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5 The Welfare Implications of Trading Blocs among Countries with Different Endowments

Antonio Spilimbergo and Ernesto Stein

5.1 Introduction

Over the last decade, a large number of bilateral trading arrangements have been created, strengthened, or proposed in nearly every region of the world. The North American Free Trade Agreement (NAFTA), the European Union, Asia-Pacific Economic Cooperation (APEC), and Mercosur are just a few examples of this trend. Furthermore, empirical evidence on bilateral trade flows shows that this phenomenon has been accompanied by increased trade regionalization, at least in some regions (Frankel, Stein, and Wei, chap. 4 in this volume). Therefore, the study of the welfare implications of trading blocs has become very relevant.

One important contributor to the debate has been Krugman (1991a, 1991b). He uses a model of trade under monopolistic competition to study how welfare of the world depends on the number of blocs into which the world is divided. In Krugman's model, the world is completely symmetrical, so all blocs are exactly the same size. He finds that the number of blocs associated with the lowest possible welfare is three. The fact that welfare declines starting from one bloc (free trade) requires no explanation. The reason for the increase in welfare beyond three blocs, however, is more subtle: the distortions associated with a given tariff level become smaller as the number of blocs becomes larger and consumers buy a larger proportion of the varieties they consume from outside the bloc. This happens because a smaller portion of the relative prices

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are affected by the tariff.[1] The conclusion is that a potential consolidation of the world into three trading blocs would have a negative effect on welfare.

Krugman's model has been criticized by Deardorff and Stern (1992) and by Haveman (1992) on the grounds that it relies too heavily on the Armington assumption: goods that differ in their country of origin are imperfect substitutes. This means that each country will be importing goods from every other country in the world. The critics claim that this feature of the model increases the likelihood of trade diversion when trading blocs are formed, and therefore results in an overly pessimistic view of the prospects for regionalization.

Deardorff and Stern reach a very different conclusion, using a model in which there are more countries than goods and trade is explained by comparative advantage. In their model, trading with a few countries is enough to realize most of the benefits that trade has to offer. Expected world welfare increases monotonically as the world consolidates into trading blocs, reaching a maximum for the case of a single bloc, or free trade. However, in order to obtain this result, the authors go to the other extreme. This happens because they assume that tariffs between countries that are not members of the same bloc are infinite! In effect, they eliminate any possibility of trade diversion altogether.

By adding optimal tariffs to the basic Deardorff and Stern model, Haveman obtains results that are rather similar to Krugman's: expected world welfare will be reduced with the expansion of blocs except at the last stage when the last barrier falls, resulting in worldwide free trade. However, for the case of exogenous tariffs, his results become consistent with those of Deardorff and Stern: expected world welfare increases monotonically as the number of blocs becomes smaller.[2]

There are a number of reasons why studying the effects of regionalization under the assumption of exogenous tariffs is important. One is that article XXIV in GATT does not allow increases in tariffs to outside countries when preferential trade agreements (PTAs) are formed. Moreover, the optimal tariff argument does not seem to be what drives governments to impose tariffs. In addition, the optimal tariffs calculated by Krugman and Haveman seem to be too large in comparison to those we see in the real world (even when tariffs are used as shorthand for all protection). We are left, then, with one model that is pessimistic regarding the prospects of regionalization, partly due to its overstating the extent of trade diversion (product-variety model), and with another model that is optimistic and probably understates the extent of trade diversion (comparative advantage).

By adding transport costs to the differentiated-products model, Stein and Frankel (1994) have produced a model that allows the study of how the welfare

1. The fact that Krugman assumes that tariffs are set optimally contributes to the increase in welfare beyond three blocs, but is not crucial for this result.

2. Haveman actually restricts the tariff level in the bloc to be smaller or equal to that of the least protectionist member. Since these restrictions are binding, for our purposes they are equivalent to exogenous tariffs.

effects depend on such costs, as well as on the geographical character of trading blocs (natural versus unnatural). In addition, including transport costs makes the model more realistic regarding the extent of trade diversion, since now natural barriers appear that restrict trade between countries that are far apart, therefore reducing the amount of trade diversion when blocs are formed.

In this paper, we go a step further in the direction of resolving the issue of the likely welfare effects of world regionalization in trade, by using a two-factor model where trade is explained both by product variety and by comparative advantage. In fact, by appropriately setting the values of some parameters, the model can be transformed into either a pure product differentiation model (as in Krugman or Stein and Frankel) or a comparative advantage model.

In addition, introducing two factors of production will enable us to study the welfare implications of the formation of trading blocs among countries at different stages of development (north-south integration), as well as those formed among similar countries (north-north and south-south integration).[3] Our framework allows us to evaluate the case of PTAs as well as that of free trade areas (FTAs), the effects of transport costs, and the effects of different countries having different tariff levels.

After setting up the model for the closed economy in the next section, we allow for trade in section 5.3. In section 5.4 we study the welfare implications of different types of trade arrangements. Section 5.5 offers our conclusions.

5.2 The Model for the Closed Economy

We will work with a model where there are three sectors: agriculture (a), intermediate inputs (v), and manufactures (m); and two factors of production: capital (K) and labor (L).[4] On the demand side, consumers share a Cobb-Douglas utility function given by

$$U = M^{\alpha} c_a^{1-\alpha}, \tag{1}$$

where $0 < \alpha \leq 1$, and M and c_a are the consumptions of manufactures and agriculture. The Cobb-Douglas specification results in consumers spending a fixed proportion of their income on each type of good.

On the production side, we make the assumption that each factor of production is specific to the production of one good. Agriculture is a homogeneous good produced under constant returns to scale, and labor is the only factor used in its production. The production function is given by $q_a = L$, which means

3. Another model that incorporates both product variety and comparative advantage can be found in Bond and Syropoulos (1993). In their work, however, countries are completely symmetric except that each of them is particularly adept at producing a different variety. Therefore, the problem of blocs when there are differently endowed countries cannot be tackled with their model. Levy (1993) has a two-factor model that combines comparative advantage and product variety with a specification that is different from the one used here. He assumes, as do Deardorff and Stern, that tariffs are either prohibitive or zero.

4. The basic structure of our model is in the tradition of Dixit and Norman (1980).

that each unit of labor is transformed into one unit of agriculture. Therefore, given perfect competition, $p_a = w$, where p_a is the price of the agriculture good and w is the wage.

There is a very large number of potential varieties of intermediate inputs, which are produced under monopolistic competition and use only capital as a factor of production. Increasing returns to scale are introduced by assuming a fixed cost (γ) and a constant marginal cost (β):

$$x_i = \frac{K_i - \gamma}{\beta}, \tag{2}$$

where x_i is the production of the ith variety, and K_i the amount of capital used in its production. Each intermediate input enters symmetrically into the production of the final manufactured good, produced under a Dixit-Stiglitz technology with constant returns to scale:

$$M = \left(\sum x_i^{\theta}\right)^{1/\theta}, \tag{3}$$

where $0 < \theta < 1$. This production function results in preference for variety, which becomes stronger as the parameter θ becomes closer to 0. Note that we use M to denote both consumption and production per capita of the manufactured good, since in this model they are always equal.[5]

We assume that each individual is endowed with one unit of labor and k units of capital. In this way, L represents population size as well as labor, and k is the capital-to-labor ratio. The total capital in the economy is, therefore, $K = kL$. Since every individual is equally endowed, we can set aside distributive considerations and work with a representative agent. Equilibrium in the intermediate input market is given by

$$x_i = Lc_i. \tag{4}$$

Equilibrium in the capital market is given by

$$K = \sum_{i=1}^{n} K_i = \sum_{i=1}^{n} (\beta x_i + \gamma). \tag{5}$$

As consumers, the individual maximization problem is

$$\max M^{\alpha} c_a^{1-\alpha} \quad \text{subject to} \quad Mp_m + c_a p_a = I, \tag{6}$$

where $I = rk + w$ is the per capita income. From the first-order conditions we can obtain the inverse demand function:

$$p_m = \frac{\alpha}{1 - \alpha} p_a \frac{c_a}{M}. \tag{7}$$

5. In fact, M could alternatively be interpreted as the utility derived from the consumption of the heterogeneous product in a two-good model. In that case, we would have a utility function that is Cobb-Douglas between goods, and Dixit-Stiglitz between varieties. Both specifications are equivalent.

As producers of the final manufactured good, individuals take p_m as given (since manufactures are produced competitively), and solve the following problem:

$$\max \left(\sum_{i=1}^{n} c^{\theta_i} \right)^{1/\theta} \quad \text{subject to} \quad \sum_{i=1}^{n} p_i c_i = M p_m. \tag{8}$$

The elasticity of demand for each variety of intermediate inputs can be derived from the inverse demand function, which in turn follows from the first-order conditions. For a sufficiently large n, it can be approximated by

$$\varepsilon_i \equiv - \frac{\partial c_i}{\partial p_i} \frac{p_i}{c_i} \simeq \frac{1}{1 - \theta}. \tag{9}$$

Note that the elasticity does not depend on the quantity demanded, but only on the parameter θ. The firms in the intermediate inputs sector are monopolistically competitive and set the price to maximize profits:

$$\pi_i = p_i x_i - (\gamma + \beta x_i) r. \tag{10}$$

Using equation (9) and the first-order condition for profit maximization, we obtain the profit-maximizing price:

$$p_i = \frac{\beta r}{\theta}. \tag{11}$$

Since β is the same for all the intermediate inputs, the price of each variety will be the same. Note that the price in equilibrium does not depend on output.

