0.447***				
			(0.093)	(0.109)	(0.094)	(0.113)				
LOG_DISTANCE	0.219***	0.184***	0.186***	0.198***	0.190***	0.200***	0.210***	0.177***	0.061	0.117**
	(0.036)	(0.036)	(0.033)	(0.035)	(0.036)	(0.037)	(0.043)	(0.061)	(0.050)	(0.051)
LOG_OPEN	0.251***	0.167	0.117	0.157	0.708**	0.657**	-0.020	-0.049	0.270	0.158
	(0.092)	(0.120)	(0.115)	(0.120)	(0.284)	(0.312)	(0.132)	(0.180)	(0.187)	(0.222)
LOG_LEGAL		-0.412*	-0.388*	-0.398*	-0.884***	-0.843***	-0.226	-0.139	-0.411	0.114
		(0.224)	(0.217)	(0.220)	(0.308)	(0.321)	(0.223)	(0.432)	(0.423)	(0.578)
NME		0.458***	0.478***	0.472***	0.917*	-0.881	0.277***	0.160	0.844***	0.181
		(0.076)	(0.076)	(0.076)	(0.537)	(0.537)	(0.069)	(0.099)	(0.159)	(0.172)
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry dummies				yes		yes				
Country dummies					yes	yes				
Number of observations	898	872	872	848	872	848	443	259	429	202
Adjusted R2	0.107	0.141	0.175	0.185	0.224	0.230	0.214	0.261	0.185	0.197

Note: clustered standard errors in parantheses; *** p<0.01, ** p<0.05, * p<0.1; interaction effects based on mean centered variables

5.3. Discussion of results

The empirical results in Tables 2 and 3 confirm that final anti-dumping duty levels vary negatively with the elasticity of substitution, but only for countries following 'the lesser duty rule'. This is in accordance to the presented monopolistic competition model in Section 2 subject to the political economy assumption that 'the lesser duty rule' countries put more emphasis on prices in anti-dumping investigations than 'the non-lesser duty rule' countries.

These results may be related to the trade policy literature mentioned in Section 1. The inverse relation between anti-dumping duties and the elasticity of substitution for 'the lesser duty rule' countries is similar to the results found by Broda et al. (2008) and Bagwell and Staiger (2011) investigating the tariff levels for industries in countries which were unconstrained of the GATT rules, i.e. countries which at the investigation period were not members of the WTO. The duties investigated in our paper concern WTO member countries, which exercise their trade policy autonomy in anti-dumping cases in accordance to the GATT rules. Within the frames of the quite flexible GATT rules, the countries with petitioning firms may, as shown, follow the general principles of 'optimal tariff fixing', as theoretically presented in the monopolistic competition model by Gros (1987) and extended with political economy consideration in Chang (2005).

The literature on optimal tariffs does not explain why our results only apply for countries following 'the lesser duty rule'. An answer of this question may be found in the anti-dumping literature on 'rules versus discretion' and the 'commitment approach to trade agreements'. Countries following 'the lesser duty rule' may establish procedures with a strong focus on price-undercutting seriously in quantifying the injury part of their anti-dumping investigation. This reduces the degree of discretion when the trade policy authorities make decisions on anti-dumping duties. Previously, this point has also been noticed by Belderbos et al. (2004) in an EU context. Countries not using 'the lesser duty rule' may take a broader approach to measure injury, and this potential larger degree of discretion may render the elasticity of substitution insignificant in explaining the duty levels for this group of countries. However, this difference in the degree of discretion between two groups of countries should not be perceived as extremes. The different treatment of non-market economies for both groups of countries reveals discretionary behavior also for 'the lesser duty rule' countries. Finally, it should be stressed that the significant and negative relation we find between elasticity of substitution and level of duty for 'the lesser duty rule' countries does not necessarily distinguish these countries for having established a procedure leading to a form of 'correct' or even an 'optimal' level of duties. The analysis in this paper is without normative conclusions.

6. Final remarks

The US and the EU have previously been the heavy users of anti-dumping measures and much anti-dumping research has therefore focused on the policy determinants for the authorities of these two policy areas. However, the use of anti-dumping policy has proliferated within the last three decades and so has the need for broader multi-country analyses of the determinants of anti-dumping measures. This paper searches for common determinants for anti-dumping measures across a larger group of countries.

