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Policy in Imperfectly Competitive Markets**

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Union Wage Bargaining and European Antidumping Policy in Imperfectly Competitive Markets

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Abstract

The purpose of this paper is to analyze the interaction between union bargaining power and the likelihood and type of European antidumping measures (duties and undertakings) in imperfectly competitive product markets. We present a simple theoretical model which is well embedded in EU legal practice, to show that cost asymmetries induced by union wage bargaining in a European firm leads to an increase in both the *likelihood* and the *level* of antidumping protection against foreign imports of a similar product. In addition our results indicate that a cost asymmetry in the form of a unionized wage differential alters the relative probability of a duty versus an undertaking. We show that the size of these effects depends on the intensity of product market competition. In a further step we use Belgian firm level micro-data to provide some evidence for our predictions.

Keywords : European Antidumping Policy, Cost asymmetry, Labour Unions, Nash bargaining, product market competition

JEL-Classification: F13, C72, D43, J51

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1. Introduction

In recent years fear has grown in the industrialized world that increased foreign competition, especially from low wage countries, would have detrimental effects on domestic industry and jobs. Especially in Europe, high labour costs and strong labour unions are often cited in the popular press as one of the causes for a deterioration of domestic competitiveness. The injury inflicted on the European Industry caused by low price importers is used by the European Union as one of the criteria to intervene in a protectionist manner. In particular, an important instrument of the European Union consists of imposing antidumping (AD) measures on low price foreign imports of similar products¹. Indeed, most countries accused of dumping in the EU between the years 1990-95 are, with the exception of Japan², the low-wage countries of South East Asia and Central and Eastern Europe. AD-measures are one of the most noticeable exceptions to free trade under the WTO Agreements and in general are viewed as a safety valve in a world characterized by increased globalization and regional integration. Their use is defended on the basis of safeguarding "fair competition". But case evidence seems to suggest that they can be used strategically to protect domestic firms from tough but not necessarily "unfair" international competition, thereby generating rents for domestic firms (Vandenbussche (1995)).

In this paper we explore how a cost asymmetry between a European firm selling in the EU only and a foreign firm exporting to the EU, induced by bargaining power of a European labour union, affects the probability and the level of EU AD-protection for different degrees of price competition in the product market. We show that under the current AD-rules, the stronger the bargaining power of a labour union in a European firm, the easier it is for that firm to apply for AD-protection and the higher the degree of protection from foreign imports it can obtain. It will also affect the type of AD-protection (undertakings versus duties) as well as the welfare effects from AD-intervention.

While this paper concentrates on the interaction between unions, European AD-policy and product market competition, there is some related literature on the relationship between unions and other international trade policy aspects³. However, in our model the timing of the trade policy intervention differs compared to the usual timing. Where other models explore the effect of trade policy on union-firm negotiations (Brander & Spencer (1988), Mezzetti & Dinopoulos (1991)), we reverse the causality and question how union-firm bargaining might affect the level and the type of AD-protection. In addition, there exists a rich literature on the relationship between product market competition and the effect unions have on firm behaviour (Bughin (1996); Dowrick (1989,90); Konings and Walsh (1994); among others). This paper

¹ Current EU AD-law stipulates that only 'like products' can be subject to dumping investigations, by which it means products similar to the European produced ones.

² Empirical evidence has shown that Japanese exporters have a low pass-through of adverse exchange rate movements into export prices. For example, an appreciation of the yen will not lead to an increase in Japanese export prices (M. Knetter (1993)).

³ see Brander & Spencer (1988), Mezzetti & Dinopoulos (1991), Gaston & Trefler (1995) and Bughin & Vannini (1995).

makes a contribution to this literature in terms of the effects of unions on trade policy in an environment where firms can face different degrees of price competition.

In the next section we present a theoretical model which captures the main elements of the interaction between union wage bargaining, European AD-legislation and competition. On the basis of this model we derive a number of algebraic results which are further explored in section 3 by using simulations. In section 4, some empirical evidence of our predictions is presented on Belgian firm level data. Section 5 sums up the main conclusions.

2. Theoretical Framework

2.1. The model

In order to study the effect of unionization on EU AD-measures we set up a simple model that closely follows EU practice and which is outlined in figure 1. We consider one EU firm which is unionized and one foreign firm exporting to the EU market without a union⁴. For simplicity we use linear inverse demand conditions for the European firm (p_d) and the foreign firm (p_f) in the EU market which are given by

$$\begin{aligned} p_d &= a_d - q_d - \gamma q_f \\ p_f &= a_f - q_f - \gamma q_d \end{aligned} \tag{1}$$

While a_d , a_f represent the European and foreign firm's market size in the EU, the parameter γ refers to product differentiation between the domestic and the foreign product sold in the EU ($0 < \gamma < 1$).

The first stage of the AD-game consists of the bargaining process between the union and the domestic firm over the domestic wage only (w_d)⁵. Employment decisions are left to the firm in the product market competition stage (final stage) of the game.

In the *absence* of a domestic union, the EU wage (w_d) and the foreign wage (w_f) are exogenous and for simplicity set equal to zero ($w_d=w_f=0$). In the *presence* of a domestic union, the EU wage will no longer be exogenous but becomes the outcome of a bargaining process between the union and the EU firm, resulting in a cost asymmetry between the EU and the foreign firm.

⁴ The entry/export decision of the foreign firm is not modeled explicitly. Only parameter values are considered for which (free trade) foreign exports are profitable. Also ignored is the possible influence of anti-dumping measures on the foreign firm's mode of entry, cf. the tariff jumping investment literature (e.g. Motta (1992), Belderbos (1994))

⁵ McDonald & Solow (1981), state that 'there is unlikely ever to be universal agreement on the right way of union modelling' (p. 896). Some papers have used a monopoly union, which bargains over the domestic wage (Brander & Spencer (1988)) while others have used an efficient bargaining model where the domestic union bargains over both the domestic wage and domestic employment (Mezzetti & Dinopoulos (1991)). From the empirical evidence on this account of which an overview is given by Dowrick (1989), it is also clear that while some find evidence of wage bargaining (Oswald (1984), Clark & Oswald (1989)), other studies report evidence in support of wage-job bargaining (MaCurdy & Pencavel (1986), Bughin (1996)) while yet others find evidence of bargaining over jobs only (Clark (1984), Dowrick (1990)).

The utility function of the Union is given by

$$U(w_d, L) = (w_d - w^a)^\varepsilon \cdot L \quad (2)$$

The parameter ε refers to the union's preference of wages over employment⁶. The variable w^a represents the *alternative wage*, what workers would get outside the industry. For simplicity we set w^a equal to zero. When we assume that one labour unit (L) is required to produce one unit of domestic output (q_d), the European firm's profits are given by :

$$\pi_d = (p_d - w_d) \cdot L \quad (3)$$

The wage (w_d) will be endogenously determined between the union and the domestic firm along a Nash bargaining model where we set the threat points of the Union and the domestic firm equal to zero (Binmore et al., 1986) :

$$\Omega = (U)^\beta \cdot (\pi)^{(1-\beta)} \quad (4)$$

The parameter β refers to the Union's bargaining power ($0 < \beta < 1$). The closer β is to 1, the larger the share the union can secure in the bargaining over product market rents. The equilibrium domestic wage w_d , which is a function of the bargaining power ($w_d^*(\beta)$), can be found by optimizing the Nash bargaining product in (4) with respect to w_d .

Once the domestic wage is determined, the European firm has to decide in the second stage of the model whether or not to file a complaint to the European government. In order for a AD-complaint to be eligible for acceptance under EU law, the legislation requires a number of conditions to be fulfilled. The current EU legislation stipulates that 'a foreign firm which is *dumping* exports in the EU thereby causing *injury* to a European industry' can be protected against when it is in the *Community's interest* to do so' (EU regulation 384/96).

The AD-law basically requires three conditions to be satisfied. The first one involves *dumping*. From an economic point of view the only type of dumping that requires government intervention is predatory dumping. But dumping in the legal sense can arise for many reasons beyond predation. The EU AD-law states that dumping occurs when *the foreign export price to the European Union is lower than the price at which a product is sold in the local foreign market*. Hence, all types of international price-discrimination with the lower price charged in the EU classify as dumping in the legal sense. This non-predatory type of dumping is believed to occur in the majority of EU antidumping cases (see Vandebussche (1995) for case evidence). Without explicitly modelling the foreign market, international price discrimination is assumed to always prevail in our model.

