DISCUSSION PAPER SERIES

No. 3571

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Jozef Konings and Hylke Vandenbussche

INTERNATIONAL TRADE

Centre for Economic Policy Research

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Available online at: **www.cepr.org/pubs/dps/DP3571.asp**

ISSN 0265-8003

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Jozef Konings, Catholic University of Leuven and CEPR
Hylke Vandenbussche, Catholic University of Leuven and CEPR

Discussion Paper No. 3571
October 2002

Centre for Economic Policy Research
90–98 Goswell Rd, London EC1V 7RR, UK
Tel: (44 20) 7878 2900, Fax: (44 20) 7878 2999
Email: cepr@cepr.org, Website: www.cepr.org

CEPR Discussion Paper No. 3571

October 2002

ABSTRACT

Does Antidumping Protection Raise Market Power? Evidence from Firm Level Data*

This Paper empirically tests the effects of Anti-Dumping (AD) protection on the price-cost margin of firms. To this end, we use a rich panel data set of 1,666 EU producers that were involved in AD cases initiated in 1996. Our findings indicate that price-cost margins in most cases significantly increase in the period of protection compared to a period before protection. In industries where competition is very tough before protection, we fail to find an increase in price-cost margins, while in industries with positive mark-ups before protection, trade policy raises market power between 3 and 15 percentage points, depending on the sector. Our results are robust to alternative specifications and estimation techniques. Our findings are also consistent with recent theoretical models that deal with the economic effects of firm behaviour in response to AD protection.

JEL Classification: F13, L13 and L41
Keywords: antidumping cases, European producers, market power and price-cost mark-ups

Jozef Konings
Department of Economics
Catholic University of Leuven
Naamsestraat 69
3000 Leuven
BELGIUM
Tel: (32 16) 326 589
Fax: (32 16) 326 599
Email: jozef.konings@econ.kuleuven.ac.be

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Hylke Vandenbussche
Department of Applied Economics
Catholic University of Leuven
Naamestraat 69
3000 Leuven
BELGIUM
Tel: (32 16) 326 920
Fax: (32 16) 326 732
Email: hylke.vandenbussche@econ.kuleuven.ac.be

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www.cepr.org/pubs/new-dps/dplist.asp?authorid=125478

* We thank Jim Harrigan, Jim Markusen, Pertti Haaparanta, Werner Roeger, Johan Van Biesebroeck, Frank Verboven, Frederic Warzynski and Ana Xavier for useful comments and discussions. We also thank the participants of the Nordic workshop 2002 in international trade. We are grateful to the Belgian Fund for Scientific Research (FWO) for financial support of grant n° G0122.98.

Submitted 27 August 2002

NON-TECHNICAL SUMMARY

This Paper applies the Roeger (1995) methodology to estimate the effect of European antidumping policy on market power in firms. We focus on all EU antidumping cases that were initiated in 1996 and match them with micro data of firms that directly or indirectly benefited from antidumping actions. To this end we make use of company accounts data of 1,666 European firms producing the product that receives antidumping protection. We trace these firms between 1991-9, which allows us to compare market power of firms before antidumping protection took place (1991-6) versus the market power of the same firms after protection took place (1997-9).

Our empirical findings indicated that the increase in mark-ups (i.e. the ratio of price over marginal cost) after antidumping protection has been put in place can vary between 0 and 15 percentage points depending on the product involved. Industries where no or little market power is present before protection, the imposition of a duty does not raise market power after protection, which is what we expect in competitive industries. 'Artificial Corundum' belonging to the Chemical industry and 'Seamless Pipes and Tubes' belonging to the Steel industry both belong to this category of cases. In contrast, those industries with prices lying significantly above cost before protection experienced the largest increase in market power after antidumping protection. Products like 'Cotton Fabrics', 'Farmed Atlantic Salmon' and 'Synthetic Fibre Ropes' belong to this category. In one antidumping case where most exporting firms accepted price-undertakings (i.e. a voluntary increase of the price set by the alleged dumper to the level of the EU producer), we found the increase in market power for the European firms involved to be higher than in the antidumping cases that were concluded with a duty on foreign imports. This illustrates the more collusive nature of price-undertakings as documented in the theoretical literature. We also found that for the one termination case in our sample, where the European Commission after the investigation came to the conclusion that no protective measures were needed, we failed to find an increase in market power for the European firms.

In this Paper we devoted particular attention to testing for the robustness of our results. This was achieved by using different estimation techniques like OLS, random effects, fixed effects and robust regression that are all reported in the text. In addition we applied a second methodology to test for changes in market power, by testing directly the effects of protection on observed price-cost margins, a method documented by Tybout (2001). We applied this method both on the firms in our sample and on a counterfactual, consisting of firms outside the EU but operating in the same lines of business. Applying this method on the firms in our sample also indicated a significant increase in market power after antidumping protection that confirmed our results found

previously. However, for the counterfactual firms we failed to find an increase in market power over the same period, suggesting that the increase in market power experienced by the EU firms was really due to the EU common antidumping policy and not to some trend or event in the industries concerned.

In all our regressions we controlled for other factors that may account for changes in market power like cyclical and business effects, demand and time effects and firm specific technology or sunk costs.

I. Introduction

Over the last two decades consecutive multilateral trade talks of the GATT/WTO have resulted in a general reduction of tariffs, voluntary export restraints and quotas. At the same time a rise in new forms of trade protection has occurred, in particular the use of antidumping (AD) measures has increased rapidly. Blonigen and Prusa (2001) indicate in a recent review of the literature that since 1980 GATT/WTO members have filed more complaints under the AD statute than under all other trade laws combined. Moreover, an increased number of AD duties are now levied in any one year worldwide than were levied in the entire period 1947-1970.

A number of papers have shown that trade liberalization has a disciplining effect on firms' pricing behavior. Levinsohn (1993) for Turkey and Harrison (1994) for Chile estimate the effects of trade liberalization on price markups and find that markups mostly go down after trade liberalization. A similar result is found by Krishna and Mitra (1998) for India. Botasso and Sembenelli (2001) find evidence that the introduction of the EU single market program, which implied the removal of non-tariff barriers within the EU, has led to a reduction of market power, but only in the so called 'sensitive' sectors. All these papers have looked at what happens to market power of domestic firms when trade liberalization takes place. However, given the enormous increase in the use of AD actions it is interesting to analyze the reverse question: What happens to domestic firms' market power once protection against imports is achieved? Either markups should stay the same if there is sufficient domestic competition or they should increase if there is potential for strategic price setting behavior. While there exist some evidence based on trade data that shows increased import values of products (Harrison, 1991; Prusa, 1997), there is no paper

that analyzes what happens to domestic firms' pricing behavior once protection against importers is achieved.

