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CENTER DISCUSSION PAPER NO. 718

A POLITICAL-ECONOMIC ANALYSIS
OF FREE TRADE AGREEMENTS

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A Political-Economic Analysis of Free Trade Agreements

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Abstract

This paper demonstrates that bilateral free trade agreements can undermine political support for further multilateral trade liberalization. If a bilateral trade agreement offers disproportionately large gains to key agents in a country, then their reservation utility is raised above the multilateral free trade level and a multilateral agreement would be blocked. Bilateral agreements between countries with similar factor endowments are most likely to have this effect. It also follows that bilateral free trade agreements can never increase political support for multilateral free trade.

KEY WORDS: Regional Integration, Political Economy, Trade Theory

A Political-Economic Analysis of Free Trade Agreements

I. Introduction

The recent pursuit of bilateral and regional trade agreements, marked most notably by the conclusion of the North American Free Trade Agreement and the further lowering of trade barriers in Europe, raises questions about the wisdom of this approach to trade liberalization. Governments have asserted that regional free trade negotiations are compatible with the goal of multilateral trade liberalization, but others (e.g., Bhagwati (1992)) have questioned whether regional arrangements will eventually lead to broader liberalization.¹ If trade liberalization is to proceed in stages, a formal approach to the process should consider the decision to liberalize at each stage and explore how the decision to liberalize multilaterally is affected by bilateral liberalization.

Two recent papers take the extent of liberalization as exogenous and examine the welfare consequences of varying degrees of regional trade bloc formation. Krugman (1991a) constructs a model in which countries form symmetric trading blocs. Each country produces a differentiated product which is demanded symmetrically by all countries. Countries within each bloc set internal tariff levels to zero and impose a common optimal (non-cooperative) tariff on all non-members. This external tariff is optimal in that it exploits the trading bloc's power over world prices to maximize the member countries' welfare, taking the behavior of other blocs as given. As one considers larger blocs, the international market power of each bloc increases, as does the level of its optimal tariff. Simulating the model over a range of demand parameters, Krugman finds that the number of trade blocs yielding the lowest world welfare appears to be three. When there are three blocs, the members of any bloc face zero tariffs on only a third of the goods they consume and face relatively high tariffs on the rest. This result seems to reflect unfavorably on regional

¹Bhagwati (1992) does not formally answer that question, but does conclude that many of the arguments in favor of preferential arrangements are of dubious merit.

approaches to trade liberalization. However, in an extension of this work (Krugman, 1991b), Krugman concludes that the symmetry in the demand structure of his earlier model probably overstates the case against bilateralism. Noting that trading blocs tend to consist of countries that conduct a disproportionate amount of trade with each other, Krugman concludes that such “natural” trading blocs are on balance probably welfare enhancing.

Deardorff and Stern (1991) present a different criticism of Krugman’s (1991a) finding that bilateralism is undesirable. They argue that Krugman’s differentiated-product assumptions drive his result. They present an alternative model with an arbitrary number of countries in which all countries produce and consume two goods. Consistent with a Heckscher-Ohlin view of the world, countries differ in terms of their autarky prices.² The countries form free trading areas in which members place zero tariffs on the goods of fellow members and place prohibitive tariffs on the goods of non-members. A country gains from joining a trading bloc if and only if its group contains trading partners whose relative autarky prices are jointly different from its own. In this model, Deardorff and Stern show it is probable that a set of bilateral agreements can capture the bulk of the potential gains from free world trade.³ On this basis, Deardorff and Stern conclude that regional trading arrangements are likely to increase welfare. They recommend that the General Agreement on Tariffs and Trade (GATT) recognize the importance of regional arrangements in the modern system and work to ensure their compatibility with liberal multilateral trade.

While these papers yield insight into the welfare impact of adopting regional trading blocs as a substitute for multilateral free trade, they do not address the central question of whether such agreements interfere with progress on multilateral trade liberalization. There are two readily apparent ways in which bilateral trade agreements could undermine

²In a Heckscher-Ohlin approach, the autarky price differences would be attributable solely to differences in factor endowments. Deardorff and Stern’s approach also allows for differences in technologies. This latter possibility has no importance for the present paper.

³In fact, a country whose autarky price matched the multilateral free trade equilibrium price could enhance its welfare by trading only with a subset of countries that had autarky prices different from its own.

multilateral liberalization: Countries could abandon multilateralism in anticipation of future bilateral agreements; or countries could sign bilateral agreements before a multilateral accord is concluded and then lose the desire to pursue multilateralism further. The latter possibility is the topic of this paper.

In fact, this paper will show that it is possible for bilateral free trade agreements to undermine political support for multilateral free trade. This is accomplished using a political economy approach similar to that of Mayer (1984), in which a simple majority of voters is required to pass a proposal. Agents are presented first with a potential bilateral free trade agreement and then with a multilateral free trade agreement. Each potential agreement offers agents new equilibrium prices and product varieties in a trade model of the sort discussed by Helpman and Krugman (1985). A majority of voters must support a trade agreement for passage.

Agents have different holdings of capital and labor and thus react differently to any given proposal. In the model, every trade agreement offers agents an increased number of product varieties, which uniformly enhances the welfare of agents. The shifts in goods and factor prices may be beneficial or detrimental depending on an agent's capital-labor ratio. In this approach the voter with the median capital-labor ratio is of primary importance, since that voter will always be in the majority on any vote.

The primacy of the median voter ensures that no proposal that diminishes the median voter's utility can ever pass. This means, for instance, that if a multilateral free trade proposal is not politically feasible under autarky — because the median voter and thus at least half the populace oppose it — then that same multilateral proposal cannot be rendered feasible by any bilateral free trade agreement. If the bilateral free trade agreement is politically feasible, it will only raise the reservation utility level of the median voter to which the multilateral proposal will be compared.

For this reason, the paper focuses on cases in which multilateral free trade is politically feasible in autarky. The most interesting cases are those in which the median

agent is roughly indifferent between multilateral free trade and the status quo. For the median agent to be indifferent, multilateral free trade must offer a balance of additional product variety (a gain) and adverse price shifts (a loss).

A bilateral free trade agreement can undermine support for multilateral free trade by offering the median agent disproportionately large gains with relatively small losses. If such a combination raises the utility of the median voter above the level offered by a multilateral free trade agreement, then the multilateral agreement will no longer be politically viable. This undermining is more likely to occur in bilateral agreements involving countries with similar capital-labor ratios and roughly indifferent median voters. In the extreme case, a bilateral agreement with an identical partner country would bring variety gains without any price shifts. The remaining variety gains offered by a move from the bilateral agreement to multilateral free trade could be insufficient to compensate the median agent for the factor price losses, in which case the multilateral accord would be blocked.

The kinds of bilateral agreements that would do the least damage to the political feasibility of multilateral free trade would be those which leave the median voter's utility unchanged by combining price shifts with variety gains. This combination could be found in partner countries with capital-labor ratios different from that of the home country. Such agreements would also necessarily engender the most political opposition of any feasible bilateral agreement, since they do the least to enhance the welfare of swing voters.

To develop the point about undermining, this paper begins with a two-good Heckscher-Ohlin model. In this model there are no variety gains to trade and it is shown that in this setting voters will never forsake multilateral free trade in favor of a bilateral free trade agreement. If a majority of voters in one country prefer a bilateral trade agreement with a given partner to multilateral free trade, the majority of voters in the partner country will prefer multilateral free trade to the bilateral accord. This result follows from the strict quasi-convexity of indirect utility as a function of the relative price; if a shift in relative prices increases an agent's utility, a further shift in the same direction will increase utility

even more. Bilateral free trade can preclude multilateral free trade only in the trivial case when multilateral free trade would result in the same relative price as bilateral free trade, in which case there would be no incentive to trade on a multilateral basis once the bilateral agreement had been struck.

This result is reversed in the second half of the paper with a specific trade model incorporating increasing returns to scale and product varieties. The introduction of product varieties allows agreements which would not be politically feasible in their absence. Specifically, these are agreements in which the median voter in one partner country would suffer from adverse price shifts but is compensated by increased variety gain. The introduction of product varieties into the welfare analysis also allows agreements between identical countries to raise the reservation utility levels in each. Thus, undermining is possible in the latter model whereas in the former it was not.

Although specific models are used, the lesson of the paper is more general. When agents are roughly indifferent between an initial situation and multilateral free trade and that indifference results from a balance of gains (increased variety) and losses (adverse price shifts), then any intermediate agreement offering disproportionately large gains will undermine support for multilateral free trade.

