POLICY RESEARCH WORKING PAPER 1293

# Product Standards, Imperfect Competition, and Completion of the Market in the European Union

Modeling the static and steady-state effects on trade, production, and market structure of completion of the European Union's internal market.

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## Summary findings

Harrison, Rutherford, and Tarr model the static and steady-state effects on trade, production, and market structure of completion of the European Union's (EU's) internal market.

The impetus for change comes from the removal of border costs and the costs of producing to different national standards. It also comes from consumers' greater ability to substitute among the products of producers in different EU countries, once the European Union adopts its program on standards.

In the analysis of the static scenario, removing border costs and the costs of supply-side standards improves the welfare of EU countries by only about 0.5 percent of GDP. Results vary greatly across the countries of the European Union, however, because the benefits to a country are roughly proportional to its share of intra-EU trade in its GDP. This is the first model to identify these country differences because of the greater country disaggregation.

The additional effect of the program of standards on consumer demand elasticities increases the competition and reduces markups in imperfectly competitive industries. Then there are additional gains from rationalization, as well as consumer efficiency gains in imperfectly competitive sectors, that result in an increase in the estimated gains to about 1.2 percent of GDP (again with wide differences across EU countries).

The steady-state results let the capital stock in each country adjust to its new higher equilibrium value, which acts as an additional endowment of capital, allowing the European Union to produce a higher level of income. The gains to the European Union then rise to about 2.6 percent of GDP.

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# Product Standards, Imperfect Competition and Completion of the Market in the European Union

by

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# 1. Introduction

How large are the static welfare benefits of completion of the internal market in the European Community? What are the economic mechanisms underlying these estimates? Are the long-run estimates significantly different from the short-run effects? The size of existing estimates, and their rationale, vary a great deal.

First consider the static welfare effects. The official forecasts were that the welfare gains would be between 4.3% and 6.4% of 1988 GDP, albeit based on heroic extrapolations of partial equilibrium calculations for a handful of industries.[1] Academic numerical general equilibrium calculations[2] tend to be much lower, ranging from 0.25% to 1.35% of GDP. These studies produce a range of estimates varying, most importantly, with the nature of the assumed market structure and pricing policy. When countries within the EC are assumed to have segmented markets, lower estimates are derived (about 0.25 to 0.50 percent of GDP). In this segmented markets case the benefits of EC integration derive from the removal of border costs *and* the reduction in costs from producing to a common standard. A commonly held view, however, is that EC92 will have its strongest impact in imperfectly competitive markets by increasing competition and inducing rationalization. The higher estimates derive from models which assume that completion of the market will induce a single integrated market in which international price discrimination is impossible, i.e., a uniform EC-wide price is imposed.

These larger estimates are sometimes characterized as hypothetical because no clear rationale is articulated for how the integration process will induce a common price. That is, if arbitrage fails to eliminate price differences (net of transportation, border and standards costs) prior to 1993,[3] it is not

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[1] This range is reported in Cecchini et al. [1988; p.83] and Emerson et al. [1988; Table 10.1.1, p.203], which are extrapolations of the work of Smith and Venables [1988] for a number of sectors which experience increasing returns to scale. Winters [1992; p.105] has appropriately characterized these extrapolations as "heroic".

[2] Due to Gasiorek, Smith and Venables [1992], Haaland and Norman [1992] and Mercenier [1992], all of which are summarized below.

[3] We use the date "1993" to refer to the nominal year in which completion of the market is to begin. The delays in national legislative efforts to implement necessary ststutes, as well as other delays in application of those laws, makes this date a matter of pedagogic convenience rather than a prediction about when the EC will in fact have completed the single-market program.

clear why it would eliminate price differences (net of transportation costs) after 1993.[4] We briefly review the empirical work testing for price discrimination in the United States. It shows that even in the United States, which is more fully integrated than the EC is likely to become in the near future, price discrimination appears to exist in a wide variety of markets. Moreover, a number of monopolistic competition models have recently been developed that indicate that price discrimination may exist even when market power arises only from monopolistically competitive product differentiation. Thus, both theory and empirical work on the relatively integrated markets in the United States indicate the implausibility of the modelling exercises that assume that no price discrimination is possible after the implementation of the EC92. In addition, we note that the imposition of uniform pricing results (due to the elimination of reciprocal dumping implied by uniform pricing) in the counterintuitive result that intra-EC trade *declines* subsequent to the EC92 program.[5] Thus, we believe that it is necessary to model market integration within the EC92 program with an approach that captures the idea that EC92 will increase competition and rationalization in imperfectly competitive markets without imposing *complete* elimination of firm level price discrimination across the EC.

We model the effects of completion of the internal market in the EC on trade, production and market structure. The impetus for change in our framework comes from two interrelated effects. One effect is the, now standard, reduction of border and standards costs (analogous to the segmented markets approach of previous studies, where the benefits of reduced standards costs is limited to the impact on improved economies of scale). In addition, we maintain that the single market program on standards will have the impact of increasing the ability and willingness of buyers to substitute among the products of

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[4] Karp [1992; p.63] makes the same point: "If it were possible to price discriminate before 1992, then lowering transportation costs (broadly defined) might either increase or decrease the incentive for price discrimination." Smith and Venables [1988; p.1523] note that "... it is not obvious that there exist feasible changes in EC trade policy and competition policy that could impose such a change. In practice policy may be expected to be some combination of our two experiments."

[5] See, for example, Smith and Venables [1988; pp.1520-1523].

producers in different countries. We review the theory and evidence regarding the impact of standards which shows that the impact of standards, especially in the manner implemented in the EC92 program, should be to increase the substitution possibilities of EC buyers for the products of EC producers. In many cases, such as common interconnection in telephone equipment, it is because the products are physically altered so that the products of different producers become interchangeable. In other cases it is because protectionist barriers are eliminated, as occurred with German beer purity restrictions. For other products a quality assurance standard may reduce the advantages of product differentiation, such as occurred in the United States as a result of SAE standards for motor oil and brake fluid.

These effects are appropriately modelled as a change in the elasticity of substitution of consumers in EC countries for the varieties of output of other EC firms. We simulate this change along a continuum from an initial situation, characterized by firm level product differentiation where consumers regard the output of other EC firms are equally substitutable with other *non-EC imports*, to where consumers regard the varieties of all other EC firms as equally substitutable with *home varieties*. A monopolistic competition model is developed in which each firm's post-1992 markup is endogenously determined as a function of the substitutability of the outputs of different EC firms in the preference structure of national consumers. We show, however, that even in the extreme case of no national preferences, pricing differences and market segmentation are not eliminated. As long as arbitrage is imperfect, price differences (net of transportation costs) may persist, and firms determine their optimal markups in each national market based on perceived elasticities that vary with (among other things) the firm's market share in each national market.[6] Thus, an important contribution of this paper is that we provide a rationale for

[6] Haaland and Wooton [1992] have shown that if trade barriers or national preferences continue to exist in the post-1992 environment, the uniform EC-wide pricing that results from complete elimination of segmentation can, contrary to the conventional wisdom, reduce welfare. The reason is that if firms are forced to charge a uniform price across the EC, but national preferences are retained, they will raise prices on their intra-EC exports and this may dominate the effects of lower markups on their domestic sales. In other words, EC92 could reduce welfare due to the loss of the beneficial aspects of a type of reciprocal dumping described by Brander and Krugman [1983]. A similar result is shown analytically by Malueg and Schwartz [forthcoming]. The Haaland-Wooton model does not,

the reduction of price discrimination occasioned by the 1992 program that we numerically implement, in which the extent of remaining price discrimination is endogenously determined.

Our estimates are that the reduction of border and standards costs associated with the EC92 program will result in welfare gains of about 0.5% of EC welfare, a nontrivial welfare increase, but not overwhelming given that increasing returns to scale sectors are in the model. Allowing for the additional effects of standardization on consumer substitution elasticities (our version of integration), however, more than doubles the estimated welfare gains.

Turning to the estimates of long-run welfare effects, the benefits appear to be much greater. In a widely cited study Baldwin [1989; pp. 266, 269] employed estimates from comparative statics models of the effects of EC92 as an exogenous input into a single sector Solow-type growth model. He suggests that the long run effects will be at least *double* the static effects and probably will be as much as four times larger.

We also estimate the steady state growth effects of EC92. Our approach differs from Baldwin [1989; 1992] in that we integrate our multisector approach and the steady state effects into a single model. Consequently, the interaction between long run growth effects and comparative static effects at any initial income level is determined endogenously in our model. We estimate that the benefits in the steady state more than *quadruple* the estimate of the welfare benefits (about 2.4% of EC GDP) compared to the segmented markets comparative statics estimate, explaining some of the anticipatory euphoria surrounding the completion program even before it is fully enacted.

