INCOME INEQUALITY AND CHOICE OF FREE TRADE IN A MODEL OF INTRAINDUSTRY TRADE*

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This paper explains why developed countries impose more trade barriers on middle-income countries than on either poor or other developed countries. We use a median voter model of the choice between trade and autarky embedded within an intraindustry trade model similar to Krugman. Our main result is the derivation of conditions under which a rich country rejects trade with middle-income countries, but accepts trade with either similar or poor countries. We also show that if increased inequality lowers median wealth in the developed country, the range of countries for which free trade is rejected is enlarged.

I. Introduction

The aim of this paper is to provide an explanation for the observation that developed countries frequently impose higher trade barriers on middle-income countries than on either poor countries or developed countries. We show that these observations are consistent with majority decisions in an intraindustry trade model.

Since the Tokyo Round of GATT, developed countries have become more protectionist, reversing the post-World War II tendency toward lower trade barriers. The stylized evidence suggests that increased protectionism in developed countries is mainly directed at middle-income countries. Consider, first, the increased emphasis on the concept of graduation, which links the Generalized System of Preferences (GSP) to the development level (see Hindley [1987]). Graduation implies that as poor countries develop, they face more trade barriers. Second, the escalation of tariffs in developed countries [Yeats 1987] has become a barrier to industrialization in middle-income countries. Furthermore, many nontariff barriers are directed at products exported by countries in the first stages of industrialization.

In developed countries there is little opposition to free trade with poor countries. As examples we can point to the Caribbean Basin Initiative and the preferential trade agreements some European countries provide their ex-colonies in Africa, in addition

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to the GSP. Similarly, there are several free trade agreements between developed countries: the European Economic Community (EEC) and the Canada-United States free trade agreement. The problems that Spain, Portugal, and Greece experienced before joining the EEC and those facing Turkey in trying to enter the EEC sustain our argument that it is difficult to establish free trade between rich and middle-income countries.[1] Adverse income distribution effects were a major argument used by United States opponents of the extension of the North American Free Trade Association (NAFTA) to Mexico.

There are trade problems between developed countries, but most of these are related to interindustry trade, as in the case of agriculture and steel.[2] Following Krugman [1981], as we argue here, interindustry trade leads to more opposition than intraindustry trade. Marvel and Ray [1987] report data showing that there is less protection in areas where intraindustry trade is prevalent. Intraindustry trade, which is the most important component of world trade, flourishes among developed countries.

In this paper the majority voting approach is used to decide whether or not a country chooses free trade with a partner country. Our model is a modified version of Krugman's [1981] monopolistic competition model. In order to simplify our analysis, we study decisions of a dichotomous nature: agents face the choice between accepting or rejecting free trade. The structure of our model is as follows. There are two types of labor: skilled and unskilled. Skilled labor is used in the production of differentiated goods, while unskilled labor is used in the production of a homogeneous good. All agents have the same endowment of unskilled labor, but the amounts of skilled labor vary between individuals. The two countries are identical except in two respects: the ratio of skilled to unskilled labor, i.e., the relative factor abundance and the relative size of the countries. We assume that the home country is rich; that is, it is the skilled-labor-abundant country.

The key to the main conclusion of the paper is the result (familiar from Krugman [1981]) that opening trade has two main effects. First, it increases the number of varieties available, and second, it increases the real wage of the relatively abundant fac-

tor while reducing the real wage of the relatively scarce factor. The closer the relative factor endowments of the two countries are, the larger the variety effect. The real income effect depends on the agent's stock of skilled labor and the foreign country's relative factor endowment.

Consider the situation of the median voter in the rich country, who is assumed to have a skilled labor endowment below average; i.e., she is relatively poor in skilled labor. If the two countries have similar relative factor endowments, her real income effect is negative—but small—because trade lowers the domestic wage of unskilled labor. On the other hand, the positive variety effect is large, and it dominates the real income effect. Accordingly, the median voter votes for free trade with similar countries.

Now consider the case where the foreign country has a low endowment of skilled labor, so the variety effect is unimportant. In the home country all agents with a large amount of skilled labor are made better off by free trade. The explanation is that trade raises the price of the factor with which they are relatively well endowed. Therefore, if the median voter in the home country has a large amount of skilled labor, she will vote for free trade with countries that have a low endowment of skilled labor.