The next section will present the Heckscher-Ohlin model along with the voting procedure. The assertion that bilateral agreements cannot preclude multilateral agreements in such a setting will then be proven. In Section 3, a specific example of a model with differentiated products and intra-industry trade will be presented. Section 4 will contain a proof that in this setting, bilateral agreements can undermine multilateral agreements. Section 5 will briefly discuss the sensitivity of the results to the specific assumptions and parameters of the models. Conclusions and implications will be presented in Section 6.

II. Bilateral Agreements in a Heckscher-Ohlin Model

This section will consider bilateral agreements in a standard two good, two factor Heckscher-Ohlin trade model. Let there be many countries, distinguishable only by their fixed endowments of the two factors of production, capital (K) and labor (L). These factors are used in the constant-returns-to-scale production of goods X and Y. The internationally identical technologies will be assumed to be such that K is used relatively intensively in X (and L in Y) with no factor-intensity reversals. Perfect competition will ensure that profits are zero.

Agents in these economies own shares of their country's capital and labor stocks. If we denote the return to a unit of labor as w and the return to a unit of capital as r , the income of an agent i is:

$$(2.1) \quad I_i = wL_i + rK_i$$

where K_i and L_i are the number of units owned by agent i . Agents are assumed to have identical and homothetic preferences. Income is fully spent on goods X and Y. Arbitrarily, let Y be the numeraire good and p the relative price of X in terms of Y.

It will be assumed throughout this paper that countries' relative endowments are sufficiently similar that when they join together in a free trade area, bilateral or multilateral, there is factor price equalization.⁴ Within the trading area, the integrated economy that would result from factor mobility will be achieved instead through trade flows. It is also assumed that tariffs are either zero or prohibitive, so a country only trades with its free trade partners.⁵

In this setting, when two countries with different capital-labor ratios form a free trade area, the resulting relative price will lie between the autarky prices in the two countries and the capital-abundant country will export X and import Y (the Heckscher-Ohlin theorem).

⁴A sufficient condition for this to hold is that the endowments of all countries lie in the intersection of the cones of diversification of the country with the highest and the country with the lowest capital-labor ratio.

⁵This assumption is restrictive, but the complications of tariff determination are not essential for the paper's argument.

When two or more countries join to form free trade areas, the resulting capital-labor ratio of the integrated economy is likely to differ from any of the countries' autarky ratios (unless they originally had identical capital-labor ratios). The effects of these shifts on agents' utility can be characterized as follows:

PROPOSITION 1: The utility of an agent i , with an endowment (L_i, K_i) , can be depicted as a function of K/L , the integrated economy's capital-labor ratio. This function is strictly quasi-convex in K/L and has a unique minimum when the agent's capital-labor ratio is equal to that of the economy.

Proof: Let $H(p, K_j, L_j)$ represent the indirect utility of a country j where we will initially assume there is a single agent. Woodland (1980) proves that

$$\frac{\partial H}{\partial p} = V_I(p, K_j, L_j) e_X^j(p, K_j, L_j)$$

where V_I is the marginal utility of income, which will always be positive, and $e_X(p, K_j, L_j)$ is defined as the excess supply of good X (production minus consumption). In autarky equilibrium, $e_X(p^A, K_j, L_j) = 0$ by definition. The Law of Comparative Advantage requires that when $p > p^A$ country j exports good X and imports Y , so $e_X > 0$. Similarly, when $p < p^A$ it follows that $e_X < 0$. Thus

$$\frac{\partial H}{\partial p} < 0 \text{ for } p < p^A; \quad \frac{\partial H}{\partial p} > 0 \text{ for } p > p^A; \quad \text{and } \frac{\partial H}{\partial p} = 0 \text{ for } p = p^A.$$

In a Heckscher-Ohlin model without factor-intensity reversals, $p = p(K/L)$ and $p' < 0$, since p is the price of the capital-intensive good, X . Thus we can replace p in H with K/L , the capital-labor ratio of the broader integrated economy. It follows that H is strictly quasi-convex in K/L with a unique minimum at $\frac{K}{L} = \frac{K_j}{L_j}$, the autarky capital-labor ratio.

Finally, it can be seen that the parallel between a country in an integrated economy and an individual in a broader economy is exact. In both cases, an economic entity with some fraction of the total capital and labor stock uses those endowments to maximize utility, either through international or interpersonal trade. Therefore, we have an indirect

utility function $U(K/L, L_i, K_i)$ for any agent i which is strictly quasi-convex in K/L with a minimum at $\frac{K}{L} = \frac{L_i}{K_i}$.

To illustrate the proposition given above, suppose an agent has a capital-labor ratio slightly higher than that of her country. For purposes of the agent's welfare, we can index all possible free trade agreements by the continuum of possible capital-labor ratios that would result.⁶ As depicted in Figures 2.1 and 2.2, any trade agreements with countries less capital-abundant than the agent's country will increase this agent's welfare by increasing the return to capital and raising the price of good X, which would then be the export good. Such agreements would lie to the left of the point labeled 'Autarky' in Figure 2.2. Trade agreements which increase the integrated economy's capital-labor ratio will first hurt the agent. Then, as the capital-labor ratio rises above the agent's own, the agent's utility will increase. To the right of point E in Figure 2.2, this agent's utility rises above its autarky level.

Next, we use this result to consider whether voters might ever opt for a bilateral trade agreement instead of multilateral free trade. The following voting structure will be assumed. Voters will be asked in a first period whether they would prefer a bilateral trade pact to autarky. Then, in a second period, voters are offered the choice between the existing trade regime (either autarky or bilateral free trade) and multilateral free trade.⁷

It is assumed that voters are fully informed about all aspects of endowments, economies, and voting. It is also assumed that the periods are close enough together in time

⁶It should be noted that, as in the proof of Proposition 1, the relative price p decreases monotonically with increases in the capital-labor ratio. I omit descriptions of most price changes in the paper because of this immediate correspondence.

⁷This is not the only possible vote ordering, of course. There are permutations in which a multilateral pact could be voted on before a bilateral offer or in which voting sequences are repeated. These permutations can affect some of the results of this paper and I hope to explore them in later work. For this paper, though, the voting structure is assumed to be the one described above.

or discount rates are sufficiently low that discounting may be ignored. Thus, agents all vote to maximize their expected utility under the final integrated trading economy.⁸ Any proposal that garners the support of a majority of voters will be enacted.

Once a free trade agreement has been approved, the participating countries retain their rights to veto an extension of the agreement to include a new country or countries. Thus free trade agreements are distinct from political unions.⁹

While each voter has a single vote and the majority will prevail, one can predict the outcome of any vote by considering the behavior of the voter with the median capital-labor ratio. Suppose, for example, a trade agreement under consideration would lead to a capital-labor ratio in the resulting integrated economy which was lower than the alternative economy-wide capital-labor ratio (either under autarky or a bilateral agreement). If this increases the utility of the voter with the median capital-labor ratio, we can deduce from Proposition 1 that all voters with higher capital-labor ratios than this median voter would also gain. Together, these agents must constitute a majority, by the definition of median. The same reasoning applies if an agreement would reduce the median voter's utility. Therefore, agreements will be approved if and only if they enhance the welfare of all participating countries' median voters. We will call such agreements politically feasible.

Now the major result of this section can be stated:

PROPOSITION 2: In a Heckscher-Ohlin setting, there can be no politically feasible bilateral agreements which would supplant a politically feasible multilateral trade agreement.

⁸I assume that agents vote their utility whether or not they believe their vote will decide the election, perhaps as a civic duty. This avoids the issue of agents' expectations about other agents' voting behavior. While that issue may be of theoretical interest, empirically one observes elections in which the winner wins by a substantial margin.

⁹As an empirical basis for this assumption, it should be noted that the EC has moved the furthest toward political union of any existing regional trade group, yet for admission of new members even the EC has relied upon the unanimous approval of its members.

Proof: It is useful at this stage to enhance the notation. Let us use k as generic notation for a capital-labor ratio. Next, let k_o^c represent the capital-labor ratio of the median agent in country c . Finally, let us distinguish between countries and integrated economies; the latter can consist of a single country (autarky) or two or more countries (free trade areas). The ratio of all the capital to all the labor in an integrated economy e will be written as k^e . Now let the function:

$$U_c (k_o^c, k^e)$$

denote the maximum attainable utility of the median agent in country c , given the capital-labor ratio in economy e , as in Proposition 1. Although the levels of capital and labor endowments determine utility, the ratios are sufficient to explore the welfare effects of policy changes and thus the levels are omitted.