A number of recent theoretical papers have shown that the AD legislation in imperfectly competitive industries can give rise to strategic price setting behavior of domestic firms which may result in increased market power of domestic firms.[1] This paper tests empirically whether AD protection gives rise to an increase in market power. For this purpose we use firm level data to estimate markups before and after receiving AD protection in the European Union[2]. Our findings suggest that markups are significantly higher during the protection period compared to the period before the protection. This result is robust to alternative econometric specifications and estimation techniques (OLS, fixed effects, random effects, robust regression). It is robust to potential business cycle effects that may affect the markups of firms, it is also robust to the inclusion of fixed effects which capture other variables that are likely to have an effect on markups like technology, or the amount of sunk costs or advertising outlays at the firm level.

The rest of the paper is structured as follows. Section II discusses the effect of antidumping measures on domestic prices as predicted by the literature. Section III explains the methodology that we use to estimate markups and discusses the company data that we use. In section IV we discuss our findings. Both on the basis of the pooled data across AD cases as well as on the case-by-case analysis we find that antidumping protection significantly raises firms' markups. In section V we carry out a robustness test by turning to the Price-Cost Margin (PCM) methodology, which is an alternative method to test for market power based on using gross margins and

[1] Fischer (1992), Reitzes (1993), Prusa (1994), Veugelers and Vandenbussche (1999), Pauwels et al. (2001) among others.
[2] Although the EU and US antidumping laws are by and large the same, for a detailed description of the differences between them we refer to Konings et al. (1999).

relating them to AD protection. Again we find a significant increase in market power as a result of AD protection. In addition, we also construct a counterfactual, with firms from outside the EU but operating in the same lines of business, for which we fail to find an increase in market power over the same period. This confirms the core result of our paper that the increase in market power for EU firms was due to the common EU antidumping policy rather than to an industry or time trend. Section VI is a concluding one.

II. Theoretical background

An AD duty is very similar to a tariff. The positive effect of tariffs on prices is very robust across a very wide range of oligopoly specifications (Helpman and Krugman, 1989). Simply consider what happens in a duopoly model with a home and a foreign firm. A duty on foreign imports when competition is in strategic complements results in an increase of the domestic price (Brander, 1995). Hence, duty protection implies that the home price will be higher under protection than under free trade. The same result holds under competition in strategic substitutes (Cournot). A duty on foreign imports results in a higher output for the protected domestic firm and a lower output for the foreign firm. It can be shown that the drop in foreign output is larger than the increase in domestic output, resulting in a higher domestic price after duty protection. This gives us a clear prediction for our empirical work. Based on the theory we then expect to find that European firms when protected by AD duties[3] have an increase in market power[4].

[3] In the EU, antidumping measures can either take the form of a duty or of a price undertaking. While a duty is like a tariff, a price undertaking is a voluntary price increase by the importers. Price-undertakings are believed to induce collusion and raise market power (Belderbos et al, 2001).

[4] A few exceptions exist with respect to this general result. When demand is very convex, Cournot reaction functions can become upward sloping and the effect of a tariff on domestic prices can be

The models described above are however static in nature. In recent years a number of dynamic models have been developed, taking into account that firms involved in AD cases may have incentives to behave strategically to influence AD outcomes (Fischer, 1992; Reitzes, 1993; Prusa, 1994; Pauwels et al. 2001). This implies that in the period before protection, prices can differ from what they would be under free trade. Empirical predictions on how prices move in the period just before protection are not straightforward since some models predict a pro-competitive effect while others predict an anti-competitive effect, depending on whether strategic substitutes or complements are assumed and depending on how the duty is determined. In contrast, second period results, when antidumping measures are actually imposed, are the same in all these models namely, domestic prices go up vis-à-vis free trade when a duty is imposed. It is on this result that we focus in the empirical analysis.

One additional remark is in order here. So far we have discussed the effects of trade policy under a fixed number of firms. The question can be raised what would happen to market power when trade policy triggers entry. A number of papers have argued that in general when entry is free, the effects of trade policy can be dampened by entry and exit (Head and Ries, 1999; Markusen and Venables, 1988). The rate of entry is a function of how much it costs to get into or out of a certain industry and of the length of the protection period. Sunk costs are an important entry-barrier. Therefore it can be expected that especially in industries where sunk costs are large, trade policy is likely to have larger effects than in industries with free entry as shown by Bernard and Jensen (1999). Also when the duration of protection is limited, like in

different than the one described here. Also, a few papers have shown that tariff and quota protection in a dynamic context under certain conditions can result in more competition rather than less (R. Deneckere and C. Davidson, 1985 and J. Rotemberg and G. Saloner, 1989)

the case of AD measures, entry is less likely to occur than under more permanent tariff changes[5].

However, in this paper we do not want to engage in discussing or explaining the different levels of market power we observe in different industries even before protection takes place. The question of interest here is whether we observe a significant *change* in market power after antidumping protection sets in.

III. Empirical Methodology and Data

III.1. Methodology

Our methodology is based on Roeger (1995), which starts from the approach introduced by Hall (1988, 1990) to estimate markups. Under constant returns to scale in production, assuming two input factors, labor and capital, the primal Solow residual (SR) can be related to the markup of price over marginal cost (μ=P/MC). Using lower case letters to denote natural logarithms we can write the primal SR as

$$SR_{it} = \Delta q_{it} - \alpha_l \Delta l_{it} - (1-\alpha_l)\Delta k_{it} = (\mu_{it} - 1)\alpha_l (\Delta l_{it} - \Delta k_{it}) + \theta_{it} \qquad (1)$$

where subscript i stands for firm i , subscript t stands for time t; while q, l and k stand for the natural logarithm of output, employment and capital respectively; α_l is labor's share in output and θ is the Hicks-neutral rate of technical progress. A similar expression as (1) can be obtained for the dual Solow residual (DSR) or

$$DSR_{it} = \alpha_l \Delta w_{it} - (1-\alpha_l)\Delta r_{it} - \Delta p_{it} = (\mu_{it} - 1)\alpha_l (\Delta w_{it} - \Delta r_{it}) + \theta_{it} \qquad (2)$$

[5] Antidumping protection in the EU are only in place for five consecutive years (the 'Sunset Clause').