For any agent the real income effect attains its minimum when the world average skilled labor equals the stock of skilled labor of that agent. Close to the minimum, the real income effect is negative and could overwhelm the positive variety effect leading to an overall negative effect of trade on the median voter. Assuming that the distribution of wealth is skewed to the right, we derive conditions under which trade with middle-income countries is rejected since the positive variety effect is not large enough to compensate the median voter for the real wage loss. In the poor country, on the other hand, the real income effect on the median voter is always positive. Since the variety effect is also positive, the median voter in the poor country prefers free trade with any richer country.

Moreover, an increase in inequality in the home country that lowers the amount of skilled labor possessed by the median voter will enlarge the range of countries with which trade will be rejected. This result matches the stylized observation that the demand for protectionist policies in the United States has increased at the same time that income distribution has worsened [Levy and Murnane 1992]. A similar observation can be made for the

EEC countries [Gottschalk 1993], where increased protection has accompanied the decline of the middle class.

Focusing on dichotomous decisions does not seem to be a very restrictive assumption. If voters do not include tariff revenue in their expected income (or if it is returned in a nonredistributive way), we believe that our results continue to hold when countries consider the wider choice of reducing or eliminating already existing protection. The assumption that developed country voters do not include tariff revenues in expected income is reasonable given that tariff revenue in developed countries represents less than 2 percent of government revenue [Linn and Wetzel 1989].[3] Moreover, in the kind of decisions we are interested in—joining a Free Trade Agreement (FTA) or granting access to the Generalized System of Preferences (GSP) to another country—voters have to make a stark decision.

Our motive for analyzing whether voters will freely choose free trade with another country is that economists usually assume the existence of identical agents or show that if agents are differentiated, suitable lump sum transfers leave everybody better off. In the real world individuals are not identical, and lump sum transfers are not employed, so trade liberalization faces opposition from agents who are hurt by trade.[4] In trade theory there are two approaches to explain the political process that leads to the design of commercial policy: the majority voting model and the probabilistic voting model. The latter approach, pioneered by Magee, Brock, and Young [1989], is based on the superimposition of political parties and lobbying groups on a factor endowments model of trade. The different groups act strategically, and their joint behavior provides an explanation of observed commercial policies.

In this paper we follow the lead of Baldwin [1982] and Mayer [1984] in using the majority voting approach to decide whether a country chooses free trade with a partner country. From a political economy point of view, the orientation of trade policy does not always correspond with the choice of the majority of voters. Organized lobbies can exert a major influence on the decisions of the government regarding trade policy. Our objective, however, is to

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3. The situation in which countries consider reducing an already existing tariff and voters include the tariff revenue as part of their income would obscure the analysis. It requires a mechanism to distribute tariff revenues without providing additional insights on the voter's choice.

4. In Dixit and Norman [1980] it is shown that weaker instruments, such as specific taxes on commodities, are sufficient to guarantee gains from trade to all agents. However, it is unlikely that these taxes will be imposed.

show the pressures for or against trade from the point of view of voters. Even if policy-makers do not respond to majority voting, our qualitative results do not change if the deciding voter is some higher percentile. After all, policy-makers cannot afford to be totally oblivious to the preferences of the public.

In a recent paper [Fischer and Serra 1992] we show that in a two-country context the median voter in the developed country favors free trade only if the trading partner is sufficiently different in relative endowments. Moreover, the difference in relative endowments required for free trade depends on the relative size of the countries and on the distribution of income within the wealthy country. This result explains why developed countries grant concessions amounting to free trade to poor countries. However, the model is incomplete in that it does not explain the relative lack of barriers to trade between developed countries.

In the early 1980s Lancaster [1980], Krugman [1981], Helpman [1981], Dixit and Norman [1980], Ethier [1982], and others developed several models of intraindustry trade in a general equilibrium framework. These models use monopolistic competition to show the possibility of gains from trade between similar countries. In Ethier's model, the intraindustry gains from trade are due to the existence of economies of scale in the assembly of finished goods, while in the other papers they result from the increase in the variety of products available to agents. We have chosen Krugman's framework because of its tractability that allows us to find explicit conditions for the median voter. We believe the results of this paper can be readily extended to more general settings.

Section II presents the basic model and describes the trading equilibrium. Section III analyzes the trade effects. Section IV studies the relationship between income