Our attention focuses more on the second requirement in the EU AD-law which is that complaining European industries must show to suffer *injury*. It can be argued that EU producers care less about dumping (which involves a price comparison with the foreign market), but more about injury (which involves a price comparison in the EU market). An AD-complaint by the EU industry will mainly be triggered when EU producers suffer injury from foreign pricing behaviour in the EU market. However, case analysis has shown that in the

⁶ A value of $\varepsilon > 1$ means the Union is wage oriented while $\varepsilon < 1$ means the union is employment oriented.

majority of cases the injury margin is based on the level of foreign price-undercutting in the EU (Vermulst and Waer (1992), Vandebussche (1995,1996)). In other words, when the price at which the foreign product is sold in the European market is lower than the European price, this price difference is regarded by the EU Commission as an indicator of injury and the injury margin is set equal to that price difference. It has been argued that this rule of thumb, may be a convenient one in terms of calculation but has little economic rationale. In the remainder of our analysis, the economic rationale of this injury measure will not be questioned but is taken as given. In terms of our model parameters, the injury margin is positive when the price of the EU product (p_d) is higher than the price in the EU of the foreign product (p_f). The injury margin is therefore defined as:

$$IM(p_d, p_f) = p_d - p_f = (a_d - a_f) - (1 - \gamma) \cdot q_d + (1 - \gamma) \cdot q_f \quad (5)$$

A last condition which needs to be checked by European Officials is whether the imposition of an antidumping measure is in the *interest of the Community*. This Community Interest Clause is generally regarded to correspond with economists' notion of national welfare (Veugelers and Vandebussche (1998)) which can be defined as the sum of European Consumer surplus (CS), European profits (PS), Union rents (UR) and in case of duty protection, duty revenue (T).

$$G = CS + PS + T + UR \quad (6)$$

Consumer surplus⁷ in (6) is given by the following expression

$$CS = q_d^2/2 + q_f^2/2 + \gamma \cdot q_d \cdot q_f \quad (7)$$

Domestic Producer surplus (PS) in (6) consists of domestic firms' profits (π_d) and in the event of a duty, tariff revenue (T) is an ad-valorem duty (t) on foreign imports in the European Union ($t \cdot q_f$)⁸. Union rents (UR) in the government welfare function are given by $w_d \cdot L$ given the scaling to zero of the unions threat points (see also Mezzetti & Dinopoulos (1991)).

In the third stage of the game, if a complaint has been filed, the European government needs to decide whether or not to impose AD-measures. In deciding if and which measure to impose, the government is assumed to choose the action that maximizes the Community's interest, which is represented by the objective function G in (6).

An often heard critique however is that the European government is using antidumping protection for industrial policy purposes. Instead of taking measures in the interest of the Community as a whole, European producers' and union's interests seem to matter more than consumers' interests if only because of the stronger lobbying of firms and unions. Therefore, apart from the welfare function defined in (6) we will also consider the results under a limited government objective function consisting of European profits (PS) and Union rents (UR) only⁹.

⁷ The consumer utility function is quasi-linear and of the form, $U(x,y,z) = f(x,y) + z$, with $f(x,y) = a_d \cdot q_d - 1/2 \cdot q_d^2 + a_f \cdot q_f - 1/2 \cdot q_f^2 - \gamma \cdot q_d \cdot q_f$

⁸ Duty revenue, in principle, has to be refunded to the foreign exporter. However, in practice it can last up to ten years before the Commission actually pays the money back. Therefore it is not unreasonable to include tariff revenue (T) in the domestic welfare function.

⁹ To study a setting where the EU would be characterized by no or little Social Europe, one could include only domestic firm's profits (PS) in the government's objective function.

When the EU government decides on protectionist action, either a duty or an undertaking is imposed. By EU law, a duty (t) is an ad-valorem tariff which increases the cost of the foreign firm ($w_f + t$) per unit shipped towards the EU. The *level of a duty* imposed equals the injury margin (foreign price-undercutting) in the period prior to the filing of a case (Vandenbussche (1996)). Hence the duty, t is equal to the *difference between p_d and p_f* prior to the filing of a complaint

$$t = IM = p_d - p_f \quad (8)$$

An **Undertaking** is a price agreement by the foreign firm to align on the domestic price or in other words an agreement no longer to price undercut the domestic firm which legal practice regards as injury. This implies that with an undertaking domestic and foreign firms maximize their profits under the restriction that prices should be equal after the undertaking ($p_f = p_d$). This agreement is assumed to be binding given that the Commission closely monitors the undertaking and in case of violation, can impose a penalty¹⁰. While an undertaking leads to equal post-file prices, a duty doesn't necessarily result in equal post-file prices, since the foreign firm will typically absorb part of the tariff. This (price-)difference between undertakings and duties will depend on the asymmetry between the foreign and the domestic firm.

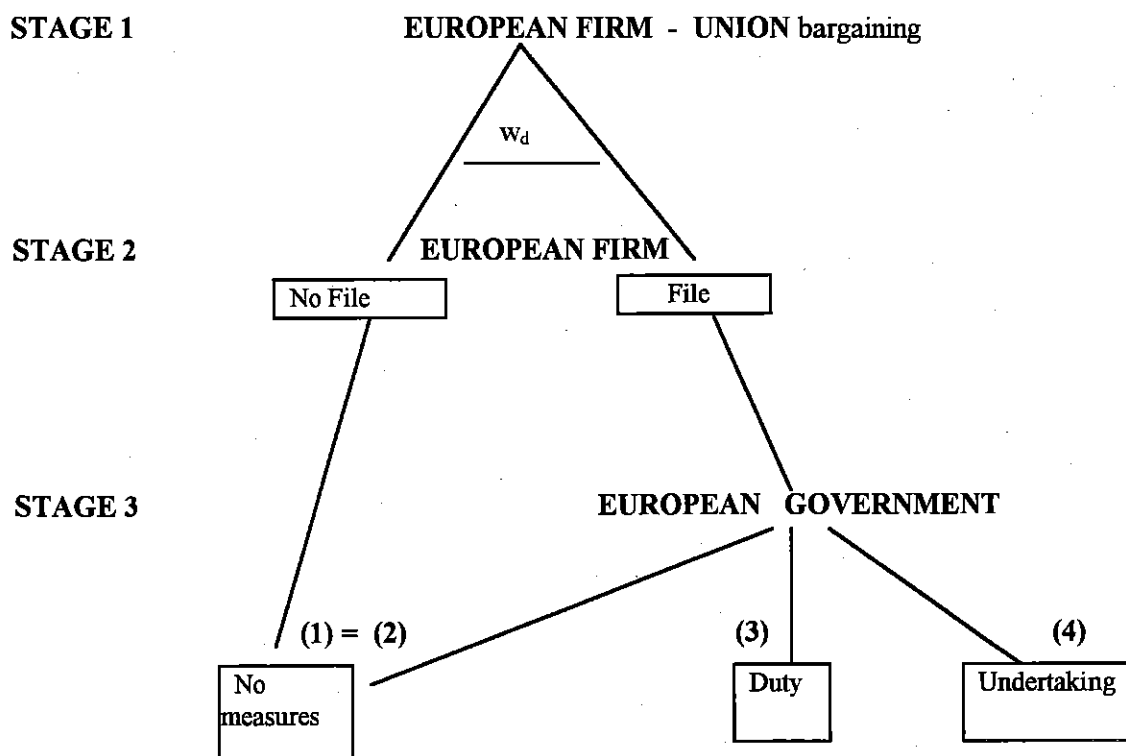
In the fourth and last stage of the game, the domestic and the foreign firm compete in the European product market. Different competition regimes are considered depending on the degree of product differentiation (γ) and whether firms compete in quantities (Cournot) or prices (Bertrand). Besides any initial demand asymmetry, EU union bargaining and any possible AD-duty further leads to asymmetries between both producers.

Figure 1 summarizes the four stages of the model. The paper endogeneizes cost asymmetries, which prove to drive the nature and impact of AD policies. In the first stage, the level of cost asymmetry is determined through the wage bargaining. This level of asymmetry will influence the conditions to file in the second stage and which AD measures the government will impose in the third stage, influencing the competition in the final stage.

Filing costs and legal expenses involved in an antidumping procedure are important to distinguish between the 'no file' and the 'no measure' equilibrium. In this full information game, if the EU government decides on 'no measures' in the final stage, the EU firm will not file which will end the game. We implicitly assume these legal expenses never to be prohibitive but do not take them on board in the rest of the analysis.

Figure 1: Four Stage Model

¹⁰ Note that while an undertaking leads to equal post-file prices, a duty does not necessarily result in equal post-file prices, since the foreign firm will typically absorb part of the tariff. This price-difference between undertakings and duties will depend on the asymmetry between the foreign and the domestic firm.



STAGE 4 : EUROPEAN FIRM-FOREIGN FIRM : Price/Quantity competition

2.2. Solutions and Comparative Statics

The game outlined in figure 1 is solved by backwards induction (see appendix B and C for calculations under Cournot and Bertrand competition respectively). We first derive the equilibrium values for the domestic and foreign firm in the final stage of the game, for each of the four possible outcomes: no file (1), no measures (2), duty (3), undertaking (4). The solutions for the domestic and foreign equilibrium values (q_d , q_f , p_d , p_f) are a function of the exogenous parameters a_d , a_f , w_f , β , ϵ , γ and of $w_d(\beta)$.

The next step involves solving for the equilibrium wage w_d^* which is a function of the exogenous parameters a_d , a_f , w_f , β , ϵ , γ (see appendix B and C for more details). The reduced form solutions of the domestic equilibrium output/price, the domestic wage (w_d^*) and the foreign firm's reaction function ($q_f(q_d^*)$; $p_f(p_d^*)$) derived under Cournot/Bertrand competition are given in tables A.1 and A.2 in appendix A at the end of the paper¹¹.

It can be checked that both under Cournot and Bertrand competition, domestic wages always increase with increasing values of β :

$$\frac{\partial w_d}{\partial \beta} > 0 \quad (9)$$

¹¹ In what follows we primarily discuss the results under Cournot output competition. Calculations of Bertrand price competition can be found in table A.2.

