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**North-South Integration in an
Enlarged European Community
Portuguese Industry and the Effects of
EC Membership**

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North-South Integration in an Enlarged European Community
Portuguese Industry and the Effects of EC Membership*

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* A substantial part of this paper uses A. Smith and A. Venables model. I am grateful to them for providing the software which is more complex than suggested by the brief description of the model presented here. A first version of this paper was presented in London, in March 1989. Remaining errors are only mine.

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Introduction

The purpose of this paper is to assess the likely effects of trade liberalisation on a group of industries characterised by significant economies of scale. Although, the focus is on the Portugal's industrial structure and adjustment other countries were included: U.K., the traditional Portuguese partner, Spain, the future natural partner and Italy another southern country. However, only the results for Portugal, Spain and the EC are reported here.^{1/}

Spain and Portugal as new EC entrants are likely to suffer the largest adjustments to their industrial structure. They have to suffer the simultaneous impact of the transition period to EC integration and the 1992's 'completion of the internal market'. The policy shocks can only be partially offset by their peripheral situation.

It has been claimed that the largest impact on Portugal's industrial structure would come from trade liberalisation with Spain which is implied by the EC enlargement to the Iberia peninsula. In fact, just at beginning of the eighties, trade between both countries was very small. The effects of trade liberalisation between Portugal and Spain is likely to be underestimated because liberalisation effects on the analytical framework used, depend on the level of base year's trade: 1983.

The analysis is carried in the context of a formal partial equilibrium model which assumes imperfect competition. Two trade policy changes are simulated: 1) EC countries, including Portugal and Spain, reduce intra-EC trade barriers equivalent to a direct cost saving of 2.5% of EC trade, and 2) Portugal and Spain reduce unilaterally trade barriers facing other EC countries (and each other), by the same amount than in experiment 1. The first experiment corresponds to the perceived trade liberalisation as result of the '1992 market' and the EC enlargement to the Iberian countries and the second experiment corresponds to trade liberalisation due only to the Iberian countries entry into the EC. The difference between the two experiments will approximate the "costs of non-Europe" for Portugal and Spain.

The paper is structured as following: section 1 describes the Portuguese industrial characteristics. Section 2 discusses the relevance of the model in the Portuguese case as well as the sensitivity testing. Section 3 describes the application of the model to eight industries and its calibration. Section 4 presents the results of the simulations of the policy changes mentioned above. Finally, section 5 compares two different cases of firms behaviour at the EC level: firms take each EC country as segmented and firms see the EC as an integrated market. The paper finishes with conclusions which is also an abstract of the paper.

1. Industry characteristics

Portuguese manufacturing sector is dominated by two industries: textiles particularly cotton industry and oil refining.^{2/} Both are important industries in the two segments of

manufactures: the first segment is labour intensive and oriented for exports and the domestic market and the second segment is more capital intensive and import substituting. Several firms of the second segment were nationalised after the revolution and constitute the core of the industrial state-owned enterprises group (SOEs).

Exporting industries are cotton, knitting, clothing and footwear industries, metal products (small tools and equipment), pulp and some paper, glass and ceramic and cork and products. Textile exports represent 25 to 30% of total exports. Except for the pulp industry, economies of scale internal to the firm are small for these industries.^{3/}

In spite of being exporting industries, the average size of firms is generally below or identical to the average firm's size in U.K. or Italy measured by the average of value of production per firm. The average size of plants in these industries are generally larger in Portugal than in Spain.^{4/} However, in the important textile industry, both countries have a dualistic structure with a large quantity of very small, family run firms and few large and more competitive firms. The later group of firms are more oriented to exporting than the first group.

Several industries where economies of scale are significant are import-substituting, state-owned firms (SOEs) and are monopolies or had a significant market power in the domestic market in 1983. For these industries the average size of firms, in terms of output and employment per firm is above or identical to the average size of firms in U.K., Italy or Spain. Such is the case of the oil refining industry and cement, both included in the analysis below. The iron, steel industry presents smaller firm size.

Before EC entry these industries were protected from international competition through several devices including quantitative restrictions such as those on the oil products. These were also government preferred suppliers. Foreign investment was also restricted or outright forbidden in the industries. As a result these industries were heavily concentrated.^{5/}

Industries selected for the analysis are both exporting and import substituting industries which have significant domestic production. All have significant economies of scale but for the metal products and the cotton industry. The analysis has been applied to the following industries at three digit NACE level:

- 140 mineral oil refining
- 242 cement, lime and plaster
- 257 pharmaceutical products
- 260 man-made fibres
- 316 tools and metal products
- 345 radio, TV, electronics
- 432 cotton industry
- 471 pulp, paper, paperboard

Together they represent 29% of Portugal's manufacturing production and 21% of manufacturing employment while the

respective figures for Spain are only 16% and 9%. Some industries, such as oil refining, cement, pharmaceutical products and other small industries were included both because they are likely to suffer adjustments in the transition period and after 1992 and they have significant economies of scale.

The analytical framework treats the world market as divided in six countries: U.K. (traditional Portuguese partner), the three Southern EC countries, Italy, Spain and Portugal, the rest of the EC, which encompasses mainly the north, and the rest of the world.

The special treatment of the Spanish market in these paper does not need justification. Since 1979, Spain from an insignificant partner has become an important Portuguese partner. In the last 10 years trade flows as well as investment grew fast. In fact, before 1980 Portugal and Spain were practically close to each other. Calibration of the model with 1983 data may not yet reflect the full potential for trade between these two countries although 1983 was a trade expansion year.

2. Trade with imperfect competition and the Southern economies

The model described briefly in annex 2 assumes horizontal product differentiation with constant and identical elasticity of substitution between any two models (differentiated products) on the demand side and oligopolist behaviour by firms and economies of scale on the supply side. Firms have positive profits although base equilibrium assumes zero profits at EC level.

Thus the model seems particularly interesting for the Portuguese import-substituting sector. However, the results have to be interpreted according to the specifications of the model. In particular, some of these specifications are not appropriate for the Portuguese industries.

First, the model departs, implicitly, from the assumption that the shadow price of resources used in each industry reflect their social opportunity costs. At least for the Portuguese case, this assumption is unrealistic particularly in the import-substituting industries. Trade liberalisation may lead to inaccurate welfare changes as well as being misleading on the optimal level of protection. As pointed by Krugman in a comment to Venables and Smith (1986), protection of industries with economies of scale and oligopolist behaviour by firms may be justified in partial equilibrium but in general equilibrium even mild protection may represent social losses exceeding the costs of the factors attracted to the protected industries.^{6/} Conversely, even for a small economy, trade liberalization may lead to a loss in welfare. In general equilibrium, the social gains may exceed the costs of the factors of production repelled by the contracting industries so that welfare may increase rather than decline.

A second limitation is that the partial equilibrium design of the model with imperfect competition assumes away the resources endowments of the Southern European countries relative

to the Northern countries. It also assumes identical cost functions for all firms in different countries. Cost reductions for the expanding economies are mainly determined by the economies of scale exogenously specified. This feature of the model has obvious limitations for the labour intensive, small economies of scale industries. A sizeable trade liberalisation would reallocate production significantly. In fact, this reallocation could be dampened by keeping wages low or devaluing the currency as an active policy or as result of an overall macroeconomic imbalance.7/

In partial equilibrium, identical cost functions for all firms will tend to underestimate the cost reduction of firms characterised by 'X-inefficiency'. Such is likely to be the case for firms (sometimes full industries) which are state-owned both in Portugal as in Spain. In general equilibrium, the social resource costs in these firms are likely to be high so that welfare changes may be underestimate as result of trade liberalisation.

In the calibration and policy simulations below the Smith and Venables (S&V) model specifications were kept. However, both for calibration as well as simulation of policy changes, I assumed that firms anticipate an output game (Cournot behaviour) and that the number of models produced by each firm is fixed.

My prior guess is that the lower level of competition of firms (domestic and foreign) selling in southern markets such as Portugal and Spain (see below Herfindahl index) are likely to perceive a (zero conjecture) output game - Cournot, rather than a (zero conjecture) price game - Bertrand.8/

For several industries, internal to firms economies of scale and market concentration are likely to be more significant than product differentiation. If the Cournot game is assumed, rather than Bertrand, more of the price-marginal cost difference will be attributed to firms' perceived ability to change industry aggregates rather than product differentiation.

Thus my prior is of a higher model elasticity obtained usually with Cournot game than the elasticity implied by the Bertrand game. In the calibration below we give some results for the Bertrand game including this elasticity (in the annex this is σ). The reason for Bertrand lower perceived elasticity of substitution is that Bertrand being more competitive than Cournot leaves more of price-cost margin to product differentiation and have less impact on prices than Cournot. Calibration is of this elasticity and not on conjectures of other firms reaction (v).

Calibration of the base case assumes that firms have the same output per model and therefore differences in firm size are due to different number of models (differentiate products). The policy simulations below all assume the number of models fixed. If the models per firm (m_i) were to vary, m_i would be consistent with profit maximisation and the calibration would resort to w_i (non-zero conjectures). As with S&V the Cournot game gives much smaller conjectures than the Bertrand solution because firms anticipate changes in sales per model at a given price in the

Bertrand game while they anticipate prices changes at constant volume in the Cournot case.

3. Calibration

The model is calibrated at 3 digit NACE industry level. The calibration consists of obtaining a set of endogenous parameters which support the data for the base year as an equilibrium. We review first, the sources and the problems of the data base, the equilibrium conditions specified for calibration and the calibrated parameters. The later are for each of the eight industries on table 1.

Table 1

1983 was chosen as the base year for the projections essentially because a full data set was available for that year. 1983 was the first year of the second stabilisation program in Portugal but it marked the beginning of recovery of the world economy, so that trade of Portugal and Spain expanded. Although this year was somewhat atypical there is no reason to believe that it affected the nature of the results of the model.