Free entry condition combined with equation (11) yields the output per variety:

$$x_i = \frac{\theta \gamma}{\beta(1 - \theta)}. \tag{12}$$

Introducing equation (12) into the capital market equilibrium condition (5), we get the number of varieties:

$$n = \frac{K(1 - \theta)}{\gamma}. \tag{13}$$

Note that the production of each variety in equilibrium depends only on the cost parameters and on the substitution parameter θ. On the other hand, the number of varieties depends on the capital endowment of the economy. The fact that production of each variety in equilibrium is fixed is the result of the assumptions made about the production and utility functions, and will be used later when solving for the effects of trading blocs.

Using the zero-profit condition in the final manufactured good sector, and plugging in the equations for n, p_i, and x_i, we obtain the price of the final manufactured good as a function of r:

$$(14) \qquad p_m = \frac{\sum_{i=1}^{n} p_i c_i}{M} = \frac{n p_i c_i}{(n c_i^{\theta})^{1/\theta}} = \left(\frac{K(1-\theta)}{\gamma}\right)^{1-1/\theta} \frac{\beta r}{\theta}.$$

Plugging equation (14) into the inverse demand function (7), substituting for M and p_m, and using $w = p_a$ and $c_a = L$, we obtain the relative returns to the factors of production:

$$(15) \qquad \frac{r}{w} = \frac{\alpha}{1-\alpha} \frac{L}{K}.$$

Note that the relative price of the factors of production depends only on the relative endowments (L and K), while the relative price (p_m/p_a) has a scale effect that depends on the capital endowment of the economy: the bigger K is, the lower p_m is, as can be verified by dividing the left-hand side of equation (14) by p_a, and the right-hand side by w.

5.3 Allowing for Trade

We assume that countries have similar tastes, technologies, and population size.[6] We will proceed in steps. First, we allow for tariffs in a world formed by N countries, assuming for the moment that they have the same factor proportions. In this first step, gains from trade arise only due to increased variety. Next, we introduce capital-rich and capital-poor countries. In this case, there are gains due to both comparative advantage and product variety. Note that if the parameter α in the utility function (1) were equal to 1, all gains would come from increase in variety, as in Stein and Frankel (1994). On the other hand, if the parameter θ were equal to 1, there would be no preference for variety, and all gains would arise from comparative advantage. Finally, we will allow, in turn, for the formation of trading blocs, and for transport costs.

5.3.1 Allowing for Tariffs in a World with N Identical Countries

We introduce ad valorem tariffs, uniform across countries, and for the moment nondiscriminatory. The tariff revenue is redistributed equally to all consumers as a lump-sum transfer.[7] Now, the producer of the manufactured good faces different prices for different varieties of the intermediate inputs, depending on whether they are produced at home or abroad. The price of a foreign variety in terms of a domestic one is

$$(16) \qquad p_f = p_h(1+t).$$

The producer of the final good now faces the following problem:

6. A recent model that addresses the consequences of trade between north and south when preferences are different is Spilimbergo (1994).

7. We assume that the number of consumers is sufficiently large that they view this transfer as exogenous.

$$\max M = \left(\sum c_i^{\theta}\right)^{1/\theta} \quad \text{subject to} \quad \sum c_h p_h + \sum c_f p_f \leq M p_m. \tag{17}$$

The first-order conditions yield

$$c_f = c_h \left(\frac{p_h}{p_f}\right)^{1/(1-\theta)} = c_h \left(\frac{1}{1+t}\right)^{1/(1-\theta)}. \tag{18}$$

In equilibrium, the per capita production of the manufactured good will be

$$M = c_h n^{1/\theta}\left[1 + (N-1)\left(\frac{1}{1+t}\right)^{1/(1-\theta)}\right]^{1/\theta} = c_h n^{1/\theta} \Psi^{1/\theta}, \tag{19}$$

where

$$\Psi = 1 + (N-1)\left(\frac{1}{1+t}\right)^{\theta/(1-\theta)} \tag{20}$$

The zero-profit condition in the production of manufactures yields the price of final manufactured goods in terms of the intermediate home variety:

$$p_m = p_h n^{(\theta-1)/\theta}\left(\frac{1}{\Psi}\right)^{(1-\theta)/\theta} = \underbrace{\frac{\beta r}{\theta}}_{p_h}\left[\underbrace{\frac{K(1-\theta)}{\gamma}}_{n}\right]^{(\theta-1)/\theta}\left(\frac{1}{\Psi}\right)^{(1-\theta)/\theta}. \tag{21}$$

We can interpret $(1/\Psi)^{(1-\theta)/\theta}$ as the price index of the intermediate inputs in terms of the price of the domestic variety. We can see that the price of manufactures is proportional to the price of the home varieties. As expected, it depends negatively on n, the number of varieties produced in each country, due to preference for variety in the production function.

We have solved the problem of the manufacturer of final goods, who takes p_m as given. Now we need to solve the problem of the consumer. We can express this problem as

$$\max M^{\alpha} c_a^{1-\alpha} \quad \text{subject to} \quad p_m M + p_a c_a \leq rk + w + T, \tag{22}$$

where T is the per capita tariff receipts that are handed back to consumers as a lump-sum transfer:

$$T = t p_h \underbrace{n(N-1)}_{\text{\# of foreign varieties}} \underbrace{c_h \left(\frac{1}{1+t}\right)^{1/(1-\theta)}}_{\text{consume per variety}}. \tag{23}$$

The first-order conditions yield

$$\frac{c_a}{M} = \frac{(1-\alpha)}{\alpha}\frac{p_m}{p_a}. \tag{24}$$

Substituting p_m, p_a, c_a, and M in equation (24), we can obtain the consumption of the home variety in terms of exogenous parameters:

$$c_h = \frac{\theta k}{\beta n} \frac{1}{\left[1 + (N-1)\left(\frac{1}{1+t}\right)^{1/(1-\theta)}\right]}. \tag{25}$$

Plugging c_h in expression (19), we can find the production of manufactures in terms of exogenous variables. Plugging c_m and c_a into (18), we obtain

$$\frac{r}{w} = \frac{\alpha}{(1-\alpha)} \left(\frac{1 + (N-1)\left(\frac{1}{1+t}\right)^{1/(1-\theta)}}{1 + (N-1)\left(\frac{1}{1+t}\right)^{\theta/(1-\theta)}} \right) \frac{1}{k}. \tag{26}$$

A comparison with expression (15) shows that, in the absence of tariffs, the relative return to the factors of production are the same as in the case of the closed economy. As the tariff rate increases, the relative return to capital falls. Note that this effect disappears in the case where the intermediate inputs are perfect substitutes ($\theta = 1$).

5.3.2 Trade When Countries Have Different Factor Proportions

We now introduce two types of countries, which differ only in their capital endowment. In poor countries, each individual is endowed with one unit of capital, as well as one unit of labor ($k_p = 1$). In rich countries, each individual owns one unit of labor and k_r units of capital (where $k_r > 1$). Since the capital-to-labor ratio in the poor country is 1, we will drop the subscript for the case of the rich country, and denote its capital-to-labor ratio simply as k. From equation (13), the number of varieties produced in rich countries will be larger than that in poor countries by a factor of k. We make the assumption that k is sufficiently large relative to the tariff rate to ensure that there is trade in agriculture.[8]

The solution of the model involves solving for the prices of the factors of production (w_r, w_p, r_r, r_p); the equilibrium conditions in trade in an intermediate input and agriculture, together with a normalization and the law of one price for agriculture, give us the conditions to solve the system.

We first find the demand for intermediate inputs. The relative price of capital in rich and poor countries will be denoted as ρ. Given that the cost and substitution parameters β and θ are assumed to be the same across countries, it follows from equation (11) that ρ is also equal to the price of the home varieties in a rich country (p_{hr}) relative to that of the home varieties in a poor country (p_{hp}):

$$\frac{r_r}{r_p} = \frac{p_{hr}}{p_{hp}} = \rho. \tag{27}$$

8. The condition for trade in agriculture to occur is $((1-\alpha)I_r(k))/(w_r(k)) > 1$, where $I_r(k)$ and $w_r(k)$ are the income and wage in the rich country.

