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ABSTRACT

Winners and Losers from Regional Integration Agreements*

How are the benefits – and costs – of a customs union divided between member countries? Outcomes depend on the comparative advantage of member countries, relative to each other and to the rest of the world. Countries with a comparative advantage between that of their partners and the rest of the world do better than countries with an 'extreme' comparative advantage. As a consequence, integration between low-income countries tends to lead to divergence of member country incomes, while agreements between high-income countries cause convergence. Results suggest that developing countries are likely to be better served by 'north-south' than by 'south-south' free trade agreements.

JEL Classification: F10 and F15
Keywords: customs union, regional integration, trade creation and trade diversion

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NON-TECHNICAL SUMMARY

This Paper addresses two questions. How are the costs and benefits of a regional integration agreement (RIA) divided between member countries? Does this distribution tend to promote convergence or divergence of *per capita* income levels amongst member states?

The analysis of the Paper is theoretical, and based on relating trade diversion and trade creation to the comparative advantage of member countries – comparative advantage relative to each other and to the rest of the world. The motivation is empirical and the Paper offers an explanation of the observation that RIAs amongst rich countries seem to promote convergence, while RIAs amongst poor countries have a more mixed set of outcomes, sometimes leading to income divergence. Thus, the EU has been associated with narrowing *per capita* income differentials, in particular during the 1960s and 1970s, and also more recently with the strong performance of Ireland, Spain and Portugal. Amongst developing countries, examples of regional integration promoting divergence include the old East African Common Market, in which, during the 1960s, Kenya steadily enhanced its position as industrial centre producing more than 70% of the manufactures. More recent examples include the concentration of industry, commerce and services in and around Guatemala City and San Salvador in the Central American Common Market, and Abidjan and Dakar in the Economic Community of West Africa**.**

This Paper shows that forces of trade creation and trade diversion will systematically produce an outcome in which RIAs amongst high income countries tend to bring convergence of income levels, and RIAs containing low income countries tend to bring divergence.

The argument is based on the comparative advantages of member countries, relative to each other and to the rest of the world. The basic point can be simply made. Suppose that countries differ in their endowments of skilled and unskilled labour, and that these differences form the basis of their comparative advantage. Take two countries that are unskilled labour abundant relative to the rest of the world (say 'Uganda' and 'Kenya') and suppose that one of them, Uganda, is also unskilled labour abundant relative to the other, Kenya. Uganda therefore has an 'extreme' comparative advantage and Kenya an 'intermediate' one. If these two countries form a RIA, what do we expect to happen? The comparative advantage of Kenya relative to Uganda will cause Kenya to export the skilled labour intensive good (say manufactures) to Uganda, which will export the unskilled labour intensive good (agriculture) in return. The first of these flows is trade diverting: Uganda is getting its imports of manufactures from Kenya, not from the rest of the world, in line with intra-union comparative advantage, not global comparative advantage. The second is trade creating: by increasing imports of agriculture from Uganda, Kenya is trading with the global, not just intra-union, lowest cost supplier.

The general argument here is that the country with an ‘intermediate’ comparative advantage will do better from the union than the one with the ‘extreme’ comparative advantage. Intuitively, interposing an intermediate country between the extreme one and the rest of the world, is exactly the circumstance likely to divert the extreme country’s trade.

Between two poor countries this unequal division of costs and benefits causes income divergence; the extreme country is the one with the least skilled labour and hence initially poorest. However, between two rich economies (both with above world average skilled labour abundance), the extreme country is the one with the highest skilled–unskilled labour ratio. Thus, exactly the same force that drives income divergence in a RIA between Kenya and Uganda, leads to income convergence in a RIA between, say, France and Spain.

The Paper develops a series of models to make this argument more formally, to check its robustness and to draw out further implications. These include the prescription that developing countries are likely to do better in ‘North-South’ RIAs than in ‘South-South’ agreements.

1. Introduction:

How are the gains and losses associated with membership of a customs union divided between member countries? Do unions promote convergence of per capita income levels amongst member states, or divergence? The standard theory of economic integration (from Viner (1950) onwards) tells us that the effects of membership are ambiguous, but gives little guidance on the answers to these questions.[1]

The empirical literature is slightly more suggestive. For customs unions containing relatively high income countries there is evidence of convergence. The work of Ben-David (1993, 1996) charts convergence within the European Union. From the late 1940s to early 1980s he finds that per capita income differences narrowed more or less steadily, falling by about two thirds over the period, due mainly to more rapid growth of the lower income countries.[2] More recently there has been the strong performance of Ireland, Spain and Portugal, which have made substantial progress in closing the gap with richer members of the EU. Whereas in the mid 1980s these countries' per capita incomes were, respectively, 61%, 49% and 27% of the income of the large EU countries[3], by the late 1990s the numbers had risen to 91%, 67% and 38%. Clearly, the prospect of convergence is motivating the queue of entrants to the EU.

For low income countries there is some evidence that the opposite process is at work, with regional integration promoting divergence. Perhaps the best documented example of this is the concentration of manufacturing in the old East African Common Market. In the 1960s Kenya steadily enhanced its position as the industrial centre of the Common Market, producing more than 70% of the manufactures and exporting a growing percentage of them to its two relatively less developed partners. The Common Market collapsed in 1977, partly because of the internal tensions that this divergent performance created. More recent

examples include the concentration of industry, commerce and services in and around Guatemala City and San Salvador in the Central American Common Market, and Abidjan and Dakar in the Economic Community of West Africa**.** Guatemala and El Salvador now account for over 80% of manufacturing value added in the Central American Common Market, up from 68% in 1980. And in the Economic Community of West Africa the combined share of Cote d'Ivoire and Senegal in manufacturing value added has risen from 55% in 1972 to 71% in 1997.[4]

Many factors may be driving these changes, but this paper concentrates just on the traditional forces of trade creation and trade diversion. It argues that these forces will tend to cause convergence of income levels within a union composed of high income countries, and divergence within a union composed of low income members.

The argument is based on the comparative advantages of member countries, relative to each other and to the rest of the world. Suppose that countries differ in their endowments of skilled and unskilled labour, and that these differences form the basis of their comparative advantage. Let us take two countries that are unskilled labour abundant relative to the rest of the world (say 'Uganda' and 'Kenya'), and suppose that one of them, Uganda, is also unskilled abundant relative to the other, Kenya. Uganda therefore has an 'extreme' comparative advantage, and Kenya an 'intermediate' one. If these two countries form a customs union (CU), what do we expect to happen? The comparative advantage of Kenya relative to Uganda will cause Kenya to export the skilled labour intensive good (say manufactures) to Uganda, which will export the unskilled labour intensive good (agriculture) in return. The first of these flows is trade diverting: Uganda is getting its imports of manufactures from Kenya not from the rest of the world, in line with intra-union comparative advantage not global comparative advantage. The second is trade creating: by increasing

imports of agriculture from Uganda, Kenya is trading with the global, not just intra-union, lowest cost supplier.