Consider two countries, A and B , which might pair to create a free trade area. In the first stage of voting, voters in both countries decide whether to continue functioning in autarky or whether to join to form a free trade area (AB). In the second stage, voters will determine whether to maintain the outcome of the first stage or join in a multilateral free trade area (M) including the other countries. Since we are only concerned with politically feasible multilateral free trade agreements, we assume

$$U_j(k_o^j, k^M) > U_j(k_o^j, k^j)$$

for each country j (i.e., all median agents prefer multilateral free trade to autarky).

Returning to the potential free trade agreement, AB , we can see that if $k^A = k^B$ then there is no basis for trade between the two countries. Therefore, let us arbitrarily say that $k^A > k^{AB} > k^B$. For agreement AB to pass, both countries must approve it. This requires that

$$(2.2) \quad \begin{aligned} U_A(k_o^A, k^{AB}) > U_A(k_o^A, k^A) \text{ and} \\ U_B(k_o^B, k^{AB}) > U_B(k_o^B, k^B). \end{aligned}$$

Because of the strict quasi-convexity of utility functions, if condition (2.2) holds, this

implies that the median voter in A must gain from decreases in the economy's capital-labor ratio at k^{AB} , while the median voter in B must gain from increases (see Figure 2.2).

Next consider the second stage of voting. The aim here is to show that there are no sets of capital-labor ratios (for the two countries A and B and the rest of the world) such that both A and B prefer the bilateral free trade agreement to multilateral free trade. In relation to free trade area AB, multilateral free trade can have one of three effects:

1) Multilateral free trade could leave the integrated economy's capital-labor ratio unchanged ($k^M = k^{AB}$). In this case, there is no basis for trade, so both A and B would be indifferent.

2) Multilateral free trade could increase the integrated economy's capital-labor ratio ($k^M > k^{AB}$). In this case:

$$U_B(k_0^B, k^M) > U_B(k_0^B, k^{AB}) > U_B(k_0^B, k^B)$$

so B would approve of the change. It is possible that

$$U_A(k_0^A, k^M) > U_A(k_0^A, k^{AB})$$

only if k^M is sufficiently greater than k^A — in which case both countries would approve the change. If

$$U_A(k_0^A, k^M) < U_A(k_0^A, k^{AB}),$$

which will occur if A is capital abundant relative to the world, then A would want to block multilateral free trade. However, Country B would foresee the result and vote against the bilateral free trade agreement in period 1.

3) Multilateral free trade could decrease the integrated economy's capital-labor ratio ($k^M < k^{AB}$). This case is simply the reverse of case 2. Country A would approve of the change. If B would want to block multilateral free trade, A would foresee the result and vote against the bilateral free trade agreement in period 1.

Thus, the strict quasi-convexity of utility functions guarantees that no two countries that originally wanted multilateral free trade can establish a bilateral free trade area that both prefer.

This argument is demonstrated in Figure 2.3. A special case is depicted in which the median voters in Countries A and B have the same capital-labor ratios as their countries. These capital-labor ratios are the minima of the two utility curves. The capital-labor ratio of a bilateral free trade area between A and B must lie between these two points. The three cases in the proof given above correspond to situations when multilateral free trade would result in a capital-labor ratio the same as, to the right of, or to the left of the bilateral FTA point. In either of the latter two cases, at least one country would strictly prefer multilateral free trade to the bilateral agreement.

Of course, if the discount rate were sufficiently high or the periods sufficiently far apart, then it would be possible for a bilateral agreement to undermine multilateral free trade. This is a caveat applicable to almost any sequential result. The point remains that in a Heckscher-Ohlin setting in which voters are asked to consider both a bilateral and a multilateral trade agreement, there cannot be coalitions of countries which would prefer the bilateral agreement to the multilateral.

It is worth noting that bilateral agreements are feasible in this model if and only if the capital-labor ratios of both participating countries lie on the same side of the multilateral integrated economy's capital-labor ratio. To see how this might happen, we can return to the example in which $k^A > k^B$. If both ratios were greater than that of the integrated economy under multilateral free trade, it is possible that Country B would gain by both an initial increase in the broader economy's capital-labor, and then a decrease sufficiently large that B became relatively capital-abundant. In Figure 2.3, this situation would involve a multilateral free trade capital-labor ratio well to the left of Country B's. The same argument could be made if both countries were labor-abundant relative to the multilateral economy. As shown in Proposition 2, though, these politically feasible bilateral agreements could not preclude multilateral free trade.

One can also readily see that a politically feasible bilateral agreement can never increase the political feasibility of multilateral free trade. If multilateral free trade is not politically feasible initially in a country j , $U_j(k_o^j, k^M) < U_j(k_o^j, k^j)$. If a bilateral free trade agreement (ij) is politically feasible, then $U_j(k_o^j, k^{ij}) > U_j(k_o^j, k^j)$. By transitivity, then, $U_j(k_o^j, k^{ij}) > U_j(k_o^j, k^M)$ so there would not be political support for an expansion from a bilateral trade agreement to a multilateral trade agreement.

Finally, note that this logic of this section would also apply to political unions. A political union between two countries would imply that majority support from the *pooled* populations would be necessary for expanding the union. Under such an arrangement, there would likely be a new median voter. However, if the voters in the two partner countries are fully informed, they would block the bilateral political union unless they concurred with the predictable ensuing choice on multilateral union.

III. A Differentiated-Product Model

In this section it will be shown that if agents value variety, the result of the previous section can be overturned; there are bilateral trade coalitions which can supplant multilateral free trade.

To show this, a specific differentiated-product model will be introduced, although many of the features of the previous section's model will be retained. Again suppose an individual country trades with an arbitrary number of partner countries. The only differences between countries will be their endowments of the two factors of production, capital, K , and labor, L , and the distribution of factor ownership. In all cases, each agent i will be assumed to own one unit of labor (for simplicity) and some amount of capital, k_i , where:

$$(3.1) \quad \sum_{i=1}^L k_i = K$$

Since labor ownership is assumed not to vary, k_i also measures the relative wealth of an agent.

The two factors are fully employed and receive returns per unit of w for labor and r for capital. Thus, agent i enjoys an income of:

$$(3.2) \quad I_i = rk_i + w$$

We turn now to the two sectors of production. Y will denote the economy's output of the homogeneous product. The constant-returns production process uses factors in the following way:

$$(3.3) \quad Y = \gamma_Y K_Y^\mu L_Y^{1-\mu}$$

where all parameters are assumed to be positive and $\mu \in (0,1)$.

The goods in the X sector are now differentiated products produced under increasing returns to scale. For an individual variety x , the production function is:

$$(3.4) \quad x = \gamma_x K_x^{\xi\eta} L_x^{\xi(1-\eta)}$$

where parameters again are positive, $\eta \in (0,1)$, and the returns to scale are reflected by $\xi > 1$. In equilibrium, n will denote the number of varieties in production and X will denote the sum of output over all n varieties in an economy.¹⁰

To keep the model tractable, agents are assumed to have identical utility functions of the following form:

¹⁰The results do not depend on the Cobb-Douglas form of the production functions. They do depend, however, on the assumption of homotheticity in production.

$$(3.5) \quad U = U_x^\alpha Y^{1-\alpha}$$

$$(3.6) \quad U_x = \left(\sum_{i=1}^n D_i^\beta \right)^{1/\beta}, \quad \beta = \left(1 - \frac{1}{\sigma} \right), \quad \sigma > 1$$

where D represents the consumption of an individual variety x and i indexes the varieties. The homotheticity of (3.5) ensures that expenditure patterns will not vary as income is redistributed or augmented. The parameter α lies in the range (0,1). The Spence-Dixit-Stiglitz subutility function implies that individuals prefer variety and have a constant cross price elasticity of substitution (σ) between varieties.¹¹

With this description of preferences in hand, we can examine producer behavior more closely. Firms in both sectors maximize profits and, due to free entry and exit, those profits are zero in equilibrium. Given the fixed expenditure shares that follow from Cobb-Douglas utility and production functions, we can readily derive factor demands in sector Y as a function of parameters and factor returns:

$$(3.7) \quad L_Y = (1 - \alpha)(1 - \mu) \left(\frac{r}{w} K + L \right) \text{ and}$$

$$(3.8) \quad K_Y = (1 - \alpha)\mu \left(K + \frac{w}{r} L \right)$$

In the increasing returns sector, X , each firm must choose which variety to produce, given the choice of other firms. For any firm, an unproduced variety will be more profitable than an existing variety, so each firm will produce a different variety. Each firm then maximizes profits by setting quantity to equate marginal revenue and marginal cost. Since varieties are valued equally in consumers' utility functions, the demand curve facing each firm is identical. In combination with identical production functions, this means that each firm in sector X produces at an identical optimal level of output, denoted by x , and

