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NEW DEVELOPMENTS IN THE STUDY OF ECONOMIC INTEGRATION

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ABSTRACT: This paper surveys developments in the theory and application of models of economic integration. Emphasis is placed on the effects of integration on intra-industry trade and on market structure. Applications are drawn from the study of the European Community's single market programme.

KEY WORDS: Economic integration, customs union, imperfect competition

1. Introduction. Developments in international economics in the last decade have profoundly changed the way in which economists think about a number of trade policy issues. Economic integration has been central among these issues, both in being informed by new research developments and in motivating new research. Reasons for this are evident. Economic integration typically occurs between economies with rather similar economic structures, consequently involving intra- rather than inter-industry trade. The gains we expect to see flowing from integration are gains from increased competition, rationalisation of industry and exploitation of economies of scale. Analysis of these issues requires trade theory to be based on industrial organisation, as well as on comparative advantage; this is one of the main developments to have taken place in recent trade theory. In addition to drawing on these innovations economic integration has provided the impetus for further development of applicable models of industrial organisation and trade. Such models have been used in the analysis of the US-Canada free trade agreement (for example Harris and Cox (1984)) and of developments in the European Community.

The aim of this paper is to provide an overview of some new approaches to the analysis of economic integration, in particular those based on intra-industry trade and industrial organisation. The main part of the paper (section 2) sets out the theoretical considerations. If trade takes the form of intra-industry trade in an imperfectly competitive environment how does this modify our analysis of economic integration? To answer this question we have

to look at a number of different levels. Imperfect competition creates 'distortions', and these distortions alter the welfare consequences of given quantity changes. The quantity changes associated with changes in trade barriers will themselves depend on the market structure in the industry. And most fundamentally, what we mean by economic integration, that is the nature of the question we ask, may be different in an imperfectly competitive environment than under perfect competition.

The message from theory is that, in an imperfectly competitive environment, there are probably significant gains from integration, but there is also the possibility of welfare loss. A variety of forces operate in different directions, and the net effect depends on details of the industry under study. This creates a role for computable equilibrium studies of integration. In these studies data and parameters for particular industries are used to 'calibrate' a theoretical model, and then simulate a policy change, so obtaining a numerical resolution of theoretical ambiguities. The method and results of some computable equilibrium studies of integration are discussed in part 3 of the paper.

2. Theory. In order to illustrate the theoretical issues we construct the simplest possible framework in which it is possible to analyse integration. This involves focussing on a single market in a single economy, that market being supplied from three sources. In concentrating on a single market we ignore factor market and general equilibrium implications of integration. The

three sources of supply are domestic production, which we shall denote X_1, imports from the partner country with which it is integrating, X_2, and imports from the rest of the world, X_3. X_2 and X_3 will be called internal imports and external imports respectively. Consumer prices of the products are p_1, p_2, and p_3, these prices differing only if products are differentiated. Before addressing the ways in which integration changes these variables, we need a way of assessing the welfare effects of any changes. We take as overall welfare criterion the sum of consumer and producer surplus and government revenue in both the integrating countries. Since we are focussing on a single market in a single economy we look at the surplus earned in that economy and accruing to residents of the two integrating economies; that is, consumer surplus, government revenue, and the profits of domestic and partner country firms. The welfare change, dW, caused by small policy changes can then be expressed in the following way (see appendix),

$$dW = (p_1 - c_1)dX_1 + (p_2 - c_2 - t)dX_2 + (p_3 - p_w)dX_3 - X_3dp_w \qquad (1)$$

In this equation c_1 and c_2 are marginal production costs of X_1 and X_2, and t is the marginal real cost of trade (arising for example, because of transport costs). p_w is the border price of X_3. Equation (1) tells us that the gains from policy derive from changes in the level of operation of activities for which price differs from marginal social cost. Thus an expansion in X_1 will raise welfare if p_1, the marginal social benefit from consuming X_1 exceeds its marginal social cost, c_1. Similarly for X_2, where marginal social cost is now $c_2 + t$. The remaining two terms are

more complicated, as the marginal social cost (to the two integrating economies) of external imports consists of two parts; the border price per unit, p_w, and any terms of trade change induced by a marginal quantity change, this having value $-X_3 dp_w$. We can use the rest of the world supply function to relate the changes dp_w and dX_3; if the elasticity of this function is denoted η_3, then equation (1) can be rewritten as,

$$dW = (p_1 - c_1)dX_1 + (p_2 - c_2 - t)dX_2 + p_w\left\{ \frac{p_3 - p_w}{p_w} - \frac{1}{\eta_3} \right\} dX_3 \qquad (2)$$

Equations (1) and (2) are exact only for small changes. For example, price changes only enter this equation in so far as they effect the terms of trade. In fact price changes also redistribute real income between consumers and firms in the integrating economies, and generate consumer surplus 'triangles'. Neither of these figure in equation (1) as consumer and producer surplus are equally socially valuable, and as 'triangles' are second order small.