Our general equilibrium model is described in section 2, and the main policy simulations discussed in section 3 (static welfare effects) and section 4 (steady state welfare effects). We compare our model and simulations in some detail with the previous literature, pointing out the differences in our

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however, explain why EC92 would force uniform pricing in markets which were previously characterized by price discrimination. The problems that they identify, however, have led Winters [1992; p.20] to call for further research to distinguish trade barriers and consumer preferences as a rationale for home market bias.

approach. Compared with earlier estimates our greater regional disaggregation reveals sharp differences of expected benefits from EC92 among EC countries based on intra-EC trade intensities. We emphasize: the endogenous determination of the extent of reduction in price discrimination deriving from the impact of the EC92 product standardization program on consumer perceptions of substitutability, the estimation of steady state growth effects in a unified endogenous framework, and the considerably greater regional and commodity disaggregation in our model. In most other respects our model is of the same genre as earlier general equilibrium work.

## 2. A Multi-Regional Trade Model

### General Model Features

In this subsection we focus on general modelling features. Due to their importance in modelling the process and effects of integration in the EC, we discuss in some detail below how we model (i) the reduction of border and standards costs as a result of the EC92 program, (ii) market integration as an endogenous consequence of other aspects of the EC92 program and (iii) the extension of static estimates of welfare effects to steady state estimates. Appendix A provides a detailed algebraic formulation of the model and the decomposition algorithm employed for solution (see Rutherford [1992a,b]).

The model separately identifies nine regions of the EC: Belgium, Denmark, France, Germany, Italy, the Netherlands, Portugal, Spain, and the United Kingdom. It also identifies Morocco, Turkey, and a residual Rest of World (ROW), making twelve regions in all. The present version identifies twenty-six sectors per region, listed in Table 1. Twelve sectors in each region are characterized by increasing returns to scale (IRTS), as identified in Table 1 in the column reporting the Cost Disadvantage Ratio (CDR). The CDR, which is defined as the ratio of fixed to total costs, provides a measure of the importance of scale

**Table 1**: Sectors of the Model

| ID | Sector | Eurostat Sectors | Value Added | CDR (%) |
|---|---|---|---|---|
| AGR | Agriculture | 010 | 3% | |
| FOO | Food | 310, 330, 350 | 3 | 11 |
| BET | Beverages and Tobacco | 370, 390 | 2 | |
| ENE | Energy | 030, 050, 070, 110 | 4 | |
| UTI | Utilities | 090 | 2 | |
| STE | Iron and Steel | 130 | 1 | 5 |
| NMM | Non-Metallic Mineral Products | 150 | 1 | 6 |
| CHM | Chemicals | 170 | 2 | 6 |
| MET | Metal Products | 190 | 2 | 5 |
| IMA | Industrial Machinery | 210 | 2 | 6 |
| OMA | Office Machinery | 230 | 1 | 4 |
| ELG | Electrical Goods | 250 | 3 | 5 |
| VEH | Motor Vehicles | 270 | 2 | 11 |
| OTE | Other Transport Equipment | 290 | 1 | 14 |
| TXC | Textiles and Clothing | 410, 430 | 2 | |
| WOO | Wood | 450 | 1 | |
| PAP | Paper and Printing | 470 | 2 | 11 |
| RPL | Rubber and Plastics | 490, 510 | 1 | 4 |
| CON | Construction and Repair | 530, 550 | 8 | |
| TRA | Trade | 570 | 12 | |
| FIN | Financial Services | 690, 710, 730 | 15 | |
| TRN | Transport and Communication | 610, 630, 650, 670 | 6 | |
| HEA | Health Services | 750, 850 | 4 | |
| EDU | Education Services | 770, 890 | 4 | |
| SER | Other Market Services | 590, 790 | 6 | |
| PUB | General Public Services | 810, 930 | 10 | |

economies.[7] The market structure in IRTS sectors is monopolistically competitive, with free entry and exit. All other sectors exhibit constant returns to scale (CRTS) and have a competitive market structure.

[7] The methodology for estimation of the CDR is discussed in Appendix B.

Table 1 also shows the original *Eurostat* sectors from which our aggregation was obtained, and the aggregate EC share of each sector in value added.

We adopt a relatively detailed level of sectoral and regional disaggregation in our model, since disaggregation has (as we show below) an important impact on the estimated effects of EC92. As Gasiorek, Smith and Venables [1992] (GSV) note, regional aggregation entails a nontrivial assumption in these exercises since it is primarily through the reduction in border and standards costs of exporting that the EC92 program will have its impact. Regional aggregation in effect converts exports, on which a cost reduction would be achieved, into domestic production. Moreover, we show below that greater regional disaggregation is fundamental in revealing the considerable differences in the welfare benefits that will accrue to the EC countries with different intra-EC trade intensities. Table 2 lists the nine EC countries in our model and their intra-EC trade intensities.

Regarding sectoral aggregation, previous studies have employed reasonable aggregation structures for IRTS sectors, but have employed one or at most two large residual CRTS sectors representing at least two-thirds of the economy. Table 8 offers a summary of the main model features of previous studies. Our 26 sector model allows us to keep separate virtually all of the sectors which have significant IRTS as estimated at the 44-sector level. It also allows us to maintain some disaggregation of CRTS sectors, along the lines that might be expected to influence results (viz., traded *versus* non-traded, labor-intensive *versus* capital-intensive). By received standards in the literature this makes for a "big model".

The rest of our static model is relatively standard. We have multiple price-wedge distortions, such as factor taxes in production, value-added taxes, import tariffs, export subsidies, voluntary export restraints (represented as *ad valorem* equivalents) and non-tariff barriers (also represented as *ad valorem* equivalents). Production entails the use of intermediate inputs and primary factors. Primary factors are mobile across sectors within a region, but are internationally immobile. Each region has a single representative consumer, as well as a single government agent.

**Modelling the Reduction in Border and Standards Costs of Intra-EC Trade**

The two types of real trade costs which constitute the "sand in the gears" in our model are border costs and standardization costs on the supply side. Border costs represent the costs of undertaking trade, such as administrative costs of transacting and transporting over international boundaries. Standardization costs on the supply side are due to differences in technical specifications and regulations across national boundaries, being associated with the production costs of fulfilling technical regulations in foreign EC markets. Standardization costs, which would include the costs on the demand side of fewer or less adequate substitutes as discussed below, are viewed as being much more of a barrier to intra-EC trade than explicit border costs (see Emerson et al. [1988; p.32ff.]), and their removal was one of the most ambitious aspects of the EC92 program. It is also the aspect of the program that has naturally been the hardest to enforce, given the welter of national legislation and regulatory directives involved. No observer of intra-EC trade would doubt that substantial standardization costs will continue to exist in the EC for many years to come.

Virtually all studies of the welfare effects of EC92 use a joint *ad valorem* production cost for these items of 2.5%. We follow this assumption, but decompose this value into an amount attributable to border costs and an amount attributable to production standardization costs. The reason for doing this is that we model the effects of each in different ways. Border costs are modelled as additional purchases of the domestic "transportation" good in each region. This good represents the activity of shipping, handling and warehousing for customs purposes. Standardization costs on the supply side are more likely to be reflected in extra costs of producing the specific good itself, rather than the purchase of inputs of any specific good. Thus we model supply side standardization costs as additional value-added in each sector in which trade takes place. These costs are treated as falling on imports to, and exports from, the region. They do not fall on domestic sales, and hence should be interpreted as the *differential* costs of transacting with other EC countries.

Estimates of border costs for many EC regions and sectors can be extracted from Cawley and Davenport [1988; Tables B2, A3]. The weighted averages of these border costs for trade with other EC regions is shown in Table 2. The EC average is about 1.7%, based on these estimates. If we assume that the real trade costs from border costs *and* supply side standardization costs amounts to 2.5% for each region, the region-specific standardization costs are derived residually and are shown in Table 2. These estimated supply side standardization costs are then assumed to apply to all traded goods within the indicated region.

**Theory and Evidence Against Uniform Pricing**

Previous studies have modelled completion of the market in two stages, with the first stage being the same as ours. In the second stage, previous studies have attempted to capture the presumption that EC integration will have its strongest impact by increasing competition in IRTS sectors. Their second stage involves a shift in the pricing behavior of national firms as the result of completion. Pricing is originally undertaken with "segmented markets", and with monopolistic competition in IRTS sectors this results in lower prices in foreign markets than at home.[8] With completion of the market these segmented markets are replaced with an integrated market in which price discrimination between home and foreign markets is assumed to be impossible.