We can now write the prices of intermediate inputs faced by producers of manufactures in a rich country, in terms of the ones produced at home:

$$(28)\qquad \begin{aligned} \frac{p_{fr}}{p_{hr}} &= 1 + t; \\ \frac{p_{fp}}{p_{hr}} &= \frac{1 + t}{\rho}, \end{aligned}$$

where the subscript f denotes foreign variety. Likewise, in a poor country, the prices are

$$(29)\qquad \begin{aligned} \frac{p_{fp}}{p_{hp}} &= 1 + t; \\ \frac{p_{fr}}{p_{hr}} &= (1 + t)\,\rho. \end{aligned}$$

The producers of manufactures facing these relative prices will demand the following relative quantities of intermediate inputs. In rich countries,

$$(30)\qquad \begin{aligned} \frac{c_{fr}}{c_{hr}} &= \left(\frac{p_{hr}}{p_{fr}}\right)^{1/(1-\theta)} = \left(\frac{1}{1 + t}\right)^{1/(1-\theta)}; \\ \frac{c_{fp}}{c_{hr}} &= \left(\frac{p_{hr}}{p_{fp}}\right)^{1/(1-\theta)} = \left(\frac{\rho}{1 + t}\right)^{1/(1-\theta)}. \end{aligned}$$

In poor countries,

$$(31)\qquad \begin{aligned} \frac{c_{fp}}{c_{hp}} &= \left(\frac{p_{hp}}{p_{fp}}\right)^{1/(1-\theta)} = \left(\frac{1}{1 + t}\right)^{1/(1-\theta)}; \\ \frac{c_{fr}}{c_{hp}} &= \left(\frac{p_{hp}}{p_{fr}}\right)^{1/(1-\theta)} = \left(\frac{1}{(1 + t)\,\rho}\right)^{1/(1-\theta)}. \end{aligned}$$

We use these relative consumptions to write the equation for equilibrium in the market for a variety produced in a rich country:

$$(32)\qquad \underbrace{\frac{\theta\gamma}{\beta(1-\theta)}}_{\text{supply}} = L\left[\underbrace{c_{hr}}_{\substack{\text{demand}\\ \text{from home}}} + \underbrace{(N_r - 1)c_{hr}\left(\frac{1}{1 + t}\right)^{1/(1-\theta)}}_{\text{demand from other rich countries}} + \underbrace{N_p c_{hp}\left(\frac{1}{(1 + t)\rho}\right)^{1/(1-\theta)}}_{\text{demand from poor countries}}\right],$$

where N_r and N_p are the number of rich and poor countries, respectively. Notice that the supply for each variety is constant, as given by equation (12); c_{hr} and

c_{hp}, on the other hand, depend on the respective prices of factors in rich and poor countries.[9]

Now we find the equilibrium condition in agriculture. Since agriculture is a homogeneous good, the law of one price requires that the price at home be the same whether the good is imported or produced domestically. Therefore, we can write $p_{ar} = p_{ap}(1 + t)$. The relative wage in rich and poor countries, then, is

$$\frac{w_r}{w_p} = 1 + t. \tag{33}$$

The equilibrium in the agriculture sector is given by

$$NL = N_r \frac{(1 - \alpha)}{p_{ar}} I_r + N_p \frac{(1 - \alpha)}{p_{ap}} I_p. \tag{34}$$

The system formed by equations (32), (34), and (33), together with the normalization $w_p = 1$, determines the prices of factors of production (r_p, w_p, r_r, w_r). Since the equations in the system above are nonlinear, an analytical solution is not possible, so the model will be solved through simulations.

5.3.3 Introducing Trade Arrangements

The framework outlined in the previous section can be used to examine the welfare implications of different types of trading blocs. Their formation simply introduces changes in the set of relative prices faced in each type of country. For the case of a rich country, the set of relative prices faced by the producers of manufactures will now be

$$\begin{aligned} \frac{p_{frb}}{p_{hr}} &= 1, \\ \frac{p_{fr}}{p_{hr}} &= 1 + t, \\ \frac{p_{pb}}{p_{hr}} &= \frac{1}{\rho}, \\ \frac{p_{fp}}{p_{hr}} &= \frac{1 + t}{\rho}, \end{aligned} \tag{35}$$

9. The results are derived following the same procedure of the previous section. c_{hr} is equal to

$$\frac{\theta a}{\beta n} \frac{\frac{w_r}{r_r} L + k(t + 1)}{\Psi_r + \alpha t k},$$

where

$$\Psi_r = k + k(N_r - 1)\left(\frac{p_{hr}}{p_{fr}}\right)^{\theta/(1-\theta)} + N_p\left(\frac{p_{hr}}{p_{fp}}\right)^{\theta/(1-\theta)}$$

is analogous to equation (20). The detailed derivations are available upon request.

where the subscript b denotes members of the bloc. Likewise, in the poor country,

$$(36)\qquad \begin{aligned} \frac{p_{fpb}}{p_{hp}} &= 1, \\ \frac{p_{fp}}{p_{hp}} &= 1 + t, \\ \frac{p_{frb}}{p_{hp}} &= \rho, \\ \frac{p_{fr}}{p_{hp}} &= (1 + t)\rho. \end{aligned}$$

In addition, whenever rich and poor countries are joined in a bloc, the price of agriculture in both countries becomes equal, except in the case of transport costs, which will be introduced below. With this new set of relative prices, it is possible to solve for the utility in both types of countries following the same procedure used in section 5.3.2.

5.3.4 Introducing Transport Costs

We will think of the world as being divided into C continents, each of them equidistant from one another. Each of these continents is formed by an equal number of rich and poor countries (Nr, Np). The transportation system within each continent is assumed to be a hub-and-spoke network.[10] In each continent there is a hub, through which all trade involving that continent must pass. Each hub has N spokes (where $N = Nr + Np$), all assumed to be of equal length, connecting it to the N countries on the continent. Note that this is a completely symmetric world, except that some countries are rich and some are poor. Transport costs will be assumed, following Krugman (1980), to be of Samuelson's iceberg type, which means that only a fraction of the good shipped arrives; the rest is lost along the way. The cost of transport from spoke to hub to spoke will be represented as a, while that of transport from hub to hub (across the ocean) is given by b, where $0 \leq a, b \leq 1$. Trade involving two countries belonging to the same continent will have to be transported from the exporting country to the hub, and from the hub to the importing country. This involves two spokes, and therefore the transport cost within a continent is a, so the fraction of a good shipped that arrives at the market is $1 - a$. Similarly, the fraction of a good that arrives in the case of trade between countries in different continents, which involves two spokes and a hub-to-hub section, is $(1 - a)(1 - b)$.

We assume that tariffs are levied on the total price paid for the good in the country of origin, which includes what is lost in transportation. An important thing to keep in mind is that once transport costs are allowed, there is a gap between consumption and quantity demanded. For example, in the case of a

10. In this, we follow Stein and Frankel (1994).

poor country, the relative price of a variety produced in a rich extracontinental country in the absence of blocs will be

$$\frac{p_{frx}}{p_{hp}} = \frac{(1 + t)\rho}{(1 - a)(1 - b)}, \tag{37}$$

where the subscript x stands for extracontinental. The relative consumption will be

$$\frac{c_{frz}}{c_{hp}} = \left(\frac{(1 - a)(1 - b)}{(1 + t)\rho}\right)^{1/(1-\theta)}, \tag{38}$$

and the relative demand will be

$$\frac{d_{frx}}{d_{hp}} = \left(\frac{(1 - a)(1 - b)}{(1 + t)\rho}\right)^{1/(1-\theta)} \frac{1}{(1 - a)(1 - b)}. \tag{39}$$

The rest of the relative prices, consumptions, and demands are determined accordingly. In particular, the relative wage between the rich and poor country will be $1/[(1 - a)(1 - b)]$, if they belong to the same bloc, and $(1 + t)/[(1 - a)(1 - b)]$ otherwise.

5.4 Welfare Implications of Trade Agreements

In this section, we use our model to analyze the welfare implications of different types of trade arrangements. First, we come back to the question of the welfare effects of the consolidation of the world trading system into a few trading blocs. By changing the substitution parameters in the model, we will be able to see how these effects change as we move from the case where trade is explained mostly by product-variety considerations to one where comparative advantages play a large role in explaining trade. Second, in a simple world of four countries (two rich and two poor), we ask what is the optimal type of arrangement for each type of country, and how the answer changes for different values of the parameters. Finally, we introduce the possibility of PTAs (rather than just FTAs), and study the optimal level of intrabloc tariffs when continental trading blocs are formed.

5.4.1 Does Welfare Increase as the World Consolidates into Blocs?

We now address the Krugman versus Deardorff and Stern debate. As discussed in the introduction, Krugman's product-variety model finds that, in the absence of transport costs, a world of a few large blocs results in the lowest level of welfare. In contrast, Deardorff and Stern suggest, using a comparative-advantage model, that welfare increases monotonically as the number of blocs becomes smaller, reaching maximum welfare under free trade. In figure 5.1, we present the results of simulations using our model, which incorporates both product variety and comparative advantages as motives for trade.

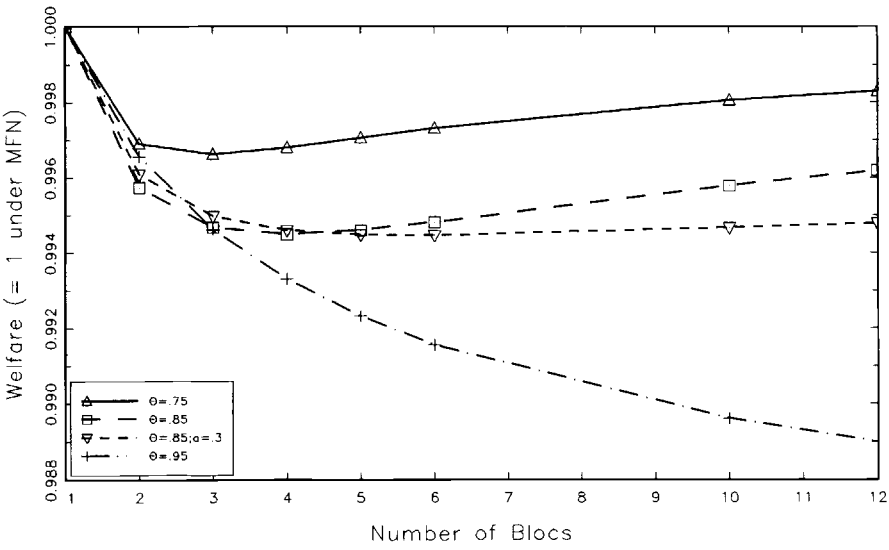

Fig. 5.1 Product variety versus comparative advantages
Notes: $\alpha = 0.5$; $t = 0.3$; $k = 3$; $a = b = 0$ (except $a = 0.3$ where noted in key); $C = 1$, $N = 60$.

