2 Trade Policy under Imperfect Competition: A Numerical Assessment

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2.1 Introduction

The literature on international trade under imperfect competition is now more than 10 years old. Many of the papers in this literature have been motivated by policy concerns, yet much uncertainty remains about the possible effects of employing trade policy in a particular industry. This is partly because we now know that it is possible to construct models in which policy conclusions are sensitive to aspects of market conduct about which little is known. It is partly because little work has been done that attempts to quantify the effects of policy on particular industries.

This paper takes a reasonably wide range of industries and a number of alternative theories of trade and systematically investigates the effects of trade policy on each industry under each theory. The policy instruments studied are those most widely discussed in the literature—an import tariff and an export subsidy. The equilibrium types covered include the cases of price and quantity competition, segmented and integrated markets, and oligopoly and monopolistic competition.

The effects of policy under these different possibilities are established by undertaking a rather large number of numerical simulations. Using the results of these simulations the paper addresses the following questions. First, are results sensitive to the equilibrium concept employed? Do we observe the magnitude, or even the sign, of the welfare effect of policy changing according to the theoretical model which has been chosen? Second, can we identify the

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characteristics of industries in which policy is successful in achieving welfare gains? Third, how large are the gains from policy? Do the qualitative effects established in the theoretical literature lead to quantitative effects of a significant magnitude?

The first stage of this project involves specifying the theoretical models (sec. 2.2) and calibrating these models to each of the industries under study (sec. 2.3). For given parameters, each theory predicts different levels of output and volumes of trade. The calibration procedure turns this around; data are available on levels of output and trade and on some parameters of the industry. Different theories then imply different values of unobserved parameters in order to support observations on the industry as an equilibrium. Of course, if there were sufficient observations one might reject some theories in favor of others. Calibration does not attempt this, but merely solves for unobserved parameters. This procedure is described in section 2.3, which discusses the way in which different theories lead to different interpretations of an industry data set.

Having calibrated each industry under each of the different theories, the second part of the project is to investigate the effects of trade policy. Import tariffs and export subsidies are evaluated in sections 2.4 and 2.5, and section 2.6 presents some concluding comments.

2.2 The Models

We investigate four different equilibrium concepts, each applied within the framework of the same general model. This model has the same structure as that used in Smith and Venables (1988), and is briefly outlined here.

The model is one of partial equilibrium, operating at the level of a single industry. There are J producing and consuming countries. The ith of these countries has n_i firms, and all firms in country i are assumed to be symmetric and to produce m_i product types. These products are tradable, and x_{ij} denotes the quantity of a single product type produced by a firm in country i and sold in country j at price p_{ij}.

Demands in each country are derived from a Dixit and Stiglitz–type welfare function (1977). Consumers in country j may consume products which are produced in each country, so the number of product types available for consumption is $\sum_{i=1}^{J} n_i m_i$. Subutility derived from consumption of these products is denoted y_j and takes the form

$$(1) \qquad y_j = \left(\sum_{i=1}^{J} n_i m_i a_{ij}^{1/\varepsilon} x_{ij}^{(\varepsilon-1)/\varepsilon}\right)^{\varepsilon/(\varepsilon-1)}, \ \varepsilon > 1, \quad j = 1, \ldots, J,$$

where the a_{ij} are demand parameters describing the preferences of a consumer in country j for a product produced in country i. The variable y_j can be regarded as a quantity index of aggregate consumption of the industry output. Dual to the quantity index is a price index (or unit expenditure function), q_j, taking the form

$$(2) \qquad q_j = \left(\sum_{i=1}^{J} n_i m_i a_{ij} p_{ij}^{1-\varepsilon}\right)^{1/(1-\varepsilon)}, \quad j = 1, \ldots, J.$$

The p_{ij} are the prices of individual varieties, and q_j can be interpreted as the price of the aggregate, y_j. Income effects are ignored, so that demand for the aggregate product is a function only of the price index, q_j. This demand function is iso-elastic, taking the form

$$(3) \qquad y_j = b_j q_j^{-\eta}, \quad j = 1, \ldots, J,$$

where the b_j reflect the size of the respective country markets. Utility maximization implies that demand for individual product varieties depends both on the price of the individual variety and on the aggregate price index, and demand functions take the form

$$(4) \qquad x_{ij} = a_{ij}(p_{ij}/q_j)^{-\varepsilon} y_j = a_{ij} b_j p_{ij}^{-\varepsilon} q_j^{\varepsilon-\eta}, \quad i,j = 1, \ldots, J.$$

The profits of a single representative country-i firm are

$$(5) \qquad \pi_i = m_i \sum_{j=1}^{J} x_{ij} p_{ij}(1 - T_{ij}) - C_i(x_i, m_i), \quad i = 1, \ldots, J,$$

where the T_{ij} are the ad valorem costs of selling in market j (transport costs or trade taxes, for example). The function C_i is the firm's cost function, assumed to depend on the output per variety, $x_i = \sum_j x_{ij}$, and on the number of varieties, m_i. The form of this function is a weighted average of linear and loglinear functions in m_i and x_i, so it takes the form

$$(6) \qquad C_i(x_i, m_i) = c_i[z(c_0 + m_i c_m + m_i x_i) + (1 - z) m^{\alpha} x^{\beta}],$$

where z describes the linear/loglinear share, c_0, c_m, α, and β are parameters common to all countries, and c_i is a country-specific cost parameter.

We investigate four different types of competitive interaction between firms. The first is the case of segmented-market Cournot behavior and is denoted case C in the following discussion. Under this hypothesis firms choose the quantities they sell in each market, x_{ij}, given other firms' sales. The first-order condition for profit maximization takes the form

$$(7) \qquad p_{ij}(1-T_{ij})\left(1-\frac{1}{e_{ij}}\right) = \frac{1}{m_i}\left(\frac{\partial C_i}{\partial x_i}\right), \; i,j = 1, \ldots, J,$$

where e_{ij} is the perceived elasticity of demand and is given by

$$(8) \qquad \frac{1}{e_{ij}} = \frac{1}{\varepsilon} + \left(\frac{1}{\eta} - \frac{1}{\varepsilon}\right) s_{ij}, \quad i,j = 1, \ldots, J,$$

where s_{ij} is the share of a single firm from country i in the country j market.

The second form of competition we investigate is Bertrand price competition, referred to as case B. Profit maximization given rivals' prices gives first-order condition (7) with e_{ij} taking the form

(9) $$e_{ij} = \varepsilon - (\varepsilon - \eta)s_{ij}, \quad i,j = 1, \ldots, J.$$

In the preceding two cases markets were segmented in the sense that firms played a separate game in each market, ignoring linkages between markets. We now turn to cases in which there is some degree of market integration, as some of firms' decisions are taken with respect to all markets. This is modeled by assuming that, instead of playing a single-stage game, firms play a two-stage game, choosing total output at the first stage and the distribution of output between markets at the second stage. Two different forms of the second-stage game will be investigated. In the first, referred to as case CB, we assume that, in the second stage, firms play a segmented-market price game. At the second stage of the game each firm therefore chooses its sales in each market, x_{ij}, to maximize profits, taking as constant its total sales $x_i = \sum_j x_{ij}$ and the prices of other firms. This gives first-order conditions:

(10) $$p_{ij}(1-T_{ij})\left(1 - \frac{1}{e_{ij}}\right) = p_{ik}(1 - T_{ik})\left(1 - \frac{1}{e_{ik}}\right), \quad i,j,k = 1, \ldots, J,$$

where $e_{ij} = \varepsilon - (\varepsilon-\eta)s_{ij}$. At the first stage each firm chooses total output x_i given the total output of other firms' and fully incorporating the reallocations of sales between markets implied by the second-stage equilibrium, equation (10), so establishing a perfect Nash equilibrium of the two-stage game. (For theoretical analysis of this case see Venables [1990]).