We claim that it is inappropriate either on *theoretical or empirical grounds* to model EC integration as a process that imposes complete pricing uniformity. First consider the theory. Although the possibility of price discrimination by a monopolist selling in segmented markets has long been accepted in economic theory, recent theoretical work has shown the existence of price discrimination equilibria in a variety of multi-firm settings, even with free entry (e.g., Katz [1984], Borenstein [1985]

[8] This result assumes, plausibly enough, that foreign market shares for a given firm are smaller than domestic market shares. Hence the perceived demand elasticity is different in the two markets, resulting in differences in mark-ups.

**Table 2**: Border, standard costs ar.. intra-EC trade intensities for EC regions (in percentage)

| *Country* | *Border costs* | *Standardization costs*[a] | *Intra-EC*[b] *trade intensity* |
|---|---|---|---|
| Belgium | 1.692 | 0.808 | 35.6 |
| Denmark | 1.695 | 0.805 | 14.9 |
| France | 1.717 | 0.783 | 11.1 |
| Germany | 1.807 | 0.693 | 11.9 |
| Italy | 1.576 | 0.924 | 10.1 |
| Netherlands | 1.623 | 0.877 | 29.1 |
| Portugal | 1.540 | 0.960 | 12.0 |
| Spain | 1.663 | 0.837 | 08.8 |
| United Kingdom | 1.903 | 0.597 | 11.9 |

a. Border plus standard costs sum to 2.5 percent.
b. Defined as one-half intra-EC exports plus imports divided by GDP.

and Holmes [1989])[9]. These analyses suggest that price discrimination may arise even when market power over price arises only from monopolistically competitive product differentiation.

On empirical grounds, consider the United States market, which is considerably more integrated than the EC is likely to become in the immediate future. Although there are generally alternative theoretical explanations for the observed pricing practices,[10] there are a wide variety of observed pricing practices in the United States that are consistent with price discrimination. These include: (1) two-part tariffs, in which a lump sum fee is charged and a usage charge per unit applies;[11] (2) discount coupons, which allow those consumers with lower opportunity cost of time to obtain a lower price; (3) selling the

[9] See Varian [1989] for a review of the theory of price discrimination under non-monopoly conditions.

[10] See Carlton and Perloff [1990] for alternate explanations. The welfare economics of these practices is a separate matter which we do not address.

[11] Tie-in sales, where the purchaser of the product is required to purchase related products, is one type of two part tariff. For example, IBM, in requiring purchasers of its computers to buy its tabulating cards was able to obtain a higher price for the machine from the more intensive users. Xerox, is charging a per unit rental fee for copies that exceeded the marginal maintenance costs, price discriminated against intensive users. See Scherer and Ross [1990].

same product under different brand names and charging a premium for the label as occurs in supermarkets;[12] (4) discounts on products that face stiff competition, for example in the shoe machinery (Kaysen [1956]) and computer markets (Fisher, McGowan and Greenwood [1983]); and (5) geographic price discrimination under single or multiple basing points, with some absorption of transportation charges by the producer.[13]

A further highly counterintuitive result of the uniform pricing assumption is that intra-EC trade declines as a result of EC integration. This is because firms charge higher markups on their domestic sales than on export sales prior to integration. Uniform pricing in the EC causes firms to raise export markups and lower domestic markups, which reduces intra-EC trade.

### Modelling the Price Effects of Integration

Impact of Standards on Substitution. As a result of the concerns raised above, reservations have been expressed regarding the manner in which integration has been modelled in previous studies of EC92.[14] Our approach is based on a review of the theoretical and empirical literature on standards which is presented in Appendix C. We conclude that the impact of the standards component of the single market program (which is regarded by businessmen as the most important component of the single market

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[12] See Wolinsky [1987].

[13] Some form of basing point system has been adopted by many U.S. industries including the steel, cement, lead and wood pulp industries. See Scherer and Ross [1990] for an elaboration. In addition, recent studies have found evidence of price discrimination in monopolistically competitive markets. Using data from retail gasoline markets, Borenstein [1991] used a model of spatial competition in which differences in the willingness of buyers to switch stations results in price discrimination between leaded and unleaded gasoline. As gasoline stations which offered leaded gasoline diminished, the relative price of leaded to unleaded gasoline rose. Shepard [1991] found the price difference between full service and self-service gasoline in stations that offered both services was considerably greater than the price difference across different stations that only offered one type of service. Based on a similar model, Borenstein and Rose [1991] found price discrimination in the U.S. airline industry. Pashigian and Bowen [1991] have found that the greater use of sales in the pricing of apparel in retail stores is consistent with a price discrimination theory of pricing (as well as greater uncertainty), in which consumers who are more interested in being in fashion have less elastic demand and pay higher prices early in the season.

[14] For example, see Karp [1992; p.63], Smith and Venables [1988; p.1523], Mercenier [1992; p.1] and Winters [1992; p.20].

program) will be to substantially increase the ability and willingness of EC buyers to substitute among the products of EC suppliers. Thus, one of the key features of our modelling approach is that the increased competitiveness in IRTS sectors comes about through the greater ability and willingness of EC buyers to substitute among the products of EC producers due to the single market program on standards.

Standards arise from a variety of reasons. Taking the United States as an example, there are literally thousands of industrywide product standards. Most of these are voluntary, arise from the demand from buyers, and may be classified into *uniformity* standards and *quality* standards.[15] There are also situations in which suppliers desire product standards, most notably for anticompetitive reasons.[16] We explain why the single market program on standards should increase the ability of buyers to substitute among the products of competing suppliers in each of these cases.

First consider uniformity standards. The most important aspect of these is interchangeability standards, which are designed for the express purpose of allowing buyers greater substitution possibilities among different suppliers. Well known interchangeability standards are those in the auto industry which were imposed on parts suppliers by the Society of Automotive Engineers (SAE) on behalf of auto assemblers; these standards were designed so that assemblers would be able to substitute among different suppliers of parts such as wheel rims, spark plugs and screws and bolts. Other examples are standardized socket sizes in lamps that allow substitution among light bulbs. A photographer may interchangeably choose among various films, cameras, tripods, lens, filters and exposure meters due to standardization. To facilitate replacement, bricks sizes were standardized under government regulation. Operating controls for forklift trucks are almost all standardized so that training of drivers is interchangeable among different manufacturers products. Despite the enormous variety of paper towels, virtually all are eleven inches wide

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[15] See Hemenway [1975] for an excellent and more elaborate treatment of the theory and evidence on industrywide voluntary standards.

[16] Another prominent reason for suppliers to desire standards is to gain economies of scale. This was discussed above and included in the model.

to fit the standardized dispenser.

Regarding quality standards, these also increase the substitution possibilities of consumers because the reduce the product differentiation advantages of producers. In the spirit of the Akerlof [1970] model, problems of degradation of product quality often arise in markets where buyers have less information than sellers and it is costly to produce higher quality products. Brand names will often develop to resolve the degradation of product quality problem, but then consumers are reluctant to substitute among competing suppliers due to product differentiation. Grading of products then will allow greater substitutability among competing brands. The auto industry succeeded in imposing quality standards on most of its raw material suppliers such as steel, rubber, petroleum and machine products. Among these industries, opposition from steel suppliers was strongest because steel suppliers were reluctant to lose product differentiation advantages associated with brand names. Similarly oil viscosity standards for auto motor oil were imposed on reluctant refineries. In general, products that are graded for quality have little product differentiation advantages.[17]

Standards are sometimes imposed by suppliers for anticompetitive purposes. For example, fearing anticompetitive standards, the U.S. Federal Communications Commission mandated standardized interconnection for terminal equipment and open network architecture (ONA), which means that the components of the telephone system are made available on an unbundled basis so that competing supplier services can be combined in any manner desired. These standards have been highly successful, at least judged by the wide variety of independent supplier equipment and services that have developed.[18]

As part of its single market program, EC policy is attempting to implement similar reforms in standards. The EC green paper on telecommunications policy indicates that through the promotion of Europe-wide standards "it shall provide equal access to all market participants (EC [1987; p.5]).

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[17] This includes milk, eggs, meat, lumber, soybeans, diamonds and mushrooms.

[18] See Besen and Saloner [1987] for further details.