Each curve represents the welfare of the world under different parameter values, as a function of the number of symmetrical blocs into which the world is divided. We work with a world of sixty countries, thirty rich and thirty poor. World welfare is obtained simply by averaging the welfare in rich and poor countries. All countries are assumed to levy the same tariff level on imports from outside the bloc (we use 30 percent in our simulations). Tariffs within the bloc are completely eliminated, as in FTAs.[11] We use a value of $\alpha = 0.5$, which means that half of the consumer's income is spent in agriculture and the other half in manufactures, and a value of $k = 3$, meaning that each individual in the rich country is endowed with three units of capital. The highest curve corresponds to a value of $\theta = 0.75$. In this case, the elasticity of substitution among varieties is 4. The rest of the curves correspond to higher values of θ. As θ increases in value, preference for variety decreases, increasing the relative importance of comparative advantage as a source of gains from trade. As θ approaches 1, preference for variety disappears, and only differences in factor proportions explain trade. Intraindustry trade is eliminated, and only interindustry trade remains.

For $\theta = 0.75$, the number of blocs associated with minimum welfare is three. This suggests that adding different factor proportions to a model with product variety does not change the implications in any significant way. It is

11. Since the tariff for the case of trade with countries outside the bloc is uniform, we do not distinguish here between FTAs and customs unions.

only for extremely low preference for variety (high θ) that the model yields results similar to those in Haveman and in Deardorff and Stern.[12] Krugman's conclusion, then, is more robust to the inclusion of comparative advantage in his model than Deardorff and Stern's is to the introduction of preference for variety in one of the goods. The reason for this result is that the elasticity of substitution among varieties (given in our model by $1/(1 - \theta)$) is much higher than that between goods (which is 1 under our Cobb-Douglas specification).[13] Thus, the elimination of tariffs when blocs are formed has a substantial effect on trade due to preference for variety (intraindustry trade), but a much smaller effect on trade due to comparative advantage.

There is a sense, however, in which Krugman's critics were right to suggest that he overestimated the extent of trade diversion. If one introduces transport costs into the picture, the factor-proportions motive for trade becomes relatively more important, since transport costs have a larger effect on intraindustry trade than on interindustry trade, precisely because of the different elasticities of substitution discussed above. Lower intraindustry trade means that there is less trade to be diverted once trading blocs are formed. Therefore, the effect of increasing transport costs a is not very different from that of increasing the value of θ, as is shown in figure 5.1, where the dotted line with triangles represents welfare as a function of the number of blocs for the case of $\theta = 0.85$ and $a = 0.3$. We also tried different values of k and α, but the results did not change in any significant way.

5.4.2 What Type of Bloc Maximizes Welfare for Rich and Poor Countries?

In this section, we work with a simple single-continent world that consists of four countries, two of them rich and two poor. Our model provides an ideal framework for the analysis of the welfare effects of different trade arrangements. For example, what is the effect of north-north integration, on both rich countries and poor ones? Are the rich countries better off by forming blocs with poor countries or among themselves?

We provide a framework to think about these questions. Figures 5.2 through 5.5 show how the welfare of the rich (figures 5.2 and 5.3) and the poor (figures 5.4 and 5.5) depends on the type of trading arrangements that exist in the world, for different combinations of the parameters α and θ. For each set of parameter values, the welfare is normalized to be 1 for the case of nondiscriminatory tariffs, as under the most-favored-nation (MFN) clause.

Note that an increase in θ results in a higher elasticity of substitution between varieties, and thus in greater changes in the consumption bundles in response to given changes in relative prices. For this reason, the welfare effects

12. The values of θ for which Krugman's result goes away correspond to elasticities of substitution that seem unreasonably high.

13. This follows from the requirement that θ be a positive number. It is a natural assumption to make, since one would expect the different varieties of intermediate inputs to be closer substitutes than the different goods.

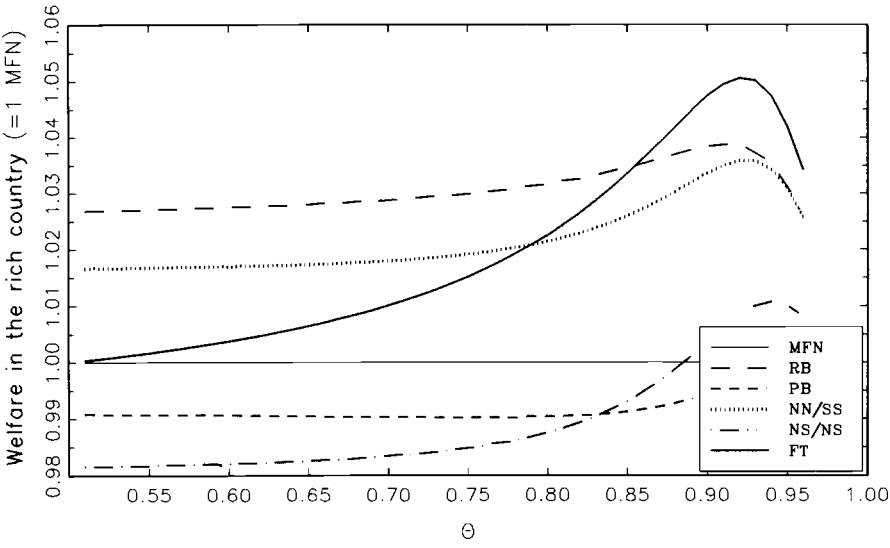

Fig. 5.2 Which arrangement should the rich country seek?
Notes: $\alpha = 0.9$; $t = 0.3$; $k = 3$; $a = b = 0$; $C = 1$; $N = 4$.

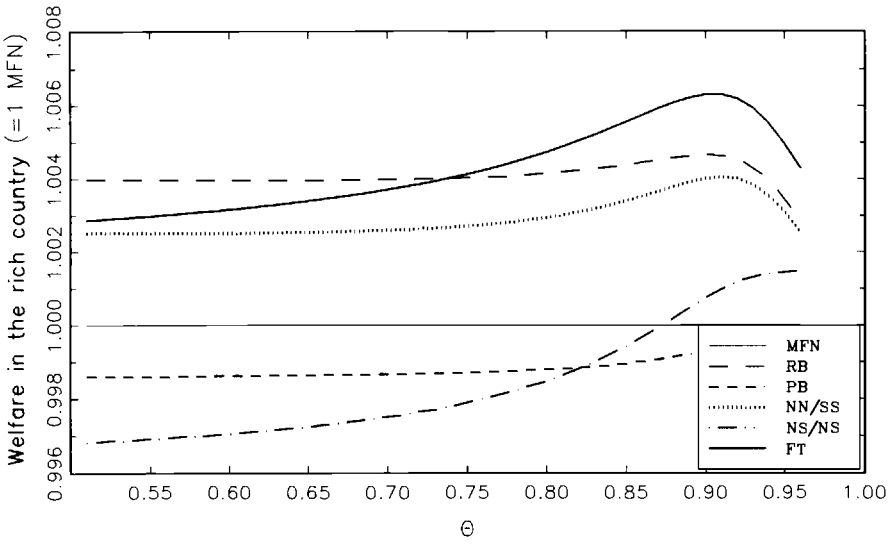

Fig. 5.3 Which arrangement should the rich country seek?
Notes: $\alpha = 0.1$; $t = 0.3$; $k = 3$; $a = b = 0$; $C = 1$; $N = 4$.

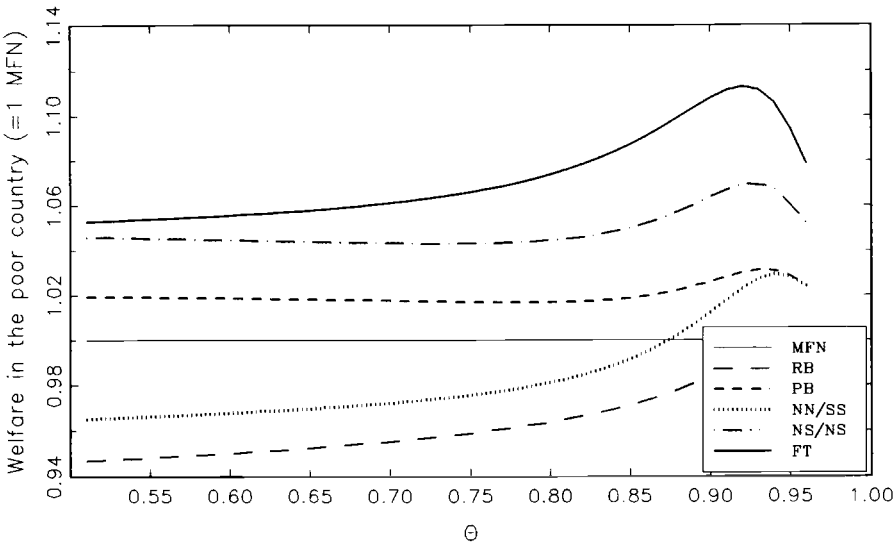

Fig. 5.4 Which arrangement should the poor country seek?
Notes: $\alpha = 0.9$; $t = 0.3$; $k = 3$; $a = b = 0$; $C = 1$; $N = 4$.