The analysis in the paper rests on three ideas. First, theoretical contributions on optimum tariffs predict a negative relation between the size of the tariff and the elasticity of substitution. The theory only has relevance for countries that have at least some autonomy to determine the tariff rate. Secondly, while member countries of the WTO only have a limited possibility of using traditional tariffs, there is

considerable autonomy in the determination of specific duties when the conditions for implementing anti-dumping measures are fulfilled. The tariff formation may therefore in these specific cases reflect the countries' endeavors to establish a preferred level of the tariff. Thirdly, countries have different attitudes towards subordinating to rules in organizing their anti-dumping policies. Countries which implement the 'lesser duty rule' indicate a more rule-based practice with a prominent role to prices, while countries which have not adopted the 'lesser duty rule' reveal a more discretion-based practice. When combining these three elements an inverse relation between the size of the anti-dumping duty and the elasticity of substitution appears for the group of countries which applies the 'lesser duty rule'. The empirical evidence is consistent with this hypothesis.

Literature

Amin, M. (2003). *Time Inconsistency of Trade Policy and Multilateralism*. New York, Columbia University.

Anderson, K. B. (1993). Agency Discretion or Statutory Direction: Decision Making at the US International Trade Commission. *Journal of Law and Economics*, XXXVI: 915-935.

Bagwell, K., and Staiger, R. W. (1990). A Theory of Managed Trade. American Economic Review 80(4): 779-795.

Bagwell, K., and Staiger, R. W. (2011). What Do Trade Negotiators Negotiate About? Empirical Evidence from the World Trade Organization. *American Economic Review*, 10: 1238-1273.

Belderbos, R., Vandenbussche, H., and Veugelers, R. (2004). Antidumping Duties, Undertakings, and Foreign Direct Investment in the EU. *European Economic Review*, 48: 429-453.

Blanchard, O., and Giavazzi, F. (2003). Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets. *Quarterly Journal of Economics*, 118: 879-907.

Bloningen, B. A. (2006). Evolving Discretionary Practices of US Antidumping Activity. *Canadian Journal of Economics*, 39(3): 874-900.

Bown ,C. P. (2007). Global Antidumping Database. Version 3.0. Working Paper. Brandeis University.

Bown, Chad P. (2010). Global Antidumping Database, available at http://econ.worldbank.org/ttbd/gad/ .

Bown, C. P. (2011). Taking Stock of Antidumping, Safeguards and Countervailing Duties, 1990-2009. *The World Economy*, 34(12): 1955-1998.

Bown, C. P., and Crowley, M. A.(2011). Self-Enforcing Trade Agreements: Evidence from Time-Varying Trade Policy. Mimeo.

Broda, C., and Weinstein, D. E. (2006). Globalization and the Gains from Variety. *The Quarterly Journal of Economics*, 118: 541-585.

Broda, C., Limão, N., and Weinstein, D. E. (2008). Optimal Tariffs and Market Power: The Evidence. *American Economic Review*, 98(5): 2032-2065.

Collie, D. R., and Le, V. P. M. (2010). Antidumping Regulations: Anti-Competitive and Anti-Export. *Review of International Economics*, 18(5): 796-806.

Chang, P. L. (2005). Protection for Sale under Monopolistic Competition. *Journal of International Economics*, 66: 509-526.

Dixit, A., and Stiglitz. J. (1977). Monopolistic Competition and Optimum Product Variety. *American Economic Review*, 67(3): 297-308.

Dreher, A. (2006). Does Globalization Affect Growth? Evidence from a New Index of Globalization. *Applied Economics* 38(10): 1091-1110.

Eymann, A., and Schuknecht, L. (1996). Antidumping Policy in the European Community: Political Discretion or Technical Determination. *Economics and Politics*, 8(2): 111-131.

Finger, J. M., Hall, H. K., and Nelson, D. R. (1982). The Political Economy of Administered Protection. *American Economic Review* 72, 452-466.

Finger, J. M., and Nogues, J. J. (2008). Safeguards and antidumping in Latin America Trade Liberalization. World Bank, *Policy Research Working Paper* 4680.

GATT (1994a). *General Agreement on Tariffs and Trade*.

GATT (1994b). *Agreement on Implementation of Article VI of the General Agreement on Tariffs and Trade 1994.*

Gros, D. (1987). A Note on the Optimal Tariff, Retaliation and the Welfare Loss from Tariff Wars in a Framework with Intra-Industry Trade. *Journal of International Economics*, 23: 357-367.