The basic data set needed for calibration is in table 1. Data on production and exports are on top part of each section. Portugal is a small producer, consumer and exporter compared with the other countries as seen in the production and consumption matrix (exporters in rows, importers in columns, diagonal is production for domestic consumption).

Data sources are explained in annex 3 as well as parameters choice which are drawn from secondary sources. Results must be carefully interpreted because there are several problems with the data, particularly those coming from bridging the NACE-production and the SITC-OECD trade as well as errors on the Portuguese CAE and Spanish CNAE adjustment to NACE.9/ Re-exports were not net out and this is another source of data inaccuracy. Moreover, industrial census are only available for plants and not for firms. EUROSTAT census data for all other EC countries is on firms, not on plants. By taking the number of firms as highly correlated with the number of plants, I underestimate the level of market concentration at least in the Portuguese market.

For the rest of the EC (REC) production and trade data is unreliable and for the rest of the world (ROW) it is unavailable. Therefore, production for the REC and ROW was calculated on the base of the same proportion of production on exports (REC) or on exports to the EC (ROW) as the average for U.K. and Italy. These figures are generally inaccurate and great caution has to be given to the results for these two aggregates.

Data was needed to quantify the number of "representative firm" in a given industry. This is given by the number of firms which may be assumed symmetrical and lead to the Herfindahl indexes which are roughly consistent with the actual size dispersion given by the Portuguese industrial census on plants and on employment. Lacking data on industrial concentration for Portugal, let alone Spain, I used average size in terms of

production as explained in annex 3.

Table 1 shows the number of "representative firms" as well as the Herfindahl indexes estimated for each industry. The figures show a higher level of industrial concentration (less competition) in Portugal and Spain than in any other EC country. Note that the indexes reflect not only the level of competition of domestic firms in their own market but also foreign firms competing in the domestic market. The level of the index seems reasonable for the Iberian countries. This appears to be reasonable as the Portuguese and Spanish smaller markets and lower incomes than other EC markets, are less attractive for import penetration and they only truly open recently. Again, for the REC and ROW figures were assumed to make firm size equal to the average of the U.K. and Italy firm size.

Some industries at 3-digit NACE are too aggregate so that some industries were divided in a certain number of symmetric sub-industries. For instance, for the electronic industry (345) I assumed two sub-industries: one sub-industry is roughly of similar scale to the largest narrowly defined group in the industry - television sets. Other sub-industries are on pharmaceutical products (257) and pulp and paper (471).

One set of parameters exogenously specified are on economies of scale, minimum efficient scale (mes) for each industry. I have used the estimates of Pratten (1988) as guidelines for the economies of scale and mes. Since I assumed the number of models fixed throughout calibration and policy simulation economies of scale are specified by a number: the effect on the average costs of reducing the output of each variety below mes. The minimum efficient scale (mes) was defined by Pratten although the figures are often smaller in table 1 than those of Pratten or for similar industries in S&V. The reason is that the Iberian Peninsula peripheral position (higher trade costs) allow a smaller efficient scale.^{10/}

For the calibration of the cost function we also need an exogenous specified weight (z in annex 2) for the linear part (fixed costs plus constant marginal costs) and a log-linear part. For some industries I gave more weight to the linear part. For instance, the cotton industry (432) has $z=0.8$ which reflects the perception that fixed costs are large and that returns to scale become exhausted as firms become larger.

Finally, an estimate of the elasticity of demand is also required. In annex 3 we compared the only available estimates for Portugal based on the linear expenditure system by Martins and Oliveira (1979) and those provided by Piggot and Whalley (1985). The perception is that the Portuguese estimates are too low so that the choice fell on estimates nearer those of Piggot and Whalley. These are also reported on table 1.

Calibration of the base case assumes that markets are segmented, firms choosing sales from profit maximisation in each market separately. As set by the model parameters listed at bottom of table 1 are consistent with equilibrium conditions which allow firms to have market power (firms equate marginal costs with marginal revenues in each market leading to price-cost

margins consistent with product differentiation and EC profits equal to zero).

As explained in the annex 2, the "tariff equivalent" shown in table 1 are consistent with differences in firms' shares in each market (country). These are derived from differences in the dual prices and profit maximisation after subtraction of transport costs set at 10% ad-valorem. The "tariff equivalent" are generally higher for Portugal and Spain imports (columns) and facing Portugal and Spain exports. These seem reasonable and clearly higher than those calculated by S&V for several industries.

The highest implicit barriers to trade in Portugal seem to be on petroleum products, cement (much lower for the two industries in Spain), pharmaceutical, man-made fibres, electronic products and pulp and paper (as high in Portugal as in Spain). Lower barriers seem to be for the labour intensive industries both in Portugal and Spain: tools and finished metal products and cotton industry. These are industries producing closer substitutes.

The base case assumes that firms perceive an output game (Cournot). In table 1 the model elasticity (σ in annex 2) corresponding to the Cournot and Bertrand version are given. As explained the Cournot version leads to an elasticity higher than Bertrand so that less of the price-cost difference is attributed to product differentiation. Concentrating on the Cournot case, the larger is the elasticity the less is product differentiation so that models are close substitutes. Note the case of pharmaceutical products and man-made fibres industry: the later has a larger model elasticity than the former. The models produced by the man-made fibre industry are closer substitutes than those produced by the pharmaceutical industry. Most cases present results on elasticities which are plausible although those for the oil refining and cement industries seem too high perhaps because of reduced number of firms with average economies of scale.

As mentioned, calibration of the base case assumes that firms have the same output per model. If the number of models were to vary, their number would be consistent with profit maximisation and calibration would resort to non-zero conjectures (w_i in table 1). The results of conjectures confirm that the Cournot game gives much smaller conjectures than the Bertrand solution.

4. Simulations of trade liberalisation

The results for the two experiments of "tariff equivalent" reductions are on table 2. First, EC countries, including Portugal and Spain, reduce implicit barriers to trade equiproportionally so as to reduce direct trade costs by 2.5% (1% for the cotton industry) of the value of intra-EC trade. This corresponds to a likely underestimation of what is involved with the EC enlargement and "completing the internal market". Second, Portugal and Spain reduce unilaterally their trade barriers by the same percentage and in the same fashion than in

the first experiment but the other EC countries keep their protection level unchanged because they are unable to complete the market.

Table 2

The top part of table 2 show the results for the first simulation (all countries reduce protection) and the bottom part of the table has the results of the second simulation (only Portugal and Spain reduce protection) for each industry. Note that the difference in the results of the two experiments may be roughly attributed to the "costs of non-Europe" because by 1983 most price barriers facing Iberian exports (common external tariff) has been eliminated. The game is Cournot and the number of models is fixed, firms equate marginal costs with marginal revenues separately for each market (markets are segmented). Two set of results are reported for ~~each~~ each experiment: one when the number of firms are unchanged by the policy and the second when exit or entry is allowed, restoring profits to zero.

For most industries implicit tariff reductions are small. The percentage change of implicit tariffs are reported in parenthesis. They range from 18% tariff reduction (the Portugal's average of 40% is reduced to 33%) in the mineral oil products (140) to 2% (72% to 71%) in the pharmaceutical industry (257).

Trade liberalisation would increase trade flows. If the firms are fixed, an increase of imports will increase competition and lower prices, sales rise and there are gains in the consumer surplus. In some circumstances the profit squeeze may offset the gains in consumer surplus so that welfare may be lowered.

As an illustrative example of the effects of the two experiments I chose an industry where the data shows that Portugal is a relative efficient producer: electronic equipment (345). The effects of a "tariff equivalent" reduction of 5%, in the first experiment, when the number of firms is fixed (short run) are: (1) an increase in intra-EC trade by 26%, exports growing more for Spain than any other country (32% for Spain and 14% for Portugal) while imports increase more for Portugal than any other country (85% and 59% for Spain); (2) competition rises (Herfindahl index lowers, not reported in table 2) particularly in U.K. and Spain (the lowering of the H.I. is smaller for Portugal probably because its base value is so high); (3) welfare improves slightly in the EC (0.18% of consumption of which 0.11% is direct cost saving) and is divided evenly between North and South: more for Portugal (.48%, .15% of cost saving and rest indirect adjustment) and U.K. than for Spain (.2%) - this corresponds to a rise in the consumer surplus and a decline in profits. 9% of trade creation is pure welfare gain.

With variable number of firms (longer run) exit or entry of firms from the industry is allowed and profits are restored to base values. Firm scale is increased so that average costs decline but concentration rises so that prices also rise. Consumer surplus has to decline. Comparing the results to the previous case consumer surplus rise less (prices are higher) and production declines less for Portugal than for Spain. The larger welfare gainer is still Portugal.

If Portugal and Spain were to reduce their implicit trade barriers unilaterally (and facing each other) by the same amount than before (5%) the results would be more dramatic for the level of output produced with smaller gains on trade creation and smaller or even negative welfare changes as % of base consumption. With a fixed number of firms, losses of profits more than offset consumer surplus gains for Portugal. The results for this industry show that "the costs of non-Europe" exist and that Portugal and Spain would defend 1992 market unification. Below, the effects of full integrated markets will be considered.

Because Portugal is a relative efficient producer in the electronic industry, it will suffer a smaller decline in output than Spain (smaller trade creation than Spain) when it reduces the implicit tariff by the same amount but corresponding to a larger drop in any of the four simulations of table 2. These results are different for import-substituting industries and for those industries where Portugal is a smaller net exporter than Spain: mineral oil refining, cement (with variable number of firms), pharmaceutical products, man-made fibres, metal products. The latter industries' output and the number of firms in the smaller country will fall more than in the larger countries.^{11/}

Judging by the welfare changes as % of base consumption, the Iberian countries would defend the "completion of the EC market" in particular on net exporting, with large economies of scale industries. They would support the EC policy change unequivocally for the metal goods (316) although Portugal would support the move more than Spain, and for the pulp and paper industry (Spain more than Portugal) particularly if the number of firms are fixed. Both countries would oppose any trade liberalisation for the cotton industry if the number of firms are fixed (short run) but would support it in the longer run. The gains would be substantial for Portugal in the pharmaceutical industry and clearly the 'completion of the EC market' would be defended by both countries.

