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Is European Antidumping protection against Central Europe too high?

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Abstract

In this paper we follow Boltuck (1987) and find that the average level of European antidumping protection against Central-Europe in the period 1985-1990 was 14 to 20% too high. Our simulation results on the Central European antidumping cases show only 'deminimis' injury margins in all cases. Hence, on the basis of these estimates the European Commission would have dismissed all European antidumping complaints against Central-European imports and no antidumping measures would have been imposed. In view of these results we feel that European antidumping legislation and its implementation seriously undermine the credibility of the Association Agreements recently signed between the European Union and the countries of Central-Europe.

JEL-Classification: F13, F17, K2

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1. Introduction

By signing the Association Agreements (December 1991) with Hungary, Poland, the Czech and Slovak Republic, the European Union (EU) expressed its willingness to move towards free trade with these countries. This political engagement is noteworthy because EU’s borders have been kept relatively closed for Central-European imports in the past. However, the Agreements' small print stipulates that the European antidumping mechanism remains in place. This way, the EU keeps the right to impose antidumping measures which are generally regarded as a very selective tool of protection (see for example Tharakan (1991), Messerlin (1991) and Hindley (1993)). The major flaw of the European implementation of the antidumping law is the calculation of injury margins. The European Commission, responsible for the injury investigation, seems to focus on the level of foreign price-underselling in the European market (Vandenbussche 1995). Price-underselling is the extent to which the price of a foreign product in the European market is lower than the European price for a similar product. The International Trade Commission, in contrast, makes use of the Boltuck-model (1987) for the calculation of injury. In this model injury is not measured as the price difference between domestic and foreign product in the domestic market but as the reduction in the domestic price resulting from foreign dumping. In our opinion the Boltuck-model is a more economically solid approach because it takes into account how the domestic market reacts to a price reduction of a substitute product. The contribution of this paper lies in simulating the Boltuck-model on European antidumping cases against Central-Europe in the period prior to the Association Agreements (1985-1990). On the basis of that we conclude that the level of price-underselling used by the European Commission is a poor injury indicator. Despite its convenience as a rule of thumb, we show that it has resulted in European protection that has been far too high. The simulation results suggest that in the period 1985-1990, antidumping measures against Central-Europe were overestimated by 14 to 20%. Moreover our results show that for all antidumping cases in our sample, each individual Central-European country's import market share was so small that it could only have caused 'deminimis' injury to the European industries involved. This normally would have lead the Commission to dismiss all antidumping complaints and no protection would have been taken. If this practice continues, the European antidumping mechanism undermines the future credibility of the Association Agreements.

In section 2 we critically discuss the assumptions underlying the model, then we move on to explain the main steps involved in this approach. For the details of the model we refer the interested reader to appendix A. In section 3 we discuss the data used and the results obtained from the simulations. Section 4 concludes.

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2 The spreadsheet version of the Boltuck-model (1991) is called CADIC which stands for Comparative Analysis of the Domestic Industry and is available from the author upon request.
2. The Model

Among the alternative approaches used by the International Trade Commission (ITC) for calculating material injury in US antidumping investigations, the Boltuck-model (1987) is the most logically valid method because it comes closest to the central question posed by the WTO\(^3\): do dumped imports cause material injury to the domestic industry. Nevertheless some of its assumptions are very stringent. In the next section we will critically discuss the most important ones.

2.A. Discussion of Assumptions

The type of dumping assumed in this model is price-discrimination whereby a lower price is charged in the export market. Price discrimination is a definition of dumping that is too wide in an economic sense but too narrow in a legal sense. Price-discrimination is profit-maximising behaviour without predatory intent on behalf of the foreign exporter and with positive welfare implications for the importing country as a whole. From an economic point of view there is no rational for protection against dumping of that type. One could argue that a competition policy in the exporting country, bringing consumer prices down would be a better type of government intervention in terms of world welfare. From a legal point of view, price-discrimination is by no means the only type of dumping that falls within the scope of the legislation. Therefore, the question remains how the level of injury would differ if dumping would be of a different type than the one assumed by Boltuck (1987). However, if one believes the majority of dumping to be the result of price-discrimination, than the Boltuck-model provides a more transparent and less arbitrary way of calculating injury than in the EU.

Another weakness is that when dumping margins are overestimated, injury margins will also be overestimated. In section 3 we use the spreadsheet version of Boltuck (1991) on a sample of EU’s antidumping cases against Central-Europe. One of the variables on the input side, is the observed dumping margin. Several authors have pointed out that especially with respect to non-market economies\(^4\) the dumping margin tends to be overestimated (Tharakan (1991), Messerlin (1989)). As a result, on the output side of the Boltuck-model, the injury margins will also be subject to overesti-

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\(^3\)World Trade Organization (WTO)

\(^4\)Hungary, Poland and (former) Czechoslovakia have been deleted from the non-market economy list by EC regulation 517/92 of February 1992. This implies that as of February 1992, the technique of the analogue country no longer applies to these Central-European countries. However in the period we look at 1985-1990 these countries were still on the non-market economy list.
mation.

Further, it is assumed that the import-competiting European industry is competitive where firms are price-takers. In many industries involved in antidumping cases this need not necessarily be the case. Political economy studies show that European antidumping cases often involve concentrated industries (see Tharakan and Waelbroeck, 1994). For those industries the Boltuck-model is still useful if one has some idea on how the direction of the injury estimates changes with the degree of imperfect competition in the industry. Or alternatively, if one can show that despite the low number of firms in the domestic industry, the share of the imports in domestic consumption guarantees a competitive domestic market. In that case the distortions of applying the Boltuck-model are relatively limited. Another limitation is the static nature of the analysis. It is assumed that the parameter values provided on the input side do not change over a specific period.

Some of these assumptions are quite stringent. Nevertheless, when the focus of the injury calculation is on prices, the Boltuck-model offers a more economically solid approach than the one favoured by the European Commission.

2.B. The Model

In this section we will briefly outline the main steps in the Boltuck-analysis. A more detailed description can be found in appendix A. The purpose is to determine the extent to which dumped imports change prices and quantities in the European industry. The Boltuck-model considers both price and output reductions of the domestic industry as injury measures. The model starts by constructing a counterfactual world where the foreign firm is not allowed to price-discriminate between its own market and its export market hence dumping does not occur. The analysis consists of three steps:

1) A calculation of the price of the foreign product in both markets when dumping cannot take place, which means that the foreign firm cannot price-discriminate and has to charge the same price (P) in both markets. This price level is then compared to the price charged by the foreign firm in the event of dumping (P0) which is lower. This is shown in graph 1.

2) The reduction in the foreigner’s price from P to P0 is used to estimate the change in demand for the European like product (∆D0) in the European market.

3) This demand shift (∆D0) is then used to estimate price (∆P0) and quantity effects (∆Q0) on the European like product which are considered as measures of injury caused by dumping.