Moreover, ONA has been mandated by the Maastricht treaty partly to insure the uniform interpretation of essential requirements across the Community in order to limit the possibilities for the imposition of restrictive licensing conditions.[19]

Probably the best known example of supplier-based anticompetitive standards is national standards that have the force of law for the purpose of protection, which the EC refers to as technical regulations. For example, EC courts interpreted German beer purity laws as protectionist and required that beer manufactured in any member state could be imported into Germany. This is an application of the mutual recognition principle in which products produced in one member state may be sold throughout the EC. In the absence of specific EC legislation however, EC states may still block intra-EC imports if certain national interests are involved. So the EC has attempted to achieve harmonization of technical regulations in which EC directives indicate mandatory requirements for national regulations.[20] In either event, the European consumer will be able to consume products from other EC states that previously were illegal to import.

It is likely that considerations such as these led businessmen who were surveyed in the "Costs of non-Europe" project to conclude that they would have greater access to new regional markets and there would be increased price and non-price competitiveness as a result of the single market (Nerb [1988; p.27]). Moreover, the survey led some observers to conclude that "there is a dynamic of demand associated with the learning process of consumers and enterprises which is released or accelerated when barriers are removed" (Nerb [1988; p.26]). Thus, the theory and empirical work on standards indicates that the impact of the EC92 program of standards will be to substantially increase the ability of buyers to substitute among the products of EC suppliers, justifying our modelling focus.

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[19] See *XIII*, September 1993, p.12 (the magazine of DG XIII of the EC) and Emerson et al. [1988; p.86].

[20] A manufacturer may meet the technical requirements either by producing a product that meets the defined essential requirements (which allows manufacturer variety subject to the constraint of meeting the essential requirements of the product) or by producing a product in conformity with European standardization bodies (Emerson et al., 1988, p.40).

Modelling the Impact of Increased Substitution. We employ a flexible demand structure in which consumers may have preferences for the products of firms depending on region of origin. As a result of standardization EC buyers may substitute more readily among products from different EC firms. Then the perceived elasticity of demand of EC firms on intra-EC exports increases, and intra-EC export price margins are reduced endogenously. Consequently, as markets become more integrated intra-EC trade generally expands. Firms in CRTS sectors will not directly be led to change their prices by this change in EC consumer perceptions, but there will be indirect effects due to the general equilibrium interactions induced by changes in the prices of IRTS sectors.[21] We discuss this aspect of the model in greater detail below.

More formally, prior to the EC92 program we envisage consumers as possessing weakly separable utility functions that allow multiple stage budgeting of their choice decisions. First, based on a Cobb-Douglas utility function at the top level, they choose between the 26 different composite goods which are listed in Table 1, such as "motor vehicles" and "textiles and clothing". Having chosen how much to spend on each aggregate commodity, they then choose between domestic and imported composites of this commodity: between "domestic autos" or "imported autos", for example. This decision is based on a CES sub-utility function. Having decided how much to allocate to imported autos, consumers then decide how much to allocate to imports from different regions in the model. This decision is also based on a CES sub-utility function. Finally, given the decision on how much to spend on autos from each country, consumers allocate expenditures on the different varieties from each country based on the lowest level CES sub-utility function.[22] Figure 1 displays this structure of preferences (after the

[21] A CRTS sector might use as an intermediate input the output of an IRTS sector whose price changes, thereby changing the costs of the CRTS sector. Alternatively, the CRTS sector may be a substitute in demand for the IRTS sector, and therefore experience a change in demand due to the change in relative prices between the two.

[22] Given that the elasticities of substitution for these last two levels of choice with respect to foreign country and foreign firm variety (within a country) are the same, the structure is equivalent to firm level competition among all imports. A special case of this structure, with all elasticities of substitution equal, yields firm level competition among all firms that is independent of the country of origin.