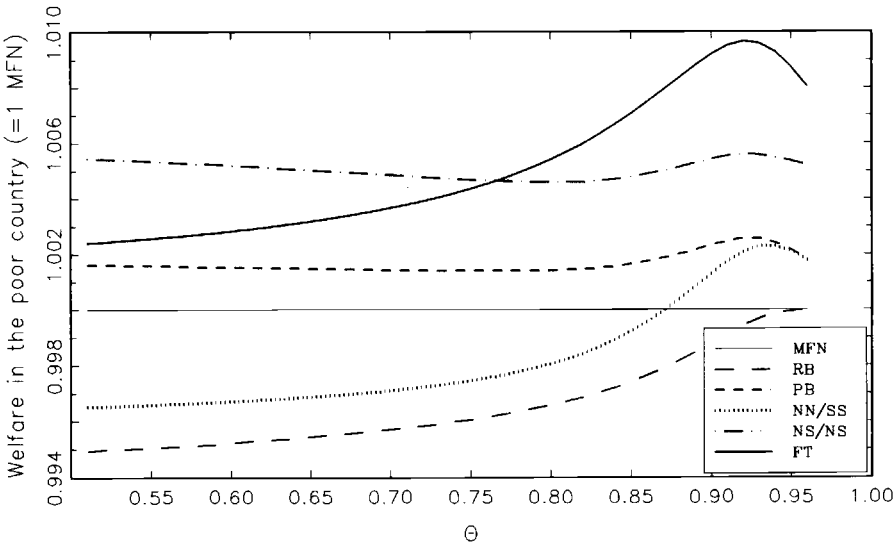

Fig. 5.5 Which arrangement should the poor country seek?
Notes: $\alpha = 0.1$; $t = 0.3$; $k = 3$; $a = b = 0$; $C = 1$; $N = 4$.

of trading blocs generally become more important for higher values of θ. As θ approaches 1, however, the taste for variety disappears, and so does the intraindustry trade, thus reducing the effects of trading blocs. This is the explanation for the shape of the curves in figures 5.2 through 5.5.

As can be seen in figures 5.2 and 5.3, it is always the case that a bloc among the rich countries (*RB* in the figure) makes the rich better off than *MFN*, while a bloc among the poor (*PB*) always hurts them. For parameter values that increase the relative importance of product variety as a source of gains from trade (high values of α and low values of θ), welfare in the case of a bloc among the rich is even higher than under free trade (FT). In the case of the poor countries, a similar pattern can be observed in figures 5.4 and 5.5: their own bloc improves their welfare, while a bloc among the rich countries lowers it. This confirms the results obtained in Stein (1994) and Goto and Hamada (1994) for the case of blocs among similar countries: those countries that are left behind when blocs are formed are always worse off. This happens because those that form the bloc experience an improvement in their terms of trade, as each member of the bloc diverts demand from nonmembers toward fellow members. As expected, the effect of a rich bloc on the poor is larger than that of a poor bloc on the rich.

In the case of north-south integration (represented by *NS/NS*), we did not allow for the formation of a single bloc between two countries.[14] For this reason, we compare each country's welfare under the north-south blocs with that under the north-north/south-south blocs (*NN/SS*). Figures 5.2 through 5.5 suggest that poor countries will always prefer north-south integration. This is true for both comparative-advantage and product-variety considerations. The rich country, however, would prefer to join another rich rather than a poor when product variety plays a large role. This preference becomes weaker for high values of θ and low values of α, when trade occurs mainly due to comparative advantage. Under comparative advantage, the rich country would obviously prefer to join a poor. This, however, is not reflected in the figure, due to the considerations discussed in footnote 14.

So far, we have worked under the assumption that tariffs are the same in rich and poor countries. However, developed countries typically have lower rates of protection than developing countries. For this reason, in what follows we will allow the tariff in the rich country (t_r) to differ from that in the poor country (t_p).[15] In figures 5.6 and 5.7, t_p is set at 30 percent, while t_r varies between 0 and 40 percent. For high levels of t_r, the results are qualitatively similar to the ones presented above. For low tariff levels in the rich country, however, the implications are very different: a rich country would rather join a poor than

14. The reason is that doing so would force us to consider four types of countries: rich in the bloc and outside the bloc, and poor in the bloc and outside the bloc. One does not gain too much insight by doing so, and the model would get much more complicated.

15. The idea of allowing for different tariffs in rich and poor countries was suggested to us by Arvind Panagariya.

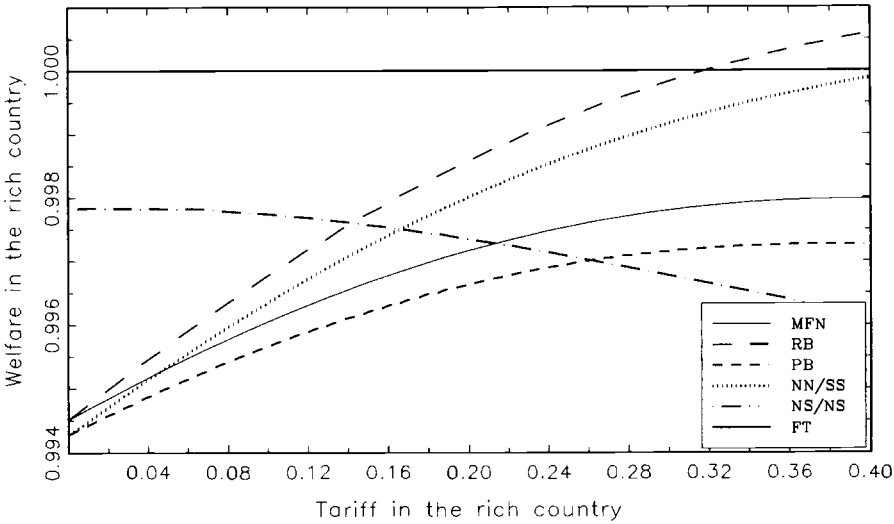

Fig. 5.6 Differentiated tariffs: the effects on the rich countries
Notes: $\alpha = 0.5$; $\theta = 0.75$; $t_p = 0.3$; $k = 3$; $a = b = 0$; $C = 1$; $N = 4$.

another rich country (figure 5.6); and, as figure 5.7 shows, the poor would rather integrate among themselves than join the rich![16] The key to these results is the effect of the formation of blocs on the terms of trade. These effects are very different when the countries start from different tariff levels. We will present a simple example to provide the intuition for this result.

Take a world of three symmetric countries, A, B, and C, where tariffs are nondiscriminatory, and uniform across countries. What are the effects on the terms of trade of the formation of an FTA between A and B? As explained above, both countries deviate trade away from C, and in favor of their partners. As a result, relative world demand for goods produced in C declines, and so do its terms of trade, while those in A and B improve. In addition to the trade-diversion effect, there is a trade-creation effect: both A and B will demand more goods from each other, at the expense of the demand for home goods. In this symmetric setting, this trade creation effect has no consequences for the terms of trade of A and B, since the effects in both countries cancel out, leaving demand unchanged. However, this changes when tariffs in A and B are not the same.

Take now the extreme example where tariffs in A are zero, while those in B are positive. The following effects will take place if A forms an FTA with B: country B will deviate trade away from C in favor of A; B will also shift demand from itself to A (trade-creation effect). However, A will neither create nor deviate trade, since its tariff structure has not changed at all. The resulting

16. We performed simulations for different values of t_p. The results are qualitatively similar.

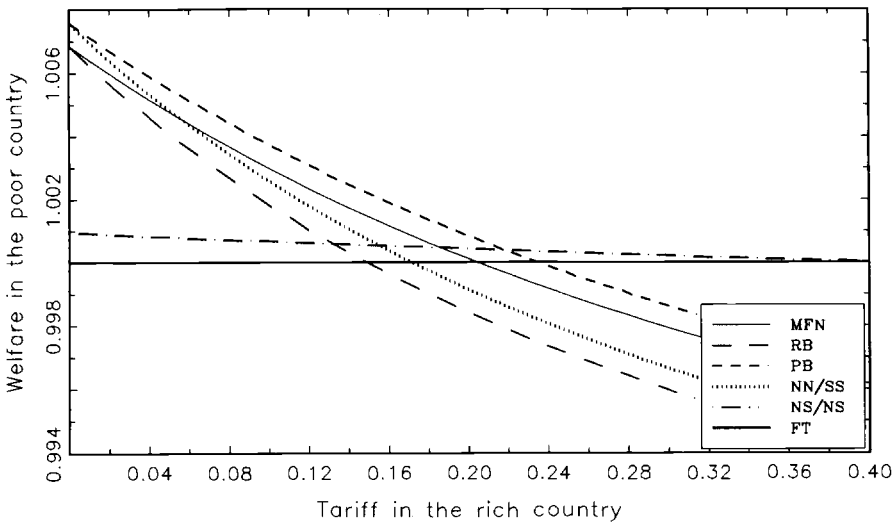

Fig. 5.7 Differentiated tariffs: the effects on the poor countries
Notes: $\alpha = 0.5$; $\theta = 0.75$; $t_p = 0.3$; $k = 3$; $a = b = 0$; $C = 1$; $N = 4$.

effect is a fall in the demand for the goods produced in country B. Therefore, the terms of trade of country B may actually fall when it enters into a bloc with A. In contrast, the improvement in country A's terms of trade is even larger than in the case where the tariff levels in A and B are similar. We chose a tariff level in A of zero for simplicity, but the result goes through for any tariff in A sufficiently low.

In the case where tariffs in the rich countries are sufficiently lower than those in the poor countries, this example helps us understand why both rich and poor countries might prefer to integrate with the poor.[17]

This type of analysis helps us understand some of the issues involved when a country like Chile has to decide whether to join NAFTA or Mercosur. We use this only as an illustrative example since our framework leaves out a number of other important considerations in making this decision.