The case of full market integration will be referred to as case CI. If the second-stage game has fully integrated markets then, for a given total x_i, at the second stage sales x_{ij} are determined by arbitrage, so as to equate the producer price of a particular product in each market. Second-stage equilibrium therefore has $x_i = \sum_j x_{ij}$ and prices satisfying

(11) $$p_{ij}(1 - T_{ij}) = p_{ik}(1 - T_{ik}), \quad i,j,k = 1, \ldots, J.$$

At the first stage, each firm chooses total output x_i given other firms' total output and fully incorporating the reallocations of sales between markets implied by the second-stage equilibrium, equation (11). The perfect equilibrium of this game corresponds to the integrated market equilibrium analyzed by, for example, Markusen (1981).

We assume throughout this paper that the number of varieties produced per firm, m_i, is a constant. The number is set so that output per model, x_i, is the same for all i. In some of the simulations reported below the number of firms in each country will be held constant, and in others the number will be allowed to adjust in response to profit changes, so giving a monopolistically competitive equilibrium.

2.3 Calibration

The theoretical models outlined above are applied to a world of six countries—France, the Federal Republic of Germany, Italy, the United Kingdom, the rest of the European Community and the rest of the world. Our treatment of the rest of the world is somewhat crude, and in the two-stage games described above, the rest of the world is treated as being segmented from the European economies.

The industries to which the models are applied are listed in table 2.1 and use the same data as Smith and Venables (1988). Production and trade flows for each industry were derived from the Eurostat Annual Industrial Survey and from Eurostat NACE-CLIO trade tables for 1982. Numbers of firms in each industry were derived from Eurostat Structure and Activity of Production data on the size distribution of firms. These numbers were adjusted to capture the number of "subindustries" operating within the broadly defined industry, and then a Herfindahl index of concentration was computed for each country and for each industry. The cross-country average values of these indexes are reported in table 2.1 and provide a summary measure of the degree of concentration of each industry. This ranges from its highest values in motor vehicles (350) and office machinery (330) to lows in machine tools (322) and footwear (451).

The second column of table 2.1 gives the price elasticity of demand for the aggregate output of each industry, η. Sources used to obtain these estimates were Piggot and Whalley (1985), Deaton (1975), Houthakker (1965), and Houthakker and Taylor (1970). The third and fourth columns of table 2.1 give some characteristics of the technology of the industry. These are drawn from

Table 2.1 **Industry Characteristics**

NACE Number: Name	Herfindahl Index	η	Returns to Scale (%)	Loglinear Share	U.K. Exports/ production (%)
257: Pharmaceutical products	0.05	0.8	22	0	32
260: Artificial and synthetic fibers	0.05	0.5	10	0.5	20
322: Machine tools	0.004	1.1	7	0.2	55
330: Office machinery	0.12	0.9	10	0.2	52
342: Electric motors, generators, etc.	0.022	1.1	15	0.5	46
346: Domestic electrical appliances	0.11	1.7	10	0.5	15
350: Motor vehicles	0.19	1.6	16	0.5	36
438: Carpets, linoleum, etc.	0.031	0.9	6	0.5	20
451: Footwear	0.009	0.7	2	0.5	15

the study of Pratten (1987). The returns to scale column gives the estimated increase in average costs associated with reducing per firm output from minimum efficient scale to half minimum efficient scale. This is largest in pharmaceuticals (257), motor vehicles (350), and electric motors and generators (342) and least in footwear (451), carpets (438), and machine tools (322). The loglinear share column reflects the z parameter of equation (6) and gives the proportion of marginal cost at minimum efficient scale (MES) coming from the two components of the cost curve. Choice of these numbers was judgmental and informed by Pratten's work. If this weight is zero, then marginal costs are constant, but average cost is falling; this is appropriate if returns to scale are due to fixed costs, for example, research and development. A positive loglinear share means that both average and marginal costs are declining and so, for example, captures industries where learning occurs. The final column in table 2.1 gives the ratio of U.K. exports of each industry's output to U.K. production, a ratio which is an important determinant of the welfare effect of some of the policy experiments undertaken.

The calibration procedure involves solving unknown parameters of the model so that the observed values of endogenous variables constitute an equilibrium of the model. There are a number of aspects to this, two of which are of economic interest: solving for the degree of product differentiation, ε, and for the implicit barriers to trade.

We assume that the base data set represents a long-run equilibrium in which profits are zero. Technology and firm scale imply a relationship between average cost and marginal cost, and, with the assumption of long-run equilibrium, this also gives a relationship between price and marginal cost. This price–marginal cost margin is supported at equilibrium by two considerations: product differentiation and market power stemming from the degree of concentration in the industry and the form of interaction between firms. If the degree of product differentiation is known, then this relationship can be solved for the form of the competitive interaction between firms. This is the approach of Dixit (1988) and Baldwin and Krugman (1988), who use this relationship to solve for a conjectural variations parameter. However, for the industries under study here, products are certainly differentiated, but we have little information about the elasticity of substitution between different products. The approach we follow is therefore to assume a form of competition between firms and see what this implies for the degree of product differentiation consistent with observed price-cost margins. Of course, we do not know that the assumed form of competition is correct. This is therefore an essential dimension in which to conduct sensitivity analysis, so we undertake the calibration procedure for a variety of different forms of competition. Table 2.2 reports the results of doing so for the four different types of equilibria described in section 2.2 above. The ε reported in the table are to be interpreted as the elasticities of demand for individual products, holding constant the prices of all other varieties.

Table 2.2 **Calibrated Elasticities (ε)**

NACE Number	C	CB	CI	B
257	5.77	5.36	5.16	4.72
260	21.11	12.72	12.29	8.70
322	13.55	13.44	13.41	13.25
330	35.21	15.52	14.48	10.9
342	7.36	7.17	7.06	6.77
346	10.76	9.60	8.79	7.75
350	13.38	10.44	8.86	7.20
438	21.39	18.68	18.49	17.59
451	53.32	46.17	46.02	42.57

We learn a number of things from table 2.2. First, looking across equilibrium concepts we see a ranking of ε (which holds for all industries) in the order C, CB, CI, B. The relationship between cases C and B is as would be expected; as quantity competition (C) is inherently less competitive than price competition (B), so less product differentiation (higher ε) is required to support a given price-cost margin as an equilibrium. The two two-stage games (CB and CI) are intermediate. Market power is lost as firms are no longer able to fully segment markets, but, at the aggregate level, both these cases assume quantity competition, so are less competitive than the Bertrand equilibrium. The difference between cases C and CI alerts us to the importance of the degree of country disaggregation. If markets are truly segmented, then we cannot aggregate them into country blocs; to do so would be to implicitly assume intrabloc integration, and thereby overstate the level of competition.