On the import substituting industries any trade liberalisation would be opposed by Portugal or Spain or both. It would be opposed by Portugal and if number of firms is variable by Spain in the cement industry (242). It also would be opposed by Portugal and Spain in the short run but the "completion of the EC market" would be supported by both countries in the longer run.

5. Integrated versus segmented markets

An important effect of 1992 is that leading to potential integrated markets. If markets are integrated, firms will be unable to discriminate between segments of the market.

When markets are segmented, generally firms tend to orient their sales towards segments with elastic demand schedules (where they charge lower prices - foreign markets) and away from market segments with relatively inelastic demand schedules (where they charge higher prices - domestic market). Emerson et. al. (1988) present evidence of substantial price differentials in the EC

countries.

When markets are integrated, firms will charge the same price (producer price) in every market although consumer prices may still diverge because of differences in trade costs. There are two main effects of integrated markets. First, firms would re-allocate sales towards those markets where they previously charged a higher price (domestic market) so that intra-EC trade would fall. As trade is reduced production would rise in net importing countries. Second, the firm market power would decline because the price-cost margin would be reduced (and equal in all markets), price would be lowered, giving also larger total sales and production volumes. Thus, welfare changes are larger than when markets were segmented.^{12/} These changes would lead to results (and conclusions) different than those of section 4.

Table 3 shows the results for all eight industries when markets are segmented, repeating the results of table 2 (top of table) and when markets are integrated. I report only the results for changes in output, average costs and welfare as % of base consumption. The implicit tariff reduction are the same to those report in table 2, for the respective industry. I also repeat some of the industry parameters and base data: model elasticity (ME), increase in average costs at 1/2 or 1/3 of mes (RS), the share of intra-EC trade in EC consumption (TS) and the EC average Herfindahl index.

Table 3

Looking again at electronic industry (345) output increases significantly in all countries with fixed number of firms. However, with entry and exit of firms, reduced profits will make firms to exit in Portugal (and the numbers of firms exiting are larger than when markets are segmented), and output would fall. The larger decline in output is in Portugal which is the market with higher concentration index. Consumer surplus rises more when markets are integrated particularly in Portugal than when markets are segmented (this is because profits are lower).

Output and welfare rise for all net importing industries in Portugal although these gains are likely to be overestimated because these industries are also associated with 'X-inefficiency' as mentioned. Output would decline for the exporting industries: metal products, pulp and paper. It would also lower for exporting industries when entry and exit of firms is allowed: electronics and cotton industry. These results are in clear contrast with those for segmented markets.

Again, judging from the point of view of welfare changes, the Iberian countries would defend the 1992 policy change for all industries in particular if 1992 would mean the type of higher integration implied when firms do not discriminate prices.

Conclusions

The effects of trade liberalisation on eight industries, characterised by significant economies of scale are described in the context of a formal partial equilibrium model which assumes

imperfect competition.

The eight industries are both import-substituting (4) and exporting industries (4) in Portugal. The first group of industries have been relatively more protected and their market power larger than the second group. Two industries are completely state-owned and are likely to be 'X-inefficient': mineral oil refining and cement. The eight industries represent 29% of the manufacturing production in Portugal and 16% in Spain. I report with some detail the results for both countries.

The partial equilibrium application of the model gives rich insights from the traditional gains and adjustments from trade together with those coming from increased competition. The later probably being more relevant than the traditional gains in Portugal and Spain because of lower level of competition at the departing line. Portugal has higher concentration indexes than the other EC countries and clearly should suffer larger effects from increased competition. Portugal and Spain will face simultaneously the transition from semi-close to open and the 1992 impact.

Several warnings were made regarding the simulation results when the model is applied to economies such as those in Portugal and Spain. First, as with other partial equilibrium and imperfect competitive models, the effects of trade liberalisation may lead, for instance, to a loss in welfare. In general equilibrium the social gains may exceed the costs of the factors of production repelled by the contracting industries so that welfare may increase rather than decline. Second, the model assumes identical cost functions for all firms in a given industry so that it does not allow for peripheral countries lower wage costs (and higher capital costs) favouring labour intensive industries. Third, the model is not designed for the SOEs in Portugal and Spain so that the welfare gains may be underestimated (and losses overestimated) if in fact those firms suffer from large 'X-inefficiency'. The results of the model must be interpreted in the context of the assumptions and are only roughly indicative of the effects of trade liberalisation in partial equilibrium. Less important but also leading to some problems and misleading results are data problems which are extensively discussed in the paper and in an annex.

The results for two basic simulations when markets are segmented were reported: 1) EC countries, including Portugal and Spain, reduce intra-EC trade barriers equivalent to a direct cost saving of 2.5% of EC trade, and 2) Portugal and Spain reduce unilaterally trade barriers facing other EC countries (and each other), by the same amount than in experiment 1. The first experiment corresponds to the perceived trade liberalisation as result of the '1992 market' and the EC enlargement to the Iberian countries and the second experiment corresponds to trade liberalisation due only to the Iberian countries entry into the EC. The difference between the two experiments roughly approximate the "costs of non-Europe" for Portugal and Spain.

In spite of the limitations of the model as applied to the Southern economies several parameters and results are plausible. In particular, the implicit trade barriers and level of

industrial concentration seem reasonable. On the results the comparison of the effects between segmented markets and integrated markets are suggestive. Another result which seems sensible is the favouring by Portugal and Spain of 1992 (when markets are integrated will be favoured more by Portugal than Spain) against a Spain and Portugal unilateral trade liberalisation (and facing each other) on the bases of the welfare criterium. Finally, trade liberalization will lead to production and firms re-allocation towards the larger economy, Spain and the EC, particularly for the net importing industries and those industries which are net exporters but less than Spain, if markets are segmented. The results are different when markets are integrated but less plausible in special for the net importing industries.

When markets were segmented the "costs of non-Europe" already existed for Portugal and Spain although they seem to be higher in the country which is the larger net exporter. Both countries would oppose any kind of trade liberalisation in the cotton industry, if entry or exit of firms is not allowed but they would support it in the longer run (number of firms variable). Other results are also reported but one must be careful in drawing precise conclusions for individual industries. If 1992 means that markets become full integrated, the "costs of non-Europe" are higher in Portugal than in Spain.

Notes

- 1/ Detailed results covering the six countries for calibration as well as for the simulations will be provided on request.
- 2/ Portugal is "small" in oil refining while it is "large" in cork (wine was not included in the analysis below because most of its production is recorded in the agricultural sector). Annex tables A-1 to A-3 contain figures describing Portuguese industrial size and plant size, measured by production and employment and comparing them with those of Spain.
- 3/ Annex table A1-5 compares the scale of production in Portugal with U.K. Not surprising the scale of production is much smaller in Portugal as the industries listed are mainly import-substituting and are limited by the size of the market. In the same table, figures for minimum efficient scale (mes) and economies of scale are also listed. As pointed by Pratten (1988), multi-product industries may have small mes for some product lines and large for other products so that analysis at industry level may be misleading.
- 4/ See annex tables A1-2 and A1-3. Corado (1984) estimated the mean plant size of largest 20 plants measured by employment and the mean size of the largest plants accounting for 60% of the industry employment both for Portugal and Spain using 1978 data. This data supports the conclusions drawn from table A1-2 in the annex: the average size of plants is larger in Portugal for most Portugal's exporting industries while the average size is larger in Spain for capital goods, automobiles and base metals.
- 5/ See annex table A1-4 for market characteristics including ownership and market concentration. A comprehensive characterisation of the state enterprises is in World Bank (1985) and a description of market structure is in Macedo, Corado and Porto (1988). See Corado and Leite (1989) for characterisation of foreign investment in Portugal and Spain as well as some effects of liberalisation of the restricted sectors where state ownership is significant.
- 6/ Corado and Leite (1989) justify protection to some private industries with economies of scale also based on partial equilibrium results. These industries are generally net exporters. They emphasised the possibility of retaliation by Spain if both countries are net exporters. Retaliation is less likely if Spain is a net importer of the type of goods which are produced in Portugal.
- 7/ See Corado and deMelo (1986) for an economy-wide model, with product differentiation on the demand side and perfect competition on the supply side and where trade liberalisation leads to an external imbalance corrected by a devaluation. The welfare effects are smaller than in the present model but production would expand for most labour intensive industries.
- 8/ As known Bertrand game is more competitive and the price-cost margin is better explained by product differentiation than by firms being able to influence the market while the Cournot game

attributes the price-cost margin more to the perceived ability of firms to change industry aggregates than to product differentiation. With no product differentiation, price-cost margins are consistent with non-zero conjectures.

9/ There are problems of bridging the Portuguese classification (CAE) and NACE. For instance, Portuguese telecommunication equipment seems to be included in the NACE 345 although part of it is recorded in another sector for other countries.

10/ See annex 1, table A1-5 for a comparison of Pratten's figures for U.K. and Portugal's scale of production. See also annex 3.

11/ See Venables (1989) for modelling the effects of trade liberalisation on two unequal sized economies a small and a large, with homogeneous goods, segmented markets, linear cost functions and a two step decision by firms (Nash game determines first output and next a sales game will determine sales). His results seem to confirm the more complex results from the model of 1985 when applied to Portugal and for the import-substituting, large economies of scale industries. There will be a sizeable reallocation of production and firms towards the larger markets particularly when goods are homogeneous. See also Corado and Leite (1989).

12/ See Norman (1989) for a graphic illustration of the effects of integrated markets.