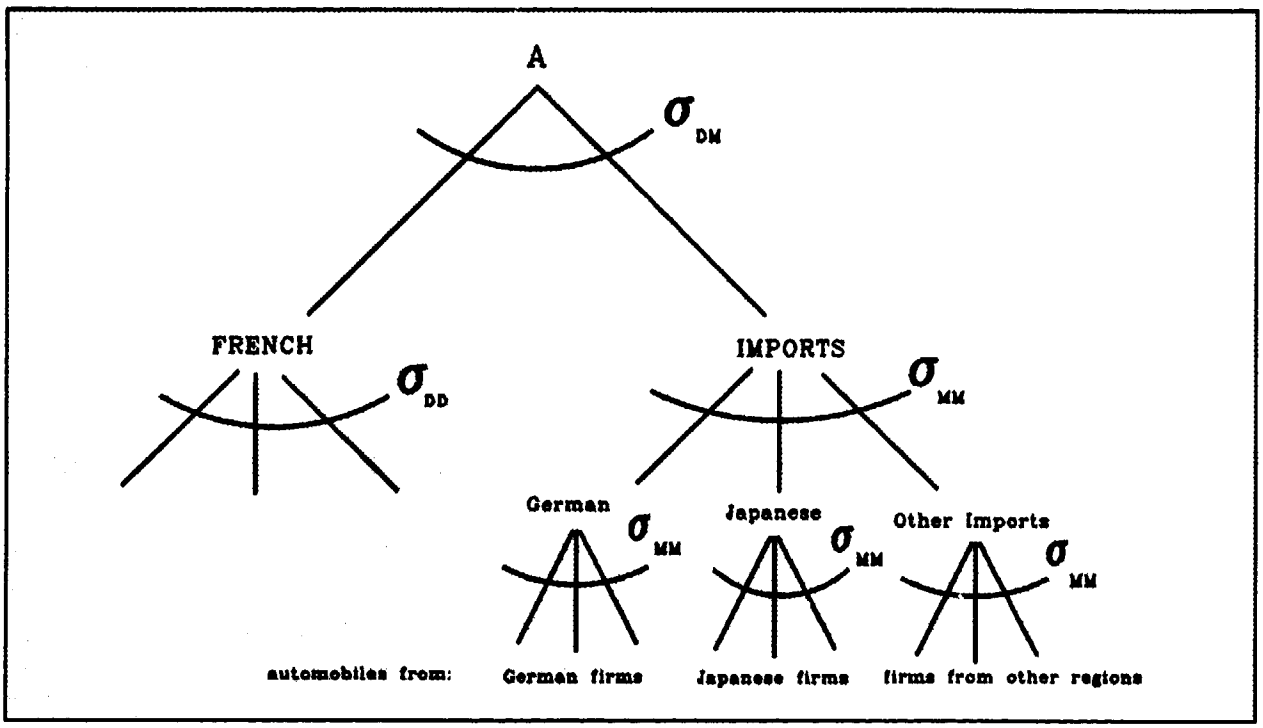


**Figure 1**: Structure of Preferences *Before* the EC92 Program

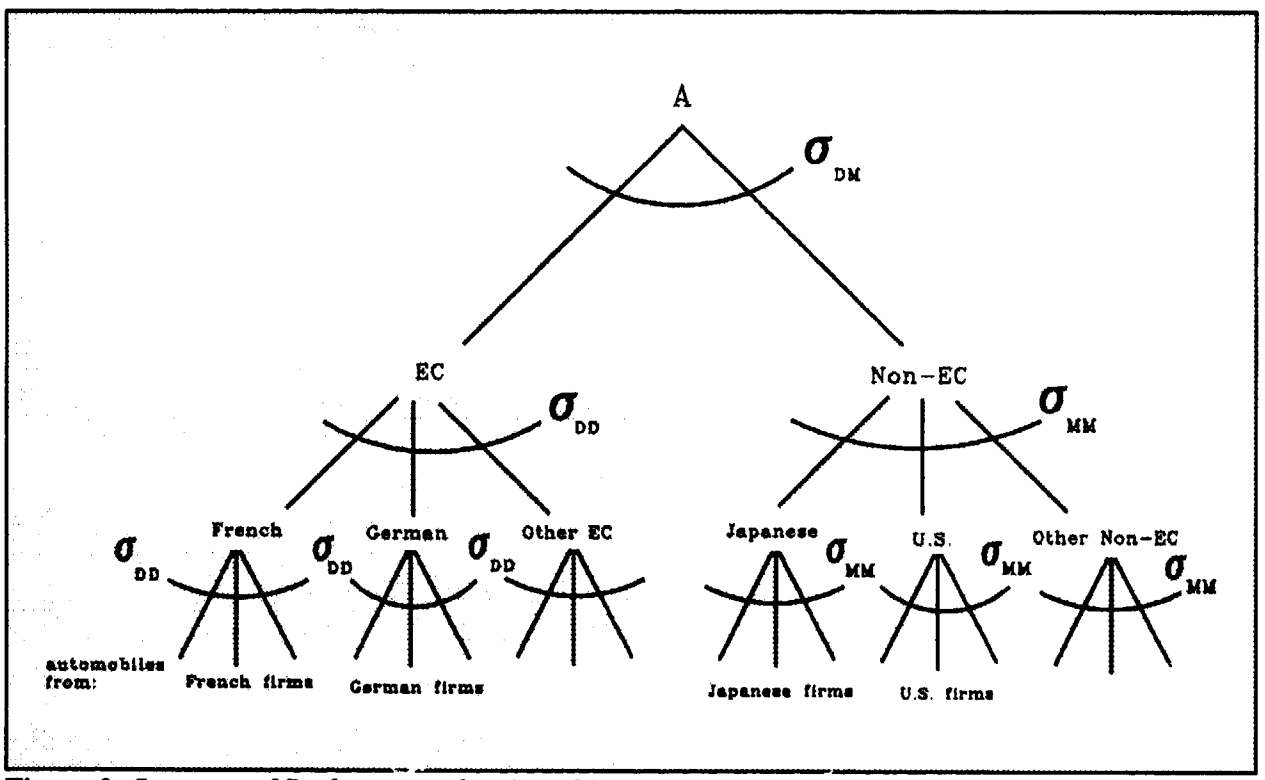


**Figure 2**: Structure of Preferences *After* the EC92 Program

initial Cobb-Douglas choice of how much to spend on the aggregate commodity).

After the EC92 program is completed, we envisage consumers have a different preference structure to reflect the notion that, due to EC92 programs regarding standards, EC-produced goods are now better substitutes than before. They are better substitutes for other EC-produced imports, and they are better substitutes for domestic varieties. We simulate this preference change along a continuum where in the limit consumers regard the products of all EC firms as equally substitutable. The latter preference structure is shown in Figure 2.

Specifically, in the fully integrated scenario the preference structure of consumers is directly analogous to the segmented scenario prior to EC92. Having decided how much to spend on any aggregate commodity, such as autos, consumers allocate that income among imported and domestic varieties of the commodity. However, now the notion of a "domestic variety" includes all other EC-produced varieties, even if they are not produced in the EC country in which the consumer lives. That is, we shift from treating other EC products as being "foreign varieties" and treat them as if they were "domestic varieties".[23]

These two preference structures represent extremes, reflecting the situation before EC92 and the situation after the successful completion of the EC92 program. It is then a simple matter to model the path towards completion of the market as a weighted average of these two preference structures. Thus a 25% weighting on the pre-EC92 preference structure could be interpreted as saying that a quarter of the (homogeneous) consumers in that country perceive no change in the substitutability of EC-produced

[23] This representation of preferences as changing "structure" just reflects presumed changes in the off-diagonal elements of an implicit Slutsky substitution matrix between domestic and foreign varieties. It is possible to represent this change explicitly in a CGE model, using flexible functional forms such as the non-separable CES structure developed by Perroni and Rutherford [1992], but we opt for the simpler more easily interpreted formulation presented here. The crucial modelling feature here is not the use of different utility function structures; rather it is the correct characterization that EC goods are now better substitutes for home goods.

goods.[24]

In most circumstances, economists are reluctant to consider changes in preferences as the basis for a policy exercise, in large part because the created difficulties in evaluating welfare measures, such as Hicksian equivalent or compensating variation. In the present model, however, we modify preferences in such a way that indices of welfare change remain well defined. This is because the changes in preferences do not alter the optimality of the initial allocation. In the absence of monopolistic pricing, the change in preferences alone do not disrupt the benchmark equilibrium.

The key elasticities of substitution are denoted $\sigma_{DM}$, $\sigma_{DD}$ and $\sigma_{MM}$, and reflect the substitutability between domestic (D) and imported (M) goods, alternative domestic varieties, and alternative foreign countries (and varieties). These elasticities are crucial to the effects of EC92. Our priors are that $\sigma_{DM} < \sigma_{MM} < \sigma_{DD}$. Our priors derive from our above discussion and appendix on standards which indicates that products produced in the same country will be more substitutable among themselves than products from different countries. This gives us the relationship that $\sigma_{MM} < \sigma_{DD}$; this inequality plays an important role in the analysis below.[25] Although it does not play an important role in the analysis, we also posit that domestic consumers are less willing to substitute foreign varieties for domestic varieties than they are among different *varieties* from foreign sources. In the absence of data-based estimates of these elasticities we initially specify $\sigma_{DM} = 5$, $\sigma_{MM} = 10$, and $\sigma_{DD} = 15$. Our priors for the three key elasticities of substitution remain the same when applied to pre or post EC92 preference structure.

A formal derivation is provided in Appendix A, but intuition into how market integration affects

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[24] We assume that this fraction is constant across all countries, reflecting the overall progress towards completion of the EC92 program. It would be a simple matter to let it vary across EC countries, perhaps reflecting the differential speed with which EC countries are accepting EC-wide standards and are removing border costs on EC imports. There is some anecdotal evidence of such differentials, at least as measured by the speed of enacting national legislation to implement the EC92 program (e.g., *The Economist*, July 3-9, 1993, Survey on the European Community).

[25] It also gives us $\sigma_{DM} < \sigma_{DD}$.

markups and intra-EC trade can be obtained through examination of the markup equations. Define the markup for firms from one EC country ($r$) selling into another EC country ($r'$) in the segmented market situation as $m_{rr'}$, and in the fully integrated equilibrium as $m^*_{rr'}$. It follows from equations (47) and (49) of Appendix A that the markup under segmented markets is:

$$m^*_{rr'} = \frac{1}{\sigma_{MM}} + \left[\frac{1}{\sigma_{DM}} - \frac{1}{\sigma_{MM}}\right]\frac{\theta_{rr'}}{N_r\theta^M_{r'}} + \left[1 - \frac{1}{\sigma_{DM}}\right]\frac{\theta_{rr'}}{N_r} \qquad (1)$$

and the markup under fully integrated markups is:

$$m_{rr'} = \frac{1}{\sigma_{DD}} + \left[\frac{1}{\sigma_{DM}} - \frac{1}{\sigma_{DD}}\right]\frac{\theta_{rr'}}{N_r\theta^{EC}_{r'}} + \left[1 - \frac{1}{\sigma_{DM}}\right]\frac{\theta_{rr'}}{N_r} \qquad (2)$$

where

$$\theta^M_{r'} = \sum_{r \neq r'} \theta_{rr'} \qquad \theta^{EC}_{r'} = \sum_{r \in EC} \theta_{rr'}$$

and $\theta_{rr'}$ denotes the market share of region $r$ firms in region $r'$.

Then the change in markup (defined as the fully integrated minus the segmented markup) simplifies to

$$m^*_{rr'} - m_{rr'} = \left[\frac{1}{\sigma_{DD}} - \frac{1}{\sigma_{MM}}\right] + \frac{\theta_{rr'}}{N_r}\left[\frac{1}{\theta^{EC}_{r'}}\left[\frac{1}{\sigma_{DM}} - \frac{1}{\sigma_{DD}}\right] - \frac{1}{\theta^M_{r'}}\left[\frac{1}{\sigma_{DM}} - \frac{1}{\sigma_{MM}}\right]\right] \qquad (3)$$

When this expression is negative, markups on intra-EC trade will fall and trade will tend, *ceteris paribus*, to increase. As we have argued above, there is likely to be greater similarity and substitutability among the products of domestic producers than among the products of foreign producers, and still less between domestic and foreign, and we have chosen elasticities accordingly, i.e., $\sigma_{DM} = 5$, $\sigma_{MM} = 10$, and $\sigma_{DD} = 15$. The first term in this simplified expression is negative when $\sigma_{DD} > \sigma_{MM}$, and for our specific values equals -0.033; but there is some ambiguity with respect to the second term. Given the

ranking of the elasticities of substitution, the second term will be positive the smaller is $\theta_r^{EC}$ in relation to $\theta_r^M$, i.e., the smaller the share domestic firms have of the domestic market relative to non-EC imports in the domestic market.[26] Given our specific values, the change in the markup equals

$$-0.033 + \frac{\theta_{rr}}{N_r}\left[\frac{(.133)}{\theta_r^{EC}} - \frac{(.1)}{\theta_r^M}\right].$$

Numerically, we find that the sign of the second term is positive in most cases, but considerably smaller than the first term because it is multiplied by the ratio of a share ($\theta_{rr}$) divided by the number of firms, where for example for Belgium's markup in Germany we have the share of Belgian exports in the German market divided by the number of Belgian firms. Thus, we find that the change in the markup is uniformly negative, where in most cases the decline in the markup is between 2 and 3.3 percent.