Looking across industries in table 2.2 we see a wide range in the extent of product differentiation. Firms derive relatively little market power from product differentiation in 451 (footwear), 438 (carpets), 330 (office machinery), and 322 (machine tools). The market power derived from product differentiation is greatest in 257 (pharmaceuticals), 342 (electric motors, etc.), 346 (household appliances), and 350 (motor vehicles). The variation in ε across the equilibria is largest for 260 (artificial fibers), 330 (office machinery), and 350 (motor vehicles). These are all industries with a relatively high level of concentration as measured by the Herfindahl index; this influences ε because the difference between Cournot and Bertrand competition is an increasing function of firms' market shares.

Inspection of the data on trade and production indicates that firms have very much larger shares of their domestic markets than they do of foreign markets, which suggests the presence of barriers to trade. For given trade barriers, each of the theories described in section 2.2 implies different equilibrium volumes of intraindustry trade. The analog of this in calibration is that we solve for a matrix of trade barriers consistent with observed trade flows between countries and with the observed market shares of firms in different countries. These calibrated matrices of trade barriers will be different for each theory. Table 2.3 presents the average height of these trade barriers for intra-EC trade for each industry and each equilibrium type. The calibration reported in table 2.3 took place using the same elasticity ε for each of the cases C, CB, CI, and C (with ε set at its Cournot level, ε^C). The numbers are expressed in "tariff-equivalent" form, as a proportion of price. We see that these implicit barriers are very high in some industries, notably 257 (pharmaceuticals) and 342 (electric motors, generators, etc.). The implicit barriers are greatest in case C, followed by CB, followed by CI. This reflects the implications of each of these equilibrium concepts for trade volumes (for analysis of these volumes see Venables [1990]). Case CB gives the same trade barriers as case B because international price relativities are the same in these cases, (see eqq. [7], [9], and [10]).

The tariff-equivalent trade barriers reported in table 2.3 were derived using the same value of ε for all equilibria, in order to illustrate the way in which different equilibria support different trade volumes. Computing the trade barriers simultaneously with the elasticities reported in table 2.2 gives the numbers contained in table 2.4. Trade barriers in cases CB, CI, and B are higher in this case than in table 2.3 because, although theories CB, CI, and B predict lower trade volumes than case C (given parameter values), the lower values of ε asso-

Table 2.3 **Tariff Equivalent Trade Barriers ($\varepsilon = \varepsilon^c$)**

NACE Number	C	CB	CI	B
257	0.556	0.526	0.521	0.526
260	0.178	0.089	0.087	0.089
322	0.176	0.173	0.173	0.173
330	0.152	0.063	0.060	0.063
342	0.439	0.426	0.423	0.426
346	0.310	0.270	0.261	0.270
350	0.289	0.198	0.181	0.198
438	0.138	0.125	0.124	0.125
451	0.065	0.057	0.057	0.057

Table 2.4 **Tariff Equivalent Trade Barriers**

NACE Number	C	CB	CI	B
257	0.556	0.557	0.568	0.614
260	0.178	0.147	0.148	0.213
322	0.176	0.175	0.175	0.177
330	0.152	0.142	0.146	0.201
342	0.439	0.435	0.439	0.457
346	0.310	0.300	0.315	0.364
350	0.289	0.250	0.269	0.352
438	0.138	0.142	0.143	0.151
451	0.065	0.066	0.066	0.071

ciated with these equilibria mean that higher tariff equivalents are consistent with observed trade levels.

Tariff-equivalent trade barriers are a way of displaying the size of implicit trade barriers consistent with equilibrium. Calibration incorporates each industry's matrix of tariff-equivalent trade barriers into the model in the following way. Off-diagonal elements of T_{ij} are set at 10 percent to capture the real costs of trade, and any further implicit trade barrier is attributed to demand differences, as measured by the demand parameters, a_{ij}. This approach means that trade barriers are viewed as real costs.

2.4 Import Tariffs

In this section we study the effects of tariffs imposed by a single country on its imports from all sources. We take the United Kingdom as the country imposing the tariff. This is of course a hypothetical experiment, the United Kingdom having treaty obligations prohibiting it from following such a policy. The role of the experiment is to demonstrate the possible effects of a unilateral tariff and to compare these effects both across equilibrium concepts and across industries. We shall initially study oligopoly, holding the number of firms in each industry and country constant, and then move on to cases in which entry and exit occur.

In order to focus on cross-equilibrium differences, we first consider a single industry and, for these purposes, take NACE 346, electrical domestic appliances, an industry with moderate returns to scale and a moderate level of concentration. Figure 2.1 gives the U.K. welfare gains (i.e., the sum of the change

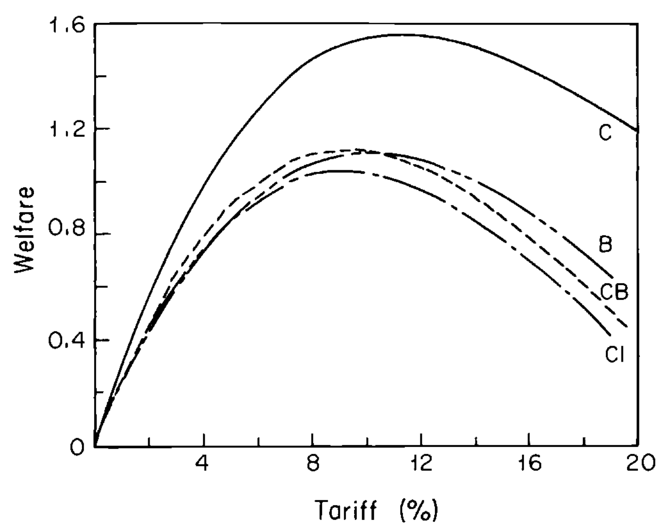

Fig. 2.1 Import tariff and welfare

in consumer surplus, profits, and government revenue expressed as a percentage of U.K. base consumption of the product) as a function of the tariff rate for each of the four different equilibria. Positive tariffs raise welfare in all cases, but the main thing to note from this figure is that case C—Cournot equilibrium in segmented markets—gives welfare gains which are very much higher than the other cases. Following case C, the gains are next highest for the other segmented-market case, B, followed by the two integrated-market cases, CB and CI. The optimal tariff rate is greatest in case C, although optimal tariff rates vary little between the four cases. The absolute size of the welfare gain, relative to the size of the industry, is rather small. For example, at a 10 percent tariff rate, case C yields welfare gains amounting to 1.54 percent of U.K. base consumption, and in case CI gains are 1.03 percent.