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Table 1
Calibration

140 mineral oil refining

Production/consumption matrix, 1983 mECU

	UK	It	Sp	Por	RoEC	RoW
UK	17145.86	105.59	61.62	4.22	3041.61	1354.55
It	56.52	13508.38	35.95	21.01	1390.95	3159.05
Sp	203.79	90.74	10990.73	63.27	1014.54	828.18
Por	14.61	0.91	21.56	2345.42	120.62	169.83
RoEC	1872.80	712.45	209.17	315.37	96161.52	8411.84
RoW	1737.19	4241.26	1220.54	133.70	15657.73	216875.85

Number of firms

18	17	10	2	92	205
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Number of sub-industries 1

Herfindahl index of concentration

.044	.064	.095	.668	.008
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Returns to scale

% increase in average cost at 1/3 output per model; 10%

% increase in average cost at 1/2 number of models; 0%

linear/loglinear weights; 0.5, 0.5

minimum efficient scale; 1000 mECU

Industry demand elasticity; 1.6

Cournot calibration

Model elasticity 30.89

Tariff equivalents, %

	UK	It	Sp	Por	RoEC	RoW
UK	0	18	22	44	6	9
It	19	0	23	40	8	5
Sp	15	17	0	37	8	9
Por	17	24	18	0	9	8
RoEC	14	17	23	38	0	8
RoW	17	14	20	42	9	0

Model conjectures (%)

w	-6.3	-6.3	-6.4	-7.6	-6.3	-6.2
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Bertrand calibration

Model elasticity 15.67

Model conjectures (%)

w	-7.3	-7.3	-7.3	-7.5	-7.3	-7.3
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242 cement, lime and plaster
Production/consumption matrix, 1983 mECU

	UK	It	Sp	Por	RoEC	RoW
UK	1217.73	0.06	0.09	0.08	5.31	28.42
It	0.00	2222.17	0.01	0.00	2.03	51.43
Sp	0.21	0.19	810.97	12.45	2.15	452.83
Por	0.02	0.00	0.00	279.80	0.00	0.36
RoEC	19.33	10.43	3.80	0.52	34591.34	526.57
RoW	3.09	8.71	0.30	0.06	17.28	5005.58

Number of firms

10	19	25	5	412	59
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Number of sub-industries 1

Herfindahl index of concentration

.097	.052	.040	.186	.002
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Returns to scale

% increase in average cost at 1/3 output per model; 20%

% increase in average cost at 1/2 number of models; 0%

linear/loglinear weights; 0.5, 0.5

minimum efficient scale; 52 mECU

Industry demand elasticity; 0.6

Cournot calibration

Model elasticity 36.14

Tariff equivalents, %

	UK	It	Sp	Por	RoEC	RoW
UK	0	31	28	49	14	12
It	44	0	33	55	18	12
Sp	35	29	0	41	17	5
Por	36	35	33	0	29	18
RoEC	33	28	27	51	0	13
RoW	33	24	28	51	15	0

Model conjectures (%)

w	-6.7	-6.9	-7.0	-6.0	-7.2	-7.1
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Bertrand calibration

Model elasticity 8.02

Model conjectures (%)

w	-7.0	-7.1	-7.1	-7.0	-7.1	-7.1
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257 pharmaceutical products
Production/consumption matrix, 1983 mECU

	UK	It	Sp	Por	RoEC	RoW
UK	3333.57	100.50	26.34	30.60	579.45	1295.81
It	31.77	4663.99	29.27	4.71	208.92	610.45
Sp	9.26	7.17	1444.64	3.33	64.40	150.18
Por	0.67	0.75	0.10	141.72	14.53	33.38
RoEC	451.97	410.07	102.87	66.31	12738.30	3829.00
RoW	297.53	359.37	132.71	71.06	1701.40	27884.52

Number of firms
46 87 75 19 312 549

Number of sub-industries 5

Herfindahl index of concentration
0.087 0.044 0.051 0.580 0.012

Returns to scale

% increase in average cost at 1/2 output per model; 22%
% increase in average cost at 1/2 number of models; 5%
linear/loglinear weights; 1, 0
minimum efficient scale; 55 mECU

Industry demand elasticity; 0.8

Cournot calibration

Model elasticity 6.12

Tariff equivalents, %

	UK	It	Sp	Por	RoEC	RoW
UK	0	55	66	67	31	22
It	65	0	66	78	44	34
Sp	65	67	0	74	44	36
Por	68	67	78	0	35	26
RoEC	53	54	65	70	0	25
RoW	61	60	67	73	41	0

Model conjectures (%)

w -14.2 -14.3 -14.3 -14.1 -14.4 -14.4

Bertrand calibration

Model elasticity 4.75

Model conjectures (%)

w 17.2 17.2 17.2 17.2 17.2 17.2

260 man-made fibres

Production/consumption matrix, 1983 mECU

	UK	It	Sp	Por	RoEC	RoW
UK	799.95	14.14	3.87	2.08	23.82	352.25
It	28.60	1041.97	9.67	4.46	161.12	224.40
Sp	3.79	7.01	593.84	2.55	19.00	52.28
Por	3.98	0.79	0.00	113.26	0.76	0.70
RoEC	116.17	192.60	43.23	10.42	3142.63	379.63
RoW	46.45	80.97	21.04	8.53	230.15	3531.78

Number of firms

7	10	8	5	34	35
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Number of sub-industries 1

Herfindahl index of concentration

0.105	0.071	0.102	0.145	0.023
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Returns to scale

% increase in average cost at 1/2 output per model; 20%

% increase in average cost at 1/2 number of models; 3%

linear/loglinear weights; 0.5, 0.5

minimum efficient scale; 100 mECU

Industry demand elasticity; 0.5

Cournot calibration

Model elasticity 12.51

Tariff equivalents, %

	UK	It	Sp	Por	RoEC	RoW
UK	0	41	54	64	31	11
It	44	0	51	62	19	17
Sp	49	41	0	61	27	21
Por	37	40	70	0	33	34
RoEC	42	33	49	63	0	21
RoW	47	39	52	63	24	0

Model conjectures (%)

w	-6.7	-6.9	-6.6	-6.0	-7.2	-7.3
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Bertrand calibration

Model elasticity 4.66

Model conjectures (%)

w	5.6	5.6	5.4	5.0	5.6	5.6
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316 tools and finished metal products
Production/consumption matrix, 1983 mECU

	UK	It	Sp	Por	RoEC	RoW
UK	3986.23	65.86	18.89	12.53	674.99	1839.37
It	154.18	1358.89	50.82	19.52	1247.68	2099.81
Sp	38.15	32.41	2054.83	6.77	168.93	300.00
Por	8.28	1.90	5.05	258.14	59.57	153.80
RoEC	861.78	551.87	181.99	54.27	19201.60	4511.42
RoW	836.82	462.64	75.69	31.94	2569.28	22202.14

Number of firms

129	111	210	33	859	895
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Number of sub-industries 1

Herfindahl index of concentration

0.006	0.008	0.004	0.034	0.001
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Returns to scale

% increase in average cost at 1/2 output per model; 5%

% increase in average cost at 1/2 number of models; 1%

linear/loglinear weights; 0.8, 0.2

minimum efficient scale; 29 mECU

Industry demand elasticity; 1.08

Cournot calibration

Model elasticity 19.49

Tariff equivalents, %

	UK	It	Sp	Por	RoEC	RoW
UK	0	17	27	28	10	6
It	15	0	21	25	6	3
Sp	18	16	0	27	12	10
Por	18	21	21	0	9	5
RoEC	15	13	23	27	0	8
RoW	15	14	27	30	11	0

Model conjectures (%)

w	0.9	0.9	0.9	0.9	0.9	0.9
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Bertrand calibration

Model elasticity 18.53

Model conjectures (%)

w	19.9	19.9	19.8	19.8	19.9	19.9
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345 radio, television sets, electronic equipment
Production/consumption matrix, 1983 mECU

	UK	It	Sp	Por	RoEC	RoW
UK	2670.68	53.60	14.04	5.03	352.61	269.19
It	22.70	3106.14	4.56	1.17	174.61	77.80
Sp	1.60	1.06	813.86	2.39	13.72	32.50
Por	16.03	17.71	5.35	328.18	84.32	9.17
RoEC	534.86	491.21	82.93	15.64	25399.58	1563.33
RoW	1789.86	239.04	529.25	8.74	3806.00	73559.14

Number of firms
37 63 34 7 493 1404

Number of sub-industries 2

Herfindahl index of concentration
0.255 0.026 0.310 0.299 0.003

Returns to scale

% increase in average cost at 1/2 output per model; 10%
% increase in average cost at 1/2 number of models; 5%
linear/loglinear weights; 0.5, 0.5
minimum efficient scale; 56 mECU

Industry demand elasticity; 1.75

Cournot calibration

Model elasticity 9.86

Tariff equivalents, %

	UK	It	Sp	Por	RoEC	RoW
UK	0	39	49	58	23	25
It	41	0	55	64	27	34
Sp	48	52	0	53	35	28
Por	29	30	41	0	16	34
RoEC	34	37	50	62	0	27
RoW	33	48	46	68	28	0

Model conjectures (%)

w 8.1 8.0 8.0 8.8 7.9 7.9

Bertrand calibration

Model elasticity 8.68

Model conjectures (%)

w 54.4 54.2 54.0 55.5 54.1 54.1

432 cotton industry
Production/consumption matrix, 1983 mECU

	UK	It	Sp	Por	RoEC	RoW
UK	1133.44	26.05	1.52	4.04	159.48	225.20
It	280.79	1376.08	22.38	16.47	752.48	620.68
Sp	29.80	5.94	822.53	0.78	88.86	80.47
Por	96.15	5.65	1.94	906.03	62.52	123.05
RoEC	778.14	498.52	32.67	52.03	9187.41	2026.39
RoW	786.64	598.40	56.61	25.92	1962.86	11208.66