where w and r are the natural logarithms of the wage rate and the rental price of capital and p_{it} is the natural logarithm of the price of firm i in period t. The traditional problem with estimating (1) or (2) is that the explanatory variables are potentially correlated with the unobservable productivity shocks (θ), which implies that good instruments need to be found and that has turned out to be difficult (e.g. Levinsohn, 1993; Harrison, 1994). However, by subtracting (2) from (1) these unobservable productivity shocks cancel out, which leaves us with an equation with only observable variables and can be interpreted as a Solow residual in nominal terms (NSR) or

$$NSR_{it} = \Delta(p_{it} + q_{it}) - \alpha_l \Delta(w_{it} + l_{it}) - (1-\alpha_l)\Delta(r_{it} + k_{it}) = (\mu_{it} - 1)\alpha_l \left[\Delta(w_{it} + l_{it}) - \Delta(r_{it} + k_{it})\right] \quad (3)$$

These equations can easily be extended to incorporate material inputs M (e.g. Basu and Fernald, 1995; Oliviera-Martins and Scarpetta, 1999) after which (3) becomes

$$\begin{aligned} NSR_{it} &= \Delta(p_{it} + q_{it}) - \alpha_l \Delta(w_{it} + l_{it}) - \alpha_m \Delta(p_{mit} + m_{it}) - (1-\alpha_l - \alpha_m)\Delta(r_{it} + k_{it}) \\ &= (\mu_{it} - 1)\left[\alpha_l \Delta(w_{it} + l_{it}) + \alpha_m \Delta(p_{mit} + m_{it}) - (\alpha_l + \alpha_m)\Delta(r_{it} + k_{it})\right] \end{aligned} \quad (4)$$

or this can be written as

$$\Delta(p_{it} + q_{it}) - \Delta(r_{it} + k_{it}) = \mu_{it} \left[\alpha_l \Delta(w_{it} + l_{it}) + \alpha_m \Delta(p_{mit} + m_{it}) - (\alpha_l + \alpha_m)\Delta(r_{it} + k_{it})\right] \quad (5)$$

where p_{mit} and m stand for the log of the price of material inputs and the log of material inputs M respectively and α_m is the share of material inputs in total output. The Roeger (1995) method is particularly well suited if one has access to company

accounts data where both output and input factors are reported in nominal values. Deflation of variables using price indexes is no longer needed in order to estimate markups. In addition, the Roeger (1995) method overcomes a problem, inherent to the Hall (1988) model, that the explanatory variables are correlated with the unobservable productivity shocks in the error term of the Hall specification. By subtracting the dual (2) from the primal Solow residual (1), the productivity term has cancelled out which can be seen in expression (3). Testing for market power on the basis of the Roeger (1995) specification implies that the use of instrumental variables is no longer needed to get consistent estimates. In addition to the Roeger method we also will use – as a robustness check – a more direct approach to estimate the effect of AD protection on markups. This second approach makes direct use of the gross margins that can be constructed from the information reported by firms in the profit and loss accounts (e.g. Tybout, 2001 for a discussion). There exist also a number of alternative, complementary approaches to estimate markups as e.g. in Goldberg and Knetter (1999) or Verboven (2002), which we will not pursue here. The reason is that we have access to the actual company accounts data of firms that enjoy AD protection, but we have no detailed information on the price these European producers charge for their product. This price information is required in these alternative approaches that are based on estimating demand functions directly.

Equation (5) shows that in order to obtain an estimate of the markup (μ), we need information on sales growth[6], growth in the wage bill, growth in material costs and growth in the value of capital[7]. The company accounts information we have allowed us to get firm level data on these variables. The profit and loss account

[6] Note that $\frac{\Delta x_{it}}{x_{it}} + \frac{\Delta y_{it}}{y_{it}} = \Delta \ln(x)_{it} + \Delta \ln(y)_{it} = \Delta \ln(xy)_{it}$ which is the growth rate of xy.

provided us the information on sales, the wage bill and material costs in consecutive years.[8] For capital we used the book value based on historic cost of the capital stock from the balance sheet, for the rental price of capital (R_{it}) we followed Hall (1990) and Oliveira-Martins and Scarpetta (1999) where

$$R_{it} = P_I(RI_t + \delta_{it}) \tag{6}$$

where P_I stands for the index of investment goods prices, measured at the country level, *RI* stands for the real interest rate in each country for each period and δ stands for the depreciation rate, measured at the firm level (see data appendix for details on sources).

For empirical tractability we further need to make the assumption, as is done in all applications of this type (see Levinsohn, 1993 for further arguments) that the markups are the same for all firms within the same sector. It is not possible to estimate for each firm separately a markup because we would have too many degrees of freedom. We further want to test whether the markup differs before protection versus after protection or in terms of equation (5) we will split up our markup in two parts, the average markup before protection, i.e. the years 1991-96 and the average markup during protection, which starts one year after the initiation of an AD case, i.e. the years 1997-99.

Our testable equation to estimate whether markups are affected after protection is given in equation (7) below. This equation is derived from rewriting (5). In particular, we rewrite the left-hand side of (5) as Δy_{it} and the term in brackets on

[7] Sales refers to $P_{it}.Q_{it}$; the wage bill to $W_{it}.L_{it}$; material costs are $P_{Mit}.M_{it}$ and the value of capital is $R_{it}.K_{it}$.

the right hand side as Δx_{it}. Note that the small caps in (5) refer to a logarithmic transformation. Therefore the LHS of (5), our dependent variable Δy_{it} in (7), can be considered as the growth rate in sales per value of capital. The explanatory variable Δx_{it} is a composite variable that represents the growth rates in the various values of the input factors weighted by their respective share in total sales. This composite variable Δx_{it} in (7) is interacted with a dummy (AD) equal to 1 for the years during which AD protection applies (from 1997 onwards) in order to capture the change in markups as a result of protection. In addition we also interact Δx_{it} with yearly GDP growth per country j to control for changes in markups due to business cycle fluctuations, demand and time effects (e.g. Rotemberg and Woodford, 1992).

$$\Delta y_{it} = \alpha + \mu_1 \Delta x_{it} + \mu_2 \Delta x_{it} \times AD + \mu_3 \Delta x_{it} \times GDP_{jt} + \beta_1 AD + \beta_2 GDP_{jt} + \psi_{it} \quad (7)$$

In (7) μ_1 is the markup before protection, while μ_2 is the *change* in the markup during AD protection which is our main interest; the total markup during protection is equal to $\mu_1 + \mu_2$. The *change* in the markup ratio due to business cycle fluctuations is captured by μ_3; α is a constant term; β_1 and β_2, measure the direct impact of the control variables, AD-protection and GDP growth, on the dependent variable and ψ_{it} is a white noise error term. Equation (7) will be estimated using different estimation techniques.