¹¹An alternative assumption described by Helpman and Krugman (1985) is that subutility preferences are of the Lancaster variety. In this case, consumers have an ideal variety and prefer products which are closer to the ideal. Lancaster preferences would not fundamentally alter the results of this paper but would make the analysis more complicated.

sells at an identical equilibrium price. If n is sufficiently large, σ serves as a good approximation of the elasticity of demand facing each firm.¹² With this approximation, plus the knowledge that in equilibrium price equals average cost, plus the optimality condition that marginal revenue must equal marginal cost, we can derive the following:

$$(3.9) \quad x = \frac{\sigma}{\xi(\sigma - 1)}$$

Since x is based solely on parameters, the number of firms, n , is determined by the equality:

$$(3.10) \quad X = nx$$

To complete our description of factor allocation, we define L_x and K_x as the factor demands of a given firm and then formally state the full-employment conditions for each factor:

$$(3.11) \quad nL_x + L_Y = L$$

$$(3.12) \quad nK_x + K_Y = K$$

and then derive the following factor demands.

$$(3.13) \quad nL_x = (1 - \eta)\alpha \left(\frac{r}{w}K + L \right)$$

$$(3.14) \quad nK_x = \eta\alpha \left(K + \frac{w}{r}L \right)$$

We will assume, rather arbitrarily, that the differentiated product sector is relatively capital-intensive. This assumption is equivalent to the requirement that $\eta > \mu$.

To complete the model, we must discuss the determination of prices in the economy. Y is assumed to be the numeraire good. Since the price of Y must equal the average cost, factor returns are restricted as follows:

$$(3.15) \quad \frac{wL_Y + rK_Y}{Y} = 1$$

¹²For a fuller discussion of the demand structure, see Helpman and Krugman (1985, Chapter 6). Note also that the fixed level of firm production is a byproduct of the Spence-Dixit-Stiglitz approach. Under Lancaster's approach, x would vary.

As stated above, there will be a single price for the differentiated product which we can denote as p . With this defined, we can close the model with our two expenditure share equations:

$$(3.16) \quad Y = (1 - \alpha)(rK + wL)$$

$$(3.17) \quad pX = \alpha(rK + wL)$$

With these equations, we can solve the model and trace all of the endogenous variables back to parameters and factor endowments.

By substituting equilibrium values into the utility function described by (3.5) and (3.6), we can derive an indirect utility function for an agent i :

$$(3.5') \quad U_i = I_i (1 - \alpha)^{(1-\alpha)} \alpha^\alpha n^{\frac{\alpha}{\sigma-1}} p^{-\alpha}$$

Recall that $\alpha \in (0,1)$ and $\sigma > 1$. This more clearly demonstrates the effect of variety on utility. It should also be noted here that I_i measures real income in terms of the homogeneous product, Y .

Before returning to the sequential voting questions of Section 2, it is useful to explore the effect of any free trade agreement on agents' utility. This analysis will later be applied to the sequential choice of bilateral or multilateral trade regimes.

From Equation (3.5') the change in agent i 's utility change due to a trade agreement can be described as:

$$(3.18) \quad \frac{U_i^{FT}}{U_i^{AUT}} = \left(\frac{I_i^{FT}}{I_i^{AUT}} \right) \left(\frac{p^{FT}}{p^{AUT}} \right)^{-\alpha} \left(\frac{n^{FT}}{n^{AUT}} \right)^{\frac{\alpha}{\sigma-1}}$$

where 'FT' denotes values after a free trade agreement and 'AUT' denotes values in autarky. Let us define λ_K as the percentage increase from an economy's capital stock to the capital stock of the integrated economy resulting from a free trade agreement (and λ_L as the percentage increase in the labor stock). In terms of the parameters of the model, the final term of (3.18) is:

$$(3.19) \quad \left(\frac{n^{FT}}{n^{AUT}} \right)^{\frac{\sigma}{\sigma-1}} = \left[(1 + \lambda_K)^\eta (1 + \lambda_L)^{1-\eta} \right]^{\frac{\sigma}{\sigma-1}}$$

Since λ_K and λ_L are always greater than zero, this “Variety” effect always exceeds one (i.e., it has a positive effect on utility).

We can call the remaining effect on utility the “Comparative Advantage” effect. This is the effect that would remain if σ went to ∞ and the differentiated product became homogeneous. It is a specific example of the utility arguments underlying Section 2. To explore this effect, we see that an agent’s income will shift as follows:

$$(3.20) \quad \frac{I_i^{FT}}{I_i^{AUT}} = \frac{r^{FT} k_i + w^{FT}}{r^{AUT} k_i + w^{AUT}}$$

To determine the sign of the Comparative Advantage effect, this income shift must be combined with the price shift. Before solving the model for this combination, it is first necessary to parameterize the shift in the economy’s capital-labor ratio by the variable ϕ , where ϕ is implicitly defined by:

$$(3.21) \quad \frac{K^{FT}}{L^{FT}} = \frac{(1 + \lambda_K) K^{AUT}}{(1 + \lambda_L) L^{AUT}} = \phi \frac{K^{AUT}}{L^{AUT}}$$

Note also that the free trade capital-labor ratio is that obtained by pooling the endowments of the partner countries. We assume, as before, that endowments are such that the integrated equilibrium can be replicated through trade. Therefore, ϕ will be greater than 1 if a country’s counterpart is relatively capital abundant and less than 1 if the counterpart is relatively labor abundant.

We can also parameterize agent i ’s capital holdings by ρ_i , where ρ_i is implicitly defined by:

$$(3.22) \quad \left(\frac{K}{L} \right)_i = k_i = \rho_i \left(\frac{K^{AUT}}{L^{AUT}} \right)$$

So $\rho_i > 1$ if agent i is relatively capital abundant, $\rho_i < 1$ if agent i is relatively labor abundant, and $\rho_i = 1$ if agent i has the same capital-labor ratio as the country.

With these parameterizations, the Comparative Advantage effect takes the following form:

$$(3.23) \quad \left(\frac{I_i^{FT}}{I_i^{AUT}} \right) \left(\frac{P^{FT}}{P^{AUT}} \right)^{-\alpha} = \varphi^{\frac{1}{1+\theta}} \left(\frac{\rho_i / \varphi + \theta}{\rho_i + \theta} \right)$$

where

$$\theta \equiv \frac{1}{\mu(1-\alpha) + \eta\alpha} - 1$$

To interpret θ , note that the denominator of the fraction term can be seen as a weighted average of the capital-intensity parameters in the two sectors. Recall also that α denotes the utility weight on the capital-intensive differentiated product sector.

Equation (3.23) allows us to say whether the Comparative Advantage effect of an agent's utility change is beneficial or undesirable, from the agent's viewpoint. This can be seen to depend on the capital abundance of the agent and the capital-labor ratio of the partner country.

Figures 3.1-3.4 depict Equation (3.23) for two values of θ . To get a better analytical feel for the function described by Equation (3.23) we transform it with a natural logarithm to get:

$$(3.24) \quad f(\varphi, \rho, \theta) = \frac{1}{1+\theta} \ln \varphi + \ln \left(\frac{\rho}{\varphi} + \theta \right) - \ln(\rho + \theta)$$

where $f > 0$ implies an increase in utility and $f < 0$ implies a decrease in utility due to a free trade agreement. We then derive the following:

$$(3.25) \quad \frac{\partial f}{\partial \varphi} = \frac{\theta(\varphi - \rho)}{\varphi^2(1+\theta) \left(\frac{\rho}{\varphi} + \theta \right)}$$

With these tools at hand, we can state a result identical to that of Section 2:

PROPOSITION 3: The median voter for a country will be the agent with the median capital-labor ratio in that country.

Proof: Consider a given free trade agreement characterized by φ . Consider the agent with the median capital-labor ratio, whom we can identify as ρ_{median} . The change in this agent's utility is given by Equation (3.24) as $f(\varphi, \rho_{\text{median}}, \theta)$. To explore the utility effects for other agents we derive:

$$(3.26) \quad \frac{\partial f}{\partial \rho} = \frac{\theta(1-\varphi)}{(\rho + \varphi\theta)(\rho + \theta)}$$

The sign of this expression depends only on whether the partner country is relatively capital abundant ($\varphi > 1$) or labor abundant ($\varphi < 1$). We can thus say, in terms of the Comparative Advantage effect, that if the partner country is relatively capital abundant, then all agents with $\rho > \rho_{\text{median}}$ are worse off than the median agent and all agents with $\rho < \rho_{\text{median}}$ are strictly better off. Since variety gains affect all voters equally, this demonstrates that the agent with the median capital-labor ratio is the median voter.