The general argument here is that the country with an 'intermediate' comparative advantage will do better from the union than the one with the 'extreme' comparative advantage. Intuitively, interposing an intermediate country between the extreme one and the rest of the world, is exactly the circumstance likely to divert the extreme country's trade.

Between two poor countries this unequal division of costs and benefits causes income divergence; the extreme country is the one with the least skilled labour, and hence initially poorest. However, between two rich economies (both with above world average skilled labour abundance) the extreme country is the one with the highest skilled - unskilled labour ratio (see figure 1). Thus, exactly the same force that drives income divergence in a CU between Kenya and Uganda, leads to income convergence in a CU between, say, France and Spain, as illustrated in figure 1.

The remainder of the paper is devoted to developing these ideas more fully. We proceed in three main stages. First (section 2), we present a 2 good diagrammatic analysis of the relationship between comparative advantage and trade creation/ diversion. Then we move to arguments based on Ricardian trade models (section 3), generalised to have many goods and (in one case) a sector specific factor. Finally (section 4), we present a simulation based exploration of a two factor and two sector model, combining a Heckscher-Ohlin structure with product differentiation by location of production (Armington).

It is worth pointing out here why this family of models is necessary. If the integrating countries trade with a large 'rest of the world' both before and after formation of the CU, then prices of all goods so traded are set in the rest of the world and unchanged by formation of the union. Thus, if there are just two goods and both countries trade with the rest of the

world, no prices change, and consequently formation of the CU has no effect whatsoever. An interesting model must therefore have one of the following characteristics. Either goods switch between being traded or not with the rest of the world, which we pursue with our diagrammatic analysis and Ricardian models. Or countries produce goods which are differentiated, so that fixed prices of rest of the world goods are consistent with variation of the prices of goods produced and exported by the integrating economies; this is developed in our Heckscher-Ohlin-Armington model.[5]

2: Internal and external comparative advantage: A diagrammatic example.

Figure 2 presents the diagrammatic argument. There are two goods, A and M, and three countries, a large rest of the world (country 0), and two small countries, 1 and 2. The figure has on the axes quantities of goods A and M, consumption of which takes place in fixed proportions, along the consumption line illustrated. The world price of good M in terms of A is p_0.[6]

Production possibilities for countries 1 and 2 are illustrated by the solid lines A_1M_1 and A_2M_2. They are constructed such that both 1 and 2 have a comparative advantage in good A relative to the rest of the world, and 2 also has a comparative advantage in A relative to 1. Thus, with free trade and prices p_0 countries 1 and 2 would produce at points F_1 and F_2. They would both export good A, country 2 more than country 1, since country 2 has the more extreme comparative advantage (like Uganda in our earlier example).

The initial situation is not free trade, but a position in which all imports by countries 1 and 2 are subject to tariffs at rate $T > 1$.[7] Equilibrium is then as follows. Country 1 is self sufficient at point $C_1 = Q_1$, with the domestic price of good M in terms of good A given by the gradient of the production possibility frontier at this point. This price ratio lies between

the domestic price ratio that would rule if good M were to be imported (p_0T), and that which would rule if good A were to be imported (p_0/T), so confirming that trade is not profitable.

Country 2 produces at Q_2 and consumes at C_2. It imports good M, meaning that the domestic price ratio is p_0T, at which Q_2 is profit maximising. The budget constraint holds at world prices, p_0, so country 2's trade vector is Q_2C_2.

What happens if these two countries form a customs union? Country 1 has a comparative advantage in M relative to country 2 and, in the initial position, a lower relative price of M. It therefore starts to export good M to 2, moving Q_1 around towards Q_1*. In the equilibrium illustrated, the CU as a whole continues to import some M from the rest of the world, so the internal price settles at p_0T. Countries 1 and 2 produce at Q_1* and Q_2, and internal trade is the vector Q_1*C_1* = Q_2E (this trade taking place at internal price ratio p_0T). External trade of country 2 is vector EC_2*, while country 1 only has internal trade.

The welfare effects of the CU are given by comparison of consumption points. Country 1 gains from the union; it now has some gains from trade, where previously it had none. Notice that this arises despite the fact that country 1's production structure has moved in the opposite direction from the way it would go under free trade. In contrast, country 2 loses, the reason being trade diversion: it was getting all its imports of M from the rest of the world, and is now getting some of them from its higher cost partner. As we argued in the introduction, the extreme country's trade (country 2) is diverted to a partner country with comparative advantage relatively close to that of the rest of the world. However, for the intermediate country trade with the partner and with the rest of the world are less close substitutes, and therefore less vulnerable to trade diversion.

This diagrammatic analysis provides a rigorous argument, but perhaps seems rather contrived – one of the countries is in autarky in the initial situation, and trades only with its

partner once the CU is in place. This reflects the problem noted at the end of the introduction, and is why we now turn to more general models.

3: Generalised Ricardian models.

Multi-product comparative advantage

If there are many goods, with different technical coefficients in different economies, then what can be said about the distribution of the gains and losses from forming a CU? We first develop a diagrammatic approach to answering this question, and then set out a fully specified model with a continuum of products and systematic variation in comparative advantage.

Consider figure 3. The vertical axis measures the cost of producing a good in country 2, and the horizontal the cost in country 1; thus, the points labelled with Greek letters represent goods, and their coordinates the costs of producing them in each country. These costs are composed of the wage in each country, w_i, times the unit labour coefficients, b_i, which vary across goods and countries, measuring Ricardian efficiency differences. All goods have rest of the world price 1 (by choice of units) and initially face country 1 and 2 import tariffs at rate T.

Of the set of goods illustrated in the figure, good α is the one with the lowest country 1 unit labour requirement. This good will therefore be exported by country 1 and, since the world price of the good is unity, this sets the country 1 wage at $w_1 b_1(\alpha) = 1$. In the initial situation, where all imports bear tariff T, country 1 is self sufficient in goods β, γ, and δ since the cost of producing locally is less than the cost of importing them (= T) and greater than the receipts from exporting them (= 1). Goods ϵ and ζ are imported from the rest of the world. The analogous configuration for country 2 can be read off the vertical axis. Good β

has the lowest unit labour requirement, so the country 2 wage is set by $w_2 b_2(\beta) = 1$. Country 2 is self sufficient in goods γ and ϵ, and imports α, δ, and ζ .