Under which conditions, then, will Chile prefer to join Mercosur rather than NAFTA?[18] The passage above suggests that the larger the tariff in the rich country (NAFTA) relative to the poor (Mercosur and Chile), the more inclined Chile will be to join Mercosur.

17. The results of our simulations involving different tariff rates are consistent with the conclusions reached by Panagariya (1995) using a three-country example. In his example, countries lose by granting preferential treatment to their partners, and gain when preferential treatment is extended to them. In this sense, Panagariya claims that the mercantilist approach is valid for analyzing PTAs.

18. In what follows we treat Mercosur as a single poor country, and NAFTA as a single rich country.

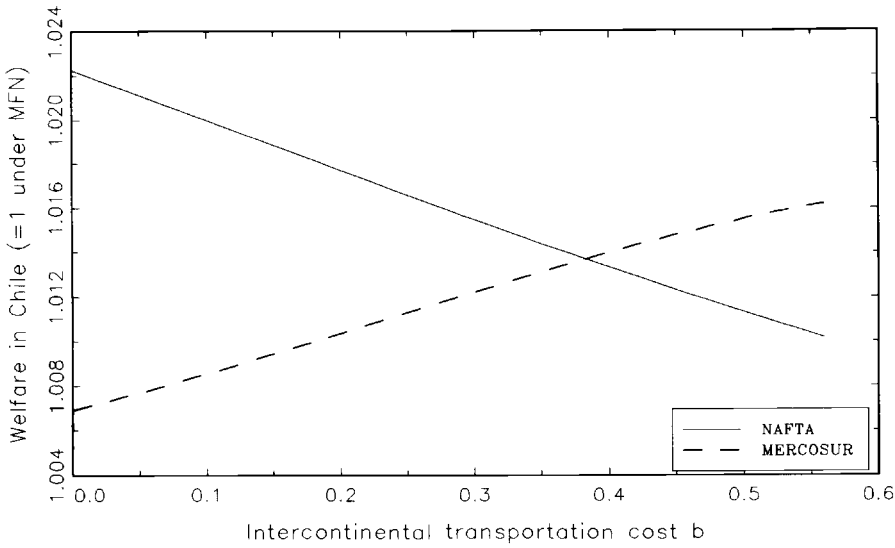

Fig. 5.8 Should Chile join NAFTA or Mercosur?
Notes: $\alpha = 0.9$; $t_r = 0.3$; $t_p = 0.3$; $k = 3$; $a = 0$; $C = 2$; $N = 4$; $\theta = 0.75$.

Another factor that plays a role in such a decision is the importance of intercontinental transport costs. To address this question, we use a simulation in which the world consists of two continents with four countries each, and compare the poor country's welfare under two different arrangements: one where each poor country joins the other poor on their continent, and another where each poor country joins a rich country on a different continent.

The results for the case of $t_r = t_p$ are shown in figure 5.8. Under these parameter values, only for very high transport costs across continents would Chile choose Mercosur instead of NAFTA.

Figure 5.9 shows how much things can change when tariffs in rich and poor countries are different. In this case, $t_r = 0.1$. The effects of joining Mercosur are qualitatively similar to those in figure 5.8. But now the effects of joining NAFTA are completely different. Notice that for $b = 0$, joining NAFTA reduces welfare with respect to MFN, as it does in figure 5.7 for the case of low tariffs in the rich countries. The reason is the same: when a high-tariff country joins a low-tariff country, its terms of trade will fall, provided the tariff differential is sufficiently high. What figure 5.9 clearly illustrates is that transport costs can have surprising effects. In this case, the negative effect on Chile's terms of trade becomes smaller as trade with NAFTA decreases due to the increase in transport costs. When transport costs are sufficiently high, Chile prefers NAFTA to Mercosur.

In fact, this analysis suggests a reason why NAFTA itself might result in welfare losses for Mexico: it represents a trading bloc with a large proximate country (so terms-of-trade effects are large), which has much lower tariffs than

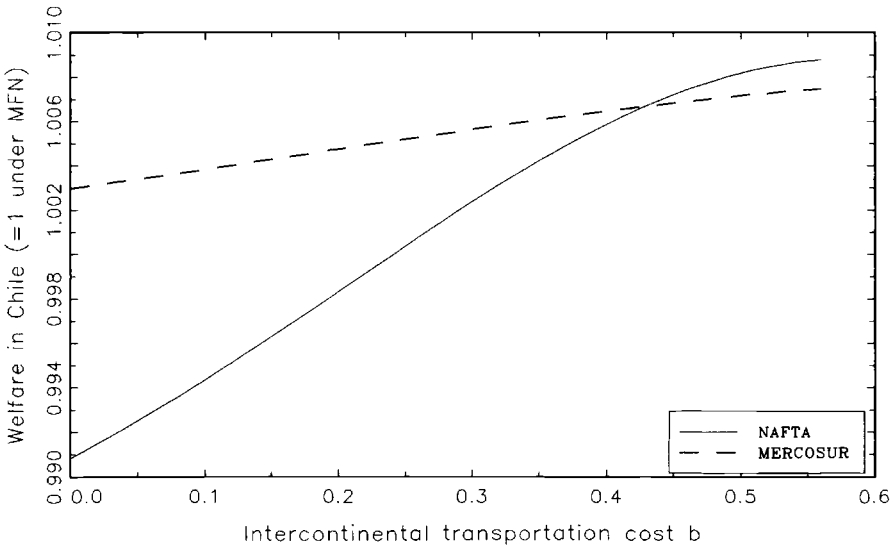

Fig. 5.9 Should Chile join NAFTA or Mercosur?
Notes: $\alpha = 0.5$; $t_r = 0.1$; $t_p = 0.3$; $k = 3$; $a = 0$; $C = 2$; $N = 4$; $\theta = 0.75$.

they did (so terms-of-trade effects can be negative). This suggests that the association between "natural" (meaning proximate) blocs and increases in welfare is valid only when the countries involved have tariff levels of the same order of magnitude.

5.4.3 Product Variety, Comparative Advantage, and Supernatural Blocs

Several authors, among them Krugman (1991b) and Summers (1991), have argued that if trading blocs are formed along "natural" lines of geographical proximity, they are likely to be good. Stein and Frankel (1994) and Frankel, Stein, and Wei (chap. 4 in this volume) have shown, in a model based on product variety, that it is possible for regionalization to go too far, even when blocs are formed along natural geographical lines.

To reach this conclusion, they allowed for continental PTAs, where tariffs within the bloc are reduced but not necessarily eliminated, as in the case of FTAs. Starting from a nondiscrimination situation as under MFN, a small reduction in intrabloc tariffs always improves welfare: there are positive returns to regionalization. As intrabloc tariffs continue to fall, however, welfare reaches a maximum level and starts to decline. Beyond the preference margin that maximizes welfare, there are negative returns to further regionalization. If the intrabloc tariff level continues to decline, welfare might become even lower than at the starting point, under MFN. In this case, the authors suggested that blocs were supernatural: regionalization is much deeper than what would be warranted by "natural" geographical considerations.

In this section, we verify whether the conclusion that continental blocs could

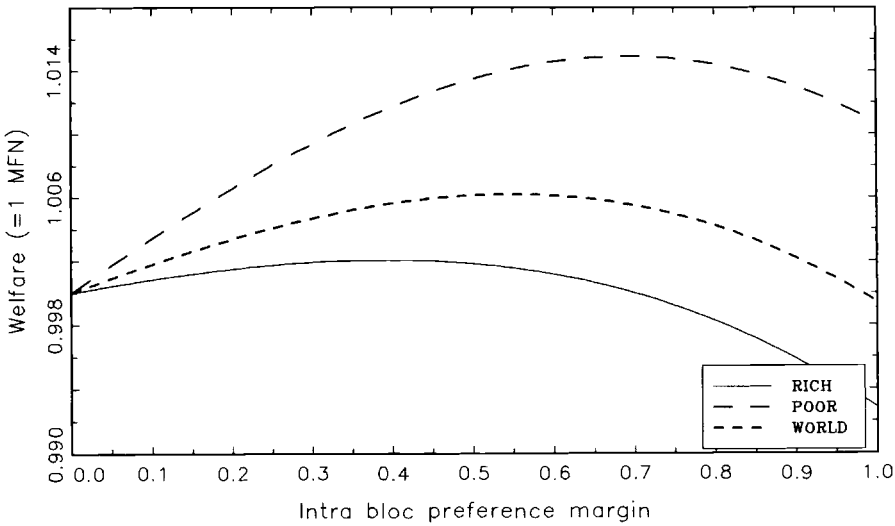

Fig. 5.10 Intrabloc preference margin and welfare
Notes: $\alpha = 0.5$; $\theta = 0.85$; $t = 0.3$; $k = 3$; $a = 0$; $b = 0.35$; $C = 4$; $Nr = Np = 4$.

become supernatural is robust to the inclusion of comparative advantages in the model. To allow for PTAs, the model has to be modified slightly. The intrabloc tariff level, instead of zero, will now be $(1 - \pi) \times t$, where π represents the preference margin within the bloc. We considered a world of four continents of eight countries each, four of them poor and four rich. Since the capital endowment in the rich countries was set at $k = 3$, this setting closely matches that in Stein and Frankel, where a world of four continents with sixteen countries each was considered.