2.1; Trade creation and diversion: The traditional theory of customs union assumes that markets are perfectly competitive, and that the only reason for differences between price and social marginal costs are trade taxes. In this case price of domestic output equals marginal cost, $p_1 = c_1$. If τ is the internal tariff rate, then $p_2 - c_2 - t = \tau$, and if the external tariff rate is denoted θ, then $p_3 - p_w = \theta$. Using this in equation (2) gives the change in welfare as,

$$dW = \tau dX_2 + \theta dX_3 - X_3 dp_w = \tau dX_2 + p_w\left\{\frac{\theta}{p_w} - \frac{1}{\eta_3}\right\}dX_3 \qquad (3)$$

Economic integration takes the form of a reduction in the internal tariff, τ. Under normal assumptions about the slopes of supply and demand curves the effect of this tariff reduction is to increase internal imports, X_2, and decrease sales from other sources, both domestic production, X_1 and supply from the rest of the world, X_3. If the rest of the world supply function is upward sloping, then the reduction in X_3 will reduce the world price of the product under study, and hence reduce p_3. We therefore see that the welfare effect of the integration consists of three parts; trade creation, $\tau.dX_2$, $dX_2 > 0$; trade diversion, $\theta.dX_3$, $dX_3 < 0$; a terms of trade gain, $-X_3 dp_w$, $dp_w < 0$; the last two of these can be combined as in equation (3).

The net effect on welfare of trade creation, trade diversion, and the terms of trade effect is ambiguous. Some light can be shed on this ambiguity by noting that the optimal external tariff, θ^*, satisfies $\theta^*/p_w = 1/\eta_3$, so the coefficient on dX_3 in equation (3) is positive or negative according as the external tariff, θ, is greater or less than its optimal value. There are therefore gains from integration if the external tariff is less than the optimal tariff. But if the external tariff exceeds its optimal value and the reduction in τ is from a point where τ is already small, then economic integration may reduce welfare.

2.2 Further distortions; The preceding section assumed that the only distortions were the internal and external trade taxes, τ and

θ. What if there are other distortions? Distortions on the demand side, for example a relatively high consumption tax on the product under study, are neutral across sources of supply but may nevertheless change our welfare assessment. For example, if the reduction in the internal tariff leads to a fall in price and hence increased consumption, then the presence of a consumption distortion would increase the gains from integration.

Distortions on the supply side, such as imperfect competition causing price to exceed marginal cost, will, in general, differ according to source. Imperfect competition in the supply of X_3 does not change our welfare assessment since it has no effect on the form of the coefficient on dX_3 as given in equation (2). The unit cost of X_3 to the integrating economies is p_w, and so long as the profits of foreign suppliers do not enter the welfare function, the actual level of their marginal costs is irrelevant.

Imperfect competition in the supply of X_1 and X_2 does however enter the welfare criterion, as it creates a gap between producer price and marginal cost. This increases the size of the coefficient on dX_2 in the welfare criterion, so increasing the gains from trade creation. But it also makes $(p_1 - c_1)$ positive, and, since we expect dX_1 to be negative, this effect will reduce the gains from integration. Under these circumstances what do we know about the relative magnitudes of the coefficients on dX_1 and dX_2? There is a wide range of possibilities here, as the following two examples illustrate.

Consider first the case in which the distortion in the supply of X_2 is greater than that in X_1, so that the mark up between price and private marginal cost in supply of X_2 is greater than than in supply of X_1. This could arise if, for example, foreign supply was undertaken by a dominant firm and domestic supply by a competitive fringe. Alternatively, it could arise if $c_2 + t + \tau$ is quite small relative to c_1; importing firms would then have relatively large market shares and substantial monopoly power. If this is the case then the gains from trade creation, $(p_2 - c_2 - t)dX_2 > 0$, are large relative to the loss arising from the contraction of domestic output, $(p_1-c_1)dX_1 < 0$, so we expect relatively large gains from union formation.

As an alternative possibility suppose that the trade under study is intra-industry trade in a homogeneous product between similar countries. If X_1 and X_2 are perfect subsititutes then $p_1 = p_2$, and if the two economies are symmetric, $c_1 = c_2$. The welfare indicator, equation (2) can then be written as,

$$dW = (p_1 - c_1)(dX_1 + dX_2) - tdX_2 + p_w\left\{ \frac{p_3-p_w}{p_w} - \frac{1}{\eta_3} \right\}dX_3 \qquad (4)$$

We would usually expect integration to increase the sum $dX_1 + dX_2$; if real trade costs are zero, then the combined effects of changes in X_1 and X_2 would then be to raise welfare. However, if there are substantial real trade costs, i.e., t is relatively large, then it is clearly possible that reallocation of supply between countries within the union results in a welfare loss. This is a

case in which the customs union encourages more trade than is socially optimal.