It can also be checked that $\partial w_d / \partial \varepsilon > 0$. Hence, unionization drives a wedge between the European wage (w_d^*) and the foreign wage ($w_f^*=0$) and determines the level of cost asymmetry between the home and the foreign firms.

The use of a monopoly union implies that (w_d, L) combinations lie on the labour demand curve which is downward sloping (McDonald and Solow, 1981). With wages increasing values of bargaining power, domestic production (employment) is always a decreasing value of β , while foreign production increases with increasing values of β :

$$\partial q_d / \partial \beta < 0; \partial q_f / \partial \beta > 0 \quad (10)$$

Further, it can be checked that $\partial q_d / \partial \varepsilon < 0$.

From the definition of the injury margin (IM) in (5) and the signs of the partial derivatives in (10), it is clear that an increase in the union's bargaining power β , results in an increase of foreign price-undercutting which the European Commission regards as the injury margin:

$$\delta IM / \delta \beta = -(1-\gamma) \cdot \delta q_d^* / \delta \beta + (1-\gamma) \cdot \delta q_f^* / \delta \beta > 0 \quad (11)$$

From the definition of t in (8), when an AD-duty is decided, it is fixed at the level of foreign price-undercutting. Hence, an increase in the labour union's bargaining power will also result in an increase in the degree of AD-duty protection:

$$\delta t / \delta \beta > 0 \quad (12)$$

This leads to the following results:

Proposition 1: *The presence of a European labour union drives a cost wedge between the European and the foreign firm. This cost asymmetry adds to the foreign price-undercutting in the European market and therefore to the level and the probability of European AD-protection from foreign imports.*

We can also check the relative ranking of home output/employment and wages under the different AD-scenarios for a particular value of β . Here it can be shown that the domestic output is highest with a duty and lowest with an undertaking. While duties increase output/employment, undertakings decrease output/employment as compared to the no-protection case:¹²

$$q_{d \text{ und}}^* < q_{d \text{ no meas}}^* < q_{d \text{ duty}}^* \quad (13)$$

In terms of wages, the domestic wage is higher under an undertaking than under a duty and both are higher than under free trade when no measures are imposed. Hence, the presence of an EU AD-policy allows unions to achieve higher wage levels in bargaining:

$$w_{\text{no meas}} < w_{\text{duty}} < w_{\text{und}} \quad (14)$$

¹² We have to keep in mind that our theoretical model predicts wage/employment combinations on the labour demand curve whereas with efficient bargaining the employment levels are likely to be higher in all scenarios.

It can be checked that this ranking of domestic wages and employment holds both under Cournot and Bertrand competition.

Proposition 2: Irrespective of the degree of price competition, with positive union bargaining power, a duty results in an increase in local output and employment while an undertaking results in a decrease of domestic output and employment compared to free trade. While both duties and undertakings lead to higher wages, undertakings leave the highest wage increase.

3. The effect of unions on the likelihood and type of AD policy

In the previous section the effects of bargaining power on wages, output and employment for a given anti-dumping measure were derived algebraically. The purpose of this section is by means of simulations to gain greater insight in the effects of bargaining power and wage preference (β, ϵ) on the likelihood and nature of European antidumping policy and how this depends on the intensity of product market competition. In a first step we analyze antidumping outcomes in the absence of a European union. In a second step we then analyze whether these decisions alter with changing values of bargaining strength and wage preference for various product market constellations.

3.1. European Antidumping Policy in the absence of Unions ($\beta=0$ and $\epsilon=0$)

We start by assuming that the European Commission is interested in maximizing total Community welfare. The choice between a duty or an undertaking to achieve community welfare (G) depends on the parameters (a_d, a_f, γ). In order to show results in a two-dimensional space we first define a parameter s_A , which gives us the initial market size of the foreign firm relative to the initial market size of the domestic firm in the EU ($s_A = a_f/a_d$). Even in the absence of unions, price-undercutting, which is a necessary condition for filing an AD-complaint, can occur as a result of an asymmetry in market size and/or a product asymmetry ($a_d > a_f$ and $\gamma < 1$)

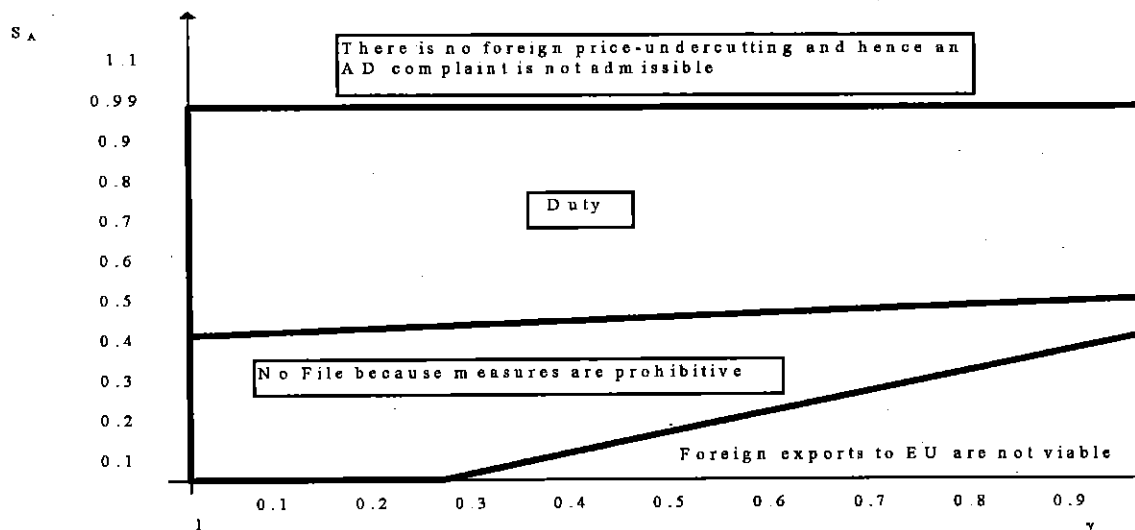


Figure 2: European AD policy in the absence of unions ($\beta=0$ and $\epsilon=0$) and in the Community's interest ($G = CS+PS+T$)¹³

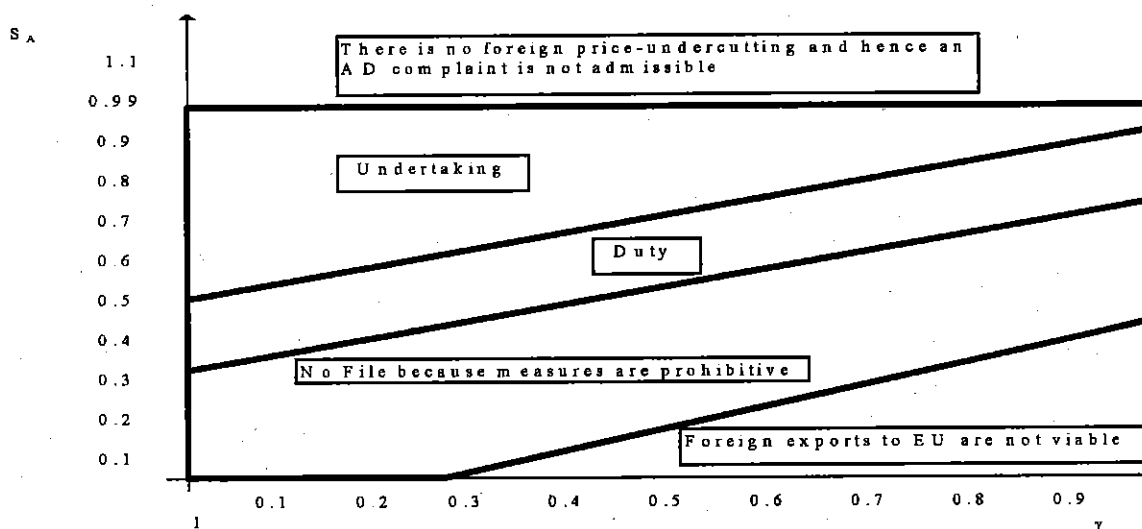


Figure 3: European AD policy in the absence of unions ($\beta=0$ and $\epsilon=0$) and in the producers's interest ($G=PS$)

Figures 2&3¹⁴ show the results in the absence of unions ($\beta=0$ and $\epsilon=0$), where the domestic wage is equal to the foreign wage and both are equal to zero ($w_d=w_f=0$) before we introduce the

¹³ In the simulations the parameter a_d was fixed at a value of 100. Changing values for s_A were obtained by varying a_f .

¹⁴ Both in figures 2 and 3 there are three different types of 'no filing'. In the bottom right corner (high values of γ and low values of s_A), the market conditions are not opportune for a foreign exporter to the EU. Under those market conditions the exporter prefers to sell nothing. In the bottom left corner of figure 2 and 3, the market is viable for a foreign exporter but only in the absence of measures. Antidumping protection would force the foreign firm to leave the EU market. However, prohibitive measures which lead to the exit of the foreign exporter after the measures have been imposed, are not allowed under EU antidumping legislation. Therefore, under these condition no measures can be imposed. The third category of 'no file' is situated in the top area of both figures. For high values of s_A , the foreign firm is not price-undercutting the domestic firm. Under these market conditions, an

additional asymmetry on the cost side due to a union on the domestic labour market. Figure 2 illustrates the outcome of the AD-process for the different parameter values when the European government is acting in the interest of the Community as a whole ($G=CS + PS + T$), while figure 3 shows the results when the European government disregards consumers' interests and duty revenue and only acts in the interest of domestic producers ($G=PS$)¹⁵.