Figure 5.10 shows the effects of increasing the preference margin π on the welfare of the world, both the rich and the poor countries, for a value of intercontinental transport costs $b = 0.35$. In the figure, the welfare of each type is normalized to be 1 under MFN. We can see that the inclusion of comparative advantage does not change the pattern reported by Stein and Frankel. For this set of parameter values used in the simulation ($\theta = 0.75$; $\alpha = 0.5$; $t = 0.3$), the optimal preference margin is 43 percent, which corresponds to a level of intrabloc tariffs of around 17 percent. Blocs become supernatural for $\pi = 0.82$ or when intrabloc tariffs are reduced below 6 percent.[19]

Keep in mind that, throughout this exercise, we ask about the welfare effects of symmetrical trading blocs. As shown in Stein (1994) for the case of similar countries, in a noncooperative game each bloc would in fact benefit from completely eliminating intrabloc tariffs, since doing so improves their terms of

19. Our results are consistent with the implication in Meade (1955) that PTAs are in general better than FTAs.

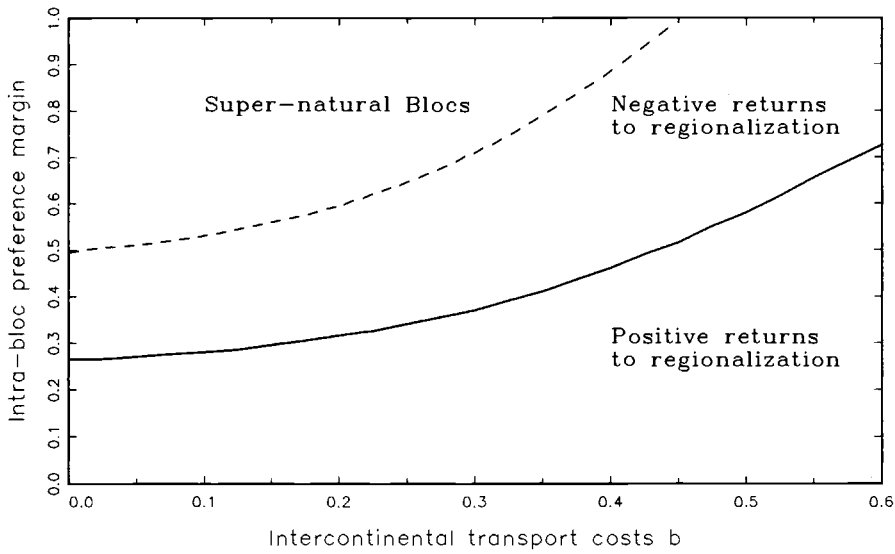

Fig. 5.11 Returns to regionalization
Notes: $\alpha = 0.5$; $\theta = 0.75$; $t = 0.3$; $k = 3$; $a = 0$; $C = 4$; $Nr = Np = 4$.

trade. However, this would result in lower welfare in each country as a result of a coordination failure in determining the margin of preference.

In contrast, here we are focusing on the perspective of an organization such as the World Trade Organization (WTO), asking what would be the preference margin that, if adopted in every continent, would lead to the highest possible world welfare, assuming that free trade is not attainable and that tariff levels outside the bloc cannot be lowered rapidly. Figure 5.10 highlights an interesting issue that was not captured before: the margin of preference that maximizes the welfare of the world does not maximize the welfare of either the rich or the poor. In general, the poor will benefit from a greater preference margin. If WTO ever abandons article XXIV of GATT, which allows for FTAs but not for PTAs as exceptions to the MFN rule, and instead imposes the level of intrabloc preference margin allowed, the determination of this preference margin would depend on the relative political power of rich and poor countries in the WTO.

Figure 5.11 shows how the optimal preference margin depends on intercontinental transport costs. As they become larger, welfare maximization requires a greater degree of continental integration. This result is similar to that obtained in Stein and Frankel (1994) and in Frankel, Stein, and Wei (chap. 4 in this volume). In the limit, if transport costs are prohibitive across continents, welfare will be maximized under continental FTAs, which in this case would represent the ideal of free trade in each relevant world.[20]

20. This extreme of prohibitive transport costs across continents was used by Krugman (1991b) as an example of how natural trading blocs would be beneficial.

5.5 Conclusions

Previous models that analyzed the welfare effects of trading arrangements were based either on product variety or on comparative advantage. The use of these models provided contradictory answers to some important questions. In this paper, we have presented a framework that encompasses both types of models. We used our framework to address a number of important questions, and reached the following conclusions:

1. In the absence of transport costs, the consolidation of the world into a few trading blocs reduces welfare, as predicted by Krugman's product-variety model. When transport costs are considered, a move toward free trade zones is more likely to improve welfare, as suggested by the models based on pure comparative advantage.

2. As long as all countries have similar tariff levels, poor countries will always prefer to integrate with rich countries, due to both product-variety and comparative-advantage considerations. The rich country maximizes welfare by joining other rich, except in the cases where product variety does not play a large role. A poor country would consider joining another poor rather than a rich only if the two poor countries are proximate and transport costs are sufficiently high.

3. However, differentiated tariff levels between rich and poor countries have important consequences for the welfare effects of trading arrangements. In the case of FTAs, joining a high-tariff country will enhance welfare more than joining a low-tariff country, other things being equal. Therefore, if rich countries have lower tariffs, the poor might choose to integrate among themselves.

4. The association between "natural" (meaning proximate) blocs and increases in welfare is valid only when the countries involved have tariff levels of the same order of magnitude.

5. The result that integration can be too deep, even if drawn along natural geographical lines, is not affected by the inclusion of comparative advantages into a model where there is preference for variety. The level of intrabloc preference margin that maximizes welfare is different for the rich and for the poor. In general, poor countries would prefer deeper integration.

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Comment

Jon Haveman

This paper provides a nice contribution to a young and growing literature. When I first sat down to think about this paper, I spent a little time, for my own benefit, putting the paper in its place within this literature. As my thoughts progressed, so did a convenient graphic depiction of the relevant work; this depiction is figure 5C.1.

The literature was really initiated by Krugman (1991a). In this piece, Krugman developed a trade model with differentiated products and optimal tariffs. He proceeded to analyze, in the context of this regime, the effect on world welfare of a sequential process of customs union formation. His original finding was that world welfare would decline until we reached a world configuration of three countries. Shortly thereafter, this work was supplemented by Deardorff and Stern (1994) and Haveman (1996). Both of these papers provided results similar in spirit if not nature to those of Krugman. Instead of a

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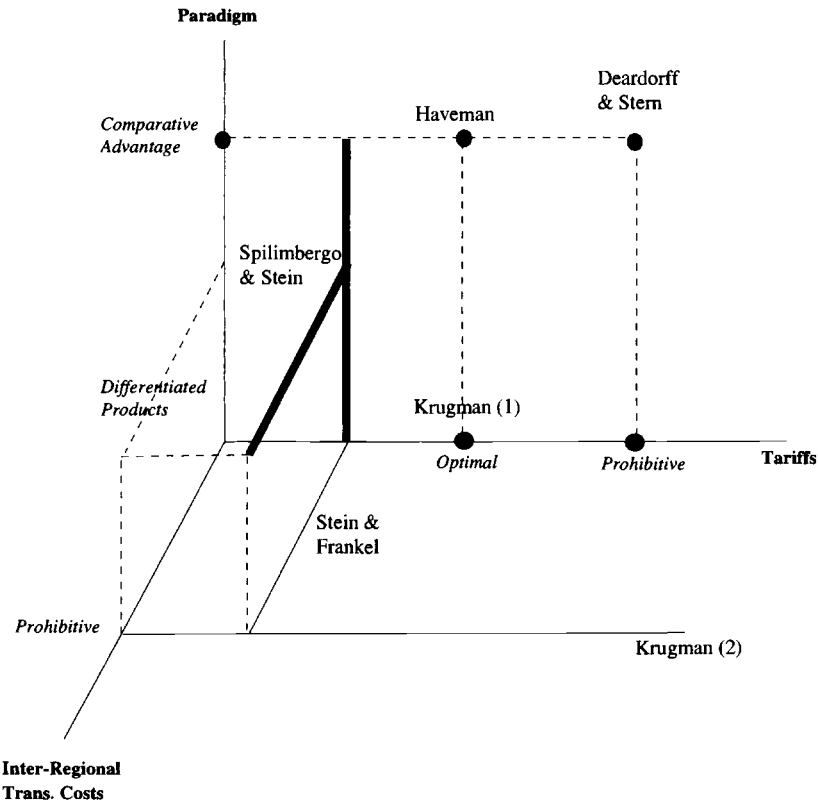

Fig. 5C.1 Mapping out the literature

world with differentiated products, trade in their world is determined by more traditional comparative advantage. The results provided by Deardorff and Stern run counter to the Krugman result, but this is due to the inclusion of prohibitive tariffs. Having isolated trade diversion (Krugman 1) and trade creation (Deardorff and Stern), the results in Haveman stem from an approach that incorporates equal parts of each. The results largely reinforce the negative Krugman result and establish its robustness across different trade paradigms (the vertical axis in figure 5C.1). He goes on, however, to note that the decline in welfare can be eliminated if the blocs are restricted in their ability to raise their ex post external tariffs.

Not to be outdone, Krugman also extended the literature and overturned his own result in Krugman (1991b) by incorporating prohibitive interregional transport costs. With this modification, welfare is seen to be an increasing function of bloc formation. In a similar vein, Stein and Frankel (1994) provide a bridge between these extremes by allowing interregional transport costs to vary between zero and infinity. What they find is that bloc formation will in-

crease world welfare if it is undertaken by natural trading partners, those with sufficiently low transport costs.