The change in the components of welfare are significantly larger than the change in overall welfare, and these are illustrated in figures 2.2–2.4. For example, in case C, consumer surplus at a 10 percent tariff is reduced by an amount equal to some 4 percent of U.K. base consumption, and profits increased by an amount equal to 3 percent of the value of U.K. base production. The most noteworthy feature of figures 2.2 and 2.3 is that the impact of the tariff on consumers and producers is smallest in case B, segmented-market price competition. Equations (7) and (9) illustrate that changes in market share have relatively little effect on price—marginal cost margins in this case; we therefore see that the profit gains of domestic firms following the tariff are approximately half the size they are under case C. The reduction in consumer surplus is correspondingly small, although tariff revenue is relatively large; the

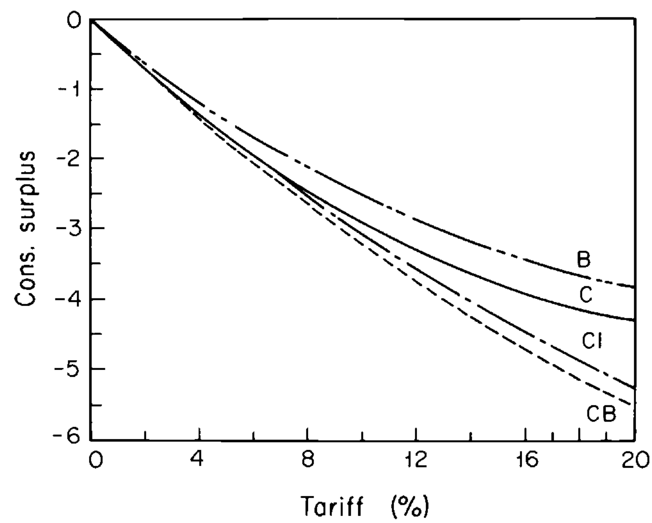

Fig. 2.2 Import tariff and consumer surplus

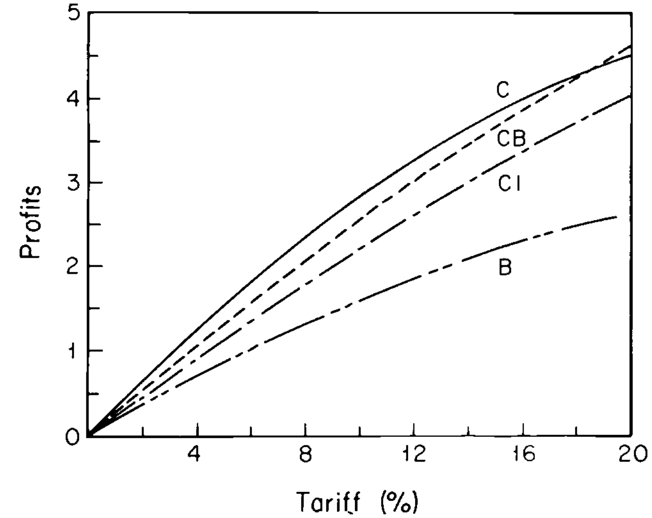

Fig. 2.3 Import tariff and profits

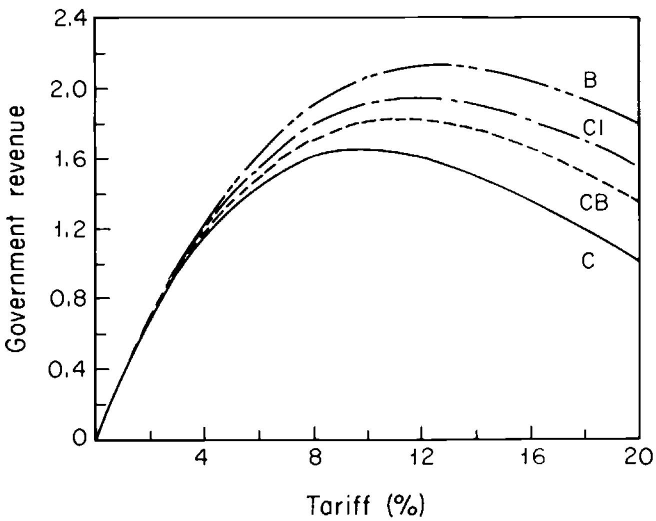

Fig. 2.4 Import tariff and government revenue

lower value of ε calibrated in case B means that imports decline relatively slowly as a function of the tariff.

The conclusions derived from NACE 346 are supported by study of the other eight industries. For 346 the welfare gain from a relatively high tariff is largest in case C, followed by B, CB, then CI. This ranking is broadly con-

Table 2.5 **Welfare Effects of Import Tariffs under Oligopoly (welfare gain as a percentage of base consumption, by NACE class and equilibrium type)**

Equilibrium Type	Tariff Rate				Equilibrium Type	Tariff Rate				Equilibrium Type	Tariff Rate			
	5%	10%	15%	20%		5%	10%	15%	20%		5%	10%	15%	20%
		257					*330*					*350*		
C	0.59	0.96	1.15	1.20	C	1.52	2.09	1.97	1.81	C	1.44	2.13	2.24	1.99
CB	0.46	0.71	0.79	0.73	CB	0.88	0.81	0.10	−0.70	CB	0.99	1.19	0.78	−0.03
CI	0.44	0.67	0.74	0.67	CI	0.84	0.76	0.02	−0.85	CI	0.92	1.11	0.75	0.03
B	0.44	0.70	0.80	0.77	B	0.70	0.62	−0.15	−1.22	B	0.90	1.22	1.09	0.64
		260					*342*					*438*		
C	2.23	3.93	5.07	5.64	C	0.76	1.04	0.96	0.65	C	0.74	0.64	0.48	0.39
CB	1.58	2.27	2.31	1.98	CB	0.72	0.96	0.84	0.51	CB	0.60	0.43	0.21	0.07
CI	1.53	2.15	2.15	1.80	CI	0.71	0.94	0.83	0.49	CI	0.59	0.42	0.19	0.05
B	1.15	1.55	1.44	1.07	B	0.71	0.96	0.85	0.52	B	0.55	0.37	0.12	−0.03
		322					*346*					*451*		
C	0.67	0.44	−0.20	−0.81	C	1.15	1.54	1.46	1.18	C	0.60	0.48	0.47	0.47
CB	0.65	0.40	−0.25	−0.88	CB	0.92	1.11	0.86	0.41	CB	0.22	0.03	0.00	0.00
CI	0.65	0.40	−0.26	−0.89	CI	0.85	1.03	0.77	0.31	CI	0.21	0.02	−0.01	−0.01
B	0.64	0.40	−0.27	−0.90	B	0.86	1.11	0.94	0.55	B	0.12	−0.10	−0.14	−0.15

firmed across the other eight industries. Table 2.5 reports the U.K. welfare gain (as a percentage of base U.K. consumption) for tariff rates of 5, 10, 15, and 20 percent, for each industry. For every industry, case C gives significantly larger welfare effects than the other cases, and the gains in CB exceed those in CI. The results from these industries (obtained, of course, with the functional forms of this model) therefore confirm the Markusen and Venables (1988) findings that, with Cournot behavior, tariff policy is more powerful when markets are segmented than when they are integrated. However, the relative ranking of CB and CI against B varies across industries. Segmented-market Bertrand behavior may produce even smaller welfare gains from tariff policy than arise under integrated markets.