In the first step outlined above and illustrated in graph 1, the question is: what would have been the
price of the imports if the foreign firm would set the same price in both its domestic and its export market. In graph 1 this price level is indicated as $P_i$. This is the price where the foreigner’s marginal cost equals marginal revenue in the integrated market. Then $P_i$ is compared to the price level in the European market when the foreign firm is allowed to price-discriminate, $P_a$. Let us denote:

$$\Delta P_a = P_a - P_i$$

From graph 1 we see that the dumping price $P_a$ from lies below $P_i$, therefore $\Delta P_a$ is negative. A reduction in the price of the foreign product from $P_i$ to $P_a$ will lead to an increase in demand for the dumped foreign imported product ($D_a$):

$$+$$

$$\text{(2) } D_a (P_a, P_u)$$

Cheaper imports will result in a lower demand for the European like product ($D_e$):

$$-$$

$$\text{(3) } D_e (P_d, P_u)$$

In (3) the direct effect of $\Delta P_a$ on $D_e$ is given. However there is also an indirect effect. $\Delta P_a$ will also affect the European price level ($P_d$). Let us define $P_{d1}$ as the European price when the price of the foreign product is $P_i$. At a price level $P_{d1}$ the domestic price level will have changed into $P_{d2}$. Let us denote:

$$\Delta P_d = P_{d2} - P_{d1}$$

The expression in (4) shows to what extent a drop in the price of a foreign product lowers the price of the European like product ($\Delta P_d$). This makes much more sense than simply taking the level of foreign price undercutting ($P_{d1} - P_i$) as the European Commission does. ($\Delta P_d$) in expression (4) is only one of the two injury measures of the Boltuck (1987)-model. The other injury measure is the change in the demand for the domestic like product ($\Delta Q_d$) as a consequence of dumping. Taking both direct and indirect effects into account the quantity effect is the following:

$$\Delta Q_d = D_e (P_{d2}, P_u) - D_e (P_{d1}, P_i)$$
Graph 1: Dumping as Price-discrimination
Expression (6) and (7) show what $\Delta P_d$ and $\Delta Q_d$ equal to in the Boltuck-model:

\begin{align*}
\Delta P_d &= (N_{ad} / (E_d - N_d)) \cdot ((P_a - P) / P) \\
\Delta Q_d &= (N_{ad} / (E_d - N_d)) \cdot ((P_a - P) / P) \cdot E_d
\end{align*}

where $N_{ad}$: cross-price elasticity of demand between domestic like product and foreign import

$E_d$: elasticity of supply of domestic like product

$N_d$: elasticity of demand for domestic like product

From (6) and (7) we see that a change in the price and the quantity of the domestic product, depends on the reduction of the foreign import price $P_a$ of the like product as a result of dumping, the substitutability between dumped and like product ($N_{ad}$), the elasticity of supply ($E_d$) and demand ($N_d$) of the European like product. $\Delta P_d$ gives the percentage change in the price of the like product consequent to dumping while $\Delta Q_d$ gives the percentage change in the volume of the like product consequent to dumping.  

In graph 2 we illustrate this graphically. A drop in the foreign firm’s export price from $P_1$ to $P_a$, causes a downward shift of the demand curve for the European like product from $D_1$ to $D_2$. As a result of that shift, the domestic price drops from $P_{d1}$ to $P_{d2}$ while domestic output of the European product drop from $Q_{d1}$ to $Q_{d2}$. The shift in the European demand curve depends on the degree of imperfect substitutability, captured by the cross-price elasticity ($N_{ad}$). By how much the price of the European product will drop also depends on the price-elasticity of the European supply curve ($E_d$) and the price-elasticity of the European demand curve ($N_d$). The European Union’s practice of simply taking the level of foreign price-undertcutting as the injury margin, is overlooking how the market reacts to a price change of a substitute product.

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5**Both price and volume of the domestic like product are injury criteria stipulated in the WTO-antidumping code. Other injury criteria mentioned in the law such as the evolution of domestic market share, employment, profits, cash flow etc. can be derived from them.**
3. Simulating EU antidumping cases against Central Europe (1985-1990)

In the latter half of the eighties (1985-1990), the European Commission initiated 33 antidumping investigations against Central Europe concerning an import value of more than 113,785 thousand ECU. This is illustrated in tables 1 and 2. Graph 3 gives an overview of the industries involved and the number of cases in each industry. The majority of cases are initiated by the European Chemical industry, followed by the Mechanical Engineering and the Wood and Paper industry.

For the application of the Boltuck-model we limited our sample to cases in the Chemical and the Mechanical engineering sector for the simple reason that the parameters required for the injury calculation were most readily available. This resulted in a sample of 17 antidumping cases for which most of the parameters could be traced.

The fact that that European duty and injury margins often equal the level of foreign price-undercutting, reflects that European officials are worried about the price of the European product. Hence, we will use the reduction in the domestic price ($\Delta P_d$) yielded by the Boltuck-model for comparison with the injury margins determined by the Commission.
Table 1: Cases initiated against imports from Hungary, Poland and Czechoslovakia

<table>
<thead>
<tr>
<th>Year</th>
<th>TOTAL</th>
<th>CEM</th>
<th>HU</th>
<th>PO</th>
<th>CZ</th>
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<tbody>
<tr>
<td>1985</td>
<td>60</td>
<td>7</td>
<td>2</td>
<td>3</td>
<td>2</td>
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<td>1986</td>
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<td>1</td>
<td>3</td>
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<tr>
<td>1987</td>
<td>50</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>1</td>
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<tr>
<td>1988</td>
<td>74</td>
<td>7</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>1989</td>
<td>55</td>
<td>11</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>1990</td>
<td>67</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>350</td>
<td>33</td>
<td>8</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>


Table 2: Import value in 10^3 ECUS of products from Hungary, Poland and Czechoslovakia (CEM) under investigation.

<table>
<thead>
<tr>
<th>Year</th>
<th>in 1000 ECUS</th>
<th>TOTAL</th>
<th>CEM</th>
<th>HU</th>
<th>PO</th>
<th>CZ</th>
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</thead>
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<td>1985</td>
<td>47,173</td>
<td>6,592</td>
<td>24,599</td>
<td>15,982</td>
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<tr>
<td>1986</td>
<td>8,473</td>
<td>740</td>
<td>1,155</td>
<td>6,578</td>
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<tr>
<td>1987</td>
<td>5,019</td>
<td>4,378</td>
<td>-</td>
<td>641</td>
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<tr>
<td>1988</td>
<td>15,291</td>
<td>-</td>
<td>12,840</td>
<td>2,451</td>
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</tr>
<tr>
<td>1989</td>
<td>37,829</td>
<td>14,085</td>
<td>11,492</td>
<td>12,252</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>?</td>
<td>-</td>
<td>-</td>
<td>?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>113,785</td>
<td>25,795</td>
<td>50,086</td>
<td>37,904</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: EUROSTAT: External Trade: 1984-90
Graph 3: EU sectors involved in Antidumping cases against Central Europe (CEM) between 1985-1990

Source: COMMISSION OF EC, Annual reports on the Community’s antidumping and antisubsidy activities, 1983-93

3.A The parameters

The spreadsheet version of Boltuck (1991) requires seven parameters on the input side. They are listed below:

- \( M \): the observed dumping margin
- \( N_d \): demand elasticity for the European like product in the EU
- \( E_d \): supply elasticity of the European like product in the EU
- \( E_t \): supply elasticity of the fairly traded imports in the EU
- \( \alpha' \): the share of the defendant’s local sales in its combined export and local foreign sales
- \( V_d \): the market share of the European like product in the EU after the dumping
- \( V_a \): the market share of the dumped imports\(^6\) in the EU after the dumping

\(^6\) When market shares of individual countries alleged of dumping are cumulated, \( V_a \) represents the cumulated market share.
On the basis of these seven parameters, eleven more parameters are calculated by the spreadsheet, mainly cross-price elasticities of demand between the three products in the model: the European like product, the dumped import product and the fairly-traded import product. In appendix B we show how these remaining parameters and the solutions from the Boltuck-model are arrived at from the seven parameters the user of the spreadsheet provides.