[8] The Profit & Loss account for European firms can be compared to the Income Statement for US

III.2. Data

To construct our dataset we used the information available in the AD case description published in the Official Journal of the European Commission. In particular, each case is initiated by one or more complainants, usually firms or professional associations, whose name is published in the case description. We focused on all AD initiations in the year 1996. The reason to focus on the AD initiations of 1996 was inspired by the company database that we had access to. In particular, we first traced the company accounts of the firms mentioned in the AD cases in the Amadeus database, a commercial database covering the published company accounts of all medium and large sized European companies. This database is commercialized by Bureau Van Dijck, a Brussels' based software and data providing company, which is also quoted on the Euronext stock market. The Amadeus database provides detailed activity codes of firms and information on their Balance sheet and Profit and Loss accounts[9] for the period 1991-1999. Because the firm level data are available for the 1990s we opted to focus on AD cases initiated in 1996, which allowed us to retrieve information of the same companies before the AD initiation as well as information of the same companies after the AD initiation, i.e. the period in which firms enjoyed AD protection. A total of 15 antidumping cases were initiated in the course of 1996. These cases are all reported in the Official Journal reports of the European Commission. In 9 of those 15 cases, we were able to trace the company accounts for the European producers involved. The remaining 6 cases initiated in 1996 could not be fully traced for one of the following three reasons. Either the name of the EU firms filing for protection was not mentioned in the case

firms.

[9] The Profit & Loss account is the equivalent of the Income Statement for US firms.

reports in the Official Journal. Or, in some cases where we had the names of the EU firms involved, we could not trace these firms in our company accounts data set. A final reason was that often the product definition was too wide to allow us a search via CSO code or name, the classification system used in Amadeus (see below). In the group of 6 cases where we did not have enough information, only one resulted in a duty (handbags), while 4 other cases were terminated without protection (Dihydrostreptomycin; Luggage & travel goods; Briefcases & Schoolbags; Video Tapes) and in a last case (pocket lighters), we failed to find the Commission's decision in the Official Journal.

The 9 cases that we did use in our analysis are listed in Table 1 together with the decision that was taken by the EU Commission in each case. We note that all but one case was decided with a duty on foreign imports. In the 'Farmed Atlantic Salmon' case, many importers accepted price-undertakings, but for those that did not a duty was imposed. A price-undertaking is an agreement between the foreign producer and the EU where the foreign producers voluntary agree to raise the price of the product alleged of dumping to the level of the domestic EU price. From table 1 we can also see that in all but one case, the EU Commission imposed protection after initiation. Only the case involving 'Synthetic Fiber Ropes' was 'terminated' without protection. A termination in the European AD policy means that while a complaint was filed by the European industry, the Commission after having looked into the case, decides not to impose protective measures, after which the case is terminated.

The number of EU firms involved in the filing of the complaint to the EU is given in the last column of Table 1. We identified their 7 digit CSO activity code, the classification used in the Amadeus company accounts dataset[10], corresponding to the

[10] The CSO code is an activity code that is used by the British Statistical Office and defines the activities of firms at a 7-digit level of detail.

product that was under the AD investigation. However, the sample of firms involved in the formulation of the antidumping complaint was too small to do any meaningful statistical analysis. To expand our sample of EU firms we used an interesting property of the AD legislation, which is that when protection is granted, it does not only apply to the firms that actually filed a complaint but it applies to all firms in the EU producing that particular product. This allowed us to increase our sample by searching for all EU firms that were producing the same product (see data appendix for a description of the various steps that we took).

Table 1: European antidumping (AD) Cases initiated in 1996

Product	**Decision**	**Import share dumpers [a]**		**Number of EU firms in final sample**	**Number of initiating firms**
		Values	**tons**		
Artificial Corundum	Duty	14%	25%	67	3
Cotton Fabrics	Duty	60%	63%	182	8
Synthetic Fiber Robes	Termination	25%	32%	155	2
Farmed Atlantic Salmon	Duty/Price-Undertaking	93%	93%	291	16
Seamless Steel Pipes and Tubes	Duty	53%	64%	98	8
Polyester Fibers Yarns	Duty	38%	43%	99	9
Bed Linen	Duty	51%	59%	6	17
Stainless Steel Fasteners	Duty	85%	84%	762	5
Ferro-silicon-manganese	Duty	26%	30%	6	7
Total				1,666	75

([a]) $\frac{import\ values\ (tonnes)\ of\ \ alleged\ dumping\ country(ies)}{total\ extra-EU\ imports\ (values\ or\ tonnes)\ of\ \ product}$

Table 1 shows for each case we considered, the final decision of the EU in column 2, the share of imports of the extra-EU countries that are named in the AD investigation as alleged dumpers in column 3, the number of EU firms that we used in our estimations in column 4 and the number of initiating EU firms in column 5.

While we were able to trace more firms than reported in table 1, a number of firms did not report all the information we required for our estimation (sales, wage bill, materials, capital). This was especially problematic for two cases namely 'Bed Linen' and 'Ferro-silico manganese' for which we could only trace full information for 6 European firms. Therefore we excluded the market power results for 'Bed Linen' and 'Ferro-silicon manganese' in the case-by-case results because we did not find these results reliable in view of the limited number of observations. However, we have included the data in these two cases for the estimates where we pool all cases together. Noteworthy is also the fact that for all cases the import shares of the alleged dumping countries, the so-called 'named' countries, were fairly large.

A number of further remarks are in order here. First, our sample may underestimate the total number of firms producing the product under investigation. The reason is that some firms may be producing the product in question but not as their main activity. Firms that produce the product not as their main activity were excluded from our sample although it is clear that those firms enjoyed protection too. Second, our estimates of the change in markups are likely to be a lower bound of the true effect for the following reason. We do not have information on the relative importance of the product under investigation in the total product portfolio of a firm beyond the fact that it is the main activity of the firm. The company accounts that we use refer to the firm's total operations and not to the financial flows associated with

the production of the single product under investigation. This suggests that if we find any effect of AD on firm's market power that it is most likely to be a lower bound of the true effect. Thirdly, our sample based on case initiations in 1996 mostly contains duty cases. This is rather coincidental since we know that the EU next to duties is also a heavy user of price-undertakings, which can be seen as price-fixing agreements between the Commission and the foreign importer. The only case in which price-undertakings were imposed together with duties was 'Farmed Atlantic Salmon'. The case involving 'Synthetic Fiber Ropes is the only termination in our sample. Since we have only one price-undertaking case and one termination case, our data do not really allow us to make strong inferences on the effects of price-undertakings or terminations. Our results however do seem to suggest that price-undertakings result in higher market power changes than duties, while a termination does not lead to a change in market power.