An important difference between figure 2 and 3 is that in the event that the European government is maximizing total Community welfare (which is what it ought to do under the Community Interest Clause), only duties are optimal. According to our results undertakings only occur when the European Commission disregards consumer welfare.

Proposition 3: In the absence of unions, undertakings only occur when the government disregards consumer welfare, products are sufficiently differentiated and s_A is not too small.

3.2 European Antidumping Policy in the presence of Unions (for $\beta > 0$, $\varepsilon > 0$)

In the presence of unions ($\beta > 0$, $\varepsilon > 0$), a cost asymmetry ($w_d > w_f$) is added to the product and market size asymmetry ($a_d > a_f$, $\gamma < 1$). Equilibrium output for the domestic and foreign firm are given in table A.1 in the appendix and domestic welfare is now determined by the parameters a_d , a_f , γ , β , ε .

Analyzing the effect of positive bargaining power and wage preference implies checking how in the (s_A, γ) -space, the undertakings and duties area move with increasing values of β and ε . While parameters ε and β work in the same direction, the effect of an increase in β is stronger. Figure 4 presents the simulation results under the total Community welfare function with extremely strong unions ($\beta=0.9$, $\varepsilon=2$). The dotted lines in figure 4 refer to the simulation results in the absence of unions ($\beta=0, \varepsilon=0$) which were shown earlier in figure 2. From comparing figure 2 and 4 it is clear that because of the additional cost asymmetry ($w_d > w_f$), price-undercutting is larger (for similar values of s_A and γ) and is now also possible for higher values of s_A i.e. when foreign firms have an initial demand advantage.

antidumping complaint by the domestic firm will not be considered of relevance by European Officials.

¹⁵ Note that in the absence of unions, union rents are not included in the government welfare function (since $w_d = 0$).

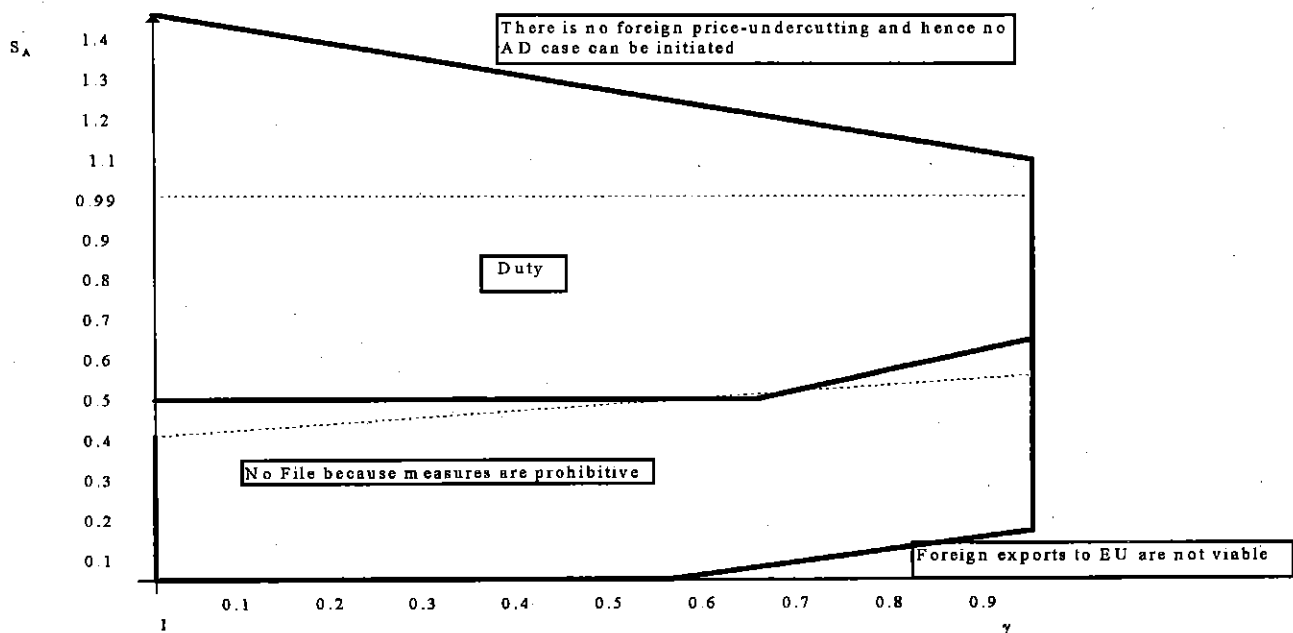


Figure 4: European AD policy in the presence of a strong union ($\beta=0.9$ and $\epsilon=2$) and in the Community's interest ($G=CS+PS+DR+UR$)

In the absence of unions, price-undercutting and hence filing was possible only for values of $s_A < 1$ i.e. an initial disadvantage for the foreign firm. In the presence of unions, the domestic industry will get a higher wage than the foreign workers. This additional asymmetry is the reason why price-undercutting still occurs for $s_A > 1$, at least when products are sufficiently differentiated (see proposition 1).

A more remarkable result is shown under the limited government welfare function in figure 5 ($G=PS +UR$)¹⁶ where the dotted lines refer to the simulation results in the absence of unions ($\beta=0, \epsilon=0$) which were shown earlier in figure 3. From comparing figures 3 and 5, it can be seen that the duty area has enlarged to the detriment of the undertakings area. This can be explained as follows. In the absence of unions ($\beta=0, \epsilon=0$), domestic wages are the same under a duty as under an undertaking ($w_d=w_f=0$). Since undertakings yield higher prices, domestic profits in the absence of a union are higher under an undertaking compared to a duty. However, as bargaining power increases ($\beta>0$), the domestic wage increases over the foreign wage ($w_d > w_f=0$). From (14) we know that the wage increase for a particular value of β is highest under an undertaking. Therefore, despite the higher prices under an undertaking, domestic profits under an undertaking become lower than under a duty.

¹⁶ Similar results are obtained when the government would only look at local Producer Surplus (PS) and ignore Social Europe.

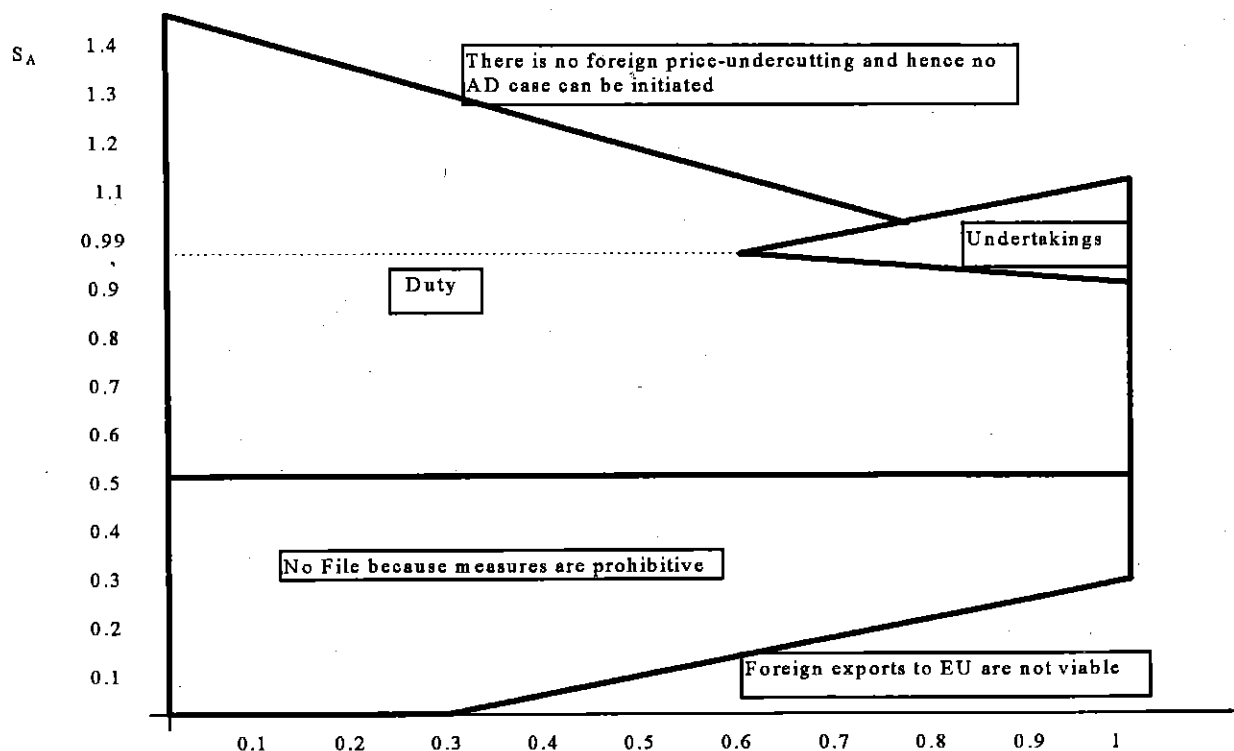


Figure 5: European Antidumping Policy in the presence of a strong union ($\beta=0.9$ and $\epsilon=2$) and in the domestic producers' and unions' interest ($G=PS + UR$)

In figure 5 it can be seen that in the event of very strong unions, only when the foreign market size is substantial ($0.9 < s_A < 1$) and products are close substitutes ($\gamma > 0.6$), is the sum of domestic profits and Union rents under an undertaking still higher than under a duty: $(PS + UR)_{UND} > (PS + UR)_{Duty}$. Only in those cases will the EU government, who is acting under a limited welfare function still decide on an undertaking. Under all other conditions, a duty is more beneficial.