Formation of a CU will change the pattern of trade of some goods, and not of others. Wages in both economies remain constant, because they continue to supply their respective export goods to the rest of the world. However, country 1 will now buy from country 2 any good for which $w_2 b_2 < w_1 b_1$ (below the 45^o line) and $w_2 b_2 < T$ (so cheaper to import duty free from the partner than import from rest of the world). As illustrated, this includes two goods. Good ϵ goes from being imported from the rest of the world to being imported from the partner country; this is trade diversion with additional cost per unit of $w_2 b_2(\epsilon) - 1$. Good β goes from country 1 self sufficiency to being imported from 2; this is trade creation, with cost saving per unit of $w_1 b_1(\beta) - w_2 b_2(\beta)$.

For country 2, the change in imports arises as it now imports from 1 any good for which $w_1 b_1 < w_2 b_2$ and $w_1 b_1 < T$. Good δ therefore experiences trade diversion, now being supplied by country 1 (since $T > w_1 b_1(\delta) > 1$). Good γ goes from being locally produced in 2 to imported from 1, and this is trade creation, since $w_1 b_1(\gamma) < w_2 b_2(\gamma)$, bringing unit cost saving equal to this cost difference.

These results are summarised in table 1, and the regions of product space within which country 2 experiences trade creation and diversion occur are illustrated by the shaded areas on figure 3; (analogous country 1 zones are not marked).

Table 1: The direction of trade

	Initial		CU		Welfare Change	
	Country 1	Country 2	Country 1	Country 2	Country 1	Country 2
α	Exp. to R	Imp. from R	Exp. to R	Imp. from R		
β	No trade	Exp. to R	Imp. from 2	Exp. to R&1	↑, TC	
γ	No trade	No trade	Exp. to 2	Imp. from 1		↑, TC
δ	No trade	Imp. from R	Exp. to 2	Imp. from 1		↓, TD
ϵ	Imp. from R	No trade	Imp. from 2	Exp. to 1	↓, TD	
ζ	Imp. from R	Imp. from R	Imp. from R	Imp. from R		

Can we now link this to our discussion of countries' comparative advantage relative to each other and relative to the rest of the world? Suppose that the set of products that exist are uniformly distributed within the ellipse shape area on figure 3. Then it is clear that country 1 is 'more like' the rest of the world than is country 2. Country 1's production costs relative to the rest of the world vary at most by an amount equal to the width of the ellipse, and on average by half of this. In contrast, country 2's production costs vary according to the height of the ellipse. Country 1 has comparative disadvantage relative to the world but comparative advantage relative to country 2 for all points in the ellipse and above the 45^{o} line. Thus, for this majority of commodities, it lies 'between' country 2 and the rest of the world.

Comparing the shape of the ellipse with the regions of trade creation and diversion completes the argument. As illustrated, a relatively small proportion of goods supplied to country 1 change source, and for most of those that do, this is trade creation. For country 2, a much higher proportion of goods change source of supply (all those in shaded areas), and

most of these changes are trade diversion – goods such as δ coming from country 1 instead of from the rest of the world. Thus, this multi-commodity framework seems to confirm our earlier findings. The 'extreme' country does worse than the 'intermediate' one.

A continuum of products:

We now develop this framework into a fully articulated model. To do this we divide the set of products into two; manufactures and agriculture. There is a continuum of manufacturing products, restricted to lie on a line on b_1b_2 space, as is usual in such a model.[8] We add a fixed factor in the agricultural sector, which means that the wage in each country rises with demand for its manufacturing exports, as labour is drawn out of agriculture.

Agriculture: The total labour force in each of the integrating economies is denoted N, and manufacturing employment is L_i, $i = 1, 2$. The agricultural production function is the same in both the integrating countries, and takes the form $A(N - L_i)$, with function A increasing and strictly concave. The world price of agriculture is unity, and in all cases we study comparative advantage is such that the integrating countries export agriculture, so the internal price of agriculture in these countries is unity. Their wages are therefore,

$$w_i = A'(N - L_i), \qquad i = 1, 2. \tag{1}$$

Industry: There is a continuum of industrial products, indexed by $z \in [0, 1]$, all of which have world price of unity. In country 1 the labour required to produce a unit of product z is $b(z)$. Products are ranked such that this is strictly increasing in z, and we assume that it is not profitable for country 1 to export any manufactures to the rest of the world, i.e. $w_1b(z) > 1$ for all z. Although country 1 has a comparative disadvantage in manufactures relative to the rest of the world, we give it a comparative advantage relative to country 2, by

making country 2 labour input coefficients $\phi b(z)$, with $\phi > 1$. Thus, country 2 has the 'extreme' comparative advantage, as before.

The initial equilibrium is constructed with the following pattern of trade. First, country 2 imports some manufactures from country 1. If the internal tariff between these countries is *t*, then this trade occurs only if

$$w_1 t = \varphi w_2 \tag{2}$$

(which ensures that $tw_1 b(z) = w_2 \phi b(z)$). Second, countries 1 and 2 both import some manufactures from the rest of the world. Products are ranked such that unit labour costs in 1 and 2 are increasing in *z*, so products imported by these countries from the rest of the world are those with *z* greater than critical values z_1^*, z_2^* respectively. Since the world price is unity and the external tariff rate is *T*, these critical values are defined by,

$$w_1 b(z_1^*) = T, \quad \textit{and} \quad w_2 \varphi b(z_2^*) = T. \tag{3}$$

To complete characterization of equilibrium we have to find labour demand and hence the equilibrium wage rates. Country 2 imports all manufactures in the interval $[z_2^*, 1]$ from the rest of the world, and products in $[0, z_2^*]$ are supplied either by domestic production or by imports from 1; we denote the proportion produced domestically by λ. For simplicity, assume that each variety of manufacturing is demanded in equal quantity, *c*. Manufacturing employment in 2 is then,

$$L_2 = \lambda c \varphi \int_0^{z_2^*} b(z) dz. \tag{4}$$

Country 1 produces manufactures to meet local demand for products in the interval $[0, z_1^*]$, and for export to country 2. Its labour demand is therefore,

$$L_1 = c\int_0^{z_1^*} b(z)dz + c(1-\lambda)\int_0^{z_2^*} b(z)dz. \qquad (5)$$

Equations (1) to (5) are seven equations in the seven unknowns, w_i, L_i, z_i^* and λ, and characterise the equilibrium, providing $\lambda \in (0, 1)$.