3. B. Data search and Sensitivity analysis

In what follows we will briefly discuss how we went about selecting values for the seven parameters listed in section 3.A.

_Dumping Margin_ : M

For each of the 17 antidumping cases we turned to the dumping margins calculated by the EU and reported in the Official Journal. The purpose of this paper is a comparison of injury margins yielded by the Boltuck-model to those arrived at by the European Commission. As we have suggested above, European dumping margins for non-market economies tend to be overestimated. Overestimated dumping margins on the input side will yield overestimated injury margins on the output side of the Boltuck-model (1987). The simulation estimates are therefore likely to be upper limits of the true injury levels. A sensitivity analysis revealed that the dumping margin (M) is positively correlated with the measure of injury (\( \Delta P_i \)). This is what we expect since the objective of the model is to measure injury caused by dumping.

_Elasticities_ :

In order to determine the reduction in the price of the European product (\( \Delta P_e \)) as a result of a drop in the price of the foreign import product (\( \Delta P_i \)), the Boltuck-model requires information on three different elasticities. The elasticity of demand (\( E_d \)) and supply (\( E_s \)) for the European product, and the elasticity of supply for the fairly traded import (\( E_i \)). Empirical studies on elasticity estimates of industries are limited in number, especially at the six digit product level which is the level of disaggregation used in the antidumping cases. Ideally one would like information on prices, production and sales at this level of aggregation to calculate the elasticities. At this point in the analysis a trade off imposed itself between the number of cases in the sample on the one hand and the degree of accuracy of the elasticity estimates on the other. We opted for a relatively large sample of cases with a somewhat rough approximation of the necessary elasticities rather than fewer cases but with a greater reliability of the elasticity estimates. The advantage of the former is that it can reveal a general trend of over- or underestimation of injury levels by the European Commission.
Values for the elasticity parameters were derived by using detailed case evidence to adjust available average industry elasticity estimates. From the case reports in the Official Journal we derived detailed information on the specific situation of the Chemical and the Mechanical Engineering sector in the antidumping investigation period. This way we could revise the elasticity average to a more appropriate value for the product involved. In addition, we performed sensitivity analysis to establish the relationship between the elasticity and the injury measure. We used the spreadsheet version of the Boltuck-model to check how a change in the parameter values affected the direction and the magnitude of the injury measure ($\Delta P_d$). This way we could determine a parameter's importance and its upper limits. By that we mean that we took parameter values that yielded relatively high injury margins under the Boltuck approach in order to strengthen our argument that the European Commission has calculated injury margins which were too high.

The elasticity of demand ($N_d$) depends among others on the availability of substitutes. The majority of the products involved in the Central-European antidumping cases (table 1 column 4), are chemicals. These tend to be homogeneous products with a production process that is relatively standardized. In addition, a sensitivity analysis reveals a negative correlation between the absolute value of the elasticity of demand for the domestic like product ($N_d$) and the injury margin ($\Delta P_d$). This suggests that the more elastic the demand for the European product, the less injury is incurred from dumped imports. Hence, for the cases in the Chemical sector, we decided to take a value of -2 for $N_d$ which is smaller that -1 and yet not too elastic such that a reduction in the foreign import price will still yield substantial injury margins.

For the standardized electrical motors belonging to the Mechanical Engineering sector we used a value of -1.3 for $N_d$. Although European officials' circumscription of the product was that of a 'mass-production good', they also mentioned that the "...ball bearings used in the electric motors coming from Central-Europe are of a lower quality than the ones used in European produced motors...", suggesting that the European motors are of a higher quality than the Central European ones. This vertical product differentiation will make consumers relatively less sensitive to a price change than when products are homogeneous like in the Chemical sector. Therefore we expect the elasticity of demand to be somewhat lower in absolute terms. Nevertheless for a 'mass-production good', price and cost competitiveness are two decisive factors. This implies that the demand for this product in the European market is still elastic and takes a value smaller than -1.
<table>
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<tr>
<th>Defendant</th>
<th>Year</th>
<th>Code</th>
<th>Product</th>
<th>Industry</th>
<th>Analogue</th>
<th>DM</th>
<th>(V_a)</th>
<th>(V_s)</th>
<th>(E_x)</th>
<th>(N_o)</th>
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<td>1990</td>
<td>29.33.90.10</td>
<td>Methenamine</td>
<td>(1) Chemicals</td>
<td>Mex</td>
<td>52%</td>
<td>85%</td>
<td>5.30%</td>
<td>1.75</td>
<td>-2</td>
<td>50%</td>
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<td>28.41.60.00</td>
<td>Potas. Perman</td>
<td>(2) Chemicals</td>
<td>U.S.A.</td>
<td>19.60%</td>
<td>21%</td>
<td>11.40%</td>
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<td>(2) Mech. Engin.</td>
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<td>69%</td>
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<td>1.94</td>
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<td>-2</td>
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<td>Yugosl.</td>
<td>139%</td>
<td>69%</td>
<td>2.40%</td>
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<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td></td>
<td>1986</td>
<td>28.56.10</td>
<td>Silicon Carb.</td>
<td>(1)</td>
<td>Chem.</td>
<td>Norway</td>
<td>9%</td>
<td>52%</td>
<td>0,60%</td>
<td>0,98</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>1986</td>
<td>28.20.30</td>
<td>Artif. Corund</td>
<td>(1)</td>
<td>Chem.</td>
<td>Yugos.</td>
<td>12%</td>
<td>69%</td>
<td>2,40%</td>
<td>0,98</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>1985</td>
<td>28.38.27</td>
<td>Cop. Sulphate</td>
<td>(1)</td>
<td>Chem.</td>
<td>Spain</td>
<td>18%</td>
<td>77%</td>
<td>3,80%</td>
<td>1,17</td>
<td>-2</td>
</tr>
<tr>
<td>Hungary</td>
<td>1989</td>
<td>31.02.10.10</td>
<td>Urea</td>
<td>(1)</td>
<td>Chem.</td>
<td>Austria</td>
<td>51%</td>
<td>75%</td>
<td>0,90%</td>
<td>1,49</td>
<td>-2</td>
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<td></td>
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<tr>
<td></td>
<td>1987</td>
<td>28.38.27</td>
<td>Cop. Sulphate</td>
<td>(2)</td>
<td>Chem.</td>
<td>Thail.</td>
<td>45%</td>
<td>82%</td>
<td>2,13%</td>
<td>1,62</td>
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<td></td>
<td>1987</td>
<td>85.01.33</td>
<td>Electric Mot.</td>
<td>(2)</td>
<td>Mech.Engin.</td>
<td>Yugos.</td>
<td>146%</td>
<td>69%</td>
<td>1,40%</td>
<td>1,94</td>
<td>-1,3</td>
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<tr>
<td></td>
<td>1986</td>
<td>28.20.30</td>
<td>Artif. Corund</td>
<td>(1)</td>
<td>Chem.</td>
<td>Yugos.</td>
<td>26,40%</td>
<td>69%</td>
<td>1,60%</td>
<td>0,98</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>1985</td>
<td>28.38.27</td>
<td>Cop. Sulphate</td>
<td>(1)</td>
<td>Chem.</td>
<td>Spain</td>
<td>19%</td>
<td>77%</td>
<td>0,70%</td>
<td>1,17</td>
<td>-2</td>
</tr>
</tbody>
</table>