Grossman, G. M., and Helpman, E. (1995). Trade Wars and Trade Talks. *Journal of Political Economy*, 103(4): 675-708.

Gwartney, J., Lawson, R., and Hall, J. (2011). *Economic Freedom of the World 2010 Annual Report*. Fraser Institute.

Johnson, H. G. (1953-54). Optimum Tariffs and Retaliation. *Review of Economic Studies*, 21(2): 142-153.

Krugman, P. (1979). Increasing Returns, Monopolistic Competition, and International Trade. *Journal of International Economics* 9: 469-479.

Krugman, P. (1980). Scale Economies, Product Differentiation and the Pattern of Trade. *American Economic Review*, 70: 950-959.

Matsuyama, K. (1990). Perfect Equilibria in a Trade Liberalization Game. *American Economic Review*, 80(3): 480-492.

Mayer, T., and Zignago, S. (2011). Notes on CEPII's Distances Measures: The GeoDist Database. CEPII WP No. 2011-25.

McCarty, A., and Kalapesi, C. (2003). The Economics of the "Non-Market Economy" Issue. Vietnam Catfish Case Study. Mimeo. Mekong Economics, available at http://www.eldis.org/fulltext/vietnam.pdf.

Melitz, M. J., and Ottaviano, G. I. P. (2008). Market Size, Trade, and Productivity. *Review of Economic Studies*, 75: 295-316.

Nielsen, J. U.-M., and Rutkowski, A. (2005). The EU Anti-dumping Policy Towards Russia and China: Product Quality and the Choice of an Analogue Country. *World Economy*, 28: 103-136.

Ottaviano, G.I.P.; Tabuchi, T., and Thisse, J.-F. (2002). Agglomeration and Trade Revisited. *International Economic Review*, 43: 409-436.

Piermartini, R. and The, R. (2005). Demystifying Modelling Mehods for Trade Policy. WTO Discussion Paper No. 10.

Prusa, T. J. (2005). Anti-dumping: A Growing Problem in International Trade. *The World Economy*, 28(5): 683-700.

Rauch, J. (1999). Networks versus Markets in International Trade. *Journal of International Economics*, XLVIII: 7-35.

Sim, E. W. (2005). Asian Trade Remedies. *The Asia Pacific Antitrust & Trade Review 2005- A Global Competition Review Special Report*..

Staiger, R. W., and Tabellini, G. (1987). Discretionary Trade Policy and Excessive Protection. *American Economic Review*, 77(5): 823-837.

Staiger, R. W., and Tabellini, G. (1999). Do GATT Rules Help Governments Make Domestic Commitments? *Economics and Politics*, 11(2): 109-144.

Tharakan, P. K. M., and Waelbroeck, J. (1994a). Determinants of Anti-dumping and Countervailing Duty Decisions in the European Communities. In: Dewatripont, M., Ginsburgh, V. (eds.), *European Economic Integration: A Challenge in a Changing* World. North-Holland, Amsterdam, pp. 181–199.

Tharakan, P. K. M., and Waelbroeck, J. (1994b). Antidumping and Countervailing Duty Decisions in the EC and in the US: an Experiment in Comparative Political Economy. *European Economic Review*, 38: 171–193.

Theron, N. (2007). Anti-dumping Procedures: Lessons for developing Countries with Special Emphasis on the South African Experience. In. B. Debroy, and D. Chakraborty (eds). *Anti-dumping*: *Global Abuse of Trade Policy Instruments*. Liberty Institute, New Delhi, India.

UNCTAD (2002). Negotiating Anti-dumping and Setting Priorities among Outstanding Implementation Issues in the Post-Doha Scenario: A first examination in the light of recent practice and DSU Jurisprudence. UNCTAD/ITCD/Misc. 72.

Vandenbussche, H. (1995). How can Japanese and Central European exporters to the European Union avoid antidumping duties? *World Competition*, 18: 56–73.

Vandenbussche, H. and Zanardi, M. (2008). What Explains the Proliferation of Antidumping Laws? *Economic Policy*, 23: 93-138.

World Bank. *World Bank Development Indicators*. Available at http://data.worldbank.org/data-catalog/world-development-indicators.