The equilibrium is illustrated on figure 4. Agriculture is, by assumption, exported by both countries so has price and unit cost of unity. Costs of producing manufactures are represented by the solid lines **o----o**, with the upper line representing the initial position. The bottom left end of this line has coordinates $\{w_1 b(0), w_2 \phi b(0)\}$, the upper right end coordinates $\{w_1 b(1), w_2 \phi b(1)\}$, and the gradient of the line measures the ratio of production costs in the two countries, so is $w_2\phi/w_1$. The critical values z_1^* and z_2^* (defined by equations (3)) are as illustrated. Above these points country 1 (respectively 2) imports from the rest of the world. Below, supply comes from domestic production (country 1) or domestic production plus partner imports (country 2).

What are the effects on the equilibrium of a preferential trade liberalization between countries 1 and 2? The direct effect is to facilitate trade according to intra-CU comparative advantage, so to increase country 2's imports of manufactures from country 1. This expands manufacturing employment in 1 and reduces it in 2, so w_1 rises and w_2 falls, and the line **o---o** shifts down and to the right When $t = 1$ production costs must be the same in both countries (providing both still have some manufacturing), so wages change to the point at which $w_2\phi = w_1$, moving the line **o---o** to the new configuration illustrated on figure 4.

The changing pattern of trade can be seen from the figure. For country 2, products in the interval $[z_2^*, z^{**}]$ experience trade diversion – they were imported from the rest of the world and are now imported from the partner. Country 1 actually increases the set of products it imports from the rest of the world, because its wage has increased, now also

importing products in the interval $[z^{**}, z_1^*]$.

Explicit expressions for the effects of a small change in t on the equilibrium are given in the appendix. Here we simply record the signs:

$$\frac{dw_1}{dt} < 0, \qquad \frac{dw_2}{dt} > 0,$$

$$\frac{dz_1^*}{dt} > 0, \qquad \frac{dz_2^*}{dt} < 0, \tag{6}$$

$$\frac{d\lambda}{dt} > 0.$$

The changes in w_i and z_i^* are in line with our discussion, and the change in λ reflects country 2's increased imports of manufactures from 1. Summarising then, there is increased intra-CU trade in manufactures, a reduction in country 2's imports of manufactures from the rest of the world, and an increase in country 1's.

Evaluation of the gains and losses each country experiences requires a welfare criterion. Total income in country i is $A(N - L_i) + w_i L_i$ and each country consumes a given quantity, c, of each manufacturing product. Since these quantities are fixed, changes in utility arise only from changes in the quantity of agriculture consumed; this is the numeraire, so is simply income minus the cost of manufactures consumed. We therefore have country 1 welfare indicator, v_1

$$v_1 = A(N - L_1) + w_1 L_1 - cw_1 \int_0^{z_1^*} b(z)dz - c\int_{z_1^*}^{1} dz. \tag{7}$$

where the final two terms are the cost of manufactures produced domestically and imported from the rest of the world (at world price 1). Country 2 welfare is

$$v_2 = A(N - L_2) + w_2 L_2 - c[\lambda\varphi w_2 + (1 - \lambda)w_1] \int_0^{z_2^*} b(z)dz - c\int_{z_2^*}^{1} dz. \tag{8}$$

where the third term captures the fact that supply of goods in the interval $[0, z_2^*]$ is split between domestic supply and imports from the partner country. Totally differentiating gives

$$\frac{dv_1}{dt}\frac{1}{c} = [1 - T]\frac{dz_1^*}{dt} + (1-\lambda)\frac{dw_1}{dt}\int_0^{z_2^*} b(z)dz < 0, \quad (9)$$

and

$$\frac{dv_2}{dt}\frac{1}{c} = \left[1 - T\left(\frac{1-\lambda}{t} + \lambda\right)\right]\frac{dz_2^*}{dt} - (1-\lambda)\frac{dw_1}{dt}\int_0^{z_2^*} b(z)dz + w_1(1-t)\frac{d\lambda}{dt}\int_0^{z_2^*} b(z)dz. \quad (10)$$

We see from this that country 1 unambiguously gains from preferential trade liberalization (a reduction in *t*). The first term is negative, and captures the fact that the increase in wages in country 1 causes it to import more manufactures from the rest of the world. These have price cost wedge (*T* - 1), so the quantity expansion is beneficial. The second term is a terms of trade improvement on the quantity of manufactures exported to country 2.

For country 2, the first two terms in equation (10) are sources of loss. The first is trade diversion; the range of products imported from the rest of the world is reduced and replaced by a combination of local production and partner country imports. (If $\lambda = 1$, the replacement is entirely local production and the price cost wedge is (*T* - 1); if $\lambda = 0$, the rest of world imports are replaced by partner imports, so the relevant price cost wedge is (*T/t* - 1), capturing tariffs on both external and internal trade). The second term is the terms of trade loss on imports from country 1, occurring as w_1 has increased. The final term is trade creation. When *t* is reduced λ falls, i.e. the share of local products in the range $[0, z_2^*]$ that are imported from the partner country increases, and this raises welfare if there is a price cost wedge ($t > 1$). The overall effect on country 2 welfare is ambiguous, depending on the magnitudes of the differentials in (10), as well as on tariff rates. However, it is clear that if the internal tariff, *t*, is close enough to free trade, then there will be welfare loss, as the final

term in (10) becomes small.

The general point is that the intermediate country, country 1, is able to expand manufacturing exports and production, this increasing its wage and improving its terms of trade. Although the increase in manufacturing production is out of line with its comparative advantage with the rest of the world, it also increases its manufacturing imports from the rest of the world (because of the wage increase) bringing further welfare gain. In contrast, the extreme country, country 2, has a decline in manufacturing production, fall in its wage, and a terms of trade decline, due to both trade diversion and to the increase in its partner's wage. Against this, it has some trade creation. The model therefore captures both the differential impact of trade creation and trade diversion, and changes in internal terms of trade due to wage changes induced by relocation of manufacturing production. Both work in favour of the intermediate country and against the extreme one.

4: Income divergence and convergence: a Heckscher-Ohlin-Armington model.

The final model derives comparative advantage from differences in factor endowments. We use an assumption of product differentiation at the national level to maintain non-specialisation and to allow output prices to change, rather than being set by supply of homogeneous products from the rest of the world. Analysis of this model requires numerical simulation, although most of the intuition comes directly from Heckscher-Ohlin.

The model structure is as follows. All countries have the same technology and are endowed with two factors of production, skilled and unskilled labour, S and U. There are three countries one of which – the rest of the world – is large, and is endowed with equal quantities of these two factors. Countries 1 and 2 may have factor endowments different from each other and from the rest of the world, and these differences are the basis of their

comparative advantage.