These examples are merely illustrative. In order to explore further we need to specify fully a model of trade under imperfect competition, and investigate the effects of economic integration in this model.

2.3. A model of trade under imperfect competition. In this section we develop the simplest possible model in which to investigate the pricing and sales decisions of imperfectly competitive firms competing in two economies. A more general version of this model is presented in Venables [1990]. We shall ignore supply from the rest of the world, so set $X_3 = 0$, and also assume that the two integrating economies are identical, thereby focussing on intra-industry trade rather than comparative advantage trade; each of these economies contains just one firm in the industry under study. The output of the firm in economy 1 is denoted $X_1 + X_1^*$, and that of the firm in economy 2 is $X_2 + X_2^*$, where X_1 and X_2 are sales in market 1 and X_1^* and X_2^* are sales in market 2. We shall assume that demand curves are linear; in market 1 the price p_i of quantity X_i is given by an inverse demand function of the form,

$$p_i = a - bX_i - (b-\alpha)X_j \qquad b > 0, \quad b-\alpha > 0, \quad \alpha \geq 0, \qquad (5)$$

$$i, j = 1, 2, \; i \neq j.$$

In market 2 we have

$$p_i^* = a - bX_i^* - (b-\alpha)X_j^* \qquad b > 0, \quad b-\alpha > 0, \quad \alpha \geq 0, \qquad (6)$$

$$i, j = 1, 2, i \neq j.$$

If products are identical then $\alpha = 0$, and price depends on total sales in the market, $X_1 + X_2$. If they are differentiated then $\alpha > 0$; an increase in X_1 reduces p_1 by more than does an increase in X_2.

In order to focus on trade we shall make the further simplifying assumption that each firm's total output is fixed. Since the total output of each firm is fixed, the only decision faced by firms is how to allocate their output between markets. Exporting incurs cost per unit of $t + \tau$, where t is the real unit cost of exporting, and τ is the unit trade tax. The country 1 firm then has to solve the problem of allocating its output between markets in order to maximise revenue net of trade costs, i.e., of choosing X_1 and X_1^* to maximise

$$\pi_1 = p_1X_1 + [p_1^* - t - \tau]X_1^* \qquad (7)$$

subject to total output, $X_1 + X_1^*$, being constant. The firm in country 2 faces an analogous choice.

The equilibrium of this game depends on the anticipated response of each firm's rival to its actions, and these anticipated responses can be summarised by a conjectural variations parameter, v. Consider the effect of the country 1 firm switching a unit of its output from export sales to domestic sales, $dX_1 = -dX_1^* > 0$. The firm conjectures that for each unit of sales that it switches from country 1 to country 2 the other firm will reallocate v units

of sales from country 2 to country 1. Profit maximisation requires that the marginal revenue of sales in each market should be equal. Using the inverse demand functions (5) and (6) and incorporating the conjecture v, this gives,

$$p_1 - X_1\{b - (b-\alpha)v\} = p_1^* - t - \tau - X_1^*\{b - (b-\alpha)v\}, \qquad (8)$$

The analogous first order condition for the country 2 firm is

$$p_2^* - X_2^*\{b - (b-\alpha)v\} = p_2 - t - \tau - X_2\{b - (b-\alpha)v\}, \qquad (9)$$

Equations (5), (6) (8) and (9) characterise equilibrium, conditional upon total output levels. Denoting each firm's total output by Z, we can solve these equations to give,

$$X_1 = X_2^* = \frac{Z}{2} + \frac{t + \tau}{2\{b + \alpha - (b-\alpha)v\}}, \quad X_1^* = X_2 = \frac{Z}{2} - \frac{t + \tau}{2\{b + \alpha - (b-\alpha)v\}}$$

$$p_1 = p_2^* = a - \left[Z\{2b - \alpha\} + \frac{(t+\tau)\alpha}{b + \alpha - (b-\alpha)v} \right] / 2 \qquad (10)$$

$$p_1^* = p_2 = a - \left[Z\{2b - \alpha\} - \frac{(t+\tau)\alpha}{b + \alpha - (b-\alpha)v} \right] / 2$$

As is clear from these equations, equilibrium prices and quantities depend on the conjectural variations parameter, v. This was defined as the switch in rival's sales from market j to market i conjectured to occur by a single firm reallocating a unit of its sales from market i to j. The conjecture may be interpreted in price terms as a measure of the extent to which firms perceive the ability to move the prices of their products independently in the two national markets. For example, consider a reallocation of firm 1's sales between markets, given total

output, $dX_1 = -dX_1^*$. From the demand functions the effect of this on the firm's prices in each market is given by,

$$dp_1/dX_1 = -b + (b-\alpha)v, \qquad dp_1^*/(-dX_1^*) = b - (b-\alpha)v. \tag{11}$$

The assumption of linear demands ensures that the effect of this reallocation on the average price is zero, but prices in the two markets are driven in opposite directions. If $v = 0$ this effect is relatively large. However, if $v > 0$ then firms anticipate offsetting quantity reallocations by other firms, so that the price effect is smaller. If $v = 1$ and products are identical ($\alpha = 0$) then firms perceive that they are unable to move prices independently as any reallocation they make between markets is countered by completely offsetting changes in other quantities. We shall refer to situations in which firms perceive little ability to vary prices independently as situations of a relatively high degree of market integration. A relatively high value of v is therefore associated with relatively integrated markets.