World Trade Organization (2009). *World Trade Report 2009, Trade Policy Commitments and Contingency Measures*. Geneva.

Appendix: Dummies

A.1. The 'lesser duty rule' Dummies

There is neither an official list of the 'lesser duty rule' countries nor any information on why the LDR (non-LDR) countries did choose the LDR (non-LDR) system. While the EU uses the LDR consistently and the US the opposite, for some of the other users of anti-dumping policy the picture is less clear, so the LDR (non-LDR) is only used in some cases. The information in *Table A1* on the users (non-users) of the 'lesser duty rule' is therefore based on the practice in the majority of cases of the countries as given in various sources.

Table A1. The use of the 'lesser duty rule' in anti-dumping cases in selected countries.

Reporting Country	**Use of the 'lesser duty' rule:** **+ /−:The country uses (does not use)'the 'lesser duty rule''**
Argentina[1]	+
Brazil[1]	+
Canada[1]	−
China[2]	−
EU[1]	+
South Korea[4]	+
Peru[3]	+
South Africa[4]	+
Turkey[5]	+
USA[1]	−

Sources: [1] WTO (2009). [2] Sim (2005).[3] Finger and Nogues (2008). [4]Theron (2007): [5] http://www.tariff-tr.com/AntiDumping.aspx.

A.2. Non-Market Economy Dummies

Table A2 Non-market economy dummies

Albania
Armenia
Azerbaijan
Belarus
China
Georgia
Kazakhstan
Kyrgyzstan
Moldova
Mongolia
North Korea
Russia
Tajikistan
Turkmenistan
Ukraine
Uzbekistan
Vietnam

According to article VI(1) of GATT 1994 (GATT, 1994a) WTO Members are given the possibility to treat non-market economy countries differently to market economies in anti-dumping cases. Typically, anti-dumping authorities have taken advantage of this GATT provision to reject information on prices and costs in countries they consider being non-market economies. Instead they used costs and price information from third countries with market economies. To take this different treatment of non-market economies into consideration in our empirical investigation the countries in *Table A2* are treated as non-market economy countries for the whole estimation period. The main problem in constructing NME-dummies is that WTO members do not use the same selection of NMEs at a given point in time (see e.g. McCarty and Kalapesi, 2003). Since the USA and the EU have the largest numbers of observations in our sample we have based our NME-dummies as defined by the EU and the US in their anti-dumping legislation for the majority of the years in our estimation period.

A.3. Summary Statistics

Table A3. Dumping Country Dummies

	Obs	Mean	Std. Dev.	Min	Max
LOG FAVD	646	3.48	1.01	-0.01	5.51
LOG_SIGMA	646	1.43	0.75	0.15	4.88
LDR	646	0.40	0.49	0.00	1.00
LOG_DISTANCE	646	8.86	0.74	5.37	9.88
LOG_OPEN	646	0.23	0.33	-0.65	2.11
LOG_LEGAL	628	2.03	0.26	1.17	2.28
NME	646	0.33	0.47	0.00	1.00

A.4. Industry Dummies

We obtain industry information from the concordance Table between HS and ISIC rev.2 downloadable from http://www.macalester.edu/research/economics/page/haveman/Trade.Resources/tradeconcordances.html#FromHS. Note that the vast majority of the cases involve the manufacturing industry. Therefore, we construct 2-digit industry dummies for the manufacturing sector and one additional dummy for other sectors; i.e. agriculture and mining. Further note that it is not possible to find ISIC matches for all product codes in our sample so that the number of observations decreases slightly when including industry dummies. Finally, one case frequently involves several products which sometimes belong to different industries. That is why it does happen sometimes that a case is associated with two industry dummies.

Table A4. Industry Dummies

2-digit ISIC Industry	Appearances
31	31
32	33
33	8
34	20
35	161
36	10
37	281
38	84
39	19
other	12

A.5. Country Dummies in Regressions with Bootstrapped Standard Errors

In regressions with bootstrapped standard errors countries with below ten appearances are grouped together into continent-specific categories. See footnote 12 for more details.

Table A5. Country Dummies

Countries	Appearances
BRA	24
CAN	11
MEX	13
USA	19
CHN	161
IDN	22
IND	33
JPN	44
KOR	40
MYS	11
RUS	24
THA	22
UKR	16
EU	83
NEWEU	25
Europe	20
Asia	37
South America	21
Africa	18