Notes:  
(1) case was decided with a price-undertaking offered by the defendant and accepted by the EU Commission  
(2) case was decided with an antidumping duty

Sources:  
(a) Official Journal of the EU: antidumping Case reports  
(b) OECD foreign Trade statistics by country (SITC/Rev2,Rev3)  
(c) Eurostat Statistics: External Trade (Nimexe/CN)  
(d) Schumacher, Francis and Stern (1976)
The elasticity of supply ($E_s$) of the European like product depends among others on the capacity utilisation in the EU industry. In Vandenbussche (1995) it became clear that in 38% of all the Central-European antidumping cases decided upon between 1984-1990, the European industry was suffering from overcapacity at the time of the investigation. This means that in the event of a price increase, production could easily have been expanded in the short run. This seems to justify values for the elasticity of supply parameter ($E_s$) greater than 1. A sensitivity test revealed that when the elasticity of supply, ($E_s$) goes up, the injury measure $\Delta P_d$ goes down. This means that the more elastic domestic supply, the more insensitive domestic prices are to the dumping of imports. Empirical estimates of elasticity of supply ($E_s$) are scarce. Estimates of import elasticities ($I_d$) are far more abundant, which is probably due to the large availability of trade data in comparison to production figures. We used expression (8) (Schumacher, Francis and Stern (1976, p93)), which states a relationship between the two elasticities, to derive values for the elasticity of supply ($E_s$).

\[
E_s = \frac{I_d - (C/IMP)}{(PROD/IMP)} \cdot N_d
\]

$E_s$: supply elasticity
$I_d$: import demand elasticity
$C$: domestic consumption
$N_d$: demand elasticity

This approach yielded values for the elasticity of supply parameter ($E_s$) ranging between 1 and 2 depending on the sector and product.

For the supply elasticity of fairly traded imports ($E_f$) parameter, The Boltuck- spreadsheet (1991) offers an option. Either a specific value is introduced or the parameter is assumed to equal infinity. An infinitely elastic supply means that whatever the quantity imported by the EU, the unit price will be the same. We used the latter option unless there was evidence which suggested otherwise. A sensitivity test showed that the injury margin ($\Delta P_d$) is relatively insensitive to changes in the value of parameter $E_f$ when the sum of $V_d$ and $V_u$ is high. A high value of $V_d + V_u$ means that there are not much 'fairly traded imports' ($V_f$) of the product\(^8\). In the majority of the Central-European antidumping cases $V_f$ is indeed relatively small. Therefore we set $E_f$ equal to its default value of infinity.

---

\(^7\)The appropriate figures for consumption, production and imports were found in the antidumping case report.

\(^8\) because $V_d + V_u + V_f = 1$
EU's market share of EU like product and dumped imports: $V_d$, $V_u$

The market share of the European like product ($V_d$) is always revealed in the case reports of the Official Journal. With respect to the market share of the dumped imports ($V_u$) in the EU, we make a distinction between individual and cumulated market shares. In Vandenbussche (1995), we disentangled the European injury determination process in two separate steps. In a first step the Commission decides on the presence of injury while in a second step the actual injury margin is calculated. In the first step the Commission often takes recourse to the practice of cumulating market shares of imports of all the defendants involved in the case. To give an example, suppose an antidumping investigation is initiated against Hungary, Poland and Czechia. Cumulation means that the Commission sums up the individual import market shares of the three defendants involved. Suppose each individual defendant has a market share in the EU of 3%, the three together represent an import market share of 9%. By taking the cumulated figure, the Commission can argue more convincingly that injury to the domestic EU industry is present. In the second step, the Commission then moves on to calculate an individual injury margin for each defendant separately. It is not difficult to see that cumulation is a bias in favour of protection. If in the first step of the injury determination process, each defendant's market share had been considered separately, it would have been difficult for the Commission to argue that an import market share of 3% is substantial enough to cause injury to a domestic EU industry. However on a cumulated basis the three defendants are far more likely to end up in the second step of the injury process and be subject to antidumping measures. In all the 17 antidumping cases in our sample, the Commission used cumulation in the injury process.

The European Commission's preference for cumulation induces us to consider the Boltuck-estimates under two alternative scenarios. We will compare EU injury margins with Boltuck estimates both in the case of individual market shares and in the case of cumulated market shares. Cumulation implies that the parameter $V_u$ and $a'$ take different values in the simulations. Here we will only discuss $V_u$, the next paragraph deals with $a'$. The figures for both the individual and the cumulated market shares ($V_d$) of the defendants in the EU were obtained from the antidumping case reports in the Official Journal. A sensitivity analysis revealed that the injury estimate ($P_d$) is very sensitive to this parameter ($V_d$). The higher the defendant's market share, the more prices for the EU import-competing industry become depressed as a result of a reduction in the price of the foreign like product. Therefore we expect the Boltuck injury margin to be bigger in the case of cumulated market shares than in the case of individual market shares.

The share of the defendant's domestic sales: $a'$

The original definition of parameter $a'$ is the following:

$$a' = \frac{1}{1 + 2}$$
(1) the defendant’s sales of the product in its foreign local market
(2) the defendant’s sales of the product in the EU

However with respect to Central-European countries, information on local market sales (1) is difficult to get. Therefore we turn to an alternative definition of $a'$ for Central-European countries:

(1) the defendant’s exports of the product to the analogue country

In antidumping cases involving Central-European countries an 'analogue country' with market economy is always used to establish the dumping margin. The logic behind the alternative specification of (1) in $a'$ is that by taking the trade of the defendant to the analogue country we have the volume of sales of the defendant’s product in the analogue country rather than in its own local market.

Out of the 17 selected antidumping cases we could only calculate $a'$ in 8 cases for the simple reason that in the remaining 9 cases there was no 'export from the defendant country to the analogue country' (see definition of $a'$) reported in the trade statistics. The low values of $a'$ in those cases where we do have information, indicate a high degree of export orientation of the products involved. Because the remaining 9 cases where we do not have an estimate of $a'$, are situated in the same industries (Chemicals and Mechanical engineering) and in the same countries, we consider a range for $a'$ between 0 and 50%. A sensitivity analysis shows that the level of injury and the value of $a'$ are positively correlated. Therefore by putting $a'$ equal to its upper limit of 50% we get the highest level of injury possible under the Boltuck-model.