Two particular values of v are of special interest as they correspond to Nash equilibria of two different games. The first is the segmented market Nash equilibrium in quantities. In this case firms play a separate quantity game in each market, so $v = 0$. The second is the integrated market equilibrium. In this case firms' strategic variables are their total output, Z; the allocation of output to markets is undertaken by arbitrageurs who incur costs of trade $t + \tau$. This equilibrium is equivalent to firms having quantity conjecture $v = b/(b-\alpha)$ since these conjectures mean that firms are unable to move the two prices

independently (see equation (11)). This conjecture also ensures that consumer prices in the two markets differ by amount $t + \tau$ (see equations (8) and (9)).

We may now return to investigating the welfare effects of integration. We continue to concentrate on intra-industry trade concerns by holding constant total output, Z, and by ignoring external imports, X_3. The welfare criterion can then be written,

$$dW = (p_2 - t - p_1)dX_2 \tag{12}$$

(To obtain this we used the assumption that the two economies are identical, so $c_1 = c_2$, and $dX_1 = -dX_1^* = -dX_2$). Now using equations (10) this becomes,

$$dW = \left\{\frac{(t+\tau)\alpha}{b + \alpha - (b-\alpha)v} - t\right\}dX_2 = \frac{t[(b-\alpha)v - b] + \tau\alpha}{b + \alpha - (b-\alpha)v}\, dX_2 \tag{13}$$

where

$$dX_2 = \frac{-d\tau}{2[b + \alpha - (b-\alpha)v]}.$$

The purpose of these equations is to demonstrate how the gains from integration depend on the nature of international market structure. If markets are integrated, $v = b/(b-\alpha)$, then (13) becomes $dW = \tau dX_2$ with $dX_2/d\tau = -1/2\alpha$. A reduction in the internal tariff, τ, therefore raises X_2 (and by a large amount if the products are near perfect substitutes, so α is small), and there are certainly welfare gains from the change.

If markets are segmented, $v = 0$, then (13) becomes, $dW = \{\tau\alpha - tb\}/(b + \alpha)dX_2$, and $dX_2/d\tau = -1/2(b+\alpha)$. Notice first that the quantity change induced by a reduction in the internal tariff is

in this case smaller. The welfare effect of the change is certainly positive if real trade costs are zero; but if there are some real trade costs, $t > 0$, and the internal tariff is small or products are close to perfect substitutes (so either τ or α is small), then the welfare effect is negative. Essentially imperfect competition with market segmentation causes 'reciprocal dumping', and generates too much intra-industry trade. Promoting more trade by tariff reductions reduces welfare, because of the real trade costs incurred. The general point here is that although there may be gains from integration, both the magnitude and the sign of the welfare effects depend on crucially on details of market structure.

2.4 Integration or segmentation? So far economic integration has been modelled as a reduction in the cost of internal trade. This could be a reduction in the internal trade tax, τ, or in the real cost of trade t; the latter case differs only in that the direct benefit of the saving in trade cost ($X_2 dt$) has to be included in the welfare measure. However, the preceding section demonstrated that the equilibrium depends on the extent to which firms are able to segment national markets, and thereby price discriminate between them. This naturally raises the question, what if it were possible for policy to operate directly on the degree of market segmentation? While there is no single instrument available to governments to reduce segmentation, it seems clear that a package of measures such as the EC measures to complete the internal market are designed with precisely this aim in mind. What then are the effects of reducing the degree of market segmentation?

The apparatus set up in the preceding section allows us to answer this question directly. We shall take the extreme case of supposing that the initial equilibrium has segmented markets ($v = 0$) and some policy change then switches markets to being fully integrated ($v = b/(b-\alpha)$), while holding trade taxes constant. The effects of this on equilibrium prices and quantities can be calculated from equations (10). Using Δ to denote the difference between the integrated equilibrium and the segmented equilibrium gives,

$$\begin{aligned} \Delta p_1 = \Delta p_2^* = \frac{-(t + \tau)b}{2(b + \alpha)} = -\Delta p_1^* = -\Delta p_2 < 0 \\ \Delta X_1 = \Delta X_2^* = \frac{(t + \tau)b}{2\alpha(b + \alpha)} = -\Delta X_1^* = -\Delta X_2 > 0. \end{aligned} \tag{14}$$

The first thing to note from these equations are the changes in price. Market integration reduces the consumer prices of firms' sales in their home markets, p_1 and p_2^*, and raises the consumer price of their exports by an equal amount. The reason for this is the following. If markets are segmented then firms derive market power from their sales, or market shares, in each market separately. If there are positive trade costs, $t + \tau > 0$, then firms have larger market shares in their home markets than in export markets, and consequently also have higher price cost margins on their domestic sales. The effect of market integration is precisely to destroy the market power associated with this relative dominance in the home market. When markets are integrated firms' market power derives from their share in the entire integrated market, rather than in separate national

markets. Consequently price cost margins fall on domestic sales and increase on export sales.