Having set this background, it is now clear where the current paper fits into the literature. The Spilimbergo and Stein paper is in the same spirit as the Stein and Frankel paper. That is, it is general enough to allow for a continuum of options along two separate dimensions. Spilimbergo and Stein allow for a continuum of possible interregional transport costs and all manner of trading regimes between comparative advantage and differentiated products. Their contribution, then, is the bold lines in the figure. On its face, their contribution appears to be more substantial than that of any other author. Other aspects of their model include countries of different sizes and varied degrees of bloc preference; that is, countries need not totally eliminate the barriers between them when forming a bloc.

Having filled in the literature map, we can now turn to more specific issues associated with this paper. Having contributed to the literature myself, I was predisposed to appreciate this work. Whenever one sees a simulation analysis, however, one has to ask if this is an appropriate place for it. Simulation analysis does have a place in economic analysis, and my take is that the current model is sufficiently complex that this is as good a place as any for it. That notwithstanding, I do have a number of concerns.

First, I admire Spilimbergo and Stein's effort to incorporate production into the analysis. This was notably absent from the Krugman and Haveman work. On the other hand, it is not clear that production is present in other than its name. That is, in the absence of the ability to substitute capital for labor and vice versa, and a differentiated products model with the number of varieties given exogenously, is production really incorporated into the model in any meaningful way? I would contend that in fact it is not; what we have is really a world full of endowment economies. While stealth can work for warfare, it can be rather misleading in a paper such as this; that is, it makes it very difficult for the reader to discern the true source of the results.

A second concern stems from the choice of tariffs in the model. Without some notion as to where the tariffs lie relative to some benchmark, perhaps optimal tariffs, one is unsure how to go about the interpretation of their effects. In particular, in figure 5.3, as we increase the degree of product differentiation, the extent to which the tariffs influence matters changes. The greater the degree of product differentiation, the higher will be optimal tariffs, and the less relevant will be any fixed tariff. So, while I admit that we seldom witness optimal tariffs in practice, I will put them forward as a useful theoretical tool. When analyzing phenomenon that we do not understand, it is best to make use of tools that we understand. I argue that we understand the impact of optimal tariffs to a greater extent than we understand the influence of any arbitrary tariff.

Third, the model introduces an asymmetry of country size. While I applaud this addition, it is not clear what it contributes to our understanding. Asymme-

try for its own sake is not terribly meaningful unless you think about the motivation for its introduction. There are any variety of motivations to which one might appeal to justify its inclusion, none of which seem to apply here. In particular, the motivation for small countries to join into blocs with large countries is to obtain an enhanced number of varieties of goods. I would argue that this motivation is not well represented in reality. Poor countries are more often striving to secure a source of supply for their limited needs than they are trying to vary their day-to-day diet. My fear is that without a firm grounding in reality, the asymmetry assumption and its corresponding result on the preference margins are rendered vacuous.

Finally, I would like to address the presentation of the results. The difference between standard theory and simulations is somewhat akin to the difference between a Ferrari and a Jeep Cherokee. The Ferrari is a wonderful tool, and it will do many special things for you. If, however, your goal is to climb the Himalayas, one would do better driving the Cherokee. Granted the Cherokee will not take you to the top, but it will smooth out many rough spots. What these authors have done is to abandon their Ferrari, an act with which I have no problem, jumped into the Cherokee, driven up to the end of the foothills of the Himalayas, stepped out of the Cherokee, and examined the view from there. All of this rather than pushing the Cherokee to its limits.

All of this is by way of saying that they are using a powerful tool but are not making use of all that it has to offer. As an example, in each of the graphs, a small number of observations is presented. The computer is capable, and is tireless in this endeavor, of producing a nice smooth continuum of observations for each of the figures provided. In addition, with respect to my remarks on the chosen tariff level, there is no reason not to produce results for many different choices of tariffs and then publish an average, with perhaps a high-low element built into the figure. There are powerful tools that might be brought to bear on this project, and the results would be strengthened tremendously by using them.

Having said my piece, I would like to finish by saying that I like the direction in which this paper is heading. It will be an important contribution to an important literature. As trading blocs become the call of the day, understanding their influence on the world as a whole is very important.

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Comment

Edward E. Leamer

Spilimbergo and Stein have tackled a very difficult and extremely important problem: Are we in a Heckscher-Ohlin world or a Chamberlinian world? Is it factor supplies that drive trade, or is it economies of scale, product differentiation, and strategic interactions?

As NAFTA was under consideration, workers earning $10 an hour in the United States looked south with Heckscher-Ohlin glasses and saw a huge Mexican low-skilled low-wage workforce that was prepared to do the same work for less than a $1 an hour. A sharp fall in U.S. wages for low-skilled workers seemed an inevitable consequence of economic integration with Mexico.

Many Mexicans looked north with Chamberlinian glasses. They saw the technological leadership of the United States and the skilled U.S. workforce and the large, highly efficient operations of U.S. businesses, and they worried that in an economic partnership with such a country Mexicans would be stuck with the "bad" jobs in the "bad" sectors, namely those that offered no economies of scale and very low levels of learning by doing. Mexicans in the twenty-first century would be sewing shirts in sweatshops and assembling electronics while U.S. workers would be writing software in fancy office buildings.

Which are the "right" kind of glasses? How much of the consequences of NAFTA will be driven by Heckscher-Ohlin comparative-costs considerations and how much by economies of scale, externalities, and hysteresis?

Answers to these important questions can be sought using four different methodologies: theory, calibration, indirect estimation, and direct observation.

By *theory* I mean writing down a fairly simple model that includes both Heckscher-Ohlin (HO) and Chamberlinian possibilities and then deriving qualitative results about the conditions under which one effect dominates. For example, a familiar result in an HO framework is that an abundant factor benefits from economic integration and a scarce factor suffers. Maybe one could write down a structure that would lead to a new result: in countries abundant in human capital, both skilled and unskilled workers benefit from economic integration; but in countries that are scarce in human capital, unskilled workers benefit but skilled workers suffer. Or something like this.

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By *calibration* I mean writing down a relatively complex model into which are inserted "plausible" numerical values for the parameters, and then using the system to simulate an intervention such as NAFTA. The system has to be too complex to solve analytically because it includes features that are intended to capture all the relevant aspects of the problem. By *indirect estimation* I mean writing down a not too complex model and estimating it with appropriate econometric techniques. By *direct observation* I mean finding equivalent historical events such as the entrance of Portugal and Spain into the European Common Market, or waiting to see what happens as a result of NAFTA.

Which of these approaches is fruitful? Which is best? What do we mean by best?

I take it as given that the goal should be to change our minds. With that as the goal, each of these four approaches can be fruitful. Any of them can change the mind of the analyst and if he or she is lucky can also change the mind of the analyst's audience. But each can turn out disappointing. And if we don't keep our eyes firmly focused on the goal, sometimes an approach is bound to be disappointing.

This paper that I am discussing falls somewhere between the first two approaches, theory and computable general equilibrium modeling. The model that is used is too complex to allow qualitative theorems. But it is not as complex as most CGE models, which attempt more completely to include all relevant factors. It looks to me to be equivalent to a model with taste for variety driven by a Cobb-Douglas utility function written in terms of agricultural goods and the services of manufactures, the latter being a Dixit-Stiglitz index of product variety in manufactures. Each variety is produced subject to a fixed cost. The model also includes transport costs that separate countries. Using this structure, the authors provide what might be called numerical theorems. As such, the approach will make neither the theorists nor the CGE modelers very happy. Theorists will not be happy because numerical theorems by their very nature are extremely special cases. Theorems derive their value from being both mathematically fragile and substantively sturdy. A theorem is mathematically fragile if no assumption can be relaxed without altering the validity of the theorem. A theorem is substantively sturdy if substantively "minor" changes in the assumptions do not alter the "content" of the theorem. The problem with a numerical theorem is that it is very hard to tell if it is mathematically fragile and substantively sturdy. Spilimbergo and Stein do attempt to address the question of fragility. Here is a quotation: "It is only for extremely low preference for variety (high θ) that the model yields results similar to those in Haveman and in Deardorff and Stern. Krugman's conclusion, then, is more robust to the inclusion of comparative advantage in his model than Deardorff and Stern's is to the introduction of preference for variety in one of the goods." I wonder what they would say if I used their model with $\gamma = \theta^{1/100}$, and claimed that for wide ranges of γ the model is similar to Haveman and Deardorff and

Stern? In other words, the words "extremely low preference for variety" have no real meaning.

A useful theorem makes us look at the world in a new way. Either it lays out the issues with increased clarity or it suggests some surprising implications. This paper is very good in terms of laying out the issues: comparative costs, fixed costs, and distance. But I don't think that the results are both sturdy and surprising. If one mixes together distance, comparative costs, and economies of scale/product differentiation, what are the possibilities? A country should look for a faraway partner? Probably not. Not much to be gained there. A poor country should look for a rich neighbor or a poor one? A rich country should look for a rich partner or a poor one? This could go either way. If you tell me there is a definite answer, I think that I could produce an equally plausible model with the reverse answer. Should a country look for a partner with high tariff walls or low ones? If you are planning to sell into the partner's market, better that it is a protected market with a high tariff.

Theorists won't find these numerical theorems much to their liking. CGE modelers will also be unhappy with the model presented here because it is far too simple. There are no Mexican oil exports, no migration from southern Mexico to the north or to the United States, no Mexican apparel exports, no Chinese apparel exports, no maquiladoras, no capital flows, no Japanese direct investment, no Mexican land policy, no Pacto, no . . .

As for myself, I like methods 3 and 4: Give me data, or give me death.

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