Number of firms
19 35 33 26 210 245

Number of sub-industries 1

Herfindahl index of concentration
0.083 0.026 0.025 0.033 0.003

Returns to scale

% increase in average cost at 1/2 output per model; 5%
% increase in average cost at 1/2 number of models; 5%
linear/loglinear weights; 0.8, 0.2
minimum efficient scale; 58 mECU

Industry demand elasticity; 0.5

Cournot calibration

Model elasticity 43.36

Tariff equivalents, %

	UK	It	Sp	Por	RoEC	RoW
UK	0	10	20	19	5	5
It	8	0	16	18	3	4
Sp	10	11	0	21	5	5
Por	8	12	19	0	6	5
RoEC	9	8	18	18	0	4
RoW	9	8	17	20	5	0

Model conjectures (%)

w 1.1 1.1 1.1 1.1 1.1 1.1

Bertrand calibration

Model elasticity 18.83

Model conjectures (%)

w 97.2 97.2 97.2 97.2 97.3 97.3

471 pulp, paper and paperboard
Production/consumption matrix, 1983 mECU

	UK	It	Sp	Por	RoEC	RoW
UK	2002.72	19.82	10.88	2.51	351.97	327.02
It	55.86	1956.58	13.42	3.19	395.57	206.31
Sp	52.01	56.27	941.93	5.52	187.36	118.25
Por	63.42	24.36	39.69	195.69	123.83	81.77
RoEC	643.77	464.46	117.81	33.74	18262.40	1245.46
RoW	2760.70	950.62	262.68	44.49	6209.70	44918.01

Number of firms

19	22	15	8	187	493
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Number of sub-industries 2

Herfindahl index of concentration

0.647	0.179	0.212	0.520	0.007
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Returns to scale

% increase in average cost at 1/2 output per model; 20%

% increase in average cost at 1/2 number of models; 5%

linear/loglinear weights; 0.5, 0.5

minimum efficient scale; 110 mECU

Industry demand elasticity; 0.4

Cournot calibration

Model elasticity 7.67

Tariff equivalents, %

	UK	It	Sp	Por	RoEC	RoW
UK	0	57	67	80	26	25
It	46	0	65	78	23	29
Sp	40	42	0	73	22	26
Por	27	40	44	0	14	17
RoEC	44	50	65	78	0	33
RoW	40	52	66	80	28	0

Model conjectures (%)

w	-2.2	-2.2	-2.1	-2.1	-2.3	-2.4
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Bertrand calibration

Model elasticity 4.49

Model conjectures (%)

w	18.6	18.5	18.3	18.1	18.6	18.6
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Table 2

Reduction of trade barriers: segmented markets

140 Mineral oil refining
(Cournot, fixed number of models)

(c - changes)

	Fixed number of firms		
	Portugal	Spain	EC

All countries reduce protection (18.28%)			
% c output	-6.4	4.5	1.9
% c cost	-4.8	4.1	1.8
Intra-EC trade			
% c exports	76	84	90
% c imports	202	296	90
Extra-EC trade			
% c exports	-8	6	2
% c imports	-89	-19	-9
c consumer surplus (mECU)	226	93	763
c profits (mECU)	-212	-71	-476
c welfare, % of base			
consumption	0.48	0.18	0.17
of which direct cost			
saving	0.32	0.06	0.12

Only Portugal, Spain reduce protection (18.28%)			
% c output	-12.3	-7.6	0.9
% c cost	-9.3	-7.1	0.8
Intra-EC trade			
% c exports	7	-5	19
% c imports	204	337	19
Extra-EC trade			
% c exports	-16	-10	1
% c imports	-89	-11	-3
c consumer surplus (mECU)	222	50	365
c profits (mECU)	-215	-81	-311
c welfare, % of base			
consumption	0.23	-0.24	0.03
of which direct cost			
saving	0.08	0.01	0.03

242 Cement, lime and plaster
(Cournot, fixed number of models)

(c - changes)

	Fixed number of firms			Variable number of firms		
	Portugal	Spain	EC	Portugal	Spain	EC
All countries reduce protection (5.57%)						
% c output	-3.7	5.2	0.1	-8.2	-5.2	-0.1
% c cost	-2.4	4.8	0.1	-8.2	-4.5	-0.2
c number of firms	-	-	-	0	1	1
Intra-EC trade						
% c exports	138	98	107	170	141	136
% c imports	108	80	107	187	135	136
Extra-EC trade						
% c exports	-12	12	4	-6	-17	-6
% c imports	-52	-15	-2	-0	11	-0
c consumer surplus (mECU)	6	4	17	0	-3	-1
c profits (mECU)	-9	-3	-22	-	-	-
c welfare, % of base consumption	-0.90	0.06	-0.01	0	-0.30	0
of which direct cost saving	0.10	0.01	0	0.10	0.01	0
Only Portugal, Spain reduce protection (5.57%)						
% c output	-3.6	4.0	0.1	-8.3	-5.0	-0.1
% c cost	-2.4	3.7	0.1	-8.3	-4.3	-0.1
c number of firms	-	-	-	0	1	1
Intra-EC trade						
% c exports	-5	83	31	-1	135	52
% c imports	105	86	31	190	134	52
Extra-EC trade						
% c exports	-11	9	3	-6	-16	-6
% c imports	-51	-12	0	0	11	0
c consumer surplus (mECU)	6	3	9	0	-2	-2
c profits (mECU)	-8	-3	-11	-	-	-
c welfare, % of base consumption	-0.88	0.04	-0.01	0	-0.28	0
of which direct cost saving	0.04	0	0	0.04	0	0

257 Pharmaceutical products
(Cournot, fixed number of models)

(c - changes)

	Fixed number of firms			Variable number of firms		
	Portugal	Spain	EC	Portugal	Spain	EC

All countries reduce protection (2.48%)						
% c output	-3.4	-1.1	0.3	-22.2	-1.9	0.3
% c cost	-2.5	-0.8	0.2	-22.3	-2.0	0.2
c number of firms	-	-	-	-4	-2	-4
Intra-EC trade						
% c exports	11	16	14	-15	14	15
% c imports	23	28	14	39	32	15
Extra-EC trade						
% c exports	0	0	0	-23	-2	0
% c imports	-12	-3	-1	-1	-1	-1
c consumer surplus (mECU)	8	10	74	0	2	61
c profits (mECU)	-4	-7	-16	-	-	-
c welfare, % of base						
consumption	1.39	0.18	0.22	0.15	0.13	0.23
of which direct cost						
saving	0.79	0.21	0.18	0.79	0.21	0.18

Only Portugal, Spain reduce protection (2.48%)						
% c output	-4.3	-1.8	0.1	-24.0	-2.8	0.1
% c cost	-3.2	-1.4	0.1	-24.0	-2.8	0.1
c number of firms	-	-	-	-5	-2	-5
Intra-EC trade						
% c exports	0	1	3	-24	-1	4
% c imports	23	28	3	40	33	4
Extra-EC trade						
% c exports	0	0	0	-24	-3	0
% c imports	-12	-3	-1	0	0	0
c consumer surplus (mECU)	8	10	18	0	0	16
c profits (mECU)	-4	-9	-3	-	-	-
c welfare, % of base						
consumption	1.31	0.08	0.06	0	0.01	0.06
of which direct cost						
saving	0.19	0.05	0.04	0.19	0.05	0.04

260 Man-made fibres
(Cournot, fixed number of models)

(c - changes)						
	Fixed number of firms			Variable number of firms		
	Portugal	Spain	EC	Portugal	Spain	EC

All countries reduce protection (4.55%)						
% c output	-4.9	-2.3	1.0	-18.6	-4.2	1.9
% c cost	-3.1	-1.7	0.9	-19.4	-4.9	0.3
c number of firms	-	-	-	-1	-1	-4
Intra-EC trade						
% c exports	12	22	24	10	29	37
% c imports	63	51	24	137	76	37
Extra-EC trade						
% c exports	-8	-3	0	-18	-4	2
% c imports	-33	-13	-8	-3	-3	-6
c consumer surplus (mECU)	5	8	53	0	2	37
c profits (mECU)	-5	-11	-48	-	-	-
c welfare, % of base						
consumption	-0.49	-0.38	0.07	0.25	0.25	0.55
of which direct cost						
saving	0.32	0.19	0.22	0.32	0.19	0.22

Only Portugal, Spain reduce protection (4.55%)						
% c output	-6.6	-4.1	0.4	-20.7	-5.6	0.7
% c cost	-4.2	-3.0	0.3	-20.6	-5.8	0.2
c number of firms	-	-	-	-1	0	-2
Intra-EC trade						
% c exports	-11	-3	6	-22	2	11
% c imports	64	52	6	136	71	11
Extra-EC trade						
% c exports	-10	-6	1	-21	-6	1
% c imports	-31	-11	-2	0	-1	-2
c consumer surplus (mECU)	5	7	17	0	0	10
c profits (mECU)	-6	-10	-18	-	-	-
c welfare, % of base						
consumption	-0.65	-0.54	0	-0.01	0.05	0.15
of which direct cost						
saving	0.07	0.04	0.05	0.07	0.04	0.05

316 Tools and finished metal goods
(Cournot, fixed number of models)

(c - changes)