Each country produces two goods which differ in factor intensity. For ease of interpretation we impose symmetry between the goods, assuming that they take the same share in consumption, and that the factor intensity in one industry is the reciprocal of that in the other industry (using Cobb-Douglas technologies, see appendix 2 for details). Each of these goods is differentiated by location of production, although we set the amount of differentiation at minimal levels – the elasticity of substitution between different countries' products is 50 in the examples that follow.

The model is constructed such that the relative price of the two goods produced in the rest of the world is unity, and this world price ratio is constant in all experiments. In the initial equilibrium all imports face the same tariff rate (set at 20%). The internal price ratios and trade patterns of countries 1 and 2 reflect these tariffs and each country's factor abundance. The experiment we study is the removal of the tariff between countries 1 and 2, and we show how outcomes depend on their endowments, relative to each other and to the rest of the world.

Results are illustrated on figure 5, the axes of which give the country 1 and 2 factor endowments of S relative to U. In this figure $S_i + U_i = 1$, ($i = 1, 2$) so, for example, at the point $S_2 / U_2 = 2$, $S_2 = 0.67$ and $U_2 = 0.33$. Thus, to the right of $S_2 / U_2 = 1$ country 2 is S abundant relative to the world, and similarly, above $S_1 / U_1 = 1$ country 1 is S abundant relative to the world. Intra-union comparative advantage is measured relative to the 45^o line, above which country 1 is S abundant relative to country 2.

The contour lines on the figure are the level sets of the country 2 proportionate welfare changes caused by formation of the CU. The lines marked **00** are zero contours, and the plus and minus signs indicate regions of country 2 gain and loss from CU formation. The

welfare surface forms a saddle, with very small gains occurring along the 45^o line, on which the countries have the same relative endowments.

The figure illustrates first, that the gains from union are largest for a country with relative factor endowment close to that of the rest of the world. Thus, the highest levels of welfare change for country 2 arise when its endowment ratio is very close to the rest of the world's, i.e., $S_2 / U_2 \approx 1$. And second, the gains for this country are largest if its partner has a relatively extreme endowment, well away (in either direction) from that of the rest of the world (i.e. at the top and bottom of the figure). As we have argued before, if a country has endowment similar to the rest of the world's, there is little scope for trade diversion; it is doing little trade with the rest of the world in the initial situation, so the potential amount of trade that can be diverted is small. Forming a CU with a country with a very different endowment maximizes the scope for trade creation.

The converse of this is that countries with 'extreme' endowments, well away from that of the rest of the world, are most likely to suffer a welfare loss. Thus, if S_2 / U_2 is very low (or high) country 2 is likely to experience welfare loss, particularly if its partner is like the rest of the world (S_1 / U_1 close to unity).

Convergence and divergence.

In figure 5 the factors S and U enter the model symmetrically, so to refer to them as skilled and unskilled labour is a misnomer -- the wage of S is on average no higher than that of U, and countries with much S are on average no richer than those with much U. To capture the idea that S abundant economies are relatively high income we now modify the figure in the following way. In figure 5, if an economy gained a unit of S it lost a unit of U (since $S_i + U_i = 1$). Now, in figure 6, we hold U constant, and simply vary the amount of S.

Thus, at a high value of S_i / U_i the representative individual in country *i* has the fixed endowment of U, plus a large number of units of S. Units of S should therefore be interpreted as efficiency units; S and U enter production as before, but S abundant economies will tend to be richer, since they are endowed with more efficiency units of S. For example, moving from $S_2 / U_2 = 0.5$ to $S_2 / U_2 = 2$ holds U_2 constant at 0.5, raises S_2 from 0.25 to 1, and approximately doubles country 2 income.

Contours in figure 6 illustrate, as before, the country 2 proportionate welfare change due to CU formation. Two main messages come from the figure. The first is the original argument, that CU formation between two poor countries tends to lead to income divergence, and between rich countries leads to convergence. Consider point A. At this point country 2 is poorer than country 1 (it is S scarce relative to its partner), and suffers a welfare reduction, while country 1 experiences a welfare gain, causing divergence. (The country 1 gain is not illustrated directly, but can be seen by reversing country labels and looking at point A', the reflection of A around the 45^o line). Conversely, at point B both countries are S abundant, but country 2 relatively more so, and therefore relatively rich. It is now country 2 that loses and country 1 that gains, causing convergence of their real incomes.

The second point concerns the attractiveness of 'North-South' agreements for low income countries. Let us take a fixed and low value of S_2 / U_2, and ask: what type of partner is country 2 best off forming a CU with? The answer is clearly a skilled labour abundant economy (high S_1 / U_1). There are two forces driving this. One is that trade creation is maximised and trade diversion minimised with such a partner (this force shows up on figure 5 as well as figure 6). The other is a terms of trade gain. If the skill abundant country has relatively high total income, then the low income country experiences relatively large growth in export demand which improves its terms of trade, giving it a larger share of the aggregate

gains from CU formation.[9]

5: Concluding comments

Systematic analyses of the comparative advantage of customs union members – relative to each other and relative to the rest of the world – enable us to establish how the real income effects of regional integration are distributed amongst member countries. In general, countries with 'extreme' comparative advantage do worse than those with comparative advantage intermediate between the partner and the rest of the world. This enables us to resolve the apparent paradox that, empirically, formation of a CU containing high income members is a force for convergence of per capita incomes, while developing country CUs have sometimes been associated with divergence. In the former case the extreme countries are those with the highest per capita incomes, while in the latter they are those with the lowest. The analysis warns of real dangers from 'South-South' integration schemes, and suggests that low income countries are better served by integration with high income countries.

The mechanisms underlying the analysis are just the traditional forces of trade creation and diversion, working in a perfectly competitive environment. Other forces may also be important in determining gainers and losers. Technology flows, foreign direct investment and other aspects of policy reform are all important, and so too may be agglomeration forces. These can lead to clustering of manufacturing in selected locations in a CU, and might be particularly powerful in developing countries. If manufacturing is starting from a small base without established historical lock-in, and if activities complementary to manufacturing (for example, provision of business services, telecommunications and transport infrastructure) are thinly distributed, then the likelihood of

manufacturing development being concentrated in a few locations is increased. This suggests that, particularly for developing countries, the forces analysed in this paper might understate the extent of divergence that could be caused by regional trade agreements.