The impact of unionized wage differentials can also be analysed in a continuous fashion. The effects of bargaining power on the type of anti-dumping measure, depend on the characteristics of the product market competition. This can be seen from figure 6 where we show in the (s_A, β) space the AD-outcomes under two extreme product market competition regimes; *weak Cournot quantity competition* with highly differentiated products ($\gamma=0.2$) which is indicated by the bold lines and *strong Bertrand price competition* with more homogeneous goods ($\gamma=0.8$) which is indicated by the dotted lines. The simulation results under these two regimes suggest that under strong competition, the effect of union bargaining power on the type of AD-measure is negligible. With not much rents to be shared in case of strong competition, the impact of higher union power (β) to capture a larger share of these rents is limited. With weak competition, the product market rents are bigger which makes an increase in bargaining power more rewarding for unions. Hence, under weak competition we observe more variability in the type of AD-measure imposed as a function of bargaining power (β) than under strong competition. There is a clear tendency of higher levels of bargaining power to result in more

duties rather than undertakings, at least when bargaining power is high enough and s_A is not extremely high or low. Furthermore, strong competition leaves a lower likelihood of AD measures, given the smaller viability of the market for the foreign sales. The effects of bargaining power on the type of AD-measures under different degrees of price competition can be summarized in the following proposition:

Proposition 4: *When the European government disregards consumers' interests, it holds that the stronger the bargaining power (β), the higher the cost asymmetry, the more likely that duties are imposed and the less likely undertakings are imposed, at least when competition is weak. With strong product market competition bargaining power has a negligible effect on the type of AD measures.*

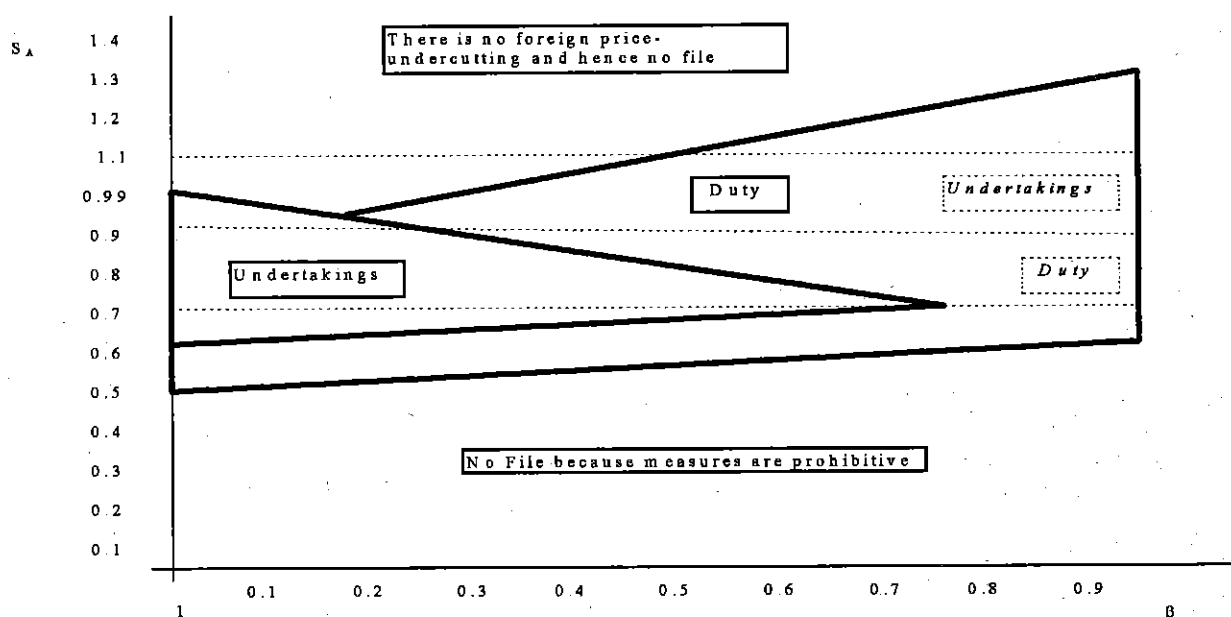


Figure 6: The effect of Bargaining Power on the type of antidumping measures under weak competition (Cournot, $\gamma=0.2$) (bold lines) versus strong competition (Bertrand, $\gamma=0.8$) (dotted lines) and limited welfare function $G=PS+UR$ ($\epsilon=1$).

3.3. Welfare Effects: who gains and who loses from protection ?

The section provides some results on how union bargaining power affects the welfare impact of AD policy and this for varying degrees of price competition in the market. The results are derived under numerical simulations, focusing only on cost asymmetries, eliminating market size asymmetries ($s_A=1$). Only main tendencies are discussed. In Konings, Vandebussche and Veugelers, (1997) a more detailed welfare ranking is provided. See also appendix for a graphical presentation of the results.

a) In the absence of Unions ($\beta=0$ and $\epsilon=0$)

In the absence of unions, a duty increases domestic profits, but reduces consumer welfare. The increase in profits and the duty revenue, is sufficient to overcome the consumers' losses, hence

total EU welfare increases compared to free trade. The foreign firm's profits however are reduced with a duty.

In the event of an undertaking, European profits increase even more than under a duty, domestic price is always higher and hence consumer welfare is lower than under a duty irrespective of the degree of price competition. Here there is no compensating duty revenue in the coffers of the EU to overcome consumers' losses and hence total welfare decreases.

b) In the presence of Unions ($\beta > 0$ and $\varepsilon > 0$)

With positive bargaining power, domestic prices rise in all scenarios and consumer surplus is always reduced compared to the absence of unions. Similar to Mezzetti & Dinopoulos (1991), we find that an increase in the bargaining power of a monopoly union, reduces domestic welfare in all scenarios. However, a duty partly offsets the negative welfare effect of bargaining power and increasingly so with higher levels of union power independent of the type of competition. With larger union power, protection through duties gives more union utility especially when competition is weak. Undertakings on the other hand reinforce the negative welfare effect of bargaining power and further decrease welfare below the free trade level. In contrast to duties, as union power and hence the cost asymmetry becomes larger, the detrimental welfare impact of undertakings also becomes larger.

The interests of the local union and the local producer in terms of whether and which AD-protection to prefer, typically coincide irrespective of the degree of price competition. Under 'strong' competition an undertaking raises both domestic profits and union utility more than a duty. Hence, both firms and unions prefer protection and prefer this protection to be in the form of an undertaking, which is welfare inferior. Under 'weak' competition, both EU firms and unions prefer a welfare-superior duty because duties give rise to higher domestic profits and higher union utility than an undertaking, but only when bargaining power is high enough β^{17} . The higher the bargaining power, the higher the relative gains from protection for the unions and the lower these relative gains for the firm.

Proposition 5 : *Both in the presence and in the absence of a domestic union, undertakings have a detrimental welfare effect while duties have a beneficial welfare effect. Both the detrimental effect of undertakings and the beneficial effect of duties are higher when union power is higher. The Union's and European firm's incentives are aligned in terms of whether and which form of protection to prefer at the expense of consumer welfare.*

4. Empirical Findings

In this section we explore to what extent our theoretical findings correspond with empirical observations. The findings in this section must be seen as a first attempt to investigate whether

¹⁷ When competition is weak and β is low, a duty still leaves higher union utility, but domestic profits are higher under an undertaking, at least.

our theoretical framework is consistent with the observed empirical correlations. They are meant to stir further empirical investigation on these issues. We use data on all European AD-cases between 1985-95. To investigate the interaction between union bargaining power and EU AD-actions, we first need to empirically identify the parameter β which measures union's strength. A standard way of doing this is by starting from the union bargaining problem (e.g. Veugelers (1989)).

$$\text{Max}U(w, L)^\beta \pi^{1-\beta} \quad (15)$$

Maximising the above with respect to the wage implies that

$$w^\circ = w^a + \frac{\beta}{1-\beta} \frac{\pi^\circ}{L^\circ} \quad (16)$$

where superscript $^\circ$ denotes optimal and w^a denotes the alternative wage. Thus workers receive the alternative wage (w_a) plus a fraction of the firm's profit per employee (π°/L°). Equation (16) can be estimated using firm level data for each sector at the three digit NACE classification level. Ideally, we would require data at the European level. However, lack of sufficiently adequate company data prevented us for the moment from carrying out the empirical analysis at the European level. Alternatively, as a first empirical test we use firm level data for Belgium, as an example of a small open economy with strong labour unions. To estimate the bargaining power of unions we use company accounts data of all Belgian firms for the period 1987-94. The data cover all firms which had to submit full company accounts to the Central Accounts Administration¹⁸. Profits per employee (π°/L°) are computed as value added minus labour costs divided by the number of workers and normalized on the consumer price index. Also a proxy of the capital stock, net tangible assets, is included as one of the control variables. The wage (w°) is measured as the total labour costs divided by the number of employees in the firm and the alternative wage (w_a) is set equal to zero¹⁹. Since there is a potential endogeneity problem in estimating (16), an instrumental variables approach is used. The instruments used include the profit per employee at t-1 and year dummies. Appendix E shows the estimated bargaining power coefficients, β , for each three digit sector in which AD-cases occurred. The bargaining power for the labour union is estimated on average for all AD-industries at 0.10, with some sectors having zero bargaining power and the estimated maximum bargaining power is 0.64. This compares to an average bargaining power of 0.06 (minimum=0, maximum=0.36) for all the other sectors that never experienced AD actions. Furthermore, the Herfindhal concentration ratio is on average equal to 0.24 for sectors in which there were initiations of AD, while this is only 0.16 for the sectors where there were no initiations. These results already seem to suggest a positive correlation between the phenomenon of AD, union power and the degree of competition in sectors.