The quantity changes given in equations (14) are, at first sight surprising -- integration reduces the volume of trade, as it raises firms home sales and reduces their export sales. But these quantity changes are the immediate demand implications of the price changes noted above. Notice also that if there are any real costs of trade, t, then quantity changes in this direction generate large welfare gains, since they save trade costs. The quantity changes predicted by (14) should however be treated with caution. If the market integration is accompanied by a reduction in trade barriers, $t + \tau$, then there will be forces pulling in opposite directions, and the net effect on trade volumes is uncertain.

The possibility that integration may change the nature of the game played by firms gives a further dimension to economic integration, and provides a further important source of welfare gains. However, the importance of this idea is quite difficult to assess. We have little idea of how segmented markets are now, and it is not clear what sort of package of policy measures might be successful in breaking down segmentation. The changes required probably include a reduction in trade costs, the facilitation of arbitrage (for example by mutual recognition of standards) and ultimately a change in 'business perceptions', so that firms see themselves as competing over the entire market, rather than segment by segment. Of course, these are all elements of the 1992

programme.

2.5 Entry and exit of firms. In the analysis so far we have held constant the number of firms in each industry. We must now consider the way in which economic integration may change the number of firms, and the consequences of any such change for economic welfare.

We shall suppose that entry and exit of firms in each country takes place in response to profit or loss. If there are increasing returns to scale then at equilibrium there will be a finite number of firms, and, if these firms are all symmetric, they will all have average cost equal to an (appropriately weighted) average of the prices they receive for sales in each market they supply. Any change which reduces this weighted average price will cause exit of firms; equilibrium is restored by an expansion of remaining firms, causing a reduction in their average costs, and an increase in their monopoly power and price marginal cost margins.

The welfare implications of these changes can easily be incorporated in our welfare criterion. So far we have regarded small price changes as of no social value -- they merely transfer income between producer and consumer surplus. With entry and exit a change in equilibrium price is now also a change in average costs. However, we can continue to evaluate welfare changes by looking only at quantity changes -- but now at quantity changes per firm, thus picking up increased firm scale (see appendix).

If X_1 is now supplied by n_1 symmetric firms, each producing output x_1 so $X_1 = n_1 x_1$, and analogously $X_2 = n_2 x_2$, then the welfare criterion, equation (2), becomes

$$dW = (p_1 - c_1)n_1 dx_1 + (p_2 - c_2 - t)n_2 dx_2 + p_w\left\{ \frac{p_3 - p_w}{p_w} - \frac{1}{\eta_3} \right\} dX_3, \quad (15)$$

or equivalently

$$dW = (p_1 - c_1)(dX_1 - X_1 dn_1/n_1) + (p_2 - c_2 - t)(dX_2 - X_2 dn_2/n_2) + p_w\left\{ \frac{p_3 - p_w}{p_w} - \frac{1}{\eta_3} \right\} dX_3. \quad (16)$$

What then are the effects of integration on firms' profits, and hence on the number of firms? For both our representations of economic integration -- a reduction in the internal tariff, and a switch from segmented to integrated markets -- firms experience a reduced price marginal cost margin on domestic sales, and increased price marginal cost margin on export sales. (For the case of the switch in market structure this is given by equations (14); for the reduction in the internal tariff additional modelling is needed, as the change comes from changes in total output, $X_i + X_i^*$). The reason for these changes in margins is the obvious one; in both cases integration increases competition from foreign firms, and so reduces firms' ability to exploit monopoly power in their domestic markets.

If the two countries are symmetric, then the net effect of these changes is to reduce profits. For example, we see from equation (14) that price cost margins move by equal absolute amounts in opposite directions, but, since domestic sales exceed foreign sales, the net effect is a profit reduction. There is therefore

exit of firms. Remaining firms are larger and operate at lower average cost, so the per firm quantity changes in the welfare criterion, equation (15), exceed the aggregate quantity changes, so magnifying welfare effects. We therefore expect gains from integration to be larger when the number of firms adjusts to the new equilibrium, than in the case of oligopoly with a fixed number of firms.