	Fixed number of firms			Variable number of firms		
	Portugal	Spain	EC	Portugal	Spain	EC
All countries reduce protection (18.62%)						
% c output	-13.0	-7.5	0.8	-73.4	-14.1	1.3
% c cost	-12.3	-7.1	0.7	-73.5	-14.1	1.2
c number of firms	-	-	-	-25	-31	-23
Intra-EC trade						
% c exports	45	63	51	-61	42	60
% c imports	122	144	51	237	177	60
Extra-EC trade						
% c exports	-4	-2	0	-74	-16	2
% c imports	-39	-15	-8	-10	-7	-8
c consumer surplus (mECU)	10	21	146	2	9	150
c profits (mECU)	-5	-9	0	-	-	-
c welfare, % of base						
consumption	1.45	0.50	0.43	0.61	0.38	0.44
of which direct cost						
saving	0.57	0.25	0.28	0.57	0.25	0.28
Only Portugal, Spain reduce protection (18.62%)						
% c output	-20.6	-13.6	0.1	-85.8	-21.4	0.5
% c cost	-19.4	-12.9	0.1	-85.8	-21.4	0.4
c number of firms	-	-	-	-28	-45	-42
Intra-EC trade						
% c exports	2	-1	11	-85	-18	17
% c imports	124	147	11	263	189	17
Extra-EC trade						
% c exports	-6	-4	0	-86	-22	1
% c imports	-38	-14	-1	-2	0	-2
c consumer surplus (mECU)	10	19	34	0	1	38
c profits (mECU)	-6	-15	-3	-	-	-
c welfare, % of base						
consumption	1.03	0.18	0.09	0.09	0.02	0.11
of which direct cost						
saving	0.10	0.05	0.05	0.10	0.05	0.05

345 Radio, TV, electronic equipment
(Cournot, fixed number of models)

(c - changes)

	Fixed number of firms			Variable number of firms		
	Portugal	Spain	EC	Portugal	Spain	EC
All countries reduce protection (5.01%)						
% c output	1.8	-3.8	0.6	-1.0	-5.8	0.6
% c cost	1.4	-3.4	0.5	-1.8	-5.9	0.5
c number of firms	-	-	-	0	-2	0
Intra-EC trade						
% c exports	14	32	26	10	28	27
% c imports	85	59	26	99	62	27
Extra-EC trade						
% c exports	1	-2	1	-3	-6	1
% c imports	-11	-3	-2	-4	-1	-2
c consumer surplus (mECU)	5	5	74	2	1	72
c profits (mECU)	-4	-2	-4	-	-	-
c welfare, % of base consumption	0.48	0.20	0.18	0.55	0.09	0.18
of which direct cost saving	0.15	0.17	0.11	0.15	0.17	0.11
Only Portugal, Spain reduce protection (5.01%)						
% c output	-2.7	-4.7	0.1	-6.2	-6.8	0.1
% c cost	-2.2	-4.1	0.1	-6.2	-6.8	0.1
c number of firms	-	-	-	0	-2	-1
Intra-EC trade						
% c exports	0	4	4	-5	1	5
% c imports	88	58	4	106	62	5
Extra-EC trade						
% c exports	-2	-3	0	-6	-7	0
% c imports	-9	-3	0	-1	0	0
c consumer surplus (mECU)	4	5	15	0	0	12
c profits (mECU)	-5	-3	-4	-	-	-
c welfare, % of base consumption	-0.02	0.14	0.03	0.06	0.02	0.03
of which direct cost saving	0.02	0.03	0.02	0.02	0.03	0.02

432 Cotton industry
(Cournot, fixed number of models)

(c - changes)

	Fixed number of firms			Variable number of firms		
	Portugal	Spain	EC	Portugal	Spain	EC

All countries reduce protection* (12.8%)						
% c output	-3.5	-3.6	1.9	-10.1	-9.4	1.3
% c cost	-3.2	-3.3	1.8	-10.5	-9.7	1.0
c number of firms	-	-	-	-4	-4	-7
Intra-EC trade						
% c exports	27	28	30	25	21	41
% c imports	130	144	30	210	203	41
Extra-EC trade						
% c exports	-2	-3	1	-13	-11	0
% c imports	-31	-23	-10	-6	-4	-8
c consumer surplus (mECU)	9	6	55	2	1	38
c profits (mECU)	-12	-7	-28	-	-	-
c welfare, % of base consumption	-0.29	-0.17	0.14	0.16	0.10	0.20
of which direct cost saving	0.07	0.06	0.14	0.07	0.06	0.14

Only Portugal, Spain reduce protection (12.8%)						
% c output	-8.0	-7.6	0.2	-17.5	-14.5	0.4
% c cost	-7.4	-7.1	0.2	-17.5	-14.5	0.3
c number of firms	-	-	-	-5	-5	-6
Intra-EC trade						
% c exports	-3	-4	6	-16	-14	9
% c imports	133	146	6	228	212	9
Extra-EC trade						
% c exports	-5	-5	0	-18	-15	1
% c imports	-30	-21	-1	0	0	-2
c consumer surplus (mECU)	8	5	16	0	0	7
c profits (mECU)	-13	-8	-18	-	-	-
c welfare, % of base consumption	-0.42	-0.28	-0.01	0.01	0	0.04
of which direct cost saving	0.01	0.01	0.02	0.01	0.01	0.02

* This industry has a high model elasticity (43.4) and low tariff equivalents (see table 1). The simulation of trade liberalisation corresponds to a direct cost saving of 1% of base trade in the cotton industry.

471 Pulp, paper, paperboard
(Cournot, fixed number of models)

(c - changes)

	Fixed number of firms			Variable number of firms		
	Portugal	Spain	EC	Portugal	Spain	EC
All countries reduce protection (3.59%)						
% c output	9.1	0.5	1.4	-3.0	-2.2	1.2
% c cost	6.4	0.3	1.1	-7.5	-3.5	0.7
c number of firms	-	-	-	-1	-1	-3
Intra-EC trade						
% c exports	14	10	18	1	8	18
% c imports	63	39	18	110	47	18
Extra-EC trade						
% c exports	8	0	1	-5	-3	0
% c imports	-33	-11	-3	-14	-4	-2
c consumer surplus (mECU)	16	23	152	6	8	109
c profits (mECU)	-10	-18	-52	-	-	-
c welfare, % of base consumption	2.00	0.43	0.28	2.06	0.59	0.31
of which direct cost saving	0.37	0.30	0.17	0.37	0.30	0.17
Only Portugal, Spain reduce protection (3.59%)						
% c output	-1.2	-3.9	0.4	-17.7	-7.3	0.4
% c cost	-0.8	-2.8	0.3	-19.1	-7.5	0.2
c number of firms	-	-	-	-2	-1	-2
Intra-EC trade						
% c exports	0	-3	4	-16	-6	4
% c imports	66	40	4	127	49	4
Extra-EC trade						
% c exports	-1	-3	0	-18	-7	0
% c imports	-32	-9	-1	-5	0	-1
c consumer surplus (mECU)	15	19	49	2	1	29
c profits (mECU)	-12	-20	-29	-	-	-
c welfare, % of base consumption	1.01	-0.06	0.06	0.80	0.06	0.08
of which direct cost saving	0.08	0.07	0.04	0.08	0.07	0.04

Table 3

Segmented versus integrated markets
All industries (Cournot, models per firm constant).

		Percentage changes (%c)								
		%c output			%c average costs			c welfare % consumption		
		Spain	Portg	EC	Spain	Portg	EC	Spain	Portg	EC
140 Oil refinery		ME=30.9, RS=10%(1/3), TS=38.5, H=.095								
Segmented markets										
Fixed no. firms		4.5	-6.4	1.9	4.1	-4.8	1.8	0.2	0.5	0.2
Integrated markets										
Fixed no. firms		15.9	35.8	5.4	14.6	26.8	5.1	1.2	8.9	0.5
242 Cement, lime, plaster		ME=36.1, RS=20%(1/3), TS=0.8%, H=.075								
Segmented markets										
Fixed no. firms		5.2	-3.7	0.1	4.8	-2.4	0.1	0.1	-0.9	0.0
Variable no. firms		-5.2	-8.2	-0.1	-4.5	-8.2	-0.2	-0.3	0.0	0.0
Integrated markets										
Fixed no. firms		-1.8	8.8	0.2	-1.7	5.8	0.2	0.1	2.7	0.1
257 Pharmaceut p.		ME=6.1, RS=22%(1/2), TS=13.3%, H=.074								
Segmented markets										
Fixed no. firms		-1.1	-3.4	0.3	-0.8	-2.5	0.2	0.2	1.4	0.2
Variable no. firms		-1.9	-22.2	0.3	-2.0	-22.3	0.2	0.1	0.2	0.2
Integrated markets										
Fixed no. firms		4.7	28.9	2.1	3.6	21.4	1.7	1.3	5.8	0.7
Variable no. firms		1.4	16.2	1.3	-1.8	7.2	0	1.1	4.8	0.8
260 Man-made fibres		ME=12.5, RS=20%(1/2), TS=32.7%, H=.091								
Segmented markets										
Fixed no. firms		-2.3	-4.9	1.0	-1.7	-3.1	0.9	-0.4	-0.5	0.1
Variable no. firms		-4.2	-18.6	1.9	-4.9	-19.4	0.3	0.3	0.3	0.6
Integrated markets										
Fixed no. firms		11.7	25.4	5.4	8.5	15.7	4.3	3.6	8.6	2.0
Variable no. firms		13.7	25.2	7.8	1.8	7.1	1.9	8.9	13.9	4.7
316 Tools, metal p.		ME=19.5, RS= 5%(1/2), TS=21.2%, H=.007								
Segmented markets										
Fixed no. firms		-7.5	-13.0	0.8	-7.1	-12.3	0.7	0.5	1.5	0.4
Variable no. firms		-14.1	-73.4	1.3	-14.1	-73.5	1.2	0.4	0.6	0.4
Integrated markets										
Fixed no. firms		-6.1	-6.9	0.9	-5.8	-6.5	0.9	0.6	1.8	0.4
Variable no. firms		-14.4	-67.9	1.2	-14.7	-68.3	1.1	0.4	0.9	0.5

Notes - next page.