In the scenario whereby we consider cumulated market shares of the imports, parameter $a'$ is likely to change. Here a problem arises. To have an accurate estimate of cumulated $a'$ we need to know 'local sales' for the defending countries with a market economy (see original definition of $a'$), and the 'exports to the analogue country', for the non-market economy defendants (see alternative definition of $a'$). Local production figures are far more difficult to obtain than trade figures. From the scenario based on individual market shares, we know that for the Central-European countries involved, the a’s are small (below 50%) suggesting a high degree of export orientation. For those cases where all the defendants are Central-European exporters, we set the cumulated value for $a'$

---

9 We thank Richard Boltuck for suggesting this alternative route

10 There are three possible reasons for the lack of this information. The first and most simple is that the product concerned is not actually traded between the countries involved, second it is also possible that the goods are first shipped via a different country. In such a case the trade statistics register the country where the goods are last shipped from and not the country of origin of the goods. A third possibility is that it concerns products whose shipments are kept confidential and which do not appear in the trade statistics. In an industry with few competitors where the trade flows might reveal information on a competitor’s sales, the firms can choose not to publish their export figures.
equal to 50% which again can be considered as an upper limit\textsuperscript{11}. In those cases where some of the
defendants are market economies and where we have no indication how export oriented these market
economies are with respect to the product involved, we also opted for a cumulated a' of 50%. The
motivation for this is that since the export orientation for the Central European defendants is very
high (and a' very low), the share of the local sales for the market economies involved would have to
be very large in order to get a cumulated a' of over 50% (see definition of a' cumulated in footnote
11).
Table 3 lists all the parameter values of the Central European cases necessary to run the Boltuck-
model.

3.C. Results

Antidumping measures in the European Union are targeted at eliminating the lower of the dumping
or injury margin. Case evidence has demonstrated that when the case is decided with a duty, usually
the injury margin is the smaller of the two (Vandenbussche 1995). Hence antidumping duties often
equal the extent of price-undercutting. When an EU antidumping case is decided by acceptance of
a price-undertaking however, the level of injury is not revealed by the European Commission. A
price-undertaking is a voluntary price increase offered by the defendant to eliminate the injury to the

\textsuperscript{11}Consider the following example: a case where three countries are alleged of dumping: Hungary,
Poland and Czechoslovakia. Each of the individual a' lies between 0 and 50%:

\begin{align*}
0 & \leq a'_{HU} = \frac{\text{HUS}}{\text{HUS} + \text{EU}_{HU}} \leq 50\% ; \\
0 & \leq a'_{PO} = \frac{\text{POS}}{\text{POS} + \text{EU}_{PO}} \leq 50\% ; \\
0 & \leq a'_{CZ} = \frac{\text{CZS}}{\text{CZS} + \text{EU}_{CZ}} \leq 50\% ;
\end{align*}

The definition of the cumulated a' is than:

\[ a'_{CU} = \frac{\text{HUS} + \text{POS} + \text{CZS}}{\text{HUS} + \text{EU}_{HU} + \text{POS} + \text{EU}_{PO} + \text{CZS} + \text{EU}_{CZ}} \]

One can show that the cumulated value for a' also has to lie between 0 and 50%:

\begin{align*}
0 & \leq a'_{CU} \leq 50\%
\end{align*}

with HUS = Hungarian sales in Hungary and EU\textsubscript{HU} = Hungarian exports to the EU
POS = Polish sales in Poland and EU\textsubscript{PO} = Polish exports to the EU
CZS = Czechosl. sales in Czechosl. and EU\textsubscript{CZ} = Czechosl. exports to the EU

17
EU industry. The extent of the price-undertaking offered is confidential. In analogy with the duty cases we believe it is reasonable to assume that the Commission acts according to the same principles. Hence in table 4 we set the European injury margins in the price-undertakings cases equal to the level of foreign price-undertcutting. Whenever the percentages reported in the column 'European injury margins' in table 4 are smaller than the dumping margins (see table 3) these percentages represent ad valorem tariffs to be paid on top of the import price in the EU in the case of an antidumping duty. Or in the case of a price-undertaking, they represent the increase in the foreign exporter's price to the EU. In our sample there are three cases where the European injury margin (table 4) is higher than the dumping margin (table 3). Potassium permanganate against Czechoslovakia, silicon carbide and artificial corundum against Poland. In those cases antidumping measures equalled the dumping margin. In all the remaining cases in our sample, antidumping measures were aimed at injury margins.

The general results from table 4 can be summarized as follows. For individual market shares, Boltuck injury levels ($\Delta P_j$) always appear to be much lower than the ones reported by the European Commission. The average European injury margin is 20.6% while the average Boltuck injury margin is only 1.15%. An injury margin of around 1% is normally regarded by the Commission as a 'deminimis' injury level which would have lead to dismiss all claims for antidumping protection against Central-European exporters. Except perhaps for the case involving Methenamine from Czechoslovakia, where the individual Boltuck injury margin equals 6%. However, this relatively high injury figure for Methenamine may be explained by the failure of the Boltuck-model to take into account the imperfect nature of the European industry for Methenamine (see below). In sum, on the basis of individual Boltuck injury levels, the majority if not all the antidumping cases in our sample would have been stopped without further recourse. However, from the course of history we know that the average level of antidumping protection for the products involved was 19.9%. This result seems to suggest that European consumers of these products on average paid 20% too much. The Boltuck results cast doubt on the argument that antidumping protection was necessary to guarantee the continued survival of the complaining European industries. Instead it may have jeopardized the competitiveness of industries further down the production chain using the products in our sample as inputs. On the basis of cumulated market shares, simulated injury margins are higher than on the basis of individual market shares but remain far below the Commission's. The average cumulated Boltuck injury margin is 6.5%, which is still 14.1% lower than the average Commission's injury margin.

---

12In calculating the average level of antidumping protection for the 17 cases in our sample we considered for each case the lower of dumping and injury margin. For the three cases in our sample where European injury margins outweighed the dumping margins, the dumping margin had to be used for the calculation of the average level of protection.
Table 4: A COMPARISON OF EU INJURY LEVELS AND CADIC INJURY LEVELS\textsuperscript{13}

<table>
<thead>
<tr>
<th>Defendant</th>
<th>Year</th>
<th>Product</th>
<th>EU Injury Margin</th>
<th>Individual Market Share</th>
<th>Cumulated Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>CADIC $\Delta P_e$</td>
<td>$V_\alpha$ (cumulated)</td>
<td>number of defendants</td>
</tr>
<tr>
<td>Czechoslov.</td>
<td>1990</td>
<td>Methenamine</td>
<td>22 %</td>
<td>6 %</td>
<td>12 %</td>
</tr>
<tr>
<td></td>
<td>1990</td>
<td>Potas.Perman</td>
<td>25 %</td>
<td>0,70 %</td>
<td>11,40 %</td>
</tr>
<tr>
<td></td>
<td>1987</td>
<td>Urea</td>
<td>19,5 %</td>
<td>0,20 %</td>
<td>20 %</td>
</tr>
<tr>
<td></td>
<td>1987</td>
<td>Electric Mot.</td>
<td>35 %</td>
<td>2,80 %</td>
<td>20 %</td>
</tr>
<tr>
<td></td>
<td>1987</td>
<td>Copper Sulph.</td>
<td>5 %</td>
<td>1,4%</td>
<td>16%</td>
</tr>
<tr>
<td></td>
<td>1986</td>
<td>Potas.Perman</td>
<td>21 %</td>
<td>0,2 %</td>
<td>77 %</td>
</tr>
<tr>
<td>Poland</td>
<td>1990</td>
<td>Methenamine</td>
<td>10 %</td>
<td>1,4 %</td>
<td>12 %</td>
</tr>
<tr>
<td></td>
<td>1987</td>
<td>Copper Sulp.</td>
<td>25 %</td>
<td>3,2 %</td>
<td>16 %</td>
</tr>
</tbody>
</table>