As a next step, the bargaining power coefficients were merged with data on anti-dumping cases. AD-measures are reported at the product level (8 digit HS-code). The merging

¹⁸ This means that all firms that satisfy at least two of the following three criteria are included: number of employees is at least 100, total assets exceed 50.85 million Belgian Francs, sales exceed 170 million Belgian Francs.

¹⁹ We experimented with using as the alternative wage the minimum wage in the sector, but this did not change our results.

od data sets required the analysis to be performed at sectoral level aggregating AD-measures from product to NACE three digit sector level. Over the period 1985-95 there were 249 EU AD-cases under investigation by the European Commission of which 21% were terminated without any measures²⁰; 30 % ended in an undertaking and 49% ended in duties (Official Journal of the EC, L-series, 1985-95). As a first observation we note that undertakings are frequently used in reality which according to our theory seems to suggest that the EU is using a limited welfare function thereby including only or mainly European producers' interests (proposition 3).

In order to test for the hypothesis that union bargaining power affects the likelihood and the level of AD-protection we would require information on actual duty and undertakings levels (proposition 1). Although on the basis of case studies it appears that in those AD-cases where duty levels are revealed by the Commission, they correspond to the injury margins and to the level of foreign price-undercutting, there are many cases in which duty levels are not made public and in the case of undertakings even less information about the degree of protection is given. Hence a formal test of whether union power affects the *level* of protection is not possible due to lack of observations. However, as a first test we tried to see whether the probability of AD-action (duty, undertaking, termination of a case) is higher in sectors with high bargaining power than in others which is what we would expect on the basis of proposition 1. In table 5a, column 1 we estimate a probit model, with as dependent variable a dummy equal to 1 if the sector never experienced an AD investigation. We find a positive and statistically significant effect of bargaining power on the probability of filing. This is what we expect as union bargaining power induces a cost asymmetry between the European firm and the foreign firm and hence increases the probability of protection.

We then tested in columns (2)-(7); for sectors with an AD action, whether bargaining power affects the type of AD protection and whether this varies with the degree of price competition (see proposition 4). In table 5a, column (2) we report the results of estimating a probit model with as the dependent variable taking the value 1 if the case ended with a duty and zero if the case ended with an undertaking²¹. To control for potential cyclical effects we also included the log of real GDP per capita. We find that the higher is the bargaining power, the higher the relative probability of having a duty. This confirms our theoretical prediction that higher bargaining power is associated with more duties and less undertaking (see Proposition 4).

To test the differential impact of bargaining power depending on the intensity of competition, an empirical proxy for the degree of price competition needs to be constructed. Two alternative measures were used and both indicated the same result. The first measure is the Herfindhal index of concentration. The data are classified to the subset of sectors facing low concentration versus the subset of sectors facing high concentration. Sectors with a Herfindhal index lower than 0.20 are classified as sectors facing "strong competition". Thus

²⁰ A termination occurs when the EU Commission fails to find evidence of dumping or injury or decides it is not in the interest of the Community to impose a measure. In our theoretical model terminations are perfectly anticipated by the domestic firm and no complaint would be filed

²¹ Termination cases were ignored in this part of the analysis. Including termination as a third possible case in a multinomial logit regression did not affect the reported results on duties versus undertakings (Konings, Vandenbussche & Veugelers (1997)).

concentration here is taken as a proxy, in the short run, for the degree of competition. The other measure used to classify the data is the degree of import penetration. We classified the sectors that faced higher than average import penetration as those sectors that face "strong" competition.

Table 5a, columns (3)-(8) show the results for the split regression. Column (3) reports the results for those sectors facing high import penetration, while column (4) represents those sectors facing weak import penetration. Likewise column (5) represents sectors with a low concentration ratio, while column (6) shows sectors facing high concentration. Comparing column (3) with column (4) we see that the effect of bargaining power only is statistically significant and positive in the subsample where firms face weak import penetration. Comparing column (5) with (6) we note that the effect of bargaining power is only statistically significant in the subsample of sectors with high concentration. Thus irrespective of the proxy that we use to measure the degree of price competition we find that the effect of bargaining power is stronger and statistically significant when firms face weak competition which is in line with Proposition 4.

In column (7) we interact import penetration with the bargaining coefficient and also include import penetration separately in the regression.²² The main result still holds: higher bargaining power implies more duties relative to undertakings. In addition, this effect weakens in sectors where import penetration is high or price competition is strong. Moreover, import penetration has also a direct positive effect on the probability of a duty relative to an undertaking. This could be related to an alternative interpretation of import penetration, namely as a proxy for the relative size of the market of foreign firms, the parameter s_A . As shown supra, the higher is this parameter, the higher the probability of duties relative to undertakings, irrespective of bargaining power.

Table 5a: Results Probit Regressions;

Dependent variable in column (1) is a dummy equal to 1 if there was a termination, 0 else, in all other columns the dependent variable is 1 if the AD action is a duty, 0 refers to undertaking

Outcome	(1)	(2)	(3) High Import	(4) Low Import	(5) Low Conc	(6) High conc	(7)
Beta	1.97* (1.13)	1.67** (0.85)	-1.00 (1.04)	7.26** (1.82)	-0.47 (1.47)	2.84** (1.10)	4.08** (1.35)
Import X beta							-0.37* (0.26)
Import							0.04* (0.029)
Pseudo R ²	0.04	0.02	0.07	0.16	0.002	0.06	0.06

²² Including concentration as an exogeneous variable in the regression analysis is more problematic as the outcome of an AD-action can affect concentration as shown by Veugelers and Vandebussche (1997).

Note: heteroscedastic robust standard errors in brackets, **/* stands for statistically significant at the 5% /10% critical level. All equations include log real GDP per capita as one of the control variables.

A final theoretical result that we want to illustrate empirically relates to the employment and wage effects of AD-actions. From proposition 2 we expect that for positive bargaining power duties have a positive effect on employment, while undertakings have a negative effect. In addition, both duties and undertakings should be positively correlated with wages, with undertakings having stronger effects. In order to fully test this proposition a rich empirical model needs to be developed, which takes into account the various spillover effects between bargaining, AD and employment and wages. Developing such a system of equations lies beyond the scope of this paper and hence the employment and wage equations should be seen as a first approximation to obtain an understanding of the correlations between these variables.

In table 5b we report employment and wage equations. The employment and wage data refer to firm level average employment and wages for each sector defined at the three digit NACE classification level. We included a dummy equal to 1 if the AD action was a duty and another dummy for undertakings. The benchmark is the 'free trade' case and refers to the sectors that had no AD measures or a termination of an AD initiation. The first two columns report reduced form employment and wage equations, while the last two columns report structural employment and wage equations and are estimated with Instrumental Variables. In the first two columns we included besides the AD dummies also the log of net tangible assets to control for capital intensity and the log of real GDP to take into account macro effects on employment and wages. In column (1), the employment equation, we can see that the effect of duties on employment is significant and positive, while undertakings have a negative effect on employment. Since proposition 2 is stated in terms of sectors facing positive bargaining power we also experimented with restricting the sample to include those sectors that only have positive bargaining²³. The sign of the coefficients remained the same, but the statistical significance of the effect of undertakings disappeared. This could be related to the limited number of undertakings observed in the restricted sample. In column (2) the wage equation is reported: both duties and undertakings have a positive effect on wages. When the sample was restricted to those sectors with only positive bargaining power the effect of undertakings remained statistically significant and became stronger. In the last two columns we report the results of estimating a structural employment and wage equation using instrumental variables, with as instruments including lagged values of the endogenous variables and the bargaining power. We obtain a strong positive effect of duties and a strong negative effect of undertakings on employment determination (column 3). Likewise, for the wage equation we find a positive effect of both duties and undertakings on wages, with the latter dominating the former. All these results seem to be consistent with the predictions of proposition 2.

²³ . Because bargaining power is highly endogenous and because there are no obvious instruments available we opted for not including bargaining power in the regressions.