Looking across industries we see that the four industries with the largest gains from tariffs are 260 (artificial fibers), 330 (office machinery), 346 (domestic appliances), and 350 (motor vehicles). These are the four industries with the highest levels of concentration as measured by the Herfindahl index (see table 2.1), although they are not the industries with the highest returns to scale. Even in these industries the gains from the tariff are rather modest reaching, in case C, gains of around 1.5–2.5 percent of base consumption. The exception to this is artificial and synthetic fibers (NACE 260), in which gains from the tariff exceed 5 percent of base U.K. consumption. The main reason for this industry to be exceptional seems to be its low aggregate demand elasticity, η, which is equal to 0.5. This means that the deadweight loss associated with the tariff is small.

So far we have assumed that the number of firms in the industry is held constant. How do things change when entry and exit occur to restore profits to their pretariff levels? Table 2.6 gives for this case information analogous to that in table 2.5. Several noteworthy features are apparent. First, comparing the effects of policy across equilibria C, CB, CI, B, we see that the gains from the tariff are now greatest in case B—reversing the position when the number of firms are constant. The reason for this follows from the observation made above about the effect of tariffs on profits. Under price competition (B) tariffs raise profits relatively little (see fig. 2.3); correspondingly, there is a relatively small increase in the number of firms operating in the United Kingdom, leaving firms operating at a relatively larger scale. Under price competition (B) tariffs therefore give rise to more significant achievement of economies of scale than is the case with Cournot behavior (C).

Free entry also reverses the ranking of cases CB and CI, with the welfare gain in case CI now always exceeding that in case CB. Furthermore, for most (although not all) of the experiments reported in table 2.6, case CI yields larger gains than case C, i.e., policy is more powerful when markets are integrated than when they are segmented. This reverses the relative magnitudes of the effects of tariffs under oligopoly, where we saw that with Cournot behavior policy was more powerful when markets were segmented. This also alerts us to the possible sensitivity of results with respect to functional form. We know

Table 2.6 **Welfare Effects of Import Tariffs under Free Entry (welfare gain as a percentage of base consumption, by NACE class and equilibrium type)**

Equilibrium Type	Tariff Rate 5%	10%	15%	20%	Equilibrium Type	Tariff Rate 5%	10%	15%	20%	Equilibrium Type	Tariff Rate 5%	10%	15%	20%
		257					*330*					*350*		
C	0.60	0.40	0.99	0.96	C	0.73	0.33	0.21	0.19	C	1.31	1.33	0.97	0.64
CB	0.57	0.86	0.94	0.89	CB	1.53	1.33	0.90	0.59	CB	1.24	1.25	0.82	0.34
CI	0.59	0.90	1.01	0.98	CI	1.62	1.48	1.05	0.71	CI	1.38	1.60	1.31	0.86
B	0.65	1.03	1.22	1.26	B	2.01	2.21	1.85	1.40	B	1.69	2.31	2.33	2.05
		260					*342*					*438*		
C	0.93	0.70	0.45	0.33	C	1.13	1.53	1.50	1.26	C	0.51	0.31	0.14	0.06
CB	1.02	0.84	0.36	−0.08	CB	1.14	1.55	1.53	1.30	CB	0.58	0.39	0.18	0.06
CI	1.04	0.89	0.43	−0.01	CI	1.15	1.57	1.57	1.34	CI	0.59	0.40	0.19	0.07
B	1.45	1.79	1.66	1.36	B	1.17	1.64	1.67	1.47	B	0.63	0.47	0.26	0.13
		322					*346*					*451*		
C	1.27	1.17	0.77	0.43	C	1.15	1.29	1.05	0.73	C	0.12	0.02	0.01	0.01
CB	1.28	1.18	0.79	0.45	CB	1.11	1.23	0.95	0.57	CB	0.16	0.01	−0.01	−0.01
CI	1.28	1.19	0.79	0.45	CI	1.18	1.40	1.19	0.84	CI	0.16	0.01	−0.01	−0.01
B	1.29	1.21	0.82	0.47	B	1.34	1.76	1.71	1.44	B	0.21	0.05	0.02	0.02

from the work of Horstman and Markusen (1986) that if demands are linear and product differentiation is country (rather than firm) specific, then, with Cournot behavior and free entry, tariff policy raises welfare when markets are segmented, but has no effect on welfare when markets are integrated.

The absolute magnitude of the welfare effects are, in this case as under oligopoly, rather small, never exceeding 2.5 percent of base consumption. It is worth noting however that, whereas under oligopoly there were large redistributions from consumers to profits and to government, in this case profits are unchanged (by the free-entry assumption), there is in most cases a small increase in consumer surplus (for reasons analyzed in Venables [1985]), and most of the welfare gains accrue in the form of government revenue. Looking across industries, we see that, as was the case under oligopoly, the largest gains from policy come in the most highly concentrated industries, namely 260 (artifical fibers), 330 (office machinery), 346 (domestic appliances), and 350 (motor vehicles).

2.5 Export Taxes

The second policy experiment we consider is an export tax or subsidy. It is on this topic that the theoretical literature has most clearly highlighted the possible sensitivity of results to the equilibrium concept. We consider first the case of oligopoly and then turn to the effect of export subsidies under free entry.

In order to illustrate the difference between equilibrium concepts , we concentrate first on a single industry—once again taking NACE 346 (domestic electrical appliances) as our example. Figure 2.5 illustrates the effect of an export tax/subsidy on this industry. The figure plots U.K. welfare gain as a function of the export tax, and from the figure we see positive gains from an export subsidy under all four equilibrium concepts. The optimal subsidy is in the range 4–5 percent in all cases, but the optimal policy yields only small gains—somewhat less than 0.1 percent of consumption in case B and only 0.25 percent of base consumption in the most powerful case, CB.

In interpreting these results it is important to note that the gains from the export subsidy consist of an increase in profits, a loss of government revenue, the sum of these being a net loss, plus a consumer surplus gain. Export policy is transmitted back to domestic consumers through two possible routes. The first is that in this industry marginal costs are a decreasing function of output; export-subsidy-induced expansion therefore reduces the price charged to domestic consumers. It is this effect which means that there are welfare gains even when markets are segmented and there is price competition (case B). However, the gains are smallest in this case, as would be expected from the work of Eaton and Grossman (1986).

The second route by which export policy is transmitted to domestic consumers is through integration of markets. In cases CB and CI there is some market

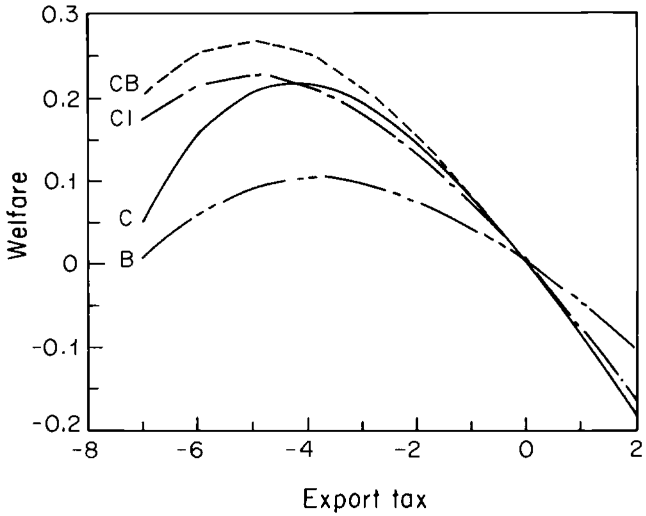

Fig. 2.5 Export tax and welfare

integration (i.e., firms do not take decisions on a segmented market basis). This means that subsidization in one market will reduce prices in others; export subsidies therefore give domestic consumer surplus gains, and it is this that accounts for the fact that welfare gains are relatively large in cases CI and CB. This is seen most clearly for NACE 257 (pharmaceutical products). This is the only industry in the sample in which, we assume, there are constant marginal costs (loglinear cost share = 0; table 2.1). At a 2 percent export subsidy, the sum of profits and government revenue is negative for all four cases. In the segmented-market equilibria, cases B and C, domestic consumer surplus is unchanged by export policy. However, in cases CB and CI export subsidies raise domestic consumer surplus, giving the net welfare gains reported in table 2.7.