One result follows directly:

PROPOSITION 4: When the median capital-labor ratio among voters is sufficiently close to that of the country's capital-labor ratio, there will be political support for any free trade agreement in that country.

Proof: Consider an agent whose median capital-labor ratio is identical to the country's. Now consider the range of possible values for φ . When $\varphi = \rho_{\text{median}}$, the comparative advantage part of utility is unchanged, as shown by Equation (3.25). That derivative also reveals that as φ increases above 1, utility increases; as φ decreases below 1, utility also increases.¹³ Thus, Equation (3.23) ≥ 1 . Since Equation (3.19) is strictly greater than 1 for any agent and any trade agreement, this means that the agent is made strictly better off by the free trade agreement. Since Equation (3.23) is continuous for $\varphi > 0$ and the variety gains are independent of ρ , it must be true that agents with ρ in some neighborhood

¹³This is a re-establishment of the standard result that any two countries gain from trade when their autarky price vectors differ.

of 1 will gain from any free trade agreement as well. If ρ_{median} lies in that neighborhood of 1, then there will be political support for any free trade agreement.

In such cases, the arguments from Section 2 against a bilateral agreement undermining a multilateral agreement will still apply. The interesting cases for analysis, therefore, will be those in which the distribution of capital in an economy is skewed. In fact, only half of these will be interesting. If the agent with median capital holdings has $\rho > 1$ and ϕ is less than 1 for all agreements under consideration (or if the median agent has $\rho < 1$ and ϕ is greater than one) then both the Comparative Advantage effect and the Variety effect will be positive for this agent and Proposition 2 will still apply.

So, only when the median voter is abundant in the same factor as the partner country is there cause for concern about a bilateral trade agreement undermining a multilateral accord. Equation (3.25) indicates that as ϕ moves from 1 toward $\rho_{\text{median voter}}$ the corresponding Comparative Advantage effect on the median voter's utility will become steadily worse. After that point, the median voter gains by further movement in ϕ . To add some intuition to this result, note that if $\phi = \rho_{\text{median voter}}$, the median voter will have the same capital-labor ratio as the integrated economy after a free trade agreement. If ϕ moves sufficiently far past $\rho_{\text{median voter}}$, the median voter can gain from the comparative advantage effect. However, there will always be a gain from the Variety effect. This means that, in terms of Figure 2.2, it is now possible for trade agreements to occur in the region between 'Autarky' and 'E' if variety gains compensate for the adverse shifts in goods and factor prices.

IV. Policy Experiments in a Differentiated-Product Model

We can now consider the implications of various specific trade agreements before returning to the idea of a voting sequence. Consider a situation in which two countries, A and B, have identical capital-labor ratios:

$$(4.1) \quad \frac{K^A}{L^A} = \frac{K^B}{L^B}$$

[Superscripts here denote the country]. Suppose these countries have two-sector differentiated-product economies and begin in autarky. We can consider the effects of a bilateral accord to remove all trade barriers.

Production in the new, integrated equilibrium will be the same as if either country had grown in size, with the endowment of each factor expanding proportionately. Goods and factor prices will remain unchanged, while production of X and Y will increase proportionately. For individual firms, the optimal level of output, x , will remain unchanged. The increase in X, therefore, will come entirely from an increase in n , the number of varieties.¹⁴

We therefore have the following proposition:

PROPOSITION 5: A free trade agreement between two economies with equal capital-labor ratios can win unanimous support, independent of the distribution of the factor endowments.

Proof: The income of any agent i , with capital k_i , remains unchanged by the removal of trade barriers. Since prices do not change, the agent consumes the same quantities of Y and X. The only difference is that agent i spreads her differentiated product expenditures over both home and foreign varieties. By Equation (3.5'), utility increases with n . All agents in each economy benefit from the liberalization, so under any distribution of capital, agents would choose the free trade agreement over autarky.

¹⁴The result that prices remain unchanged requires only homotheticity in production. The fixed optimal output result, as stated above, is particular to the Spence-Dixit-Stiglitz subutility assumption. With increasing returns, if the optimal output level increased, it is possible that the relative price of the differentiated product would fall while factor returns remained constant. This could further enhance welfare.

We can now return to the scenario of Section 2 and ask about the results if these countries are two among many. Consider a bilateral and then a multilateral free trade pact offered in an exogenously determined sequence. We can ask whether an agreement between A and B could affect the political support for a multilateral free trade pact. The answer is stated in the following proposition:

PROPOSITION 6: An agreement between similar countries can only diminish the political support for completing a broader agreement.

Proof: Let us say an action “diminishes political support” for a given agreement when the action results in fewer votes in favor of an agreement and more votes against.¹⁵ Suppose there exists an agent in Country A who would be indifferent between her autarkic situation and her situation under multilateral free trade. This means that each side of Equation (3.18) is equal to 1. Since variety gains are greater than 1 for all agents, an indifferent agent must be relatively abundant in the same factor as the world and Equation (3.23) must be less than 1. If the indifferent agent is asked to vote for or against a bilateral free trade agreement with Country B, she will vote for it, since B is similar and the agreement offers painless variety gains, described by Equation (3.19). If, next, this agent is asked to vote on a proposal to include Country C, she will vote against it. The third term in the Equation (3.18) utility comparison will be strictly smaller while the first two terms will be unchanged. Therefore the utility comparison for the previously indifferent agent will now be less than 1. Because of the continuity of Equation (3.23), agents with ρ slightly closer to the Country A mean would have benefited from an autarky-to-multilateral change, but would now be hurt by the extension of a bilateral agreement to a multilateral agreement. Therefore, support will be undermined unless there are no agents with ρ in the specified

¹⁵Of course, this diminution of support will be critical only when the votes in favor fall below half of the total.

range. Since A and B are assumed to have identical capital-labor ratios, the possibility is equally relevant in both countries.

Note that if the median voter was either the original indifferent agent or any of the agents whose support for a three-way accord switched, then the bilateral accord *would have* precluded multilateral liberalization. For the swing voters, the pain due to the adverse shift in factor returns was counterbalanced by the gain of more available varieties of the differentiated product. A bilateral accord allowed these agents to capture some gains without pain, thus upsetting the balance.

This result can be generalized beyond the case of countries with equal capital-labor ratios. Without loss of generality, let a Home Country be capital-abundant relative to the collected endowments of the Multilateral Free Trade area. This is the basis of Figure 4.1.

Suppose that there is initially majority support for multilateral free trade and, as before, there is an agent who would be indifferent between autarky and multilateral free trade. This agent's indifference curve is depicted in the figure, with the lowest dot representing the autarky situation. While the curvature is arbitrary, decreases in ϕ hurt the agent and variety gains are beneficial, so the curve slopes downward.¹⁶ Free trade agreements can be located as points on this map; their effect on the integrated capital-labor ratio will determine the location on the horizontal axis and Equation (3.19) will position the agreement with the vertical axis. Any agreement will result in an upward movement. If the agreement is with a similar country, there will be only upward movement and no lateral movement. As discussed above, this undermines political support for multilateral liberalization.

¹⁶It is important to note that ϕ represents the capital-labor ratio for the integrated economy, i.e., the Home Country and any countries who have signed free trade agreements with the Home Country. An agent's indifference curve would bend back downwards if $\rho_i > \phi_{MFT}$. This could have adverse effects on interim agreements but should not affect the argument in the neighborhood of autarky. The curvature will depend at least in part on the units for the vertical axis.

The indifference curve depicted in Figure 4.1 for the “Indifferent agent” (who must have $\rho < 1$, incidentally) represents a political neutrality locus. Any trade agreements which put the integrated economy at a point along this line will not alter political support for multilateral free trade in the Home Country.

Suppose the “Second agent” in Figure 4.1 is the median voter. In this case, the area between the two curves is a sliver of excess votes. Any move into this region results in fewer votes for a multilateral free trade agreement, although the agreement would still pass. Any move above the indifference curve of the median voter will be politically fatal for multilateral free trade. We can now state the major proposition of this section:

PROPOSITION 7: No agreement involving a proper subset of countries can render politically feasible an otherwise infeasible agreement involving the full set of countries. However, bilateral agreements can render otherwise politically feasible multilateral agreements infeasible.