We discuss how we model the steady state effects of completion of the market in section 4.

## 3. The Static Effects of Completion of the Market

### Static Welfare Effects

Table 3 displays the results of completion of the market on aggregate EC welfare. In effect, this measure of the welfare effects adopts a utilitarian social welfare function for the EC, such that we simply add up the welfare effects for individual EC countries. In Table 3 we display a matrix of results where we simulate partial and full removal of border and supply side standards costs and well as partial and complete change in the elasticities of substitution (referred to in the table as percent of integration). Although the steady state results are presented in Table 3, we defer discussion of them to section 4.

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[26] Specifically, the second term will be positive if and only if $4\sum_{r\in EC}\theta_{rr} + \sum_{\substack{r\in EC \\ r\neq r'}}\theta_{rr} > 3\theta_{r'r'}$.

**Table 3**: Welfare effects of EC92 on the EC[a]

| | *Percent Removal of Border and Standards Costs* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *0%* | | *25%* | | *50%* | | *75%* | | *100%* | |
| *Percent Integration* | *Static (1)* | *Steady state (2)* | *Static (3)* | *Steady state (4)* | *Static (5)* | *Steady state (6)* | *Static (7)* | *Steady state (8)* | *Static (9)* | *Steady state (10)* |
| 0% | | | | | | | | | | |
| IRTS | 0.00 | 0.00 | 0.12 | 0.38 | 0.25 | 0.85 | 0.38 | 1.33 | 0.52 | 1.79 |
| CRTS | 0.00 | 0.00 | 0.11 | 0.34 | 0.22 | 0.74 | 0.34 | 1.15 | 0.46 | 1.56 |
| 25% | | | | | | | | | | |
| IRTS | 0.11 | 0.30 | 0.24 | 0.72 | 0.37 | 1.14 | 0.51 | 1.57 | 0.66 | 2.03 |
| CRTS | 0.00 | 0.00 | 0.11 | 0.33 | 0.23 | 0.70 | 0.35 | 1.08 | 0.47 | 1.48 |
| 50% | | | | | | | | | | |
| IRTS | 0.23 | 0.59 | 0.36 | 0.98 | 0.50 | 1.38 | 0.65 | 1.80 | 0.81 | 2.25 |
| CRTS | 0.00 | 0.00 | 0.11 | 0.30 | 0.23 | 0.64 | 0.35 | 0.99 | 0.49 | 1.37 |
| 75% | | | | | | | | | | |
| IRTS | 0.36 | 0.83 | 0.50 | 1.20 | 0.65 | 1.59 | 0.81 | 2.00 | 0.98 | 2.44 |
| CRTS | 0.00 | 0.00 | 0.11 | 0.27 | 0.23 | 0.57 | 0.36 | 0.90 | 0.50 | 1.24 |
| 100% | | | | | | | | | | |
| IRTS | 0.50 | 1.04 | 0.65 | 1.38 | 0.82 | 1.76 | 0.99 | 2.16 | 1.18 | 2.60 |
| CRTS | 0.00 | 0.00 | 0.11 | 0.23 | 0.23 | 0.49 | 0.36 | 0.79 | 0.50 | 1.10 |

a. Welfare effects are in each case the aggregate equivalent variation as a percent of aggregate EC GDP.

*Source*: Model estimates.

First, consider the static welfare effects with IRTS in Table 3. These estimates imply that *removal of internal trade barriers and market integration are complementary* to each other, which is consistent with the received wisdom from previous studies. Full integration with complete removal of internal trade barriers results in an aggregate welfare gain of 1.13% of GDP per annum.

The *relative contribution of market integration and removal of trade barriers appears to be roughly additive and, as it turns out, somewhat symmetric*. That is, $x$% integration and $y$% removal of sand achieves about the same welfare increase as $y$% integration and $x$% removal of sand, provided neither $x$ nor $y$ are zero.

CRTS Results and Comparison with IRTS. Despite the fact that we have argued strongly that it is appropriate to model 12 of the 26 sectors (about 21 percent of value-added) as being subject to IRTS, it is helpful in understanding the results to consider the results in the counterfactual case in which all sectors are subject to CRTS. We implement this by setting the CDR equal to zero for all sectors. Given that there are no rationalization gains to be realized from improved scale efficiency in a CRTS model, we would expect that the welfare effects of EC92 would be much smaller, and indeed they are. In Table 3 the effect of assuming IRTS and monopolistically competitive pricing in our model is seen to increase the welfare gains by almost nothing (if we assume zero price integration) or by as much as 100% (if we assume full price integration).

In Table 4 we present results showing the distributional effects across countries. We find considerable disparity in the welfare effects across EC countries, even though all gain. Table 4 shows the effect on welfare in percentage and in absolute terms (equivalent variation as a percent of GDP and in billions of 1985 U.S. dollars, respectively), the percentage change in the real wage and the real price of capital, and finally the percentage change in the real cost of living. The numbers without parentheses are for the IRTS fully integrated scenario in which all border and standards costs "sand" are removed. The CRTS results are in parentheses.

Examining Table 4 for the distribution of welfare gains across the countries of the EC in the CRTS case, one sees that Belgium and the Netherlands are the countries which experience the largest increase in welfare as a percent of GDP. The key to understanding this is to recognize that we have modelled the impact of the EC92 program on standards and borders costs as costs which will be reduced on intra-EC exports only, i.e., there are no cost reductions on production for the domestic market. Border costs require resources of the domestic transportation sector in our model and supply side standards costs are a component of value-added to the extent that the good is exported. Since the single market program is assumed to reduce the border and standards costs of intra-EC exporting by 2.5 percent, the first order

**Table 4**: Country composition of the welfare effects of EC92[a]: 100% integration and removal of border and standards costs