\textsuperscript{13} Sources: (a) Official Journal of the EU: antidumping Case reports

? : data not plausible with price discrimination: no results are given by CADIC
<table>
<thead>
<tr>
<th>Defendant</th>
<th>Year</th>
<th>Product</th>
<th>EU injury margin</th>
<th>CADIC (ind) $\Delta P_{a}$</th>
<th>$V_{a}$ cumulated</th>
<th>Number of defendants</th>
<th>$a'$ (cum)</th>
<th>CADIC (cum) $\Delta P_{a}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1987</td>
<td>Electric Mot.</td>
<td>35 %</td>
<td>0 %</td>
<td>20 %</td>
<td>7</td>
<td>50 %</td>
<td>11.8 %</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1986</td>
<td>Silicon Carbide</td>
<td>16 %</td>
<td>0 %</td>
<td>40 %</td>
<td>5</td>
<td>50 %</td>
<td>2.40 %</td>
</tr>
<tr>
<td></td>
<td>1986</td>
<td>Artif Corund</td>
<td>13 to 20 %</td>
<td>0,10 %</td>
<td>7 %</td>
<td>3</td>
<td>50 %</td>
<td>0.90 %</td>
</tr>
<tr>
<td></td>
<td>1985</td>
<td>Cop. Sulphate</td>
<td>18 %</td>
<td>0.90 %</td>
<td>11 %</td>
<td>3</td>
<td>50 %</td>
<td>2.60 %</td>
</tr>
<tr>
<td>HU</td>
<td>1989</td>
<td>Urea</td>
<td>17 %</td>
<td>0,10 %</td>
<td>11.50 %</td>
<td>6</td>
<td>50 %</td>
<td>6.30 %</td>
</tr>
<tr>
<td></td>
<td>1987</td>
<td>Cop. Sulphate</td>
<td>19 %</td>
<td>1.80 %</td>
<td>16 %</td>
<td>4</td>
<td>50 %</td>
<td>10 %</td>
</tr>
<tr>
<td></td>
<td>1987</td>
<td>Electric Mot.</td>
<td>35 %</td>
<td>0,20 %</td>
<td>20 %</td>
<td>7</td>
<td>50 %</td>
<td>12.2 %</td>
</tr>
<tr>
<td></td>
<td>1986</td>
<td>Artif. Corund</td>
<td>18,50 %</td>
<td>0,40 %</td>
<td>7 %</td>
<td>3</td>
<td>50 %</td>
<td>1.80 %</td>
</tr>
<tr>
<td></td>
<td>1985</td>
<td>Cop. Sulphate</td>
<td>18 %</td>
<td>0.20 %</td>
<td>11 %</td>
<td>3</td>
<td>50 %</td>
<td>2.70 %</td>
</tr>
</tbody>
</table>
Under cumulated Boltuck, only three cases would definitely be dismissed because of 'deminimis injury'. It involves Potassium permanganate from Czechoslovakia with an injury margin of 1.3 %, the 1985 Copper sulphate case against Poland with an injury margin of 0.9% and the Artificial corundum case against Hungary with an injury margin of 1.8 %. In all the other cases the Boltuck injury margins would probably lead to the imposition of antidumping measures. The average level of antidumping protection in the case of cumulated market shares under Boltuck is equal to the average injury margin of 6.5 %. The reason for this is that all the Boltuck injury margins lie below the dumping margins. Therefore the injury margins also reflect the height of the antidumping measure.

The overall conclusion is that the European injury margins in our sample are seriously overestimated. They result in an average level of antidumping protection which is 20 % too high compared to Boltuck (1987) injury estimates on the basis of individual market shares and 14 % too high compared to Boltuck (1987) injury estimates on the basis of cumulated market shares. This shows among others, that no matter how convenient the level of foreign price-undercutting may be as a rule of thumb, to use it for the calculation of injury margins results in injury and duty levels which are far too high. The simulated injury margins on the basis of the Boltuck-model (1991) are derived under the implicit assumption of a competitive European industry where firms are price-takers. The objection could be raised that the low values of the simulated injury margins might be due to the failure to take into account the imperfect nature of the European industries involved. From a theoretical point of view it is difficult to predict how the Boltuck-injury estimates would change under imperfect competition. This will depend on the specific type of oligopoly prevailing in the industry concerned. The number of firms in the industry, the presence of price or quantity competition, horizontal or a vertical product differentiation are all factors that will determine to what extent the European price will get depressed as a result of foreign dumping. However, from an empirical point of view the oligopolistic power of the European industries concerned is diluted by import competition. This can be seen by calculating the share of imports in the EU consumption. In table 5 we have listed this share for all the antidumping cases in our sample. In the cases for which this share is relatively large, the market structure problem is not too serious because the high import penetration guarantees the competitiveness of the European market. The last column in table 5 shows that only in 2 cases, this share is smaller than 20 %. In 4 cases, the imports constitute between 20 and 30 % of European consumption. The majority of cases, 6 in total, have a share lying between 30 and 50 %. In 4 cases this ratio is over a 100 % which suggests that imports exceed European consumption14. In cases where imports constitute less than 20 % of European consumption it is not correct to conjecture that the level of competition is sufficiently high to justify the use of the Boltuck-model. The European market for Methenamine is in this position. In all the other cases, the share of imports in consumption is sufficiently high to rely on the Boltuck-estimates.

14 One possible explanation for this is the difficulty that arises when trying to match production and trade figures.
Table 5: share of imports in European consumption for the products involved in the Central European antidumping cases

<table>
<thead>
<tr>
<th>Defendant</th>
<th>Year</th>
<th>Product</th>
<th>EU production (a) in tonnes</th>
<th>Extra EU imports (b) in tonnes</th>
<th>Extra EU exports (c) in tonnes</th>
<th>share of imports in EU consumption (b)/(b+a-c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Czechosl.</td>
<td>1990</td>
<td>Methenam.</td>
<td>27,500</td>
<td>3,956</td>
<td>1,272</td>
<td>13 %</td>
</tr>
<tr>
<td></td>
<td>1990</td>
<td>Pot.perm.</td>
<td>402</td>
<td>2,657</td>
<td>837</td>
<td>119 %</td>
</tr>
<tr>
<td></td>
<td>1987</td>
<td>Urea</td>
<td>4,313,000</td>
<td>1,370,064</td>
<td>921,867</td>
<td>29 %</td>
</tr>
<tr>
<td></td>
<td>1987</td>
<td>Electr.mot.</td>
<td>20,700 (*)</td>
<td>40,957</td>
<td>25,906</td>
<td>114 %</td>
</tr>
<tr>
<td></td>
<td>1987</td>
<td>Cop.sulph.</td>
<td>50,287</td>
<td>11,162</td>
<td>10,059</td>
<td>22 %</td>
</tr>
<tr>
<td></td>
<td>1986</td>
<td>Pot.perm.</td>
<td>696</td>
<td>2,657</td>
<td>1,778</td>
<td>169 %</td>
</tr>
<tr>
<td>Poland</td>
<td>1990</td>
<td>Methenam.</td>
<td>27,500</td>
<td>3,956</td>
<td>1,272</td>
<td>13 %</td>
</tr>
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<td></td>
<td>1987</td>
<td>Cop.sulph.</td>
<td>50,287</td>
<td>11,162</td>
<td>10,059</td>
<td>22 %</td>
</tr>
<tr>
<td></td>
<td>1987</td>
<td>Electr.mot.</td>
<td>20,700 (*)</td>
<td>40,957</td>
<td>25,906</td>
<td>114 %</td>
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<tr>
<td></td>
<td>1986</td>
<td>Silic.carb.</td>
<td>100,000</td>
<td>59,921</td>
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<tr>
<td></td>
<td>1986</td>
<td>Art.corund</td>
<td>121,193</td>
<td>72,845</td>
<td>46,380</td>
<td>49 %</td>
</tr>
<tr>
<td></td>
<td>1985</td>
<td>Cop.sulph.</td>
<td>34,000</td>
<td>16,656</td>
<td>9,047</td>
<td>40 %</td>
</tr>
<tr>
<td>Hungary</td>
<td>1989</td>
<td>Urea</td>
<td>4,564,529</td>
<td>1,370,064</td>
<td>1,434,355</td>
<td>30 %</td>
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<td></td>
<td>1987</td>
<td>Cop.sulph.</td>
<td>50,287</td>
<td>11,162</td>
<td>10,059</td>
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<td>34,000</td>
<td>16,656</td>
<td>9,047</td>
<td>40 %</td>
</tr>
</tbody>
</table>