Proof: Here we return to the notation of Proposition 2, in which k_o^c represents the capital-labor ratio of the median agent in country c and the ratio of all the capital to all the labor in an integrated economy e will be written as k^e . Let the possible values of e be: MFT for multilateral free trade, c for autarky, and FTA for a free trade agreement involving a subset of the countries. The utility notation must now also include n^e to represent the number of varieties in economy e . Now the utility function for an agent in country c can be written as:

$$U_c(k_o^c, k^e, n^e)$$

The first half of the proof mimics Section 2. Suppose that

$$U_c(k_o^c, k^{MFT}, n^{MFT}) < U_c(k_o^c, k^c, n^c).$$

This implies multilateral free trade is politically infeasible. An agreement involving a proper subset of countries is politically feasible if and only if

$$U_C(k_o^c, k^{FTA, n FTA}) \geq U_C(k_o^c, k^c, n^c).$$

But that implies

$$U_C(k_o^c, k^{FTA, n FTA}) > U_C(k_o^c, k^{MFT, n MFT}).$$

Therefore multilateral free trade must remain infeasible, thus proving the first assertion.

Suppose next that

$$U_C(k_o^c, k^{MFT, n MFT}) > U_C(k_o^c, k^c, n^c)$$

so multilateral free trade is initially politically feasible. If

$$U_C(k_o^c, k^{FTA, n FTA}) > U_C(k_o^c, k^{MFT, n MFT})$$

then the subset agreement will have rendered an otherwise politically feasible multilateral agreement infeasible. In contrast to Section 2, Proposition 5 showed that bilateral agreements in which

$$U_C(k_o^c, k^{FTA, n FTA}) > U_C(k_o^c, k^{MFT, n MFT})$$

are possible in the differentiated product model and feasible since the inequality can hold for multiple members of a free trade agreement.

It is of some interest to explore how a country could avoid undermining support for multilateral liberalization in this differentiated-product setting. One answer, of course, is to pursue only a policy of multilateral liberalization from the start. If bilateral free trade agreements are to be sought, though, the answer would be to pursue agreements with countries or groups of countries with different factor endowments. If, in the case shown in Figure 4.1, we wish to hold variety gains constant but lower ϕ , the Home Country needs partner countries with less capital and more labor.¹⁷ In fact, though, there is a tighter requirement for preserving the feasibility of multilateral free trade:

PROPOSITION 8: To preserve the feasibility of multilateral free trade, subset agreements must meet the requirement that

$$U_j(k_o^j, k^{FTA, n FTA}) \leq U_j(k_o^j, k^{MFT, n MFT})$$

for *all* countries j participating in the agreement.

¹⁷Formally, this tradeoff can be derived by holding the left-hand side of Equation (4.3) constant and varying λ_L and λ_K .

Proof: We start by assuming the initial feasibility of multilateral free trade. If $U_j(k_o^j, k^{FTA, n^{FTA}}) > U_j(k_o^j, k^{MFT, n^{MFT}})$ for any country j that is party to a subset agreement, then that country would block an expansion of the free trade area to include the remaining non-member countries, since such an expansion would diminish the utility of a majority of its voters.

This can be seen graphically in Figure 4.2, which translates Figure 4.1 into capital-labor space. In Figure 4.2, rays from the origin mark out the capital-labor ratios for the median agent, that agent's country, and for the integrated economy offered by a multilateral free trade agreement. The indifference curve connected to the point labeled "Country" represents the autarky utility level of the median agent. To trace out the indifference curve, it should be noted that moves outward along a ray are strictly welfare-enhancing (since they represent variety gains). Less easily, one could hold variety constant and consider a change in the economy's capital-labor ratio; a move to the southeast would decrease the ratio, for example. The exact direction would depend on the parameters of the model. As shown, the median agent is relatively labor-abundant and thus moves in the southeast direction are detrimental to the agent's welfare.

In Figure 4.2, the variety gains offered by multilateral free trade more than compensate the median agent for the adverse price shifts (I' represents a higher utility level). The diagram is useful for contemplating any bilateral or subset agreement. Any agreement must lie to the northeast of the point "Country", since the new integrated economy will necessarily have more capital and labor than the median agent's country in autarky. If it lies below the indifference curve I' it will not be politically feasible. If it lies between the two indifference curves, it will be politically feasible, but will not block multilateral free trade (at least in the median agent's country). If it lies beyond I' , it will be

politically feasible and will block multilateral free trade. To preserve the viability of multilateral free trade, agreements must lie below the equivalents of curve P' for all countries involved.

V. Comparative Statics

Ideally, one could describe in detail how the shape of indifference curves is affected by each parameter of the model. Unfortunately, complex formulae emerge from the Cobb-Douglas framework and only some rough generalizations are possible.

The first parameter to consider is σ , the elasticity of substitution between differentiated products. We have assumed only that $\sigma > 1$. As σ increases, differentiated products become more substitutable and the importance of variety diminishes. In the limit, variety plays no role and there will be no undermining of political support. A country would liberalize if and only if the median voter would experience comparative advantage gains — the same result as in Section II. In Figure 4.2, indifference curves would become rays from the origin.

The parameter α governs the weight of the differentiated product sector in the utility function. As it increases, variety effects become more important, *ceteris paribus*. A higher α will also correspond to a lower θ , given the assumption that the differentiated product sector is relatively capital intensive. Figures 3.1-3.4 and Equation (3.23) show that a decrease in θ — an increase in the average capital-intensity of the two sectors — diminishes the importance of the Comparative Advantage effect in agents' utility. Increases in η and μ will also have this effect on θ .

It is even more difficult to consider alterations in the functional form of the model. It may be noted, though, that for two key features the model in Section III is sufficient but not necessary. The first feature is that any trade agreement resulted in increased varieties of

the differentiated product available to all agents.¹⁸ The second feature is the homotheticity of agents' preferences. Without this, an agreement between similar countries could affect factor returns and the sharp distinction between the Comparative Advantage effect and the Variety effect in Section III would be undone.

VI. Conclusion

This paper has shown that in a Heckscher-Ohlin setting it is politically impossible for a bilateral trade agreement to supplant multilateral free trade. In contrast, it was shown that, in a model with differentiated products and variety gains, bilateral free trade can undermine support for multilateral free trade. Conditions were described under which this could happen. To explain the difference, it is important to understand that the differentiated-product setting permits trade agreements which would have been politically impossible in the setting of Section 2 by allowing gains through variety gains as well as price shifts. In the Heckscher-Ohlin setting, a voter's utility depended solely on the capital-labor ratio. For undermining to occur in the differentiated-product setting, the median voter would have to experience lower utility under free trade in the absence of variety gains and higher or equal utility once variety gains are taken into account.

Throughout the paper, the distribution of factors was shown to be crucial. The task of maintaining political support for multilateral free trade when countries negotiate side agreements in a differentiated-product setting was shown to require a clear understanding of the political situation (i.e. factor distribution) in all participating countries as well as a careful selection of those participating countries. The general principle emerged that the more politically popular a bilateral agreement is, the more likely it is to undermine political support for further multilateral liberalization.

¹⁸Helpman and Krugman (1985) discuss the intricacies of showing gains from trade in models with increasing returns to scale in Chapter 9 of their book.

The applicability of these results to more intricate models merits further research. Still, the general lesson should remain: intermediate accords can upset the balance of gains and losses offered by multilateralism and can therefore undermine political support. Only when such balances are impossible — as in the Heckscher-Ohlin setting — do these concerns subside.

As stated above, all such difficulties are readily avoidable if countries are restricted to pursuing multilateral liberalization. This is not necessarily an argument against more lenient GATT rules of the sort endorsed by Deardorff and Stern (1991). The GATT must accommodate the strong desires of its most powerful members if it is to survive as an institution. Were it to veto major policy initiatives put forward by the United States or the European Community countries, it would be more likely to come apart at the seams than to prevail. Instead, this paper suggests that those powerful member countries might wish to return their attentions to the task of multilateral liberalization.