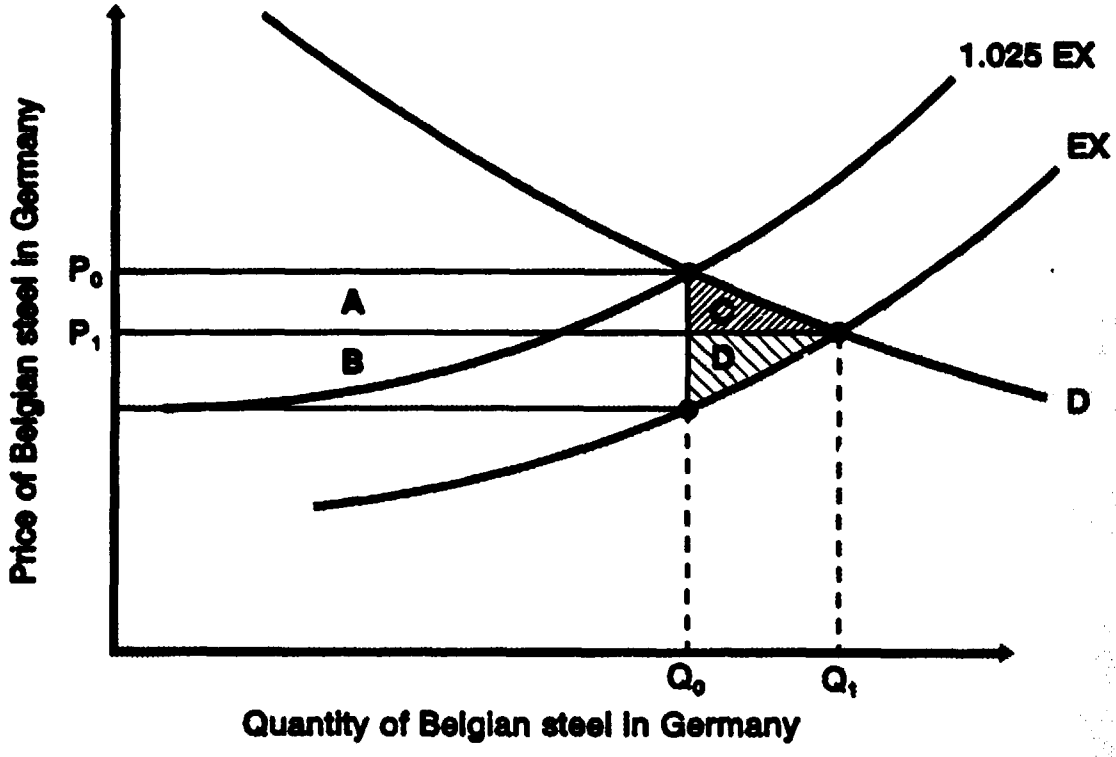
| Region | Percent change in: | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Welfare[b] | | Welfare in dollars[c] | | Real wages | | Real price[d] of capital | Real consumer prices | |
| | Static | Steady state | Static | Steady state | Static | Steady state | | Static | Steady state |
| Belgium (BE) | 3.37 (1.53) | 6.39 | 3.32 (1.51) | 6.31 | 5.2 (2.6) | 6.7 | 3.3 (1.3) | 1.4 (0.7) | 1.0 |
| Germany (DE) | 1.10 (0.44) | 2.03 | 7.27 (2.90) | 13.39 | 1.0 (0.4) | 1.6 | 0.9 (0.3) | 0.1 (0.1) | 0.1 |
| Denmark (DK) | 1.82 (0.81) | 3.78 | 1.21 (0.54) | 2.51 | 2.4 (1.2) | 3.0 | 1.7 (0.8) | 0.7 (0.4) | 0.4 |
| Spain (ES) | 0.80 (0.36) | 1.96 | 2.19 (0.98) | 5.36 | 0.8 (0.4) | 1.4 | 1.2 (0.5) | 0.4 (0.2) | 0.0 |
| France (FR) | 1.13 (0.50) | 2.47 | 7.07 (3.14) | 15.44 | 1.1 (0.5) | 1.8 | 1.4 (0.7) | 0.3 (0.2) | 0.1 |
| Italy (IT) | 1.05 (0.46) | 2.03 | 4.62 (2.03) | 8.88 | 1.0 (0.4) | 1.5 | 0.8 (0.3) | 0.0 0 | -0.1 |
| The Netherlands (NL) | 2.48 (1.20) | 7.73 | 3.41 (1.65) | 10.63 | 3.0 (1.3) | 4.9 | 4.0 (2.5) | 1.2 (0.7) | 1.1 |
| Portugal (PT) | 1.04 (0.42) | 1.72 | 0.53 (0.21) | 0.87 | 0.5 (0.3) | 0.6 | 1.3 (0.8) | -0.2 0 | -0.6 |
| United Kingdom (UK) | 0.80 (0.29) | 1.49 | 4.31 (1.57) | 7.97 | 0.1 (-0.2) | 0.4 | 1.0 (0.4) | -0.3 (-0.3) | -0.3 |
| Rest of World (ROW) | -0.00 (-0.005) | 0.05 | -0.35 (-0.42) | 4.06 | -0.00 (-0.1) | 0.0 | 0.3 (0.1) | 0 0 | 0.0 |

a. Numbers without parentheses are for IRTS in fully integrated scenario with all border and standards costs removed. Results for experiment with all sectors subject to constant returns to scale are in parentheses.
b. Equivalent variation as a percent of GDP.
c. Equivalent variation in billions of 1985 U.S. dollars.
d. Real price of capital is fixed in the steady state scenario.

effect on welfare (as a percent of GDP) will be approximately equal to the share of intra-EC trade in GDP times 2.5 percent. But there will be additional gains from removing distortion costs.

In Figure 3 we depict the welfare economics of a 2.5% reduction in the costs of intra-EC exporting under CRTS (in partial equilibrium). We take the example of Belgian exports of steel to Germany. There is a rectangle of benefits from the reduction of the costs of exporting Belgian steel to

**FIGURE 3: Distribution of EC 92 Benefits under CRTS: Case of Belgian Steel in Germany**




NOTE: The initial equilibrium for Belgian steel in Germany is at ($P_0$, $Q_0$), determined by the intersection of the export supply curve of Belgian steel producers to Germany (1.025 EX), and the demand by German consumers for Belgian steel (D). Following the changes of EC92, the export supply curve shifts down by 2.5 percent to EX, resulting in a new equilibrium (abstracting from general equilibrium effects) at ($P_1$, $Q_1$). There are rectangles of benefits **A** (to Germany) plus **B** (to Belgium), the sum of which is 2.5 percent of the initial exports; plus triangles of benefits from reduced distortion costs equal to **C** (to Germany) and **D** (to Belgium).

Germany, equal to 2.5% of the initial costs of exporting. Provided neither German demand for steel, nor Belgian supply of steel, are limiting elasticity cases, the initial rectangle of benefits will be shared between the exporting and importing country (*A* to German consumers and *B* to Belgian producers in the figure). In addition, the border and standards costs are analogous to distortions to trade, which when removed allow a reallocation of resources with an increase in intra-EC trade. That is, there are "triangles" of benefits that augment the benefits from the reduced costs of exporting. In Figure 3 triangle *C* is a benefit to German consumers and triangle *D* is a gain to Belgian exporters. These reallocation benefits will be increased or decreased to the extent that the country is responsive to changes in relative prices of imports and exports. Figure 3 also reveals an important feature which impacts on the sharing of the benefits of EC92 across the EC countries. The more elastic is a country's demand or supply curves in relation to the other countries of the EC, the smaller will be its share of the benefits of EC92.

In Table 2 we list the intra-EC trade intensities of the EC countries in our model. The three countries that trade most intensely within the EC are Belgium, Netherlands and Denmark, and these are the three countries that gain the most from the EC92 program in the CRTS case. For the remaining countries there is little difference in their intra-EC trade intensities (ranging from 12% to 8.8%), and there is also not a large difference in their welfare gain as a percent of GDP (ranging from 0.5% to 0.29%).

The benefits for all countries under CRTS exceed the first order effect of the lowering of the cost of production. In particular, 2.5% times the trade intensity ratio yields the following first order welfare effect in percent of GDP: Belgium 0.89, Netherlands 0.37, Denmark 0.37, Germany 0.30, Portugal 0.30, U.K. 0.30, France 0.28, Italy 0.25, and Spain 0.22. Other than for the U.K. and Denmark, the welfare benefits are between 1.4 and 2.2 times this "first order" effect, suggesting that the triangles in Figure 3

are quite large.[27] By the standards of CRTS models, we have assumed rather large trade elasticities in our benchmark equilibrium, so the triangles in figure 3 are almost as large as the rectangles.[28] Examining Figure 3 reveals that the benefits would be closer to the rectangles the more inelastic are the demand elasticities.[29] When we counterfactually reduce all three import demand elasticities for all countries in our model to one-fourth of their original values, the benefits for most EC countries are reduced to between 1.17 and 1.28 of the rectangle effect.[30]

Thus, the intensiveness with which a country engages in trade is of first order importance in explaining the benefits that are likely to be achieved from CRTS sectors. More aggregated models have aggregated small countries such as Belgium with larger countries. In so doing they have produced a region which is closer to average with respect to trade intensities, which will mask important distributional effects across the EC countries.

In column 9 of Table 3 the CRTS welfare gain to the aggregate EC from complete removal of border and standards costs barriers to intra-EC trade varies from 0.46% to 0.5% with CRTS, depending on the degree of market integration. Market integration, which in our model is greater substitutability among EC products, has only a very small effect on welfare in a CRTS model (by inducing slightly more resource movement) because it does not affect markups or entry and exit.

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[27] For the U.K. the benefits are close to the first order effect; this indicates that the U.K. is obtaining a relatively small share of the benefits of integration. As discussed above, this suggests that U.K. import demand or export supply is more elastic than that of the other EC countries.

[28] Similar to the approach of Gasiorek, Smith and Venables [1992], we choose to calibrate with elasticities to be consistent with price-cost margins given by estimates of the CDR subject to a zero profit model assumption. Nonetheless, the trade elasticities are small in relation to those used in their models.

[29] We show below, however, that the higher elasticities reduce the additional welfare gain from rationalization and consumption efficiency gains in IRTS sectors. Thus, the high elasticities have offsetting effects regarding their welfare impact.

[30] Exceptions are Denmark, which remains an outlier, obtaining benefits equal to 1.78 times the rectangle effect, and Germany and the U.K. which obtain less than the rectangle effect. Note also that the large demand elasticities that we have employed, however, result in somewhat higher estimates of the welfare effects and of the adjustment across industries in both the CRTS and IRTS cases.