Sources:  
(a) Official Journal case report  
(b) en (c) EUROSTAT External Trade Statistics  
Notes: (*) This figure is the equivalent of the 'number of motors', the unit measure used in the case.
4. Conclusion

In this paper we find that the European Commission has overestimated injury margins in 17 antidumping cases against Central Europe in the period 1985-1990. This conclusion was arrived at by comparing the European Commission's injury margins with those obtained on the basis of an alternative approach. For this purpose we turned to the Boltuck-model which is often used by the International Trade Commission in the US for the calculation of injury in dumping cases. In calculating injury margins, the European Commission seems to focus on the level of foreign price undercutting. The Boltuck-approach defines injury as the reduction in the domestic price resulting from cheaper imports. From an economic point of view the Boltuck-model is preferable because it takes into account how the market reacts to the price change of a substitute product. One of the critical assumptions underlying this approach is that the European industry is competitive. Although the import--competing European industries in our sample are relatively concentrated, the share of imports in domestic consumption was high enough to guarantee competitive European markets and to rely on the injury estimates. Our injury calculations show that on the basis of individual market shares, the average overestimation by the European Commission is 20 %, while on the basis of cumulated market shares, the average overestimation is 14%. The European Commission's own estimates in those cases were all derived using cumulation. Therefore, it seems appropriate to consider 14% as the most likely figure of overestimation. By law, antidumping measures have to offset the lower of dumping or injury margin. In the large majority of the Central European cases in our sample, the injury margins are the lower of the two. This means that the injury margins determine the level of antidumping protection. The fact that European Commission seems to have overestimated injury margins suggests that this resulted in an overestimation of the level of protection in those cases. By keeping the European antidumping mechanism in place, the European Union can continue denying access on legal grounds to Central-European imports. In our opinion, the way towards a more liberal and unrestrained trade order with the new Associated Members of Central-Europe lies elsewhere. A first-best solution would be to dismiss the antidumping mechanism between the signing parties of the Association Agreements and to install the EU's competition policy as guardian of fair practices as it is now the case between member states. A second best solution would be to change the method of injury margins calculation from the arbitrary rule of thumbs which are being used today to more economically solid methods.
References:


APPENDIX A: THE BOLTUCK - MODEL

1. List of symbols:

\( D_h \) : demand for the dumped product in foreign market (= country of origin)

\( D_u \) : demand for the dumped product in European market

\( D_f \) : demand for fairly-traded imports in EU

\( D_d \) : demand for like product in EU

\( C \) : average (marginal) cost of production

\( S_d \) : supply of like product

\( S_f \) : supply of fairly-traded imports

\( a \) : the ratio of the foreign exporter’s local sales over the sum of his local sales and exports to the EU (fractional) when exporter sets one single price

\( P_i \) : Single price of the integrated market for the dumped product

\( N_i \) : Elasticity of demand for the dumped product in the integrated market

\( a' \) : the ratio of the foreign exporter’s local sales over the sum of his local sales and exports to the EU (fractional) in the case of separated markets.

\( V_d \) : EU market share of EU like product (fractional)

\( V_u \) : EU market share of dumped imports (fractional)

\( N_T \) : Elasticity of demand for aggregate import I

\( N_A \) : Elasticity of demand for aggregate import A

\( N_d \) : Elasticity of demand for EU like product

\( N_u \) : Elasticity of demand for dumped import

\( N_u' \) : Augmented elasticity of demand for dumped import

\( N_f \) : Elasticity of demand for fairly-traded import in the EU

\( N_h \) : Exporter’s home market elasticity of demand for dumped product in his local market

\( N_{du} \) : cross-price elasticity of demand between like product and dumped import price

\( N_{ud} \) : cross-price elasticity of demand between dumped import and like product price

\( N_{fd} \) : cross-price elasticity of demand between fairly-traded import and like product price

\( N_{df} \) : cross-price elasticity of demand between like-product and fairly-traded import price
\( N_{fu} \) : cross-price elasticity of demand between fairly-traded import and dumped import price

\( N_{uf} \) : cross-price elasticity of demand between the dumped import and the fairly-traded import

\( E_d \) : Elasticity of supply of like product in EU

\( E_f \) : Elasticity of supply of fairly-traded import in EU

\( M \) : dumping margin

2. The Economic Model

A. DUMPING

The dumping exporter selects a price in its local foreign market, \( P_h \), and a price in its export (EU) market, \( P_u \), so as to maximise its profits (\( \Pi^F \)) under constant marginal costs given by c:

\[
\Pi^F = (P_h \cdot D_h + P_u \cdot D_u) - [C \cdot (D_h + D_u)]
\]  
(1)

In the foreign market, demand depends only on the price of the exporter's product, whereas in the EU market demand for the dumped product depends on the price of the dumped product \( P_u \), the price of the EU like product \( P_d \) and the price of a fairly-traded product \( P_f \) available in the EU market. All three products are imperfect substitutes:

\[
D_h = D_h(P_h)
\]  
(2a)

\[
D_u = D_u(P_u, P_d, P_f)
\]  
(2b)

Profits (1) are maximised if the partial derivatives with respect to, the exporter's choice variables \( P_h \) and \( P_u \), both equal zero. For \( D_h \) this is relatively simple since it depends only on one variable. However in order to calculate the influence of the change in \( P_u \) on \( D_u \) we have to take the total derivative because \( P_u \), \( P_d \) and \( P_f \) are not independent. A change in \( P_u \) will also effect \( P_d \) and \( P_f \).