2.6. The location of industry. If economies are symmetric then integration reduces profits and causes exit of firms in all countries. However, if countries are asymmetric, integration may have important implications for the location of industry, as exit pressures are stronger in some countries than in others. This issue is explored in Krugman and Venables [1990], and is illustrated by the following example. Suppose that the two economies under study are of different size. If trade barriers are sufficiently high that no trade occurs, then the number of firms in each country will be approximately proportional to the size of the market in each country. Now let integration reduce the trade barriers between the economies. We know that there will, overall, be exit of firms. It turns out that the fall in the number of firms is much more dramatic in the small economy than in the large. The reason for this is that integration weakens the forces tying firms to home markets; but if market access still has some cost (i.e., there are positive trade costs), then firms located close to the large market will tend to do better than firms located close to the small market. There are therefore centripetal forces at work, pulling firms towards the

larger economy, or, more generally, towards the centre of the integrating region. Peripheral regions become net importers in industries characterised by imperfect competition and increasing returns to scale.

There are of course forces at work to mitigate these centripetal tendencies, the most obvious of which are through factor markets and the relative price of labour. Consider what may happen to wages as trade barriers are reduced. Movement of the imperfectly competitive industry to the centre is associated with reduced labour demand and hence lower wages in the peripheral region; lower relative wages partially offset the incentive to relocate in the centre. However, as trade barriers become very low so it only takes small wage differences to attract industry back to the periphery, and of course, in the limit when there are no trade barriers, there is factor price equalisation. Putting these pieces together we see that during a process of integration there may initially be a divergence of relative wages between central and peripheral regions, followed by convergence in the final stages of integration. This means that it is difficult to say whether a move to integration will lead to convergence or divergence of factor prices. It depends on which side of the U shaped relationship the economy starts from.

2.7 External trade considerations. In discussing the implications of less than perfectly competitive market structures our attention has so far focussed on internal trade. Several brief remarks may be made about the way in which imperfect

competition modifies our view of the external trade effects of integration.

On the import side, the welfare effect of integration still depends on the difference between border and internal consumer prices, and on the elasticity of foreign supply. It is possible that this elasticity is lower in an imperfectly competitive environment than it would be under perfect competition, so that a fall in the quantity of imports, X_3, is likely to be associated with a relatively larger terms of trade improvement. The reason for this is that the fall in X_3 might reduce p_w as foreign suppliers move back down their marginal cost curves -- the traditional effect. In addition, reduced X_3 is now associated with reduced market share and a lower price marginal cost margin. This additional source of terms of trade gain reduces the possibility of losing from trade diversion.

On the export side the question is, what happens to the total profits earned by firms from the integrating economies on rest of the world markets? There are two forces at work here. The first is that if marginal costs are decreasing with output, then the fact that firms in the integrating countries are now larger means that their lower marginal costs will give each of these firms larger market shares and higher profits in export markets. Against this, the fact that there are fewer firms will tend to reduce total exports and profits earned on exporting. The net effect of these two forces is ambiguous.

3. Empirical Studies: The preceding section outlined some of the considerations which are of importance in analysing economic integration. Even under perfect competition the problem is relatively complex because of the presence of at least three countries and two distortions. Adding imperfect competition increases the number of distortions, makes their size endogenous, and creates a whole new way of modelling what is meant by integration -- a change in market structure rather than just a reduction in trade barriers. This complexity suggests an important role for numerical analysis and simulation studies. Such work can provide insights into the magnitude of these effects, and a way of assessing the quantitative importance of different policy changes. In this section we describe some of the research which attempts to quantify these effects.

The first stage in this research is of course, formulation of a theoretical model -- one rich enough to capture all the effects described above, and to provide a reasonable description of the industries under study. The precise form of the model will depend on the industry under study. The model on which most of the discussion below is based is one that has been applied to a number of manufacturing industries by Smith & Venables [1988], Norman [1989], and others. The model is essentially a multi-country multi-firm generalisation of that set out in section 2. On the demand side, products are assumed to be differentiated, and this is modelled by the use of constant elasticity of substitution utility functions (the 'Spence- Dixit- Stiglitz' approach). This means that in general each firm's output will be consumed in each

country, so giving intra-industry trade. On the supply side, each country has a number of symmetric firms, each of which operates under conditions of increasing returns to scale. Firms act non-cooperatively, and the precise form of the equilibrium depends on the structure of the game and firms' strategic variables. The benchmark case for the discussion below is that in which firms act as Cournot competitors in segmented national markets. Market power, and each firm's price marginal cost margin in each market, then depends on the share of the firm in that market. The number of countries studied in the model depends on the questions being addressed and in the work of Smith & Venables it is five EC countries plus the rest of the world. Although the focus of these models is imperfect competition at the industry level, industries can also be linked together through a demand system and factor markets to give a full general equilibrium model as in Norman [1989] and Gasiorek, Smith and Venables [1990].