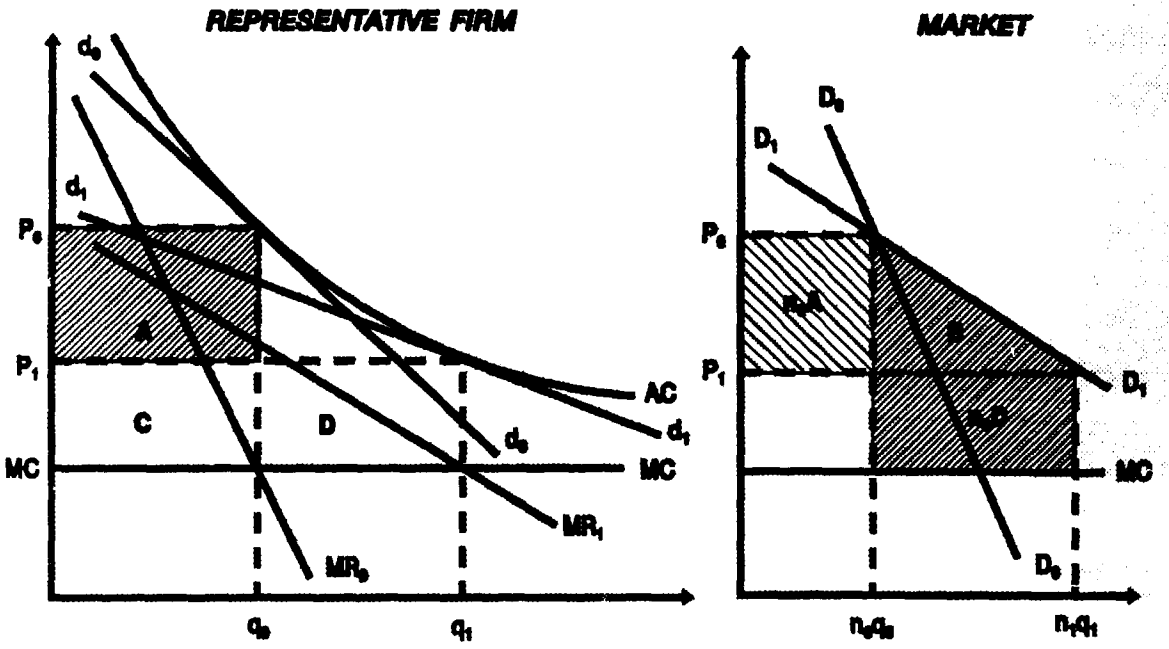
The Impact of IRTS. Examination of Tables 3 and 4 reveals that the welfare benefits of the complete removal of border and standards costs roughly double. both for the aggregate EC as well as for individual EC regions, when the impact of IRTS with full market integration is incorporated. The key to explaining the impact of IRTS is the role of market integration on elasticities, markups and entry and exit. To clarify this point first compare the CRTS and IRTS results with 0% integration (row 1 of Table 3). Then the static effects of removing border or standards costs are virtually identical between IRTS and CRTS. That is, without additional effects from market integration, the beneficial effects of removing border and standards costs can be attributed to "traditional" efficiency gains found in a standard CRTS framework.

The key to understanding the impact of IRTS in our model is that integration increases the elasticity of demand on intra-EC exports, thereby inducing markup declines. The equation for the markup was discussed earlier. A decline in the equilibrium markup can only be achieved through an improvement in the realization of scale efficiency.

Despite the fact that we employ equivalent variation in general equilibrium, to isolate the crucial variables in IRTS sectors, in Figure 4 we present a partial equilibrium, consumers surplus interpretation of a symmetric monopolistically competitive industry with a given level of fixed costs per firm and constant marginal costs (MC). An additional simplification in Figure 4 is that it presumes a homogeneous output, so the elasticity increase is represented simply as a rotation of the market demand curve.[31] Originally there are $n_o$ firms charging price $P_o$ and producing $q_o$. We assume zero profits, so rectangles $A+C$ equal fixed costs per firm. As a result of an increase in the market elasticity of demand, the perceived marginal revenue of the firm will equal marginal costs at a larger output level. In the absence of general equilibrium effects which change factor costs, the marginal and average cost curves for the

[31] The analysis of Figure 4 extends naturally to our firm level product differentiation case by defining the market output as the CES aggregate of the output of the individual firms, and the market price as the price dual to the CES quantity aggregate.

**FIGURE 4: Rationalization and Consumption Efficiency Gains from Increased Elasticities**




NOTE: Increased market demand elasticity induces representative firms to lower price and some to exit industry in the new zero profit equilibrium. The welfare gain equals the area under the market demand curve above MC, i.e., the consumption efficiency gain B plus the rationalization gain $n_0D$, where $n_0D = n_0A$.

representative firm remain unchanged. Then, due to the zero profit constraint, exit must occur such that the new perceived demand curve of the representative firm, $d_1$, is tangent to the average cost curve at the new lower markup. It follows that $P_1 < P_o$ and industry output increases.

Welfare effects are shown in the panel of Figure 4 labelled Market, where $D_o$ and $D_1$ are the initial and new market demand curves. Since price exceeds marginal costs in the initial equilibrium, the expansion of output increases welfare; but the welfare gain is decomposed into two parts. First there is the typical consumption efficiency triangle $B$ (as would occur for example with removal of a tax).[32] Unlike a tax, however, there is an additional gain of consumers' surplus equal to the rectangle $n_oA$ that has no offsetting cost or lost tax revenue. The additional consumers' surplus gain derives from the rationalization gain of spreading fixed costs. That is, the expansion of output costs society resources at the rate of MC per unit but is valued as the area under the demand curve.[33] These consumption efficiency and rationalization gains from increased elasticities in IRTS sectors are gains from the single market program over and above the gains from the reduction of the costs of exporting that were characterized in Figure 3.[34]

A similar interpretation will apply even when general equilibrium effects are incorporated that will induce shifts in the market demand curves. For IRTS industries that experience output decline or only small output increase, exit occurs. For those that experience output increases, entry can occur with a markup decline only with a significant output expansion. All of these scenarios result in rationalization

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[32] Following the procedure of Burns [1973], the efficiency triangle is obtained by connecting the pre and post equilibria by a straight line.

[33] Since fixed costs per firm are unchanged $A+C = C+D$, i.e., $A=D$ and $n_oA = n_oD$. Then the welfare increase equals the area under the demand curve between $n_oq_o$ and $n_1q_1$ that lies above industry marginal costs.

[34] The greater the absolute value of the decline in the markup, the larger will be the welfare benefits from rationalization and consumption efficiency. A proportional reduction in the elasticities of substitution in the model, however, will increase the absolute value of the decline in the markup. That is, given benchmark elasticities, $\sigma_{DD} = 15$, $\sigma_{MM} = 10$, the dominant first term in equation 3 is (1/15)-(1/10) = -1/30. If the elasticities of substitution were scaled down, for example by 1/5, then the first term in equation 3 would equal (1/3)-(1/2)= -5/30. This would result in a larger drop in the new equilibrium price in Figure 4 and greater welfare gains.

in the use of fixed costs and, since price-marginal costs markups decline, a decrease in consumption deadweight loss. These are benefits above what would occur in a CRTS sector.

In Table 5 we present some of the key data for the IRTS sectors in three representative countries: Belgium, France and Spain. We focus on these countries because: Belgium is the country that gains the most from the EC92 program; France is a representative large country; and Spain is a country with relatively small trade shares in Germany. The table presents results for the scenario of 100 percent integration and 100 percent removal of border and standards costs.

In the first three columns we present the percent decline in the "Lerner" markup ([price-marginal costs]/price). The equation for the change in the Lerner markup is presented in equation 3. Note that for the industries in all three countries, their markups on their export sales in Germany change between -1.0 and -3.3 percent. For some products there are no exports to Germany in the benchmark data, hence the markup equation is not applicable. Since the Spanish share of the German market is small, when the markup equation applies, the decline in the markup is close to -3.3 percent, which is the value of the first term in the change in the markup equation.

In columns 4-6 we present the percent change in entry and exit, and in columns 7-9 we present the percent change in output per firm. The key differences appear in the output per firm columns. We see that rationalization is much greater in Belgium than in the other two countries. Again the reason is that the intra-EC trade intensity of Belgium is much greater than the other two countries in the table. Since export sales constitute a much larger percentage of output for Belgium, the same percentage decline in markup on exports to the various EC markets induces a much larger reallocation of resources in Belgium's IRTS sectors.

Columns 10-12 show the percent change in output in the IRTS sectors, and the numbers in parentheses show the percent change in production when these sectors are presumed to operate under CRTS. One can see that different IRTS scenarios expand and contract in the different countries (a full