In order to capture a change in market power in our empirical analysis, we use a dummy equal to zero for the years before protection and equal to 1 in the years after the initiation of an AD case. There are several reasons why we decided not to use the exact duty levels for each case. While some cases are decided with ad-valorem duties, others have specific duties or a combination of both. In cases concluded with price-undertakings, the level of protection is not revealed. This makes it difficult to get consistent duty levels across cases. In a case involving multiple defending countries, each country gets a different duty level. Also, differences arise between the level of provisional and final duties. The use of duty levels imposes the additional problem that we would not be able to report the results for the 'Synthetic Fibre ropes' case (which was a termination) separately because the duty level for that case is 0%, hence we would not obtain results for the period after 1997. Moreover, the use of the duty

levels in a case-by-case does not add anything compared to a dummy since in the EU there is no variation in the duty level over time and the duty is constant per case.

IV. Results

We start by reporting results for the pooled sample, where we pool all AD cases together, to obtain an idea of the average effect of protection on markups. In table 2 we show the results of estimating (7) with OLS (1), fixed effects (2) random effects (3) and robust regression (4). With the fixed and the random effects model we replace the constant term in (7) by a firm level fixed effect α_i. This controls for unobserved firm heterogeneity, that is usually prevalent in micro data. These fixed effects may control for sunk costs and other firm and sector characteristics that are fixed over time. The robust regression technique controls for potential outliers in the data, by weighting observations according to their distance to their average in the sample.

We note that the average markup in table 2 lies around 32%, and the increase in markups during the protection period, given by μ_2, is in the order of 3 to 4% points and significant at the 1% critical level. This result holds independently of the estimation method. Since the Roeger (1995) method deals with the endogeneity problem inherent in the Hall (1988) method, the need for using IV estimates is less of a necessity as was also pointed out by Oliveira-Martins and Scarpetta (1999). This implies that the estimates from the methods listed in table 2 can be considered consistent. Nevertheless, for completeness in the appendix in table A1 we report the results where we instrument the right hand side variables of (7), using the general

methods of moments technique of Arellano and Bond (1991).[11] We note that the coefficient μ_2 is still significant and positive at the 1% critical level suggesting there is an *increase* in markups during the protection period.

Table 2: Estimation Results for Pooled Cases

Dependent Variable: Δy_{it} (see equation 7)

	OLS	**Fixed Effects**	**Random Effects**	**Robust Regression**
μ_1	1.32*** (0.011)	1.32*** (0.012)	1.32*** (0.011)	1.34*** (0.006)
μ_2	**0.03***** (0.012)	**0.044***** (0.014)	**0.032***** (0.012)	**0.031***** (0.007)
μ_3	-0.90** (0.503)	-1.08** (0.577)	-0.95** (0.503)	-1.81*** (0.303)
β_1	0.008** (0.004)	0.015 *** (0.005)	0.009** (0.004)	0.007*** (0.002)
β_2	-0.086 (0.182)	-0.651*** (0.244)	-0.152 (0.186)	-0.322*** (0.110)
R^2	0.90	0.90	0.90	-
Hausman test (P-value)	-	-	0.023	-
Number of observations	6855	6855	6855	6855

Note: The parameter that captures the change in market power after 1996 is given by μ_2. The significance of this parameter interests us most.
Standard errors in brackets, ***/** denotes statistically significant at the 1%/5% critical level or lower. For μ_1 the statistical significance refers to statistically different from 1.

[11] This method exists in using lagged values of the variable that is potentially endogenous as instruments. The instruments that can be used are all available moment restrictions for Δx dating t-2 and before, since they are not correlated with the contemporaneous error term, but may be well correlated with the contemporaneous explanatory variables. The model is estimated in first differences to control for potential unobserved fixed effects. Since we use the lagged values of the explanatory variables we generate an increasing number of instruments as the panel progresses, which increases the efficiency of the estimates. To test whether our instruments are valid we report a Sargan test of over-identifying restrictions, which is $\chi 2$ distributed. We also report a test of second order serial correlation, which is standard Normal distributed. This test is useful to detect serial correlation, in which case a static model would not be valid. Since we estimate equation (7) in this case in first differences, what matters is the absence of second order serial correlation in order to have no first order serial correlation in the levels equation of (7).

Our results control for business cycle fluctuations that may affect markups. In table 2 this effect is captured by μ_3. The counter-cyclicality of markups that we find here has also been reported by others (e.g. Rotemberg and Woodford, 1992). While the estimates based on the pooled sample clearly indicate an increase in market power as a result of AD protection, it is likely that the technology and the strategic behavior of firms may differ in the different product markets in which the AD investigations took place. Therefore, we also look at each case individually. We will focus our discussion on the results of the fixed effects model, summarized in table 3.

The estimates of the full model based on OLS and Fixed Effects estimation techniques are reported in the appendix on a case-by-case basis. It will become clear that our result of increased market power as a result of AD protection is robust across cases and across specifications.[12] Column (2) of table 3 suggests that prior to AD protection, two products have prices close to marginal cost. The two products facing tough competition are 'Artificial Corundum' that belongs to the Chemical industry, and 'Seamless pipes and tubes' that belongs to the Steel industry. For those products, we observe from Table 3 that the effect of AD protection does not have an impact at all on markups. These results correspond with the theoretical prediction that in competitive markets, tariff protection does not affect markups (Levinsohn, 1993). This may suggest that for these products, domestic European competition is sufficient to discipline prices, even after protection from imports.

[12] Markets in Europe may be segmented along national borders. Therefore the number of firms does not necessarily reflect the intensity of competition.