Table 3 - continuation

	Percentage changes (%c)								
	%c output			%c average costs			c welfare % consumption		
	Spain	Portg	EC	Spain	Portg	EC	Spain	Portg	EC
345 Electronic eq.	ME=9.9, RS=10%(1/2), TS=7.4%, H=.180								
Segmented markets									
Fixed no. firms	-3.8	1.8	0.6	-3.4	1.4	0.5	0.2	0.5	0.2
Variable no.firms	-5.8	-1.0	0.6	-5.9	-1.8	0.5	0.1	0.6	0.2
Integrated markets									
Fixed no. firms	5.4	4.7	1.6	4.8	3.8	1.4	0.8	3.8	0.3
Variable no. firms	0.1	-8.5	1.3	-2.5	-12.0	0.9	0.4	4.6	0.3
432 Cotton industry	ME=43.4, RS=5% (1/2), TS=25.3%, H=.050								
Segmented markets									
Fixed no. firms	-3.6	-3.5	1.9	-3.3	-3.2	1.8	-0.2	-0.3	0.1
Variable no.firms	-9.4	-10.1	1.3	-10.0	-10.5	1.0	0.1	0.2	0.2
Integrated markets									
Fixed no. firms	12.8	6.7	5.2	11.9	6.2	5.0	0.9	0.9	0.4
Variable no. firms	1.8	-4.5	5.4	-2.2	-8.4	4.9	3.0	3.7	0.6
471 Pulp, paper,brd	ME=7.7, RS=20%(1/2), TS=14.5%, H=.433								
Segmented markets									
Fixed no. firms	0.5	9.1	1.4	0.3	6.4	1.1	0.4	2.0	0.3
Variable no.firms	-2.2	-3.0	1.2	-3.5	-7.5	0.7	0.6	2.1	0.3
Integrated markets									
Fixed no. firms	32.9	-10.0	11.7	23.1	-7.1	9.3	9.3	17.9	1.7

Note: ME- model elasticity, RS- increase in average costs at 1/2 or 1/3 of MES, TS- share of intra-EC12 trade in EC consumption, H- EC12 average Herfindahl index.

Annex 1
Industry Characteristics

Table A1-1
Industry characteristics, 1983

NACE	Portuguese production as % of EC11	Portuguese production as % of total manufactures

Selected industries		
140 Oil refining	1.9%	13.0%
242 Cement	2.8%	1.5%
257 Pharmaceutical goods	0.6%	1.0%
260 Man-made fibre	2.9%	0.6%
316 Tools and metal goods	1.2%	2.4%
345 Radio, TV, electron.	1.9%	2.2%
432 Cotton industry	7.9%	5.9%
471 Pulp, paper, pboard	2.8%	2.7%
Total		29.3%

Other industries		
221 Iron, steel	0.8%	2.1%
247 Glass, glassware	1.0%	0.7%
248 Ceramic products	1.5%	0.8%
350 Motor vehicles, parts	0.4%	3.0%
436 Knitting fabrics, goods	3.1%	2.1%
451 Footwear	1.9%	1.2%
453 Clothing	1.8%	2.5%
466 Cork, products	16.5%	1.1%
Total		13.5%

Warning: the first column of figures is not reliable, because at 3-d NACE, many countries do not declare figures to the Eurostat.

Source: Table A1-3 and EUROSTAT, 1983/84.

Table A1-2
Employment per plant and size of industry¹
(1983)

NACE	Plant size		Size of industry ²	
	Portugal	Spain	Portug.	Spain
140 Oil refining	1128	952	0.3	0.4
220 Metal processing	346	228	1.4	4.2
221 Iron & steel	668	542	1.0	2.9
240 Non-metallic mineral products	45	15	7.8	5.8
242 Cement, lime, plaster	180	42	0.4	0.6
247 Glass	79	32	1.3	0.9
248 Ceramic products	103	28	1.9	1.4
250 Chemical products	50	44	4.5	4.8
257 Pharmaceuticals	88	91	1.1	1.4
260 Man-made fibres	231	529	0.4	0.4
310 Metal products	58	10	7.0	10.8
316 Tools and metal prod.	51	22	4.6	3.8
340 Electrical engineer.	162	52	4.6	5.8
345 Radio, TV, electron.	324	57	2.2	0.6
350 Motor vehicles, part	115	152	2.3	6.2
351 Motor vehicles	321	4697	0.9	4.4
353 Parts	77	62	0.6	1.6
430 Textile industry	120	28	19.5	5.6
432 Cotton industry	211	56	10.3	1.1
436 Knitting industry	77	23	4.5	1.5
450 Footwear, clothing	70	16	8.9	6.2
451 Footwear	48	21	2.8	1.7
453 Clothing	88	15	6.1	3.9
460 Timber and wood industry	18	5	7.4	7.0
466 Cork and straw	29	8	2.0	0.2
470 Paper and products	36	17	6.1	5.0
471 Pulp, paper	140	102	1.7	0.8
Total	-	-	70.2	62.2

1/ All establishments. Average employment per establishment.

2/ Industry employment as percentage of total industrial employment.

Source: EUROSTAT, Structure and Activity of Industry, Annual Inquiry, 1983/84.

Table A1-3
Value of production per plant¹
(Mio ECU - 1983)

NACE	Portugal	Spain	Production as % of industrial production Port. Spain	
140 Oil refining	1320.1	1297.1	13.0	8.8
220 Metal processing	19.4	20.0	2.8	5.9
221 Iron & steel	39.6	38.1	2.1	3.3
240 Non-metallic mineral products	0.8	0.7	5.0	4.1
242 Cement, lime, plaster	17.6	5.0	1.5	1.1
247 Glass	1.3	1.4	0.7	0.6
248 Ceramic products	1.2	0.9	0.8	0.7
250 Chemical products	3.0	3.9	9.9	7.0
257 Pharmaceuticals	2.2	5.6	1.0	1.3
260 Man-made fibres	11.2	39.2	0.6	0.5
310 Metal products	0.8	0.3	3.6	5.5
316 Tools and metal prod.	0.8	0.8	2.4	2.2
340 Electrical engineering	4.4	2.3	4.4	4.0
345 Radio, TV, electronics	9.4	3.7	2.2	0.6
350 Motor vehicles, parts	4.2	9.0	3.0	5.8
351 Motor vehicles	17.2	323.0	1.8	4.8
353 Parts	3.1	2.1	0.9	0.8
430 Textile industry	1.8	0.9	10.1	3.1
432 Cotton industry	3.4	2.5	5.9	0.8
436 Knitting industry	1.0	0.6	2.1	0.6
450 Footwear, clothing	0.8	0.4	3.7	2.6
451 Footwear	0.6	0.6	1.2	0.8
453 Clothing	1.0	0.3	2.5	1.4
460 Timber and wood industry	0.2	0.1	3.3	2.5
466 Cork and straw	0.5	0.2	1.1	0.1
470 Paper and products	0.9	0.8	5.2	3.6
471 Pulp, paper	6.2	9.2	2.7	1.1
Total	-	-	64.6	53.4

1/ All establishments. Average production value per establishment.

Source: EUROSTAT, Structure and Activity of Industry, Annual Inquiry, 1983/84.

Table A1-4
Market characteristics

NACE	Number of firms	Level of concentration	Ownership/ market orientation
Selected industries			
140 Oil refining	2	high	1 SOE (IS)
242 Cement	13	high	SOE
257 Pharmaceutical goods	55	medium	Priv/For (IS)
260 Man-made fibre	11	high	Private (IS)
316 Tools and metal goods	358	low	Private (Ex)
345 Radio, TV, electronics	30	medium	Priv/For. (Ex)
432 Cotton industry	287	low	Private (Ex)
471 Pulp, paper, pboard	57	high	SOE/For (Ex)
Other industries			
221 Iron, steel	10	high	SOE (IS)
247 Glass, glassware	35	low	Private (Ex)
248 Ceramic products	71	low	Private (Ex)
350 Motor vehicles, parts	98	high	For/Priv (IS)
436 Knitting fabrics, goods	249	low	Private (Ex)
451 Footwear	254	low	Private (Ex)
453 Clothing	380	low	Private (Ex)
466 Cork, products	146	low	Private (Ex)

Note: SOE - state-owned, For - foreign owned, IS - import substituting, Ex - exporting industry.

Table A1-5
Scale of production: Portugal

		UK data (circa 83)			
	Unity	MES scale 1/	% increase in costs at less than MES scale2/	UK output	Portugal output 1982
140 Oil refineries	m. tons a year	10 (2-3 refi.)	4 (1/3)	75	8.5 (3 refi.)
221 Steel plants	m. tons a year	4	11 (1/3)	15	2.1
Mini steelworks		0.7-0.8	>10 (1/3)		
242 Cement (only)	m. tons a year	1.3	10-26 (1/3)	13	6.1
247 Glass bottles	th. tons a year	133	11 (1/3)	2.7 m. tons	40 th. tons
260 Synthetic fibres					
Nylon	th. tons a year	23	12 (1/2)	530 all	65.5 all
Acrylic		19	9.5 (1/2)		
Polyester		18	10 (1/2)		
		100	2.6 (1/2)		
Rayon		57	5 (1/2)	128	2.5
345 Radio, TV, other TV sets	m. units a year	1.1-1.2	15 (1/3)	2.9	0.634
Videos		0.8-1	-	-	-
451 Footwear	m. pairs a year	17.4	1.5 (1/3)	58	20
471 Pulp, paper					
Linerboard	m. tons a year	0.3	8 (1/2)	3.1 all but newspaper	0.55 all but newspaper and pulp
Kraft paper		0.34	13 (1/2)		
Printing paper		0.22	9 (1/2)		
Pulp		-	-	-	.720

Notes of table A1-3:

- 1/ See Pratten (1988) for definition of minimum efficient scale, p. 68.
- 2/ The figure in brackets indicates the proportion of MES to which the percentage refers.