Appendix:

Section 3:

Comparative statics: Totally differentiating equation (2),

$$\frac{dw_2}{w_2} = \frac{dw_1}{w_1} + \frac{dt}{t}, \tag{A1}$$

Totally differentiating (1) with L_i substituted from the manufacturing employment equations (4) and (5) gives,

$$\begin{aligned} -dw_2 &= c\varphi A''(N-L_2)\left[\lambda b(z_2^*)dz_2^* + d\lambda\int_0^{z_2^*} b(z)dz\right], \\ -dw_1 &= cA''(N-L_1)\left[b(z_1^*)dz_1^* + (1-\lambda)b(z_2^*)dz_2^* - d\lambda\int_0^{z_2^*} b(z)dz\right]. \end{aligned} \tag{A2}$$

Totally differentiating equations (3)

$$\begin{aligned} dw_2 b(z_2^*) + w_2 b'(z_2^*)dz_2^* &= 0, \\ dw_1 b(z_1^*) + w_1 b'(z_1^*)dz_1^* &= 0. \end{aligned} \tag{A3}$$

Adding equations (A2) gives:

$$-\frac{dw_2}{\varphi cA''(N-L_2)} - \frac{dw_1}{cA''(N-L_1)} = b(z_1^*)dz_1^* + b(z_2^*)dz_2^* \tag{A4}$$

Using (A3) to eliminate dz_2^* gives

$$H_2\frac{dw_2}{w_2} + H_1\frac{dw_1}{w_1} = 0 \tag{A5}$$

where

$$H_1 = \left[\frac{b(z_1^*)^2}{b'(z_1^*)} - \frac{w_1}{cA''(N-L_1)}\right] > 0, \qquad H_2 = \left[\frac{b(z_2^*)^2}{b'(z_2^*)} - \frac{w_2}{\varphi cA''(N-L_2)}\right] > 0 \tag{A6}$$

Using (A5) and (A1) we derive

$$\frac{dw_1}{w_1} = -\frac{dt}{t}\left(\frac{H_2}{H_1+H_2}\right) < 0, \qquad \frac{dw_2}{w_2} = \frac{dt}{t}\left(\frac{H_1}{H_1+H_2}\right) > 0. \tag{A7}$$

These equations sign the changes in wages. Changes in z_1^* and z_2^* follow directly from (A3). Using (A3) in (A2) we obtain the following expression for $d\lambda$

$$\frac{\lambda b(z_2^*)^2}{w_2 b'(z_2^*)} - \frac{1}{c\varphi A''(N-L_2)} = \frac{d\lambda}{dw_2}\int_0^{z_2^*} b(z)dz > 0. \tag{A8}$$

Welfare change: The welfare indicators can be simplified, using equations (4) and (5) for L_i, to the form:

$$\begin{aligned} v_1 &= A(N - L_1) + w_1(1-\lambda)c\int_0^{z_2^*} b(z)dz - c\int_{z_1^*}^{1} dz, \\ v_2 &= A(N - L_2) - w_1(1-\lambda)c\int_0^{z_2^*} b(z)dz - c\int_{z_2^*}^{1} dz \end{aligned} \tag{A9}$$

Totally differentiating and using (2) and (3) gives (9) and (10) of the text.

Section 4:

There are two goods, *x* and *y*, (indicated by superscripts), two countries 1 and 2 (indicated by subscripts), and the rest of the world (indicated by subscript 0). Factor endowments are S_i and U_i with respective prices v_i and w_i. Technologies are described by cost functions,

$$c_i^x = w_i^{\lambda} v_i^{1-\lambda}, \qquad c_i^y = w_i^{1-\lambda} v_i^{\lambda}, \qquad \lambda = 0.25. \tag{A10}$$

Factor market clearing takes the form

$$S_i = \frac{\partial c^x}{\partial v_i} q_i^x + \frac{\partial c^y}{\partial v_i} q_i^y, \qquad U_i = \frac{\partial c^x}{\partial w_i} q_i^x + \frac{\partial c^y}{\partial w_i} q_i^y, \qquad i = 1, 2. \tag{A11}$$

where q_i^k denotes the quantity of good *k* produced in country *i*.

Preferences are described by

$$m_i = u_i (G_i^x G_i^y)^{1/2}, \tag{A12}$$

where m_i is income, u_i is utility, and G_i^k is the price index of good *k* in country *i*, defined by

$$G_i^k = \left[(p_i^k)^{1-\sigma} + (tp_j^k)^{1-\sigma} + T^{1-\sigma}\right]^{1/(1-\sigma)}, \qquad i,j = 1,2, \quad i \neq j. \tag{A13}$$

where p_i^k denotes the price of good *k* produced in country *i*, equal to unit cost, *t* denotes the internal tariff and *T* the external tariff. σ is set at 50, and *t* and *T* both take initial value 1.2, *t* dropping to 1 when the customs union is formed. Demands are derived from utility maximisation, and income is given by

$$m_i = w_i U_i + v_i S_i + p_j^x q_{ji}^x (t-1) + p_j^y q_{ji}^y (t-1) + q_{0i} x(T-1) + q_{0i} y(T-1), \qquad i,j = 1,2. \tag{A14}$$

where q_{ij}^k denotes the quantity of good *k* produced in *j* and sold in *i*. In addition, country 0 has demands q_{i0}^k which have demand elasticity σ and are scaled such that in the initial equilibrium an average of 10% of the output of countries 1 and 2 are exported to country 0.

In figure 5 endowments vary in the interval S_i = [0.25, 0.75] with $U_i = 1 - S_i$.
In figure 6 endowments vary in the interval S_i = [0.1667, 1.5] with U_i = 0.5.

Endnotes:

[1] There is a large literature on sufficient conditions, typically in terms of changes in endogenous variables. For a survey see Baldwin and Venables (1995).

[2] Differences measured by the standard deviation across countries of log per capita incomes.

[3] The average of France, Germany, Italy and the UK.

[4] Another good example is the divergence in economic performance between East and West Pakistan which was one of the factors leading to the break up of the country. See World Bank (2000) for fuller discussion of these cases.

[5] Previous attempts to build structured general equilibrium models to analyse economic integration include the 3x3 models surveyed in Lloyd (1982).

[6] p_0 is the relative price on international markets. There are no trade or transport costs, and internal prices differ from p_0 only because of tariffs.

[7] We use tariff factors throughout, so T = 1 is free trade.

[8] Manufactured products are modeled as in Dornbusch, Fischer and Samuelson (1977).

[9] See Spilimbergo and Stein (1998) for a similar conclusion.