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Figure 2.1

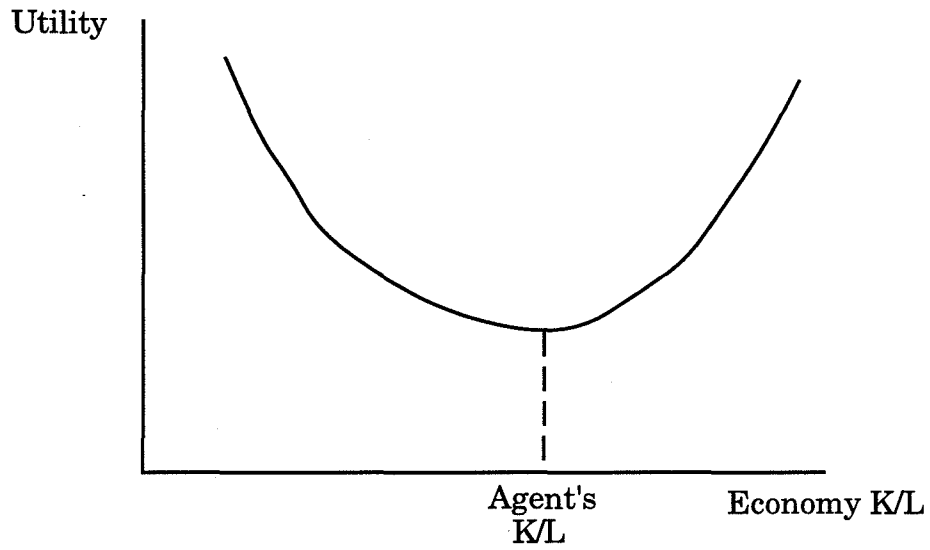


Figure 2.1 depicts the strictly quasi-convex utility of an agent with a given capital-labor ratio as a function of the economy's capital-labor ratio, i.e. the capital-labor ratio of the entire trading region.

Figure 2.2

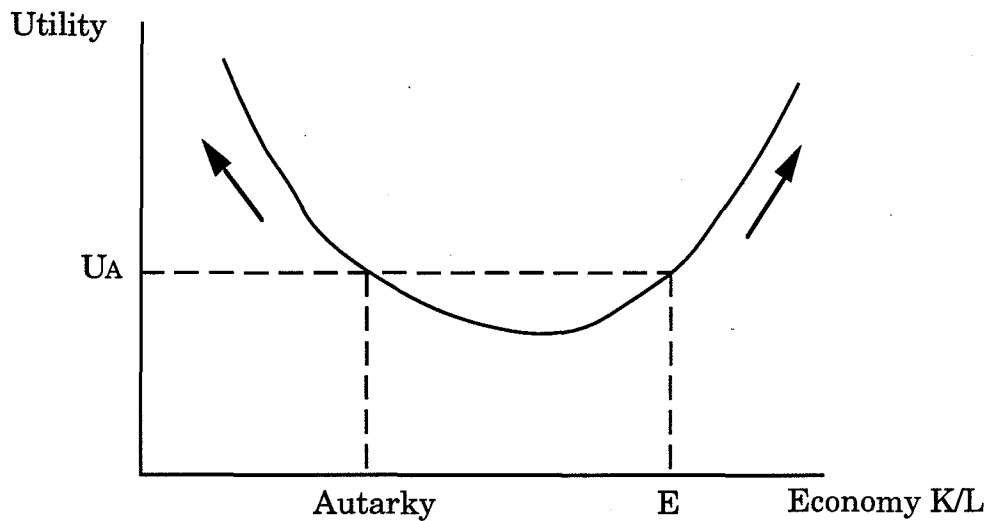


Figure 2.2 uses the same utility curve as Figure 2.1. If this represented the median voter in a country, she would reject trade agreements which resulted in economy capital-labor ratios in the range (Autarky, E). Outside of that range, utility increases as the distance from Autarky increases.

Figure 2.3

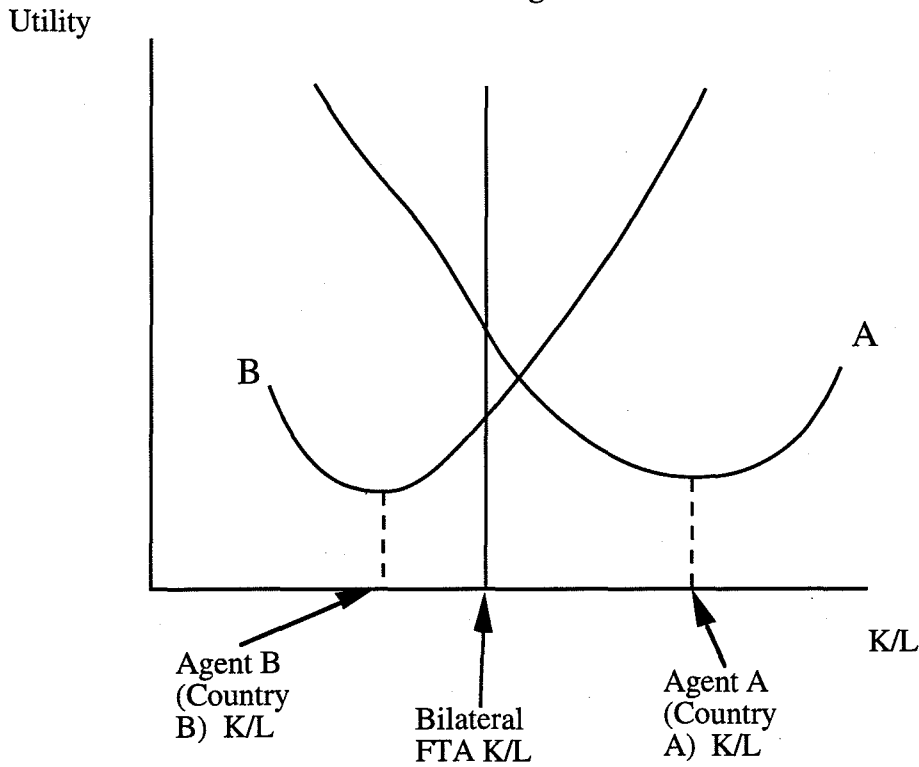


Figure 2.3 demonstrates the impossibility of undermining in the Heckscher-Ohlin setting using a special case. Here utility curves are shown for two agents, A and B, each of whom is assumed, for simplicity, to have the same capital-labor ratio as their country. Also shown is the capital-labor ratio that would result in a free trade area involving the two countries.

Figure 3.1

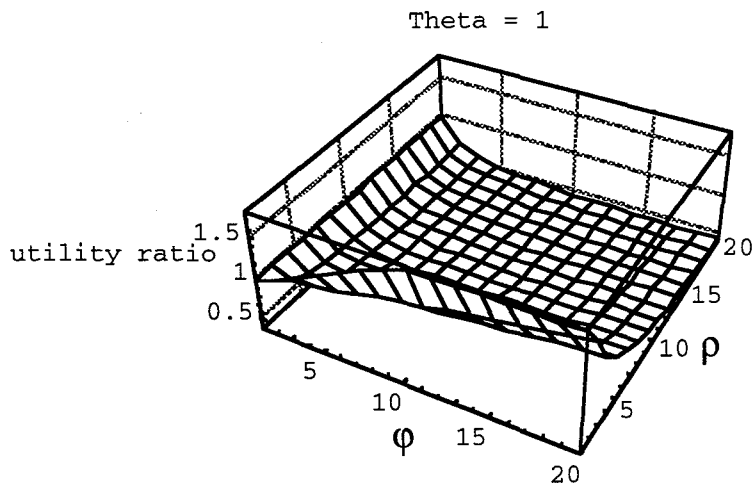


Figure 3.1 depicts the ratio of comparative-advantage utility after a free trade agreement relative to before for agents with $\rho \geq 1$ (relatively capital abundant) and agreements for which $\phi \geq 1$ (a capital abundant partner country). When the utility ratio dips below 1, an agent is worse off.

Figure 3.2

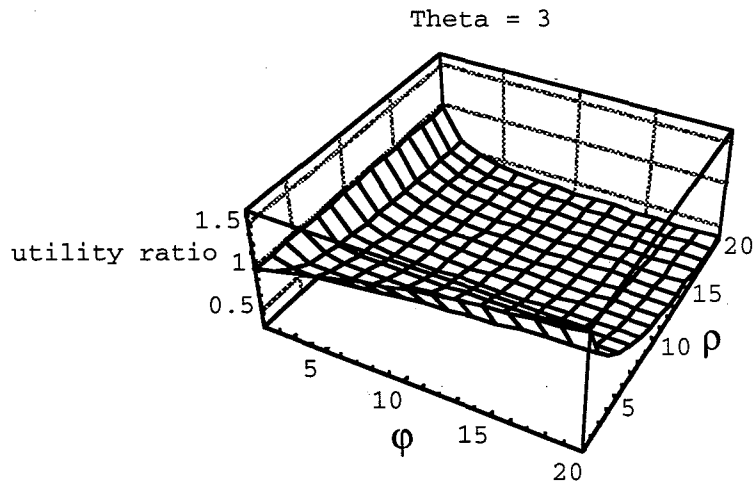


Figure 3.2 differs from Figure 3.1 only in the value of θ .