Source: Pratten (1988), table 5.5 mainly (pp. 88-92) and Portugal's industrial census, INE, 1982.

Annex 2

Summary of the model with imperfect competition and economies of scale

The partial equilibrium model described here, is similar to the Smith and Venables model (1986) so that only a sketch is presented.

Equilibrium in segmented markets

There are I countries ($i=1, \dots, I$) in which firms are located and these countries are also separated markets ($j=1, \dots, I$). Each firm is located in only one country. The number of firms active in market i , is n_i . Each firm produces m_i final products (models), so that consumers in each market may choose from $\sum_{i=1}^I n_i m_i$ product varieties. Every model is tradable. The quantity of a model produced by one firm in country i and sold in country j is given by x_{ij} , associated with a price p_{ij} .

Demand in a market is derived from a two stage, separable utility function. The strong separable, sub-utility index for the composite good y_j is of the CES type assuming identical elasticities of substitution between any two models. Cost minimisation, provides dual, CES price functions, for the composite good (q_j is the price of y_j). Total expenditures is given by $q_j y_j = \sum_i n_i m_i p_{ij} x_{ij}$. There are no income effects and the expenditure share of each model in market j is only affected through relative price changes due to the separability assumption implying homotheticity.

Demand in market i is given by:

$$(1) \quad x_{ij} = p_{ij}^{-\sigma} a_{ij} b_j q_j^{\sigma-\mu}$$

and the inverse demand function is:

$$(2) \quad p_{ij} = x_{ij}^{-1/\sigma} a_{ij}^{1/\sigma} b_j^{1/\sigma} y_j^{(1/\sigma-1/\mu)}$$

where

x_{ij} - quantity of a model produced in i and sold in j ,
 p_{ij} - price of x_{ij} ,
 q_j - price of composite product y_j ,
 a_j - parameters describing preferences of a consumer in market j ,
 b_j - parameter measuring the size of the market j ,
 σ_j - sub-utility CES parameter,
 μ - price elasticity of demand for the composite industrial product.

On the supply side, it is enough to model the behaviour for one firm and sum up results over firms since firms are symmetric in a given market i . In this way the results for the industry are obtained.

Each firm located at i has a cost function given by:

$$(3) \quad C_i = C_i(x_i, m_i)$$

This function has economies of scale and economies of scope, i.e. (superscripts denote partial derivatives):

$$C_i^x < C_i / x_i$$

$$C_i^m < C_i / m_i$$

and where $x_i = \sum_j x_{ij}$. The cost function has a linear part (fixed costs plus constant marginal costs) with a weight z and a log-linear part absorbing more marginal and average cost reductions as output become larger than the linear part. The log-linear part has the weight $1-z$. For each industry the weights for each cost form are set up exogenously. Firms in all countries have the same cost functions.

Each firm has profits given by:

$$(4) \quad \pi_i = m_i \sum_j x_{ij} [p_{ij} (1-t_{ij})] - C_i(x_i, m_i)$$

where t_{ij} are ad-valorem taxes or transport costs. Fixing m_i , the firm chooses sales in each market separately so as to maximise (4). It equates marginal revenues and marginal costs:

$$(5) \quad (1-t_{ij}) p_{ij} \left(1 - \frac{1}{e_{ij}}\right) = \frac{C_i^x}{m_i}$$

If the firm in i , changing its sales, anticipates that the other firms will hold sales constant (Cournot hypothesis), the perceived elasticity of demand e_{ij} will be given by:

$$(6) \quad \frac{1}{e_{ij}} = \frac{1}{\sigma} - \left(\frac{1}{\sigma} - \frac{1}{\mu}\right) s_{ij}$$

where s_{ij} is the share of a firm located in i in market j .¹ The Cournot market equilibrium for a given number of models is obtained when (6) is satisfied for all firms.

If there is free entry and exit of firms in each country then there are additional equilibrium conditions of zero profits (4).

Equilibrium in integrated markets

When markets are integrated firms do not discriminate between markets and all producer prices are the same although consumer prices may be different due to differences in trade costs. With p_i as the price charged in the domestic market, export prices are given by:

$$(7) \quad p_i (1-t_{ii}) = p_{ij} (1-t_{ij})$$

where $i \neq j$. Then equation (5) is replaced by (first order conditions of profit maximisation):

$$(8) \quad (1-t_{ii}) p_i \left(1 - \frac{1}{E_i}\right) = \frac{C_i^x}{m_i}$$

If behaviour is Cournot, each firm chooses total sales in the integrated market taking as given the sales of the other firms, and dividing up sales in different markets to meet demand.

These completes the model as used in this paper. An additional note on the determination of the "tariff equivalent" often referred to in the text is in order.

Note on the "tariff equivalent"

As mentioned these are consistent with different shares in different markets. It follows from the assumptions on the utility function and from demand functions (1) that the ratio between expenditure in country k on goods produced in i , and those produced in the domestic market k , is:

$$(9) \quad \frac{p_{ik} x_{ik}}{p_{kk} x_{kk}} = \frac{a_{ik}^{1-\sigma}}{a_{kk}^{1-\sigma}}$$

The tariff equivalents are the tariff rates by which prices have to be adjusted (beyond the transport costs set arbitrarily to 10%) to make market shares consistent with $a_{ik} = a_{kk}$. These are parameters of the preference functions so that "the tariff equivalent" will absorb potential differences in preferences of consumers in each market.

NOTE

1/ I do not discuss the case of the Bertrand hypothesis and the case when the number of models are variable because these are cases not treated in the paper. See Smith and Venables (1988) for discussion of these cases as well as further details on the model.

ANNEX 3

Data Sources and Data Treatment

Trade data - OECD, Trade by commodities, 1983 from tape and in thousand US\$, converted to ECU, using a trade weighted (EC10) exchange rate (1983 EUROSTAT has domestic currency conversion to ECU, OECD has year average domestic currency in US\$).

Production - all data base is from EUROSTAT, Structure and activity of industry, Annual Inquiry - Main results 1983/1984. However, production data and number of enterprises surveyed are for firms with more than 20 employees except data for Portugal and Spain which is given for all establishments. I assume that the number of firms is equal to the number of establishments and call them firms through out. At 2-digit NACE, a proportion of production for establishments with more than 20 employees on total production was applied on three digit NACE production. This proportion for Portugal and Spain was taken from EUROSTAT, Structure and Activity of Industry, Data by size of enterprises, 1983.

Number of firms - same sources as production except that for Portugal and Spain an adjustment was made. The Portuguese industrial survey of 1982 (not available in 1983) give precisely the number of establishments with more than 20 employees. The Portuguese proportion of number of firms with more than 20 employees on the total number of firms was applied to Spain in each industry. The precise figures for Spain are not available.

Number of "representative" firms - I estimated the number of firms for UK based on the size distribution of firms as given by the Eurostat, "Structure and Activity of Production" and derive the number of firms for the other countries based on a proportion of the industry average size to that of the UK. This keeps up to the notion of "symmetry" of firms in each market although allowing for different firm sizes between markets. The Herfindahl index of concentration come from these data. As seen, I assume high levels of industrial concentration for Portugal but less for Spain.

Minimum efficient scale and economies of scale - from Pratten (1988) either literally or as a guide. See annex 1, table A1-5. Some data is arbitrary. The characteristics of each industry are on table A3-1.

Table A3-1
MES and economies of scale
(actually used)

Sector	Source	mes m. ECU	increase in unit costs	
			below mes scale	of models (m)
140 Oil refining	Pratten	1000 ²	10% at 1/3 mes	0% at 1/2 m
242 Cement	Pratten	52	20% at 1/3 mes	0% at 1/2 m
257 Pharmaceutical ³	Pratten	55	22% at 1/2 mes	5% at 1/2 m
260 Man-made fibre	arbitrary	100	20% at 1/2 mes	3% at 1/2 m
316 Tools and metal goods ³	arbitrary	30	5% at 1/2 mes	1% at 1/2 m
345 Radio, TV, electronics	Pratten	56	10% at 1/2 mes	5% at 1/2 m
432 Cotton industry ³	arbitrary	58	5% at 1/2 mes	5% at 1/2 m
471 Pulp, paper, pboard	arbitrary	110	20% at 1/2 mes	5% at 1/2 m

Notes: 1/ The increase in unit costs when models are reduced (last column) was not estimated by Pratten so that they are arbitrary for all sectors. 2/ Pratten's mes for the refinery is around 1000 MECU (less than Portugal and Spain average size) and around 400 for steel (4 m tons /year) although small plants can be competitive if using scrap. 3/ For these industries $z > 0.5$, indicating mainly linear cost functions because of significant initial fixed costs.

Elasticities of demand (table A3-2) - There are several sources. For Portugal there are the cross section (household based inquiry of 1973), foreign sources the main of which is Piggot and Whalley survey linear expenditure system estimates of Martins and Oliveira (1985). We used mostly the latter for three reasons: the Portuguese estimates only apply to the Portuguese market, they are not recent and the linear expenditure system underestimates elasticities. The table lists the chosen elasticities in the last column.

Table A3-2

Estimates for Uncompensated Own Price Elasticities of Household Demand Functions (all from Piggott & Whalley except the Portuguese estimates)

Industry	Linear expenditure system		Log Linear Demand	Other	Chosen Elasticities
	Portuguese	Other			
140 Oil refining	.074	1.283	1.404	1.978	1.60
242 Cement	.0	-	-	-	.60**
257 Pharmaceu.	.368	.685*	.890*	.680*	.80**
260 Manmade f.	.275	-	-	-	0.50**
316 Tools	.129	-	1.522	.989	1.08
345 Electronics	.475	-	1.388	1.049	1.75**
432 Cotton Ind.	.033	-	-	-	.50
471 Pulp, paper	.035	.191	.343	.416	.40

* Estimates for the chemical industry; ** Smith and Venables guesses for similar sectors.