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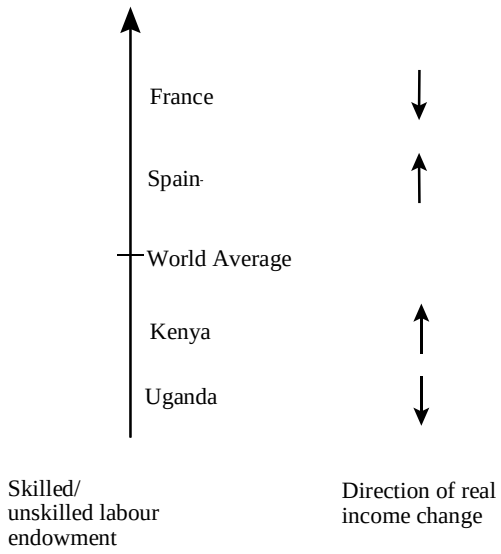


Figure 1: Relative endowments and welfare change

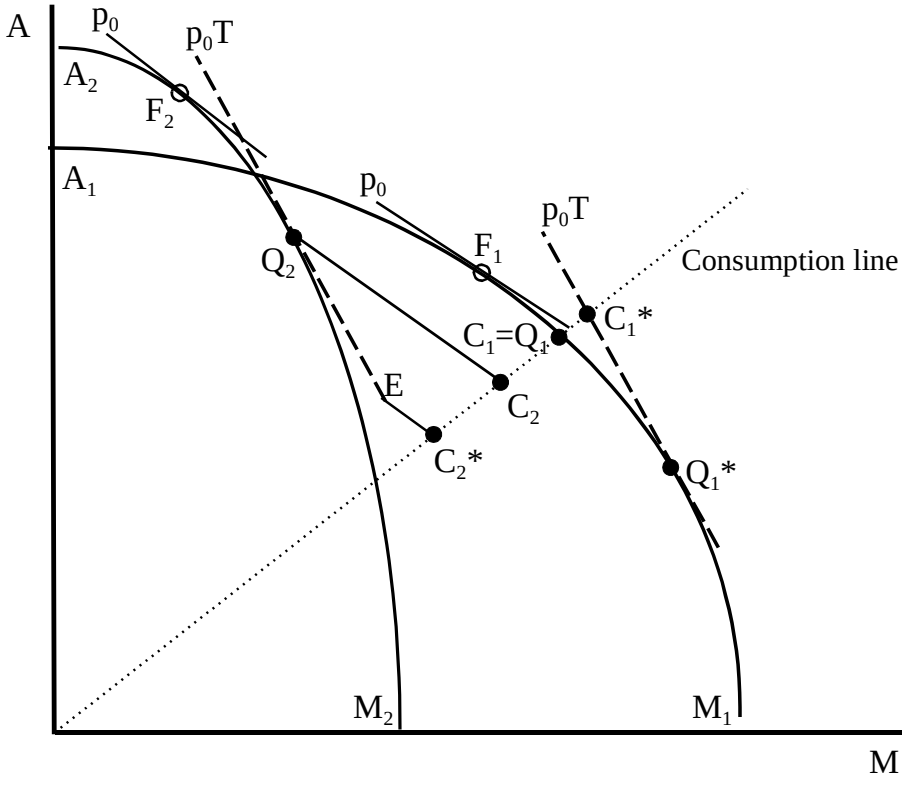
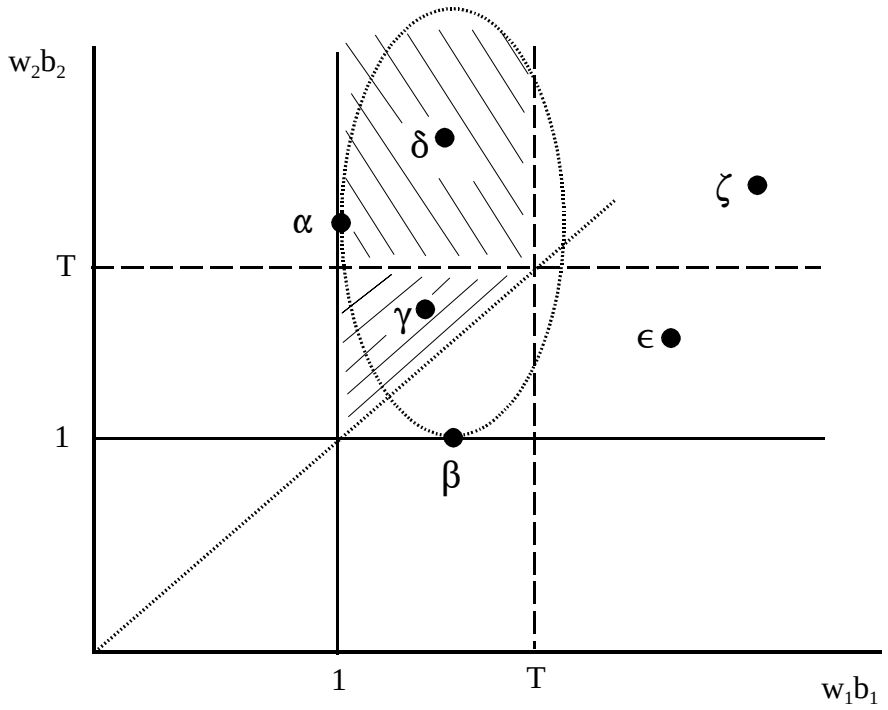


Figure 2: Preferential liberalization



Country 2 trade creation: Country 2 trade diversion:

Figure 3: Sourcing of manufactures

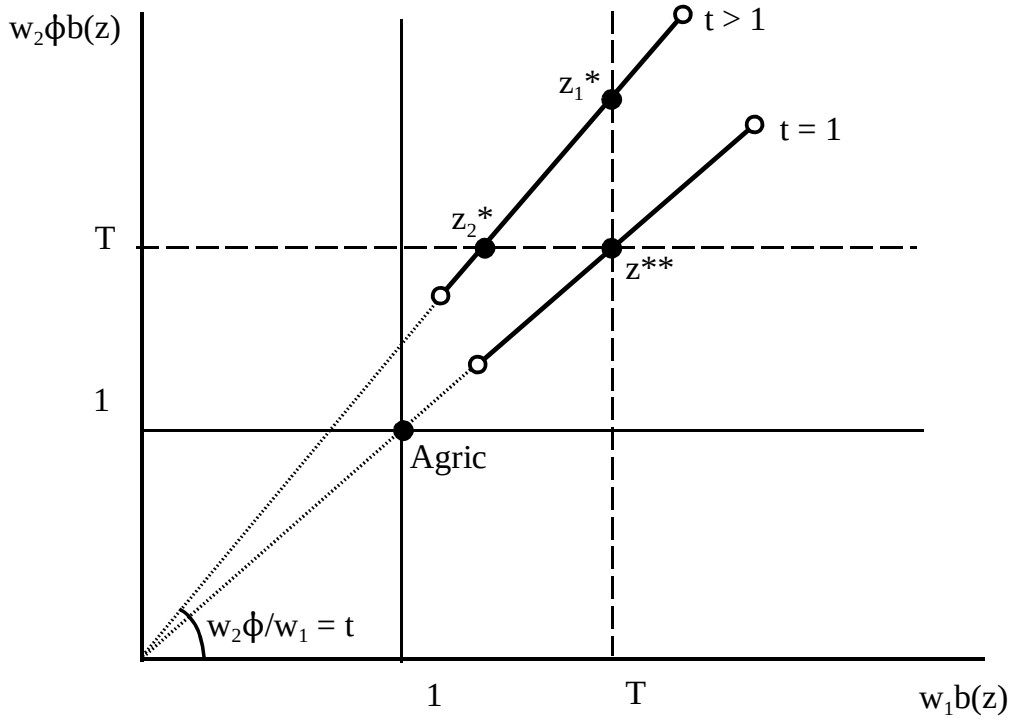


Figure 4: A continuum of products

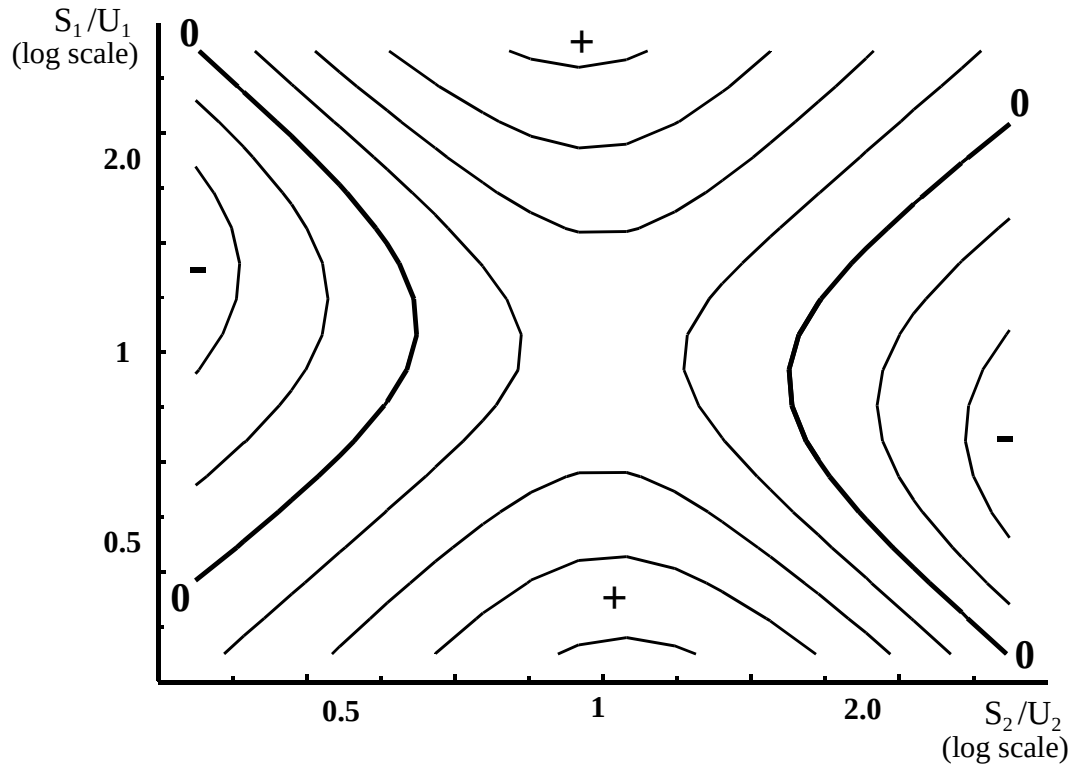


Figure 5: Country 2 welfare change contours. ($S_i + U_i$ = constant)

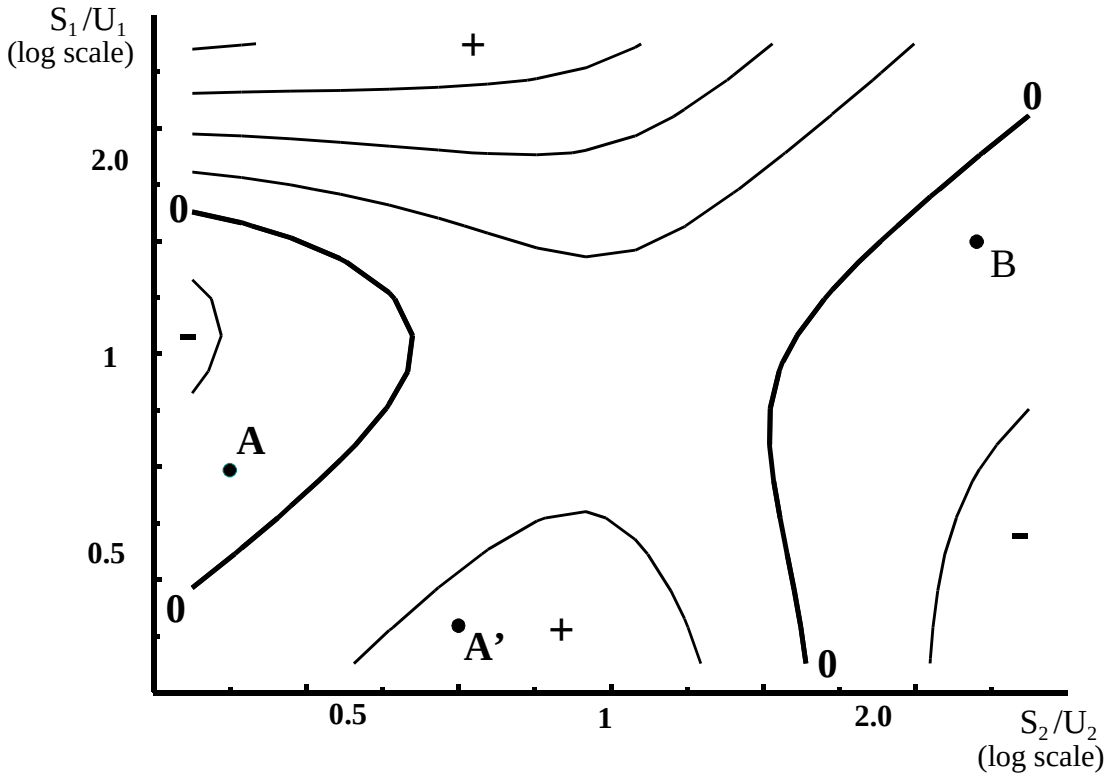


Figure 6: Country 2 welfare change contours: (U_i = constant)