Table 2.7 summarizes the position in all the industries, reporting the U.K. welfare gain from export subsidies set at 4 percent and 2 percent, and from a 2 percent export tax (with changes measured from a base position of zero export tax). The most frequent ranking of welfare gain by equilibrium type is that the gains are largest (or losses smallest) in case C, followed by cases CB, CI, and B. In all cases the gains from an export subsidy are small, only reaching as much as 1 percent of base consumption in one case (260). Although a 2 percent export tax reduces welfare in all cases, the range of values of the export tax/subsidy which produces an improvement over free trade seems extremely small—in six of the nine industries there are losses from export taxes set as high as +2 percent or as low as −4 percent, under all types of equilibria. In only three industries (260, artificial fibers, 346, domestic electrical appliances, and 350, motor vehicles) are there gains, under all types of equilibria, from

Table 2.7 **Welfare Effects of Export Tariffs under Oligopoly (welfare gain as a percentage of base consumption, by NACE class and equilibrium type)**

Equilibrium Type	Export Tax Rate −4%	−2%	2%	Equilibrium Type	Export Tax Rate −4%	−2%	2%	Equilibrium Type	Export Tax Rate −4%	−2%	2%
		257				*330*				*350*	
C	−0.23	−0.06	−0.03	C	−1.09	0.23	−0.96	C	0.92	0.66	−0.77
CB	−0.01	0.04	−0.13	CB	−0.49	0.03	−0.36	CB	0.87	0.54	−0.63
CI	−0.02	0.04	−0.11	CI	−0.46	0.02	−0.33	CI	0.63	0.40	−0.50
B	−0.24	−0.08	0.00	B	−0.63	−0.10	−0.17	B	0.15	0.16	−0.27
		260				*342*				*438*	
C	1.01	0.55	−0.48	C	−0.38	−0.05	−0.17	C	−0.65	0.04	−0.21
CB	0.46	0.26	−0.29	CB	−0.34	−0.03	−0.18	CB	−0.40	0.03	−0.18
CI	0.42	0.25	−0.27	CI	−0.34	−0.03	−0.17	CI	−0.39	0.03	−0.18
B	0.06	0.07	−0.12	B	−0.36	−0.05	−0.15	B	−0.41	0.00	−0.16
		322				*346*				*451*	
C	−1.34	−0.25	−0.24	C	0.22	0.14	−0.18	C	−3.49	−0.19	−0.14
CB	−1.31	−0.25	−0.23	CB	0.25	0.15	−0.18	CB	−2.39	−0.16	−0.13
CI	−1.31	−0.25	−0.23	CI	0.21	0.13	−0.16	CI	−2.38	−0.16	−0.13
B	−1.31	−0.25	−0.23	B	0.10	0.08	−0.11	B	−2.44	−0.17	−0.21

export subsidies set at both 2 percent and 4 percent. These industries share the common characteristics of high concentration and a relatively low volume of exports (see table 2.1). The low volume of exports means that the revenue cost of export subsidies is relatively small. The effect of export subsidies at the margin is therefore obtained without the revenue cost of large subsidies being paid on existing, intramarginal export quantities.

The effects of export subsidies under free entry are summarized in table 2.8. The same three industries (250, 346, and 350) have unambiguous gains from 2 percent and 4 percent export subsidies, as was the case under oligopoly. The magnitude of the gains remains extremely modest, generally not exceeding 1 percent of base consumption. Notice that in some, although not all industries, the ordering of equilibria by welfare gain is changed; for example, in industry 350, free entry reverses the ordering of equilibria as compared to oligopoly giving the largest welfare gain in case B, followed by CI, CB, and C. The reason for this is as it was for tariffs; the policy has a relatively smaller profit effect in equilibrium B than in C, so fewer firms enter the industry, giving an equilibrium with fewer firms and lower average costs. The most striking feature of table 2.8 is the extremely large welfare losses imposed by export subsidies in some cases—322 (machine tools), 330 (office machinery), and 451 (footwear). In these industries the U.K. export subsidy is sufficient to drive the number of firms in some other countries to zero. There are then very large increases in U.K. exports, and the revenue cost of the subsidy becomes extremely large, this accounting for the size of the welfare loss.

2.6 Constant Parameters

Each experiment so far has been based on the following method. Assume a type of equilibrium, calibrate this equilibrium of the model to the data, and then simulate policy changes. As we saw in section 2.3, this implies different values for some parameters of the model (ε and a_{ij}) in each of the cases C, B, CB, and CI. Comparison of the effects of policy changes for different cases therefore incorporates different equilibrium types *and* different parameter values—these being chosen to support the same base equilibrium. An alternative procedure (and the standard one in theoretical work) would be to compare the effects of policy for different equilibrium types given the same parameter values in all cases—although this implies different values of endogenous variables in the initial equilibrium. What difference does it make if we follow this route?

We can address this question in the following way. First, calibrate an industry to a particular equilibrium type. Second, given the calibrated parameters compute the equilibrium of the model under an alternative equilibrium concept, so generating a new "base" equilibrium. Third, introduce policy changes, and simulate the way in which the equilibrium moves from this new base.

Table 2.9 reports the results of following this procedure for one industry

Table 2.8 **Welfare Effects of Export Taxes under Free Entry (welfare gain as a percentage of base consumption, by NACE class and equilibrium type)**

Equilibrium Type	Export Tax Rate −4%	−2%	2%	Equilibrium Type	Export Tax Rate −4%	−2%	2%	Equilibrium Type	Export Tax Rate −4%	−2%	2%
		257				*330*				*350*	
C	−0.23	−0.03	−0.10	C	−19.10	−4.42	−1.72	C	0.44	0.80	−1.04
CB	0.20	0.18	−0.26	CB	−7.33	−0.50	−2.11	CB	0.88	0.84	−1.02
CI	0.29	0.22	−0.33	CI	−12.30	−0.19	−2.17	CI	1.07	0.82	−0.96
B	0.28	0.21	−0.31	B	−7.26	0.93	−2.23	B	1.13	0.73	−0.86
		260				*342*				*438*	
C	0.52	0.51	−0.50	C	−0.01	0.45	−0.82	C	−1.03	0.01	−0.22
CB	0.33	0.28	−0.32	CB	0.17	0.54	−0.92	CB	−0.64	0.07	−0.23
CI	0.32	0.27	−0.31	CI	0.25	0.58	−0.94	CI	−0.61	0.07	−0.24
B	0.34	0.22	−0.27	B	0.39	0.62	−0.97	B	−0.49	0.09	−0.24
		322				*346*				*451*	
C	−12.56	−0.20	−1.76	C	0.30	0.20	−0.23	C	−10.32	−0.43	−0.16
CB	−12.77	−0.19	−1.82	CB	0.42	0.24	−0.29	CB	−9.01	−0.32	−0.18
CI	−12.77	−0.18	−1.82	CI	0.46	0.25	−0.27	CI	−8.98	−0.31	−0.18
B	−12.42	−0.14	−1.83	B	0.45	0.25	−0.26	B	−7.35	−0.21	−0.19