Table 5b: Employment and Wage Equations

	Ln(employment) OLS	Ln(wages) OLS	Ln(employment) IV	Ln(wages) IV
Duty	0.13* (0.08)	0.063** (0.02)	0.17** (0.09)	0.047** (0.024)
Undertaking	-0.25** (0.09)	0.065** (0.02)	-0.27 (0.10)	0.105** (0.027)
Ln(wages)	-	-	-0.43* (0.29)	-
Ln(output)	-	-	-	0.077** (0.04)
Ln(capital)	0.51** (0.02)	0.10** (0.03)	0.54** (0.03)	0.04 (0.03)
Ln(GDP/capita)	0.02 (0.12)	0.10** (0.03)	0.11 (0.14)	0.077** (0.036)
Adjusted R ²	0.67	0.55	0.64	0.57

Notes: standard errors in brackets; * resp. ** denotes statistically significant at respectively the 5% and 10% critical level, all equations include a constant term. In column (3) the instruments that were used are lagged wage and lagged employment; while in column (4) the instruments are lagged wage and lagged output.

Although the results from Table 5a and 5b seem to be in line with the theoretical predictions, the proxies that we used to measure bargaining power and the degree of price competition are not perfect. Also the employment and wage equations could be modeled in more detail (e.g. allowing for dynamic effects). Thus the above results should be interpreted with care. The main purpose of the above experiments is to stir attention to induce further testing on these relationships.

5. Conclusions

In this paper we showed how domestic labour union bargaining power, by inducing cost asymmetries between domestic and foreign producers, has a strong impact on European Union anti-dumping decisions, especially when product market competition is weak. Since AD-measures lead to rents for domestic firms, labour unions have an interest in capturing and influencing the size of this rent. The model shows that labour unions can lead to higher levels of AD-protection. Since higher union bargaining power results in higher wages and hence more price-undercutting, union's strength enhances the likelihood of AD-measures leading to higher levels of protection. But in addition, the cost asymmetry induced by labour market imperfections, also determines the difference in market outcome between a duty and an undertaking as AD-measure. An AD-duty is like an import tariff while an undertaking forces the foreign firm no longer to price-undercut the domestic firm. When the EU government uses a limited welfare function thereby ignoring consumer interests, stronger cost asymmetries induced by higher union bargaining power lead to more duties relative to undertakings being

imposed. As union's bargaining power is higher, and when competition is weak, domestic firms no longer prefer undertaking to duties, as more rents are shifted towards unions with undertakings as compared to duties. The stronger is the competition, the smaller the rents to be captured, and hence the smaller the impact of unions on the likelihood and type of AD-measures.

The impact of unions' bargaining power on the welfare consequences of AD-policies is also briefly discussed. The higher the cost asymmetry due to union bargaining power, the more beneficial is the impact of duties on welfare due to rent-shifting, while the detrimental effect of undertakings on welfare increases as bargaining power rises. This is an important result, given that higher bargaining power also induces a higher probability of duties relative to undertakings. With protection increasing union utility, domestic firms and unions preferences are aligned, also with respect to the type of AD-measure that they prefer.

Some empirical evidence on the relationship between union bargaining and the likelihood and type of AD-policy is provided. Industries in which AD-cases were initiated in the EU between 1985-95 were identified. Using firm level panel data for Belgium, labour union bargaining power was first estimated per sector and then included in a probit model to test how bargaining power affects the likelihood and type of AD-measure imposed. We find evidence for our theoretical predictions that, at least when competition is weak, higher levels of bargaining power increase the likelihood of duties over undertakings. Similarly in this case, higher import penetration leaves more probability for duties relative to undertakings. When competition is strong, union bargaining power shows no significant effect on AD-policy. In addition, the data support the hypothesis that the type of AD-measure affects employment and wage growth as suggested by our theoretical framework.

The findings in this paper suggest that cost asymmetries, as induced by labour market imperfections through the presence of unions, are important in explaining the outcomes and effects of strategic trade policy in imperfectly competitive industries. With these phenomena, union bargaining power and AD-policy, so closely entwined, certainly in more concentrated industries, this paper hopes to incite further research on this underexplored relationship.

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Appendix A

Table A.1 : COURNOT Solutions to the Model for β and $\epsilon > 0$

	w_d	q_d^*	$q_F(q_d)$	t
No file	(1), (2)	$\frac{\beta \cdot \epsilon \cdot (2a_d \gamma \cdot a_F + \gamma \cdot w_F)}{2 \cdot \beta(\epsilon - 1) + 4}$	$\frac{(2a_d \gamma \cdot a_F + \gamma \cdot w_F) \cdot (2 - \beta)}{(2 + \beta(\epsilon - 1)) \cdot (4 - \gamma^2)}$	$\frac{a_F - w_F - \gamma \cdot q_d^*}{2}$
	(3)	$\frac{\beta \cdot \epsilon \cdot (2a_d \gamma \cdot a_F + \gamma \cdot w_F + \gamma \cdot t(\beta))}{2 \cdot \beta(\epsilon - 1) + 4}$	$\frac{(2a_d \gamma \cdot a_F + \gamma \cdot w_F + \gamma \cdot t(\beta)) \cdot (2 - \beta)}{(2 + \beta(\epsilon - 1)) \cdot (4 - \gamma^2)}$	$\frac{a_d - a_F - (1 - \gamma) \cdot q_d^* + (1 - \gamma) \cdot q_F}{2}$
File	Duty			
(4)	$\frac{\beta \cdot \epsilon \cdot (a_d \gamma \cdot (a_F - a_d) / (1 - \gamma))}{2 + \beta \cdot (\epsilon - 1)}$	$\frac{(a_d \gamma \cdot (a_F - a_d) / (1 - \gamma)) \cdot (2 - \beta)}{2 \cdot (1 + \gamma) \cdot (2 + \beta \cdot (\epsilon - 1))}$	$q_d^* - (a_F - a_d) / (1 - \gamma)$	

Table A.2: BERTRAND Solutions to the Model for β and $\epsilon > 0$

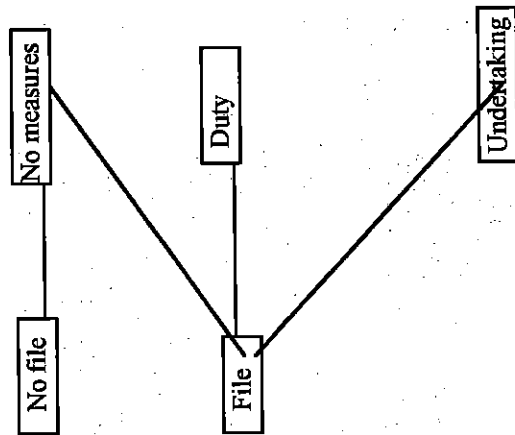
For Bertrand competition we invert the inverse demand functions used under Cournot. The demand functions under Bertrand are then given by

$$q_D = h_D + k \cdot p_F - \delta \cdot p_D$$

$$q_F = h_F + k \cdot p_D - \delta \cdot p_F$$

with

$$h_D = \frac{a_D - \gamma \cdot a_F}{1 - \gamma^2}; \quad k = \gamma / (1 - \gamma^2); \quad h_F = \frac{a_F - \gamma \cdot a_D}{1 - \gamma^2}; \quad \delta = 1 / (1 - \gamma^2)$$



	w^*_D	$\bar{p}_D(w_D)$	$\bar{p}_F(w_D)$
(1), (2)	$\frac{\beta \cdot \epsilon \cdot (2\delta \cdot h_D + k \cdot (h_F + \delta \cdot w_F))}{(\beta - 2 - \beta \cdot \epsilon) \cdot (k^2 - 2 \cdot \delta^2)}$	$\frac{2\delta \cdot (h_D + \delta \cdot w_D) + k \cdot (h_F + \delta \cdot w_F)}{4 \delta^2 - k^2}$	$\frac{2\delta \cdot (h_F + \delta \cdot w_F) + k \cdot (h_D + \delta \cdot w_D)}{4\delta^2 - k^2}$
(3)	$\frac{\beta \cdot \epsilon \cdot (2\delta \cdot h_D + k \cdot (h_F + \delta \cdot w_F + \delta \cdot t(\beta)))}{(\beta - 2 - \beta \cdot \epsilon) \cdot (k^2 - 2 \cdot \delta^2)}$	$\frac{2\delta \cdot (h_D + \delta \cdot w_D) + k \cdot (h_F + \delta \cdot w_F + \delta \cdot t(\beta))}{(4 \delta^2 - k^2)}$	$\frac{2\delta \cdot (h_F + \delta \cdot w_F + \delta \cdot t(\beta)) + k \cdot (h_D + \delta \cdot w_D)}{4\delta^2 - k^2}$
(4)	$\frac{\beta \cdot \epsilon \cdot h_D}{(2 - \beta + \beta \cdot \epsilon) \cdot (\delta - k)}$	$\frac{h_D + w_D(\delta - k)}{2 \cdot (\delta - k)}$	$\frac{h_D + w_D(\delta - k)}{2 \cdot (\delta - k)}$

Appendix B: Cournot Calculations

The quantities resulting from the product market Cournot equilibrium in the final stages of the game are:

No File (1) = No Measures (2)

$$q_d = \frac{2.(a_d - w_d) - \gamma.(a_f - w_f)}{4 - \gamma^2} \quad (\text{B.1})$$

$$q_f = \frac{2.(a_f - w_f) - \gamma.(a_d - w_d)}{4 - \gamma^2} \quad (\text{B.2})$$

The effects of the domestic wage w_d on the equilibrium quantities are

$$\frac{\partial q_d}{\partial w_d} = \frac{-2}{4 - \gamma^2} < 0 \quad (\text{B.3})$$

$$\frac{\partial q_f}{\partial w_d} = \frac{\gamma}{4 - \gamma^2} > 0 \quad (\text{B.4})$$

The equilibrium value of the domestic wage can be found by plugging (B.1) into (5) and solving for w_d . This gives:

$$w_d = \frac{\beta.\varepsilon.q_d.(4 - \gamma^2)}{2.(2 - \beta)} \quad (\text{B.5})$$

By replacing q_d in equation (B.5) by its equilibrium value given in (B.1) we get the equilibrium value for the domestic wage in terms of all the exogenous parameters which occurs in table 1.