Once the model has been formulated, it is fitted to the industry under study. The technique used is calibration rather than estimation. That is, as many of the parameters of the model as possible are obtained from secondary sources, some econometric (e.g. demand elasticities) and some case study (e.g. returns to scale, industrial concentration). Remaining parameters of the model are then computed so that the equilibrium of the model is consistent with a base data set giving production, consumption and trade flows for the industry in some base year. One of the sets of parameters computed this way is implicit barriers to trade. Firms consistently have lower shares of export markets than they

do of their domestic market, and this must be due to some disadvantage that firms have in exporting relative to domestic sales. This disadvantage can be measured as a 'tariff equivalent trade barrier' on trade. In terms of the model the barrier is assumed to be partly real costs of trade (transport costs, bureaucracy, etc) and partly international demand differences.

3.1 Completing the internal market in the EC: As an application of this modelling technique we consider completion of the internal market in the EC, as analysed by Smith & Venables [1989]. Two different interpretations of 'completion of the market' were studied, these corresponding to the two types of integration experiment discussed in section 2. The first experiment is to describe completion of the market as a reduction in the cost of intra-EC trade, this reduction being set at an amount equal to 2.5% of the value of EC trade. It was assumed that this reduction in trade costs is a real cost reduction, arising, for example, from reduced travel time, less bureaucracy, and mutual recognition of standards. The change therefore has direct benefits, as well as welfare changes induced by changes in the equilibrium. The second experiment describes completion of the market as the reduction in trade costs, plus a switch from segmented to integrated markets, as discussed in section 2.4 above.

To illustrate the effects of these changes we shall concentrate on a single industry, and look at each experiment in turn. We choose the domestic electrical appliance industry (NACE 346) as our example, this being an industry with moderate returns to scale and

a moderate level of concentration. Details of the industry are not given here, but are available in Smith & Venables [1988]. We think that the industry is representative in conveying some quantitative feel for the qualitative effects described in section 2.

What are the effects of the first experiment, a reduction in intra-EC trade costs by an amount equal to 2.5% of the value of trade? The first effect is to change trade volumes. In the base 20% of consumption is met by internal trade. The reduction in t increases intra-EC trade by 22.1%, so that this trade is now of a value equal to 24.4% of base consumption. This change is large because the products of different firms, although differentiated, are quite close substitutes; changes in trade costs are partly absorbed by firms, and partly passed on to consumers, this giving large demand effects. Increased trade volumes tend to increase production in countries which, in the base position, are net exporters, and possibly reduce production elsewhere. Overall EC production of the industry increases by some 2.1%. Notice that supply of output by domestic firms to the domestic market falls by an amount approximately equal to 2.3% of base consumption -- the difference between the increase in production and the increase in intra-EC trade.

The welfare effects of these changes are calculated by computing changes in consumer surplus and producer surplus in each market and for each firm. However, the first order approximations used in section 2 give a good guide to the welfare change. Intra-EC

trade rises from 20% to 24.4% of base consumption, so dX_2 is 4.4% of base consumption. The price marginal cost margin on intra-EC trade is approximately 10% (approximately because the exact size of the margin differs according to each firm's share in each market). This term gives welfare gain of 0.44% of base consumption. dX_1 is -2.3%, and the price marginal cost margin on domestic sales is approximately 15% -- significantly larger than on exports, because of firms' dominant position in their domestic markets. This gives welfare loss of around 0.34% of base consumption. In addition there is the direct cost saving from the policy change, amounting to 0.5% of the value of consumption (2.5% cost reduction, times intra-EC trade of 20% of total consumption). Summing these terms gives a first order approximation of the gains from trade of of 0.6%; this compares with the exact figure computed in the model of 0.64% of base consumption.

This overall figure for welfare change masks a redistribution from firms to consumers, as increased import competition reduces prices and profits. Now suppose that the number of firms in the industry in each country adjusts to restore profits to their base levels. This is achieved by exit (or merger) reducing the number of firms in the EC as a whole by around 5%, relatively evenly spread between countries. This exit has little effect on the aggregate magnitudes, but adds a further 5% to firm scale. The effect of this on welfare is given by equation (16). With dX_2 equal to 4.4% of base consumption, X_2 equal to 20% of base consumption and $dn_2/n_2 = 0.05$ we obtain $n_2dx_2 = dX_2 - X_2dn_2/n_2 = 5.4\%$ of base consumption. Similarly, with dX_1 equal to -2.3% of base

consumption, X_1 equal to 80% of base consumption and $dn_1/n_1 = 0.05$ we obtain $n_1 dx_1 = dX_1 - X_1 dn_1/n_1 = 1.7\%$ of base consumption. Using the price marginal cost margins described above, these give welfare changes of 0.54% and 0.25% of base consumption respectively. Adding the direct effect of the reduction in trade costs (0.5% of consumption) gives a figure of 1.29% of base consumption. In fact this considerably overstates the gains, as this approximation does not take into account the reduction in variety of products available for consumption when firms exit. The exact welfare change computed for this case is a gain amounting to 0.81% of base consumption.