Table 2.9 **Trade Policy Comparisons with Parameters Constant across Equilibria (welfare gain as a percentage of base consumption for NACE 346)**

Equilibrium Type	Calibration on Equilibrium Type C (1)	Calibration on Equilibrium Type C (2)	Calibration on Respective Equilibrium Type[a] (3)	Calibration on Respective Equilibrium Type[a] (4)	Welfare Change due to Change in Equilibrium Type (5)
	Tariff Rate				
	5%	15%	5%	15%	
C	1.15	1.46	1.15	1.46	0
CB	0.77	0.64	0.92	0.86	0.79
CI	0.69	0.50	0.85	0.77	0.91
B	0.82	0.72	0.86	0.94	0.85
	Export Tax Rate				
	−4%	−2%	−4%	−2%	
C	0.22	0.14	0.22	0.14	
CB	0.24	0.15	0.25	0.15	
CI	0.20	0.13	0.21	0.13	
B	0.08	0.07	0.10	0.08	

[a]From tables 2.5 and 2.7.

(once again NACE 346, electrical domestic appliances) taking case C as the equilibrium type against which the model is calibrated. Column (5) of this table gives the welfare change associated with moving from the equilibrium of type C to an alternative type of equilibrium (with no policy change and unchanged parameters). There are welfare gains because, as noted previously, case C is the least competitive of the equilibrium types under study. From this new base equilibrium policy changes are introduced and reported in columns (1) and (2) of the table. Columns (3) and (4) reproduce results from sections 2.3 and 2.4 for purposes of comparison. Results are reported only for two values of each experiment, and only for cases in which the number of firms is held constant.

From table 2.9 we see that the gains from policy, both import tariffs and export subsidies, are somewhat reduced when simulations are undertaken using parameters obtained from calibration under equilibrium type C (columns [1] and [2], compared to [3] and [4]). The reason for this is that the calibrated elasticity ε is highest for case C (see table 2.2). Using this higher elasticity reduces firms' price-cost margins in the new base equilibrium. The distortion due to imperfect competition is thereby reduced, and consequently policy has a smaller welfare effect. However, the basic conclusions of previous sections still hold. For example, the export subsidy raises welfare in all cases, and by considerably more in case C than in case B.

2.7 Conclusions

The simulations reported in this paper study the welfare implications of two trade policy instruments, an import tariff and an export tax. The effects of these instruments are examined in a family of models of trade under imperfect competition, applied to nine industries in the European Community. From the large number of simulations undertaken, what conclusions can be drawn?

The first message to emerge from the simulations is the small size of the welfare gains that can be derived from use of these policy instruments. Under oligopoly there is only one industry in which tariffs yield welfare gains in excess of 2.5 percent of the base value of consumption of the industry's output. Taking simple averages across industries and equilibrium types we see that the gains from tariffs of 5, 10, 15, and 20 percent average out at 0.48, 0.81, 0.99, and 0.82 percent of base consumption, respectively. With free entry the average gains are somewhat larger, at 0.66, 0.88, 1.05, and 1.00 percent of base consumption for these tariff rates. Export subsidies give even smaller welfare gains, only reaching 1 percent of base consumption in a few of the cases studied. Under oligopoly the net welfare figure is the difference between increases in firms' profits and losses for either consumers or government. This means that if these components of welfare were weighted differently, then results could easily be changed. For example, attaching a premium to government revenue would strengthen the case for import tariffs and rapidly destroy the case for export subsidies.

The second message from the simulations is that, looking across industries, the gains from policy intervention are greater the more concentrated the industry. This is as would be expected. Tariff policy offers welfare gains for all industries studied, these gains arising both from the distortions associated with imperfect competition and from standard terms of trade effects. The effect of export subsidies is more varied across industries, with only three of the nine industries studied giving unambiguous welfare gains from a 4 percent export subsidy, these three being industries with a relatively high level of concentration. The reason for the greater ambiguity in the effects of export subsidies is, of course, that the effect of the policy on distortions and its effect on the terms of trade work in opposite directions. Another industrial characteristic that is important in determining the effects of an export subsidy is the base volume of exports. An industry with a large volume of exports will incur a heavy revenue cost of subsidizing existing exports, in order to achieve the marginal expansion in exports, and is therefore less likely to generate welfare gains from the export subsidy.

Third, although the welfare gains from these policies are relatively small, the quantity effects are quite large. Some part of a tariff is absorbed by the supplying firm, but the larger part is passed on to consumers, and with elasticities of demand for individual models at the levels reported in table 2.1, the order of magnitude of the quantity effect is apparent. Quantity effects are particularly large in the case of trade-promoting policies—export subsidies—since they permit exporters to undercut firms in their home markets and lead, in some cases, to some degree of international specialization of production. This suggests that in order to adequately capture the effects of trade policy, models of imperfect competition need to be put into a general equilibrium framework. Factor price changes would then reduce the size of quantity changes and reduce the likelihood of specialization.

Fourth, the simulations of this paper explored a number of different equilibrium concepts: from the case of price competition (B) to the less competitive behavior implied by Cournot equilibrium (C), from pure market segmentation to pure integration (CI), as well as the intermediate case of integrated-market Cournot competition followed by segmented-market price games (CB). These cases cover a wide range of possible behavior, although it cannot be claimed that actual industry behavior is necessarily within the range spanned by these cases—for example, the industry may be more collusive than is implied by Cournot behavior. The four different equilibria studied lead to significantly different interpretations of the base data sets, as calibration generated different elasticities of demand, in each case, and different levels of the implicit barriers to trade.

How do results differ across these four types of equilibria? Ranking the effectiveness of policy across cases yield some quite surprising results. As would be expected, under oligopoly, policy is more effective if the industry has Cournot competition than if it has Bertrand competition. But with free entry this is (in most cases) reversed; in the long run there are greater gains from policy under the more competitive Bertrand interpretation of the industry, similarly, with the segmented/integrated dimension. Under oligopoly, policy is more effective when markets are segmented than when they are integrated; with free entry this distinction is less clear, and in most cases the gains from policy are greater when markets are integrated. Despite these changes in ranking, the overall sensitivity of results with respect to equilibrium type is not as great as might have been feared from a reading of the theoretical literature. For example, there are relatively few cases in which moving from one type of equilibrium to another changes the sign of the welfare effect of the policy. The tariff simulations report four different tariff rates on nine industries for both oligopoly and free entry. This generates 72 cases for each of which results were derived under the four different equilibria; in 10 of the 72 cases there are sign differences between the equilibria. Export taxes were evaluated at three different rates, and in only 7 of the 54 cases are there sign changes as the experiments go across equilibria.