Table 3: Fixed Effects Results of Estimating Market Power (equation 7)[13]

Protection cases	**Number of EU firms** (1)	μ_1 **before protection** (2)	**Before AD** (3)	μ_2 **Change after protection** (4)	**During AD** (5)	R^2
Artificial corundum	67	0.76 (0.090)	P = MC	**-0.095** (0.077)	P = MC	0.75
Cotton fabrics	182	1.42*** (0.028)	P > MC	**0.107*** ** (0.038)	P > MC	0.91
Farmed Atlantic Salmon	291	1.14*** (0.056)	P > MC	**0.157** ** (0.07))	P > MC	0.71
Seamless Pipes and Tubes	98	0.989 (0.058)	P = MC	**-0.02** (0.06)	P = MC	0.80
Polyester Fiber and yarns	99	1.37*** (0.04)	P > MC	**0.128** ** (0.06)	P > MC	0.86
Stainless steel fastener	762	1.40*** (0.015)	P > MC	**0.03** ** (0.016)	P > MC	0.94
Termination Case						
Synthetic Fiber Ropes	155	1.25*** (0.039)	P > MC	**0.052** (0.044)	P > MC	0.94

Note: in brackets you find the standard deviation. *** indicates significance at the 1% level, ** at the 5% level. If μ_1 is statistically different from 1 this is equivalent to a consumer price that exceeds marginal cost

Also, from Table 1 we recall that the import share of the countries named as dumping countries, for example in the 'Artificial corundum' case was relatively small compared to the other cases, suggesting that the share of the non-dumping countries in that case was large. The competitive situation in the market for 'Artificial Corundum' even after AD protection could be due to a sufficient amount of imports originating from non-dumping countries. An alternative explanation could be the low degree of

[13] Mark-ups in Europe tend to be higher than in the US. A study by Oliveira-Martins and Scarpetta (1999) comparing mark-ups in the manufacturing sector in the US versus the EU over a period of 20 years finds US mark-ups in the range of 10-15%, while European mark-ups are in the range of 15 to 30%. The European figures correspond quite well with the magnitude of the mark-ups we find for our set of European industries.

product differentiation that characterizes the chemical sector. Homogeneous products make it more likely for competition to be tough and prices to be close to marginal cost. For the 'Seamless pipes and tubes' however, the source of competition is likely to be largely domestic since the import share of the non-named countries is relatively small. The steel sector is known for its overcapacity world wide, and its large amount of state aid, at least in the past, usually in terms of subsidies, which are likely to keep prices low.

From column (2) in table 3 it seems that the other industries are characterized by imperfect competition prior to protection with prices all exceeding marginal costs. We also can note that the initial markup is different in different sectors. In the 'Farmed Atlantic Salmon' case we find a positive markup before protection and the highest increase in markup during antidumping protection. 'Farmed Atlantic Salmon' is the only agricultural product in our sample and only one country was under investigation for dumping into the EU namely Norway. Table 1 shows that in 1996, Norway had an import share both in values and in tons of about 93% of 'Farmed Atlantic Salmon' in the EU. Hence, potential import diversion after protection is likely to be very limited. Given that Norway seems to be almost the only source country for the imports of Farmed Atlantic Salmon, other extra-EU importers will benefit little from Norway's conviction. This no doubt makes it easier for European producers of Salmon to raise their prices after antidumping protection, knowing that other extra-EU importers have only very small market shares in the EU and cannot discipline the market after Norway's conviction. While total Norwegian imports in 1996 was about 500 million ECU, total sales of the EU firms in our sample was about 1.2 billion USD (≅1.2 billion ECU). The fact that this case was settled for many

Norwegian importers with the acceptance of price-undertakings, could be another additional reason why the change in market power is large.

It is also interesting to point out the results for 'Synthetic Fiber Ropes'. This AD case was terminated without imposing a duty. While our estimates indicate a positive market power before protection, we do not find a statistically significant increase in markups after the case was terminated with no AD protection in 1997. This suggests that in the absence of duties, prices for domestic producers are not affected. This is what we would expect on the basis of the existing literature. [14]

A few additional remarks are in order here. Of course an increase in mark-ups can be the result of two distinct causes. Either price has increased or costs have gone down. (Marginal) Cost data are not revealed in the AD case investigations. However, theoretically we have strong arguments to believe that prices go up as a result of protection. It is far less clear in what direction costs move with protection. Most likely costs will not go down with protection. This would suggest that the increase in market power that we find is mainly due to an increase in prices.

Our findings are also consistent with earlier work that shows little or no effects of so called import diversion in response to AD protection. Konings et al. (1999) show that for all EU antidumping cases initiated between 1985 and 1990 there was only low amount trade diversion from the alleged dumpers on to other existing or new importers into the European Union, suggesting that the antidumping mechanism works well in keeping imports out. The results we report here of increased markups after protection for the EU industry is consistent with this earlier finding of relatively low import diversion as a result of protection.

[14] Prusa (1997) using trade data to investigate the evolution of unit import values of products affected by US AD protection, found that in 'duty cases' the rise in unit values was much higher than in cases where no duty was imposed. Also, Harrison (1991) reports increasing unit import values in US antidumping cases.

V. Robustness Tests

The PCM-method

The fact that we have access to company accounts data allows us to estimate the effect of a change in the trade regime on firms' mark-ups in an alternative way (Tybout, 2001). In particular, it is possible to construct a direct measure of price-cost margins (PCM_{it}) in each firm and for each year from the information provided in the profit and loss accounts. PCM_{it} stands for variable profits measured as firm level sales minus material costs and labor costs divided by the sales figure.

$$PCM_{it} = \frac{P_{it}.Q_{it} - P_{Mit}.M_{it} - W_{it}.L_{it}}{P_{it}.Q_{it}} \qquad (8)$$

We follow the literature and specify the following simple regression equation (Schmalensee, 1989; Tybout, 2001)

$$PCM_{it} = \gamma_0 + \gamma_1(K_{it} / P_{it}Q_{it}) + \gamma_2 AD + \gamma_3 Mshare_{it} + \gamma_4 GDP_{jt} + \varepsilon_{it} \qquad (9)$$

The second term on the RHS is the firm level capital stock (K_{it}) over firm level sales, which controls for the fact that firms with different capital intensities are likely to have different profitability levels. The next term AD is a dummy equal to 1 in each case from 1997 onwards and GDP_{jt} is the yearly GDP growth rate for each country j in the sample. We also include firm level market shares ($Mshare_{it}$) to control for firm size effects on mark-ups.

The results based on the pooled sample of AD cases are shown in table 4 below where we report the results of a fixed effects model and of robust regression. The results in table 4 suggest that the effect antidumping protection is positive and significant. While the magnitude of the increase in markup differs across estimations, the basic result we are interested in namely the *change* in market power during antidumping protection, captured by γ_2, is significant which is reassuring.