These estimates suggest that the gains from reducing trade costs are rather small, particularly if we incorporate welfare costs due to loss of variety. The second experiment is more radical, consisting of both a reduction in trade costs and a switch in the equilibrium concept, from segmented market behaviour to integrated market behaviour. As discussed in section 2.4, the effect of this is to remove firms' ability to price discriminate, and consequently to lead to significant price reductions in markets where firms have a relatively large market share -- their domestic market. This tends to reduce intra-industry trade volumes, and, in the industry under study, this effect is large, giving a fall in intra-EC trade of 23%, from 20% of base consumption to 15.4%, so $dX_2 = -4.4\%$ of base consumption. The price reductions and increased competitiveness raise overall EC output by some 8.1%. This means that consumption of domestic output X_1, increases by some 12.5% of base consumption. If we use initial price marginal

cost margins of 10% and 15% these quantity changes translate into welfare gains of -0.44% and +1.87% of base consumption respectively. Adding the 0.5% attributable to direct cost savings gives an approximate estimate of the welfare gain of 1.93% of base consumption. The exact gain computed from the model is 1.79% of base consumption.

The large price reductions in this case have a large effect on profits. Restoration of profits to their base level now requires much more significant restructuring and, for the industry under study, we see a 40% reduction in the number of independent firms operating in the industry. Clearly this is a massive reduction, but it is worth pointing out that the integrated EC market is less concentrated after this reduction than any of the segmented national markets are in the base case. Combining increased total EC output with changes in the number of firms, we find ndx_1 = 60% of base consumption and ndx_2 = 1% of base consumption. Combining the value of these quantity changes with the direct cost saving from the policy gives a welfare gain of 9.6% of base consumption. This corresponds to a computed reduction in average costs of 9% as firms exploit economies of scale more fully. However, as previously noted, this approximation misses a number of ingredients of welfare change -- quantitatively the most important of these being the welfare cost of loss of product varieties; incorporating these elements gives a computed welfare gain of 3.85% of base consumption.

The numbers we have reported in this section are for a single

industry, but one which we think quite representative. (For details of results on other industries see Smith & Venables [1988]). Exact numbers are of course less important than the broader messages which emerge from this analysis. The first message is that policy changes give rise to large quantity effects -- large changes in trade volumes and in the number of firms. This is as would be expected in a model of intra-industry trade. However, the magnitude of these quantity changes is likely to be reduced if general equilibrium considerations are taken into account. Second, the welfare gains from reductions in trade costs with a fixed number of firms are quite small. The reduction in trade cost of 2.5% caused a welfare gain of 0.64% of base consumption -- nearly three-quarters of which is the direct effect of the policy change. However, welfare gains become larger when entry and exit of firms is permitted. These bring benefits from fuller realisation of economies of scale, although these must be traded off agains losses due to loss of variety. Welfare gains are larger still when the policy change is from segmented to integrated markets. In this case gains from increased competition are achieved without incurring trade costs.

4. Concluding comments: The examples of this paper illustrate some of the progress that has been made in developing the theory of economic integration, and in attempting to apply this theory. But of course, much more work is needed. Empirical work is needed to assess the extent to which markets are segmented or integrated. Case studies are needed to review the experience of industries in the integration process. Theory is needed to build richer models

of integration and to start to address issues of dynamics and of adjustment. All these topics remain open for future study.

Appendix to section 2:

The welfare criterion has the following components.

(i) Consumer surplus on sales in country 1. This is measured by the indirect utility function, $V(p_1,p_2,p_3)$, in which the marginal utility of income is normalised at unity.

(ii) Profits earned by firms from country 1 and country 2 on these sales. Country i has n_i symmetric firms with sales x_i in market 1, where $X_i = n_i x_i$, i = 1, 2. The production costs incurred on these sales are C_i per firm, with associated marginal cost c_i, i = 1, 2.

(iii) Government revenue, at rate τ on internal sales X_2, and rate $(p_3 - p_w)$ on external imports X_3.

Summing these components gives,

$$W = V(p_1,p_2,p_3) + n_1[p_1x_1-C_1] + n_2[(p_2-\tau-t)x_2-C_2] + X_2\tau + X_3(p_3-p_w)$$

Totally differentiating this gives equation (1) of the text. In total differentiation notice that, (a) terms in dp_1, dp_2, dp_3 and $d\tau$ cancel out. (b) If the numbers of firms are constant then $dn_i = 0$; if they vary then we assume profits per firm in the integrating economies are zero, so the coefficents on the dn_i terms are zero. (c) Equation (16) also uses the differential of $X_i=n_ix_i$ to give $n_i dx_i = dX_i - X_i dn_i/n_i$.

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