Duty (3)

$$q_d = \frac{2.(a_d - w_d) - \gamma.(a_f - w_f - t)}{4 - \gamma^2} \quad (\text{B.6})$$

$$q_f = \frac{2.(a_f - w_f - t) - \gamma.(a_d - w_d)}{4 - \gamma^2} \quad (\text{B.7})$$

The effects of the domestic wage w_d on the equilibrium quantities are

$$\frac{\partial q_d}{\partial w_d} = \frac{-2}{4 - \gamma^2} < 0 \quad (\text{B.8})$$

$$\frac{\partial q_f}{\partial w_d} = \frac{\gamma}{4 - \gamma^2} > 0 \quad (\text{B.9})$$

The equilibrium value of the domestic wage can be found by plugging (B.6) into (5) and solving for w_d . This gives:

$$w_d = \frac{\beta \cdot \varepsilon \cdot q_d \cdot (4 - \gamma^2)}{2 \cdot (2 - \beta)} \quad (\text{B.10})$$

By replacing q_d in equation (B.10) by its equilibrium value given in (B.6) we get the equilibrium value for the domestic wage in terms of all the exogenous parameters which occurs in table 1.

Undertaking (4)

An undertaking implies that the domestic price and the foreign price after the undertaking have to be equal :

$$P_d = P_f \quad (\text{B.11})$$

$$a_d - q_d - \gamma \cdot q_f = a_f - q_f - \gamma \cdot q_d \quad (\text{B.12})$$

$$q_f = \frac{a_f - a_d}{1 - \gamma} + q_d \quad (\text{B.13})$$

An undertaking implies that the European firm becomes a Stackelberg leader while the foreign firm follows a reaction function given by (B.13).

The equilibrium quantities then become:

$$q_d = \frac{a_d - w_d - \gamma \cdot (a_f - a_d) / (1 - \gamma)}{2 \cdot (1 + \gamma)} \quad (\text{B.14})$$

$$q_f = q_d + (a_f - a_d) / (1 - \gamma) \quad (\text{B.15})$$

The effects of the domestic wage w_d on the equilibrium quantities are

$$\frac{\partial q_d}{\partial w_d} = \frac{-1}{2(1 + \gamma)} < 0 \quad (\text{B.16})$$

$$\frac{\partial q_f}{\partial w_d} = \frac{-1}{2(1 + \gamma)} < 0 \quad (\text{B.17})$$

In contrast to a duty an undertaking reduces both the domestic and the foreign output which results in the most anti-competitive outcome.

The equilibrium value of the domestic wage can be found by plugging (B.12) into (5) and solving for w_d . This gives:

$$w_d = \frac{\beta \cdot \varepsilon \cdot (a_d - \gamma \cdot (a_f - a_d) / (1 - \gamma))}{2 + \beta(\varepsilon - 1)} \quad (\text{B.18})$$

Appendix C: Bertrand Calculations

For Bertrand competition we inverted the demand functions used under Cournot which are shown in table A.2 in the text.

The equilibrium prices in the final stage of the game then become:

No File (1)=No Measures (2)

$$p_d = \frac{2.\delta.(h_d + \delta.w_d) + k.(h_f + \delta.w_f)}{4.\delta^2 - k^2} \quad (C.1)$$

$$p_f = \frac{2.\delta.(h_f + \delta.w_f) + k.(h_d + \delta.w_d)}{4.\delta^2 - k^2} \quad (C.2)$$

The effects of the domestic wage w_d on the equilibrium prices are

$$\frac{\partial p_d}{\partial w_d} = \frac{2.\delta^2}{4.\delta^2 - k^2} > 0 \quad (C.3)$$

$$\frac{\partial p_f}{\partial w_d} = \frac{k.\delta}{4.\delta^2 - k^2} > 0 \quad (C.4)$$

The equilibrium value of the domestic wage can be found by plugging (C.1) into (5) and solving for w_d . This gives:

$$w_d = \frac{\beta.\varepsilon.(2.\delta.h_d + k.(h_f + \delta.w_f))}{(k^2 - 2.\delta^2).(\beta - 2 - \beta.\varepsilon)} \quad (C.5)$$

Duty (3)

$$p_d = \frac{2.\delta.(h_d + \delta.w_d) + k.(h_f + \delta.w_f + \delta.t)}{4.\delta^2 - k^2} \quad (C.6)$$

$$p_f = \frac{2.\delta.(h_f + \delta.w_f + \delta.t) + k.(h_d + \delta.w_d)}{4.\delta^2 - k^2} \quad (C.7)$$

The effects of the domestic wage w_d on the equilibrium quantities are

$$\frac{\partial p_d}{\partial w_d} = \frac{2.\delta^2}{4.\delta^2 - k^2} > 0 \quad (C.8)$$

$$\frac{\partial p_f}{\partial w_d} = \frac{k \cdot \delta}{4 \cdot \delta^2 - k^2} > 0 \quad (\text{C.9})$$

The equilibrium value of the domestic wage can be found by plugging (C.6 and C.7) into (5) and solving for w_d . This gives:

$$w_d = \frac{\beta \cdot \varepsilon \cdot (2 \cdot \delta \cdot h_d + k \cdot (h_f + \delta \cdot w_f + \delta \cdot t))}{(k^2 - 2 \cdot \delta^2) \cdot (\beta - 2 - \beta \cdot \varepsilon)} \quad (\text{C.10})$$

Undertaking (4)

An undertaking implies that the domestic price and the foreign price after the undertaking have to be equal :

$$p_d = p_f \quad (\text{C.11})$$

An undertaking implies that the European firm becomes a Stackelberg leader while the foreign firm follows a reaction function given by (C.11).

The equilibrium prices then become:

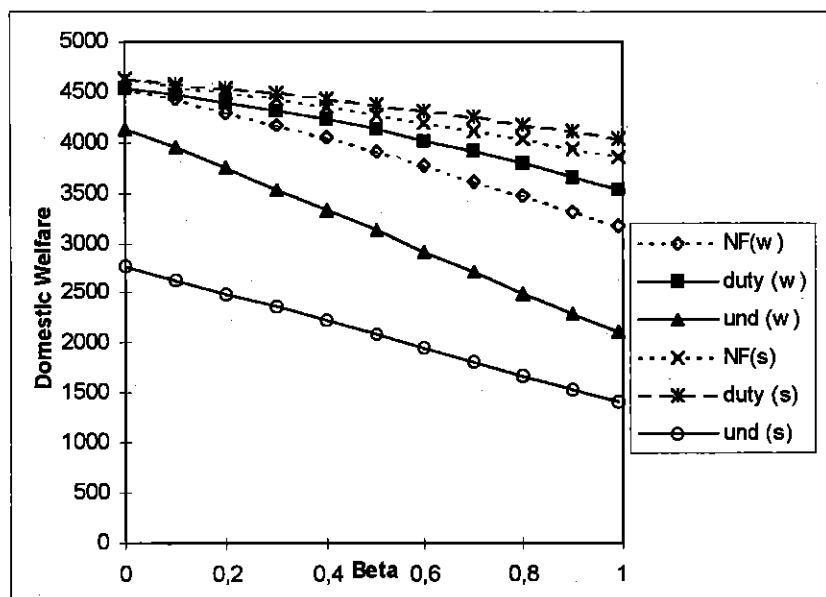
$$p_d = \frac{h_d + w_d \cdot (\delta - k)}{2 \cdot (\delta - k)} = p_f \quad (\text{C.12})$$

The effects of the domestic wage w_d on the equilibrium prices are

$$\frac{\partial p_d}{\partial w_d} = \frac{1}{2} = \frac{\partial p_f}{\partial w_d} > 0 \quad (\text{C.13})$$

Appendix D: WelfareEffects

Figure A.1. : Total Domestic Welfare ($W=CS+PS+UR+T$)
 as a Function of Bargaining Power/Cost asymmetry ($s_A=1$)
 w=weak (Cournot & $\gamma=0.2$) / s=strong (Bertrand & $\gamma=0.8$)



Appendix E: Bargaining Power per Sector

Nace code	β
221	0.11
222	0.47
223	0.15
224	0.23
231	0.05
239	Ns
242	0.05
243	Ns
245	Ns
247	0.11
252	0.06
253	Ns
256	0.06
257	Ns
259	0.11
260	Ns
311	0.38
313	0.08
316	0.08
325	Ns
326	Ns
328	0.11
330	Ns
342	0.23
344	0.12
345	Ns
346	Ns
347	0.30
363	Ns
373	0.24
436	0.09
439	0.10
451	0.64
455	Ns
462	Ns
466	0.21
471	Ns
472	Ns
481	0.14
483	0.06
495	Ns

Note: Ns stands for not statistically significant; these coefficients were estimated using instrumental variables.

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