This first-order conditions for maximising (1) are:

\[
P_h = \frac{C}{(1 + \frac{1}{N_h})}
\]  
(3a)

\[
P_u = \frac{C}{(1 + \frac{1}{N_u})}
\]  
(3b)
with $N’_u$ equal to:

$$N’_u = N_u + N_{ud} \cdot \frac{d \ln P_d}{d \ln P_u} + N_{uf} \cdot \frac{d \ln P_f}{d \ln P_u}$$

(4)

$\frac{d \ln P_d}{d \ln P_u}$ can be evaluated in terms of basic elasticity parameters by differentiating the equilibrium condition for the EU like product market. This equilibrium condition is:

$$D_g(P_u, P_d, P_f) = S_d(P_d)$$

(5)

$\frac{d \ln P_f}{d \ln P_u}$ can also be evaluated in terms of basic elasticity parameters by differentiating the equilibrium condition for the market for the fairly-traded import. The equilibrium condition is:

$$D_f(P_d, P_u, P_f) = S_f(P_{fd})$$

(6)

Logarithmically differentiating (5) and (6) w.r.t. $P_u$ and solving the resulting linear equations simultaneously yields:

$$\frac{d \ln P_d}{d \ln P_u} = \frac{[N_{du}(E_f - N_f) - N_{fu} \cdot N_{df}]}{[(E_d - N_d) \cdot (E_f - N_f) - N_{fd} \cdot N_{df}]}$$

(5')

$$\frac{d \ln P_f}{d \ln P_u} = \frac{[N_{fu}(E_d - N_d) + N_{du} \cdot N_{fd}]}{[(E_d - N_d) \cdot (E_f - N_f) - N_{fd} \cdot N_{df}]}$$

(6')

So in order to calculate $P_u$, we have to put (5') and (6') into (4) and then (4) into (3b). This gives us $P_u$ in terms of elasticities and cross-elasticities.

B. INTEGRATED MARKET

What price would the exporter have charged had it been forced to select a single price for both markets? The exporter would select its price based on the amount of market power it enjoys in the now integrated market:

$$P_i = \frac{c}{1 + \frac{1}{N}}$$

(7)

What is $N_i$ in terms of basic parameters? Therefore we have to turn to total demand which is given by:

$$D_i = D_h(P_i) + D_u(P_i, P_d, P_f)$$

(8)

---

15 Condition (5) assumes that the market for the EU like product is competitive.
Logarithmically differentiating (8) w.r.t. $P_d$ yields,

$$N_i = a \cdot N_h + (1 - a) \cdot N_u'$$

(9)

where $N_u'$ is given by (4) and $a$ is given by:

$$a = \frac{D_b}{(D_h + D_u)}$$

(10)

So in order to write $P_d$ in terms of elasticities and cross-elasticities we put (4) into (9) and then (9) into (7).

3. Solutions given by the CADIC - spreadsheet

A. EFFECT OF DUMPING ON THE PRICE OF DUMPED IMPORTS

The percentage change in the price of the dumped import consequent to dumping is:

$$d\ln P_u = \frac{(P_u - P_i)}{P_i}$$

(11)

B. EFFECT OF DUMPING ON THE CONDITION OF THE EU INDUSTRY

The percentage change in the price of the EU like product as a result of dumping is:

$$d\ln P_d = \frac{d\ln P_d}{d\ln P_u} \cdot d\ln P_u$$

(12)

The percentage change in the volume of the EU like product consequent to dumping is:

$$d\ln Q_d = d\ln P_d \cdot E_d$$

(13)

Note: if $E_d = +\infty$, then (5') simplifies to:

$$d\ln P_d = \frac{N_{du}}{(E_d - N_d)}$$

and $$d\ln P_f = 0$$
APPENDIX B : HOW TO ARRIVE AT SOLUTIONS FROM PARAMETERS PROVIDED IN CADIC?\textsuperscript{16}

The parameters we provided are:
\[ M, V_d, V_u, N_d, E_d, E_f, a \]
The parameters that are derived from them are:
\[ N_{df}, N_{du}, N_{fd}, N_{ud}, N_{uf}, N_{fu}, N_f, N_u, N_h, a, P \]

The following separable utility function is assumed:
\[ U = U \{ A \{ (Q_f, Q_u), Q_d \}, Q_0 \} \]
\[ \left(1 + \frac{1}{V_d} \right) \left( N_A - N_f \right) + N_A \]

where \( Q_0 \) comprises all goods outside of the subject product category \( A \{ \cdot \} \) is a linear homogeneous aggregation function and so is \( I(\cdot) \). \( N_A \) is the elasticity of the aggregate good A, and \( N_f \) is the elasticity of demand for the aggregate good I.

If the user does not provide \( N_A \) specifically, then the spreadsheet sets \( N_A = 0 \), \( N_f \) can be arrived at by solving:
\[ N_d = -\frac{(1-V_d)}{V_d} \cdot \left( N_A - N_f \right) + N_A \]
\[ N_{du} \text{ and } N_{df} \text{ are obtained from:} \]
\[ N_{df} = \frac{(1-V_d-V_u)}{V_d} \cdot \left( N_A - N_f \right) \]
\[ N_{du} = \frac{V_u}{V_d} \cdot \left( N_A - N_f \right) \]
\[ N_{fd} \text{ and } N_{ud} \text{ equal: (via Slutsky Symmetry)} \]
\[ N_{fd} = \left( N_A - N_f \right) \]
\[ N_{ud} = \left( N_A - N_f \right) \]

Via the MURRAY and BALDWIN-assumption ("any two cross-price elasticities of demand for product within a product category, w.r.t. the same price of another product within the category are equal"). This implies that:
\[ N_{uf} = N_{df} \]
\[ N_{fu} = N_{du} \]

The own-price elasticities of demand \( N_f \) and \( N_u \) equal the following:

\textsuperscript{16}Own calculations.
\[ N_f = -\frac{(V_d + V_u)}{V_d} \cdot (N_A - N_i) + N_A \]  
\[ N_u = -\frac{(1 - V_u)}{V_d} \cdot (N_A - N_i) + N_A \]  
\[ N_h = \frac{[N'_u \times (1 + M)]}{(1 - N'_u \times M)} \]  
\[ a = \frac{D_h(P_i)}{[D_h(P_i) + D_u(P_i)]} \]  
\[ P_i = \frac{C}{1 + \frac{1}{[a \cdot N_h + (1-a) \cdot N'_u]}} \]  

The demand elasticity \( N_h \) can only be solved by making use of \( M \) and \( P_i \), which cannot be observed, can only be found simultaneously since \( a \) depends on \( P_i \) and \( P_i \) depends on \( a \). 

The CADIC spreadsheet looks for values of \( P_i \) and \( a \) that satisfy (simultaneously) both equations, by means of an iterative process. 

When all the above took place the solutions can be calculated

\[ d\ln P_u = \frac{P_u - P_i}{P_i} \]  
with

\[ P_u = \frac{C}{(1 + \frac{1}{N'_u})} \]  
\[ P_i = \frac{C}{(1 + \frac{1}{N_i})} \]  
\[ N_i = a \cdot N_h + (1-a) N'_u \]
\( N'_u = \text{a function of } N_u, N_u^d, N_{ud}, N_{uf}, E_f, N_f, N_{fu}, N_{df}, E_d, N_d, N_{fd}, E_d, N_d \)

\[
dln P_d = \frac{d\ln P_d}{d\ln P_u} \cdot d\ln P_u
\]

with

\[
\frac{d\ln P_d}{d\ln P_u} = \text{a function of } N_{du}, E_f, N_f, N_{fu}, N_{df}, E_d, N_d, E_d, N_d, N_{fd}, N_{df}
\]

\[
d\ln Q_d = d\ln P_d \cdot E_d
\]
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