Table 4: Estimation of the PCM method

PCM	**Fixed Effects**	**Robust Regression**
γ_1	-0.016*** (0.01)	0.07*** (0.004)
γ_2	**0.005***** **(0.001)**	**0.027***** (0.003)
γ_3	0.44* (0.23)	-0.805*** (0.16)
γ_4	-0.03 (0.083)	-1.78*** (0.14)
Number of observations	6140	6140

The reason for constructing our own measures of variable profit as a dependent variable in the PCM method instead of using the accounting profits is that accounting profits may not be a good measure of economic profits (Fisher and McGowan, 1983). However, as an extra robustness test we check the average accounting profit margin before and after 1996 to see whether average accounting profits are different in the period before and during protection. The accounting profit margin in our company dataset Amadeus is defined as 'company profits before tax over operating revenue'. While we find the average in the period 1991-1996 to be 2.5% with a standard deviation of 0.075, in the period 1997-99 we find the average accounting profit margin to equal 4.1% with a standard deviation of 0.075. Running

the PCM regression, now using the accounting profit as a dependent variable yielded a positive and significant coefficient in the fixed effects regression at a critical significance level of 1%, suggesting a positive effect of AD protection on company accounting profits.

A Counterfactual Control group:

In order to make sure that the significant increase in market power we obtain for the firms located in one of the EU-15 countries is not simply a time or an industry effect, we construct a counterfactual control group. This control group we use is composed of firms in the same industries but in countries outside the EU-15 namely Norway, Switzerland and Iceland. However, in one antidumping case, 'Farmed Atlantic Salmon', Norway was involved as the defendant country. Many of the Norwegian importers of 'Farmed Atlantic Salmon' obtained price-undertakings for their sales into the EU market. Price-undertakings are known to be a collusive device which may not only raise the market power of European producers but also of foreign firms active on the European market (Vandenbussche and Wauthy, 2001). For this reason we decided not to include the Norwegian firms involved in the 'Farmed Atlantic Salmon case' into our counterfactual.

The results for the PCM method on the counterfactual can be found in the table 5 below. In both the fixed effects specification and the robust regression we do not find a significant increase after 1997 on firms' mark-ups. This again seems to confirm the results in the core of the paper namely that the increase in market power in the EU-15 countries was actually driven by European Union's common AD policy.

Table 5: Estimation of the PCM method for the counterfactual Norway, Iceland Switzerland

PCM	Fixed Effects	Robust Regression
γ_1	0.026*** (0.005)	0.077*** (0.004)
γ_2	0.0008 (0.005)	0.007 (0.006)
γ_3	0.038 (0.092)	-0.108 (0.074)
γ_4	0.013 (0.037)	-0.006 (0.05)
Number of observations	1833	1833

VI. Conclusion

In this paper we document empirically the evolution of market power in firms that are involved in European antidumping cases. For this purpose we used very detailed company accounts data of 1,666 European firms involved in nine European Antidumping cases initiated in the year 1996. The company accounts data run from 1991-1999, allowing us to study the evolution of market power both before and after antidumping protection. For this purpose we used the Roeger (1995) method. We found that for the pooled sample of firms in our data, market power of European firms is on average about 3 to 4% points higher during antidumping protection. The finding that price-cost markups increase with protection appears to be very robust across specifications (OLS, fixed effects, random effects, robust regression). On a case-by case basis we find that in those industries where market power before protection is low, antidumping protection has little effect on markups. While industries with prices well above marginal cost before protection benefited most with changes in market power after protection ranging between 3 to 15% points depending on the sector. As a robustness test, we also used an alternative method to test for changes in market

power based on the evolution of variable profits constructed on the basis of company accounts called the Price-Cost Margin (PCM) method. The PCM method confirmed a significant increase in firms' markups as a result of antidumping protection. And finally we also constructed a counterfactual of firms outside the EU but in the same lines of business, for which we did not find a significant increase in market power, excluding the possibility of a mere industry or time effect.

Our results suggest that in the majority of EU AD cases protection is associated with a reduction of allocative efficiency, reflected in increased prices, which has a negative impact on European consumer welfare. However, in this paper we did not investigate the potential impact of AD protection on employment and wages, which could also enter the welfare objective of the EU. The empirical analysis of how markups may jointly be determined with wage setting in labor markets is an interesting avenue for further research.

The results in this paper suggest also that trade policy may conflict with the objectives set out by competition policy. While our results do not point out whether firms are abusing their market power or are acquiring a dominant market position due to AD protection, the results do indicate that market power is not reduced, an observation which may be of concern for competition policy authorities.

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Appendix

Table A1: Estimation Results for the Pooled Cases

General Method of Moments IV Estimators (Fixed Effects Model)

$$\Delta y_{it} = \alpha_i + \mu_1 \Delta x_{it} + \mu_2 \Delta x_{it} \times AD + \mu_3 \Delta x_{it} \times GDP_{jt} + \beta_1 AD + \beta_2 GDP_{jt} + \psi_{it}$$

	Fixed effects (IV, GMM)
μ_1	1.48***(0.16)
μ_2	**0.21*** (0.16)**
μ_3	-10.58***(7.6)
β_1	0.002 (0.007)
β_2	-1.370***(0.41)
R^2	0.82
Sargan test of over-identification (P-value)	0.68
Second Order Serial Correlation Test	0.941

Note: two-step robust standard errors in brackets, *** denotes statistically significant at the 1% critical level or lower. Instruments include moment restrictions from t-2 and before for *d.x* The Sargan test of over identifying restrictions is $\chi 2$ distributed and the test for second order serial correlation follows as standard normal distribution.

Table A2: Estimation Results for Artificial Corundum

	OLS	**Fixed Effects**
μ_1	0.70 (0.08)	0.73 (0.09)
μ_2	**-0.06 (0.06)**	**-0.09 (0.07)**
μ_3	12.65*** (3.28)	12.21***(3.8)
β_1	0.006 (0.026)	-0.002 (0.029)
β_2	-1.27 (1.01)	-1.76 (1.21)
R^2	0.75	0.75
Number of observations	321	321

Note: standard errors in brackets, *** denotes statistically significant at the 1% critical level or lower, ** denotes statistically significant at the 5% critical level.

Table A3: Estimation Results for Cotton Fabrics

	OLS	**Fixed Effects**
μ_1	1.43 ***(0.025)	1.42***(0.028)
μ_2	**0.055**(0.033)**	**0.107***(0.038)**
μ_3	-1.64 (1.24)	-1.78 (1.41)
β_1	0.026 ***(0.01)	0.036*** (0.01)
β_2	0.025 (0.42)	-0.41 (0.50)
R^2	0.91	0.91
Number of observations	873	873

Note: standard errors in brackets, *** denotes statistically significant at the 1% critical level or lower, ** denotes statistically significant at the 5% critical level.