This paper has not, of course, investigated all possible dimensions of sensitivity analysis. For example, results may well be sensitive to choice of functional form. But the conclusion which emerges from the simulations is that trade models of this type provide a rather weak case for policy intervention. This is not because results are so sensitive to market structure that anything is possible, but rather because even if government gets the policy right, the maximum gains it can expect from it are quite small.

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Comment David G. Tarr

The paper by Venables is interesting in a number of respects and represents another application of the model and extensive data set developed by Smith and Venables (1988) regarding the EC 1992 project. If properly interpreted, this work is a helpful first step in the process of assessing the consequences of 1992. My concern, however, is that the model and calibration do not allow Venables (or Smith and Venables in the related papers) to make the interpretations he does in three important areas: (1) the model is not a full Dixit-Stiglitz model, but rather closer to Armington, (2) the rates of trade protection reported are not trade protection, but rather a combination of trade protection and taste preferences, and (3) as a consequence of (2), the exercises which assess the liberalization of trade protection, especially market integration liberalizations such as 1992, are eliminating the taste preferences consumers have for national products along with the trade protection, attributing therefore too much to the trade liberalization. These will be discussed in turn.

The Model Is Closer to an Armington than to a Dixit-Stiglitz Model

Equation (1) of the paper simply does not follow from the assumptions of the author. It is claimed that products are differentiated by firm and model variety of the firm, and the Dixit-Stiglitz model is employed. We need to define some notation to investigate this. For a typical industry like automobiles, let

$x_{\alpha ij}$ = the output of variety α produced in country i and sold in country j,

$p_{\alpha ij}$ = the price of variety α produced in country i and sold in country j, and

$a_{\alpha ij}$ = a parameter in the utility function of consumers in country j reflecting taste preferences for variety α produced in country i.

Then, if we follow Dixit-Stiglitz, the preferences of consumers in country j can be characterized as CES and we have that their utility is

$$y_j = \left(\sum_{i=1}^{I} \sum_{\alpha=1}^{n_i m_i} a_{\alpha ij} x_{\alpha ij}^{\rho} \right)^{1/\rho}, \rho < 1, \quad j = 1, \ldots I, \tag{1}$$

where $\varepsilon = 1/(1 - \rho)$, and otherwise notation is in Venables.

I now ask how we can get from our equation (1), which is Dixit-Stiglitz preferences, to equation (1) of Venables? Make the following assumptions:

(A) $a_{\alpha ij} = a_{ij}$ for all α, i, and j, and

(B) $p_{\alpha ij} = p_{ij}$ for all α, i, and j.

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The views expressed are the author's and not necessarily those of the World Bank.

If the consumer in country j maximizes our utility function (1) subject to expenditure allocated to the good in question being fixed, it follows from assumptions A and B that

(C) $$x_{\alpha ij} = x_{ij} \text{ for all } \alpha, i, \text{ and } j.$$

That is, consumers in country j will buy an equal amount of each variety of the goods from country i. If we substitute (A) and (C) into (1) we arrive at equation (1) of Venables (and of Smith-Venables 1988).

To arrive at Venables's equation (1), however, we have developed a framework in which the price of Mercedes-Benz and Volkswagen are the same (B), and in which when consumers face equal prices for these cars they buy them in equal proportions (C). This is a long way from product variety within a country. The only significant product differentiation in Venables's equation (1) is by country of origin. In fact, except for the scalar factor, $n_i m_i$, which reflects love of variety, Venables's equation (1) is exactly the Armington specification, where products are differentiated by country of origin only. Thus, I suggest that this model is closer to an Armington model (without nesting) than to the Dixit-Stiglitz product variety model.[1]

Taste Differences Are Calibrated as Trade Protection

From equation (4) of Venables, we have that the ratio of sales of country i in country j to the sales of country j in country j can be written as

(2) $$x_{ij}/x_{jj} = (p_{ij}/p_{jj})^{-\varepsilon}(a_{ij}/a_{jj}).$$

Let $\bar{p}_{ij}$ be the border price of products from country i sold in country j and t_{ij} be the rate of protection applied on products from country i in country j; let t_{ij} be the combination of tariffs and nontariff-barrier equivalents. Rewrite (2), recognizing that it is the tariff-inclusive price that consumers pay for their products that enters the utility maximization problem (and $t_{jj} = 0$):

(3) $$x_{ij}/x_{jj} = [\bar{p}_{ij}(1 + t_{ij})/p_{jj}]^{-\varepsilon}(a_{ij}/a_{jj})$$

The usual calibration procedure involves a search for estimates of the rate of protection t_{ij}, which is difficult, and given these exogenous estimates of t_{ij}, the taste parameters a_{ij} are calibrated to assure initial equilibrium. In this paper, however, the t_{ij} are taken to equal 10 percent of all countries, which is assumed to equal transportation costs. Any further difference in the ratio of the sales of country i in country j to sales of the home country firms is attributed to trade distortions. That is, consumers in country j are assumed to display no taste differences among the products of any countries in the model; any market

1. Instead of using (A) and (B) to derive (C) given equation (1), it is possible to assume (A) and (C) from which (B) follows. These are equivalent procedures from the perspective of the interpretation of what type of model we have.

share differences beyond transportation costs are due to trade distortions. "Trade distortions" are, thus, endogenously calibrated from (3).

If Germans prefer strong beer and Americans prefer weak beer, there will be differences in the market shares of each country's producers in the two markets, independent of trade distortions. Thus, tables 2.3 and 2.4 of estimated trade distortions cannot be interpreted as such. The values are in fact a combination of taste differences and trade protection; without the usual external search for rates of trade protection, we have no way of knowing whether taste differences constitute almost all or almost none of the calculated values.

Eliminating Taste Preferences Is Interpreted as Trade Liberalization in These Models

Given the method by which trade protection is calibrated, when a trade liberalization exercise is conducted in this model, such as the market integration of 1992, the first thing that is done is to assume that the taste parameters (a_{ij}) are reduced or equalized in the markets that are liberalizing. This is interpreted as a reduction in protection. For small changes in protection, where significant differences in the a_{ij} remain, this is an acceptable exercise because we can assume that we have not exceeded any real rates of protection in the economy. For more significant simulated changes in protection, such as the 1992 changes, however, this procedure will eliminate taste changes as well. Thus, what Smith-Venables refer to as the "more conservative" estimates are probably closer to the truth.

Conclusion

I note also that the partial-equilibrium approach represented in this work leads to some obvious biases. For example, all 10 sectors in the Smith-Venables work on EC 92 expand. Since capital and labor must come from somewhere, obviously not all sectors can expand. One cannot simply apply a methodology like this across many industries and obtain an aggregate result. Thus, there is a need to do the kind of research suggested by these models in general equilibrium. Multilevel CES nesting is required, however, to incorporate the fact that the goods of individual countries in the European Community will become better substitutes after 1992, that is the issue is not simply one of lowering border protection. If product variety is to be incorporated, it could be done at the bottom level of the CES nest, along the lines of Krishna, Hogan, and Swagel in this volume. A properly interpreted version of the work of Smith and Venables will provide good intuition into these effects until results from more complicated general equilibrium studies are available.