Figure 3.3

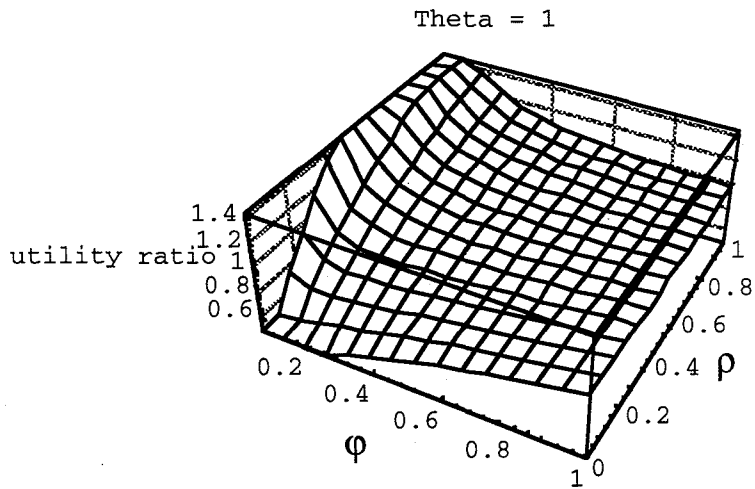


Figure 3.3 depicts the ratio of comparative-advantage utility after a free trade agreement relative to before for agents with $\rho \leq 1$ (relatively labor abundant) and agreements for which $\phi \leq 1$ (a labor abundant partner country). When the utility ratio dips below 1, an agent is worse off.

Figure 3.4

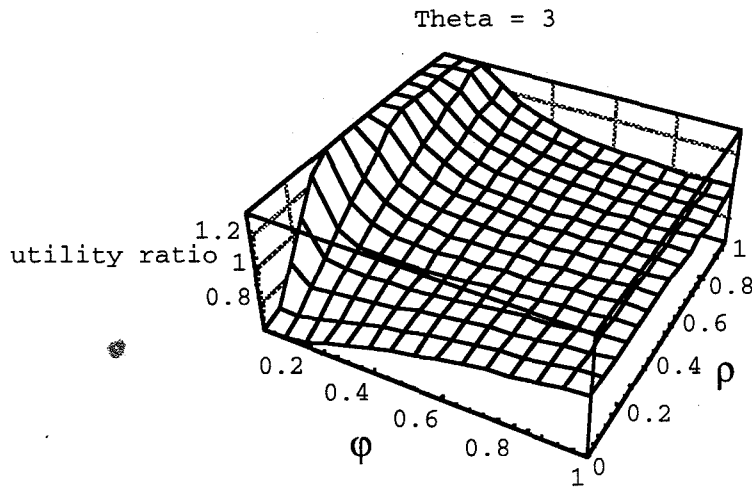


Figure 3.4 differs from Figure 3.3 only in the value of θ .

Figure 4.1
Indifference Map

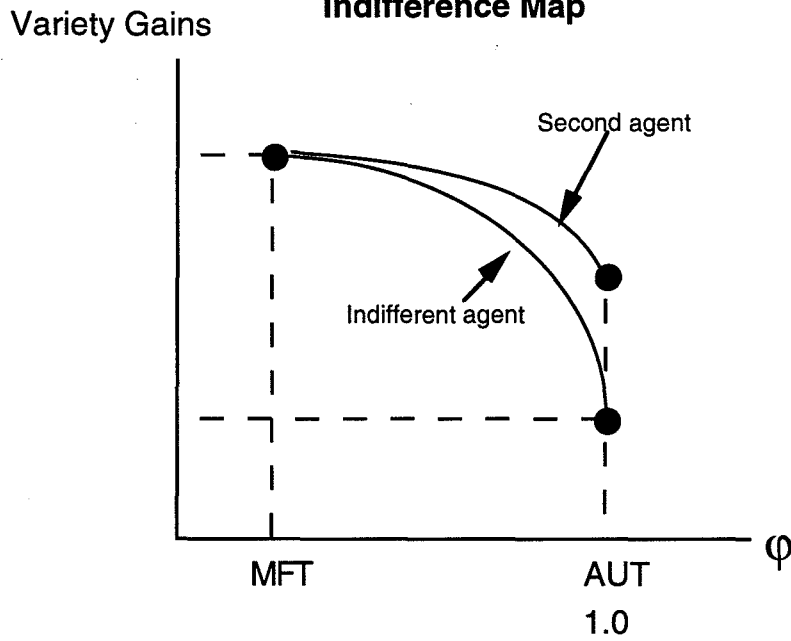


Figure 4.1 shows indifference curves for two agents. The vertical axis can be interpreted as the number of available varieties or some monotonic function thereof.

Figure 4.2

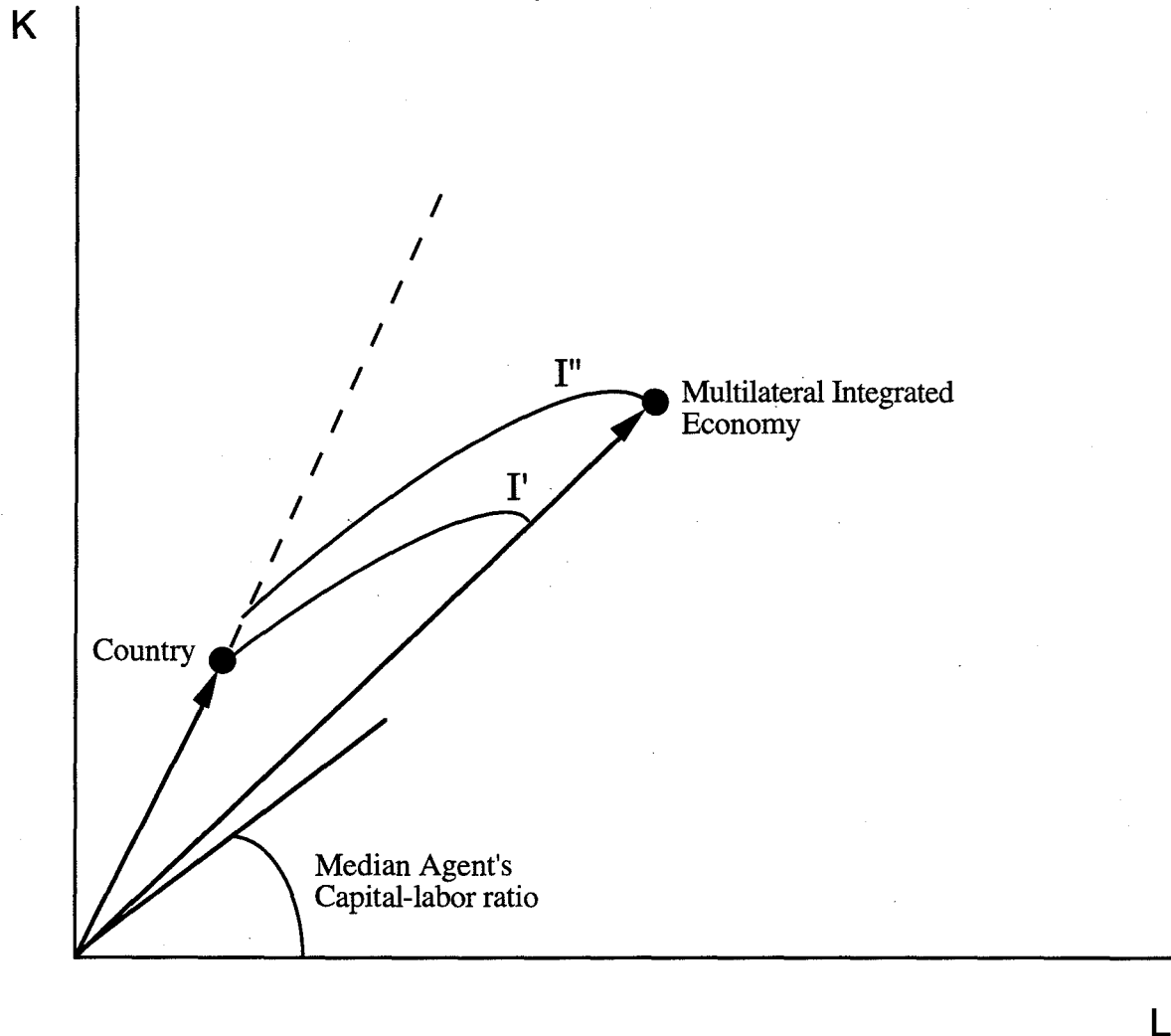


Figure 4.2 translates Figure 4.1 into capital-labor space for an arbitrary set of endowments. The endowments of both a median agent's country and the multilateral integrated economy are shown along with indifference curves for the median agent. As shown the median agent prefers multilateralism (curve I'' is preferred to I' since points along it offer greater variety at a given capital-labor ratio).