Table A4: Estimation Results for Synthetic Fibre Ropes

	OLS	**Fixed Effects**
μ_1	1.27***(0.03)	1.25***(0.039)
μ_2	**0.026 (0.04)**	**0.052 (0.044)**
μ_3	-1.80 (1.6)	-1.71 (1.88)
β_1	0.012 (0.015)	0.012 (0.018)
β_2	-0.64 (0.59)	-1.54**(0.85)
R^2	0.94	0.94
Number of observations	591	591

Note: standard errors in brackets, *** denotes statistically significant at the 1% critical level or lower, ** denotes statistically significant at the 5% critical level.

Table A5: Estimation Results for Farmed Atlantic Salmon

	OLS	**Fixed Effects**
μ_1	1.134***(0.05)	1.14***(0.056)
μ_2	**0.073 (0.06)**	**0.157***(0.073)**
μ_3	-0.69 (2.44)	-2.88 (2.78)
β_1	0.022 (0.017)	0.033*(0.020)
β_2	-0.73 (0.68)	-2.26**(1.00)
R^2	0.71	0.71
Number of observations	978	978

Note: standard errors in brackets, *** denotes statistically significant at the 1% critical level or lower, ** denotes statistically significant at the 5% critical level.

Table A6: Estimation Results for Seamless Steel Pipes and Tubes

	OLS	Fixed Effects
μ_1	1.02 (0.05)	0.98 (0.058)
μ_2	**0.011 (0.05)**	**-0.020 (0.06)**
μ_3	4.11** (2.21)	6.59***(2.51)
β_1	0.020 (0.019)	0.022 (0.020)
β_2	0.23 (0.75)	-0.25 (0.95)
R^2	0.78	0.78
Number of observations	492	492

Note: standard errors in brackets, *** denotes statistically significant at the 1% critical level or lower, ** denotes statistically significant at the 5% critical level.

Table A7: Estimation Results for Polyester Fibres and Yarns

	OLS	**Fixed Effects**
μ_1	1.37*** (0.044)	1.37***(0.048)
μ_2	**0.11** (0.055)**	**0.128**(0.060)**
μ_3	-5.28***(1.94)	-6.18***(2.14)
β_1	0.016 (0.013)	0.021* (0.014)
β_2	-0.57 (0.56)	-1.31**(0.67)
R^2	0.86	0.86
Number of observations	446	446

Note: standard errors in brackets, *** denotes statistically significant at the 1% critical level or lower, ** denotes statistically significant at the 5% critical level.

Table A8: Estimation Results for Stainless Steel Fasteners

	OLS	Fixed Effects
μ_1	1.40***(0.013)	1.40***(0.015)
μ_2	**0.018* (0.001)**	**0.03**(0.016)**
μ_3	-1.12* (0.59)	-1.35**(0.68)
β_1	-0.003 (0.006)	0.005 (0.007)
β_2	0.012 (0.24)	-0.39 (0.34)
R^2	0.94	0.94
Number of observations	3122	3122

Note: standard errors in brackets, *** denotes statistically significant at the 1% critical level or lower, ** denotes statistically significant at the 5% critical level.

Data Appendix

Construction of the data set

The data that we use are based on all European AD cases that were initiated in the European Union in 1996. The final data set covers 9 different cases and more than 1,666 European firms for which usable information on sales and input usage needed for the analysis could be retrieved. For most of the cases only the firms that filed the complaints are mentioned in the Official Journal reports of the European Commission. However, once protection is granted, all EU firms producing the product benefit from protection. The data source that we used to obtain the company account information is the Amadeus database. This is a commercial database covering all medium and large sized European companies.[15] In order to compose our sample of firms for which we are relatively certain they would be affected by antidumping protection we proceeded in various steps.

We first traced the companies that were mentioned in the filing of a case reported in the Official Journal published by the European Commission. We identified the 7-digit CSO activity code[16] corresponding to the product that was under the AD investigation. However, the sample of firms involved in the formulation of the antidumping complaint was too small. To expand our sample of EU firms we turned to a property of the antidumping legislation which is that when protection is granted it does not only apply to the firms that actually filed a complaint but it applies to all EU firms producing that particular product. Hence, we retrieved all EU firms that had in their description of activities that particular 7-digit CSO code. This still resulted in a

[15] For companies located in the UK, Germany, France and Italy, firms are included that satisfy at least of the following criteria: the number of employees larger than 150, operating revenue at least 15 million Euro and total assets of at least 30 million Euros. For the companies located in other countries these criteria collapse to 100 employees, operating revenue of at least 20 million Euro and total assets of at least 100 million Euros.

relatively small number of firms. To increase the sample size more, we identified from our initial sample of complaining firms, the four-digit *primary* CSO codes and refers to the main product produced by the firm. This corresponds with an aggregation within the product/activity line. We retrieved the company accounts of these firms between 1991 and 1999. This allowed us to have a period before protection and a period during which protection was in place, which would allow us to compare market power of these firms both before and during protection.

Measurement of the Variables

P_{it} .Q_{it}: Firm level operating revenue in each year, source: Amadeus

R_{it} K_{it}: Book value of tangible fixed assets for each firm in each year times the price of capital, R_{it} , defined as

$$R_{it} = P_I(RI_t + \delta_{it}) \qquad (8)$$

P_I : the price index of investment goods for plant and machinery, measured at the country level. The data stem from the AMECO-database from the ECFIN department at the European Commission. We are grateful to Werner Roeger for providing this data.

RI: stands for the real interest rate in each country. The data stem from the ECFIN department at the European Commission. We thank Werner Roeger for making these data available to us.

δ: stands for the depreciation rate, measured at the firm level (total depreciation divided by tangible fixed assets); source: own computations based on Amadeus

[16] The CSO code is a product code that is used by the British Statistical Office and defines the activities of firms at a 7-digit level of detail.

$W_{it}\, L_{it}$: total wage bill in the firm consisting of the price of labor (P_L) times employment (L) ; source: Amadeus

$P_{itM}\, M_{it}$: total material costs in the firm consisting of the price of materials (P_M) times materials (M) ; source: Amadeus

GDP growth: growth rate in gross domestic product in each country; source: OECD *Main Economic Indicators*

Anti-Dumping Cases: source: 'The Official Journal of the European Union' various issues in the 'C-series' for notifications of case initiations and the 'L-series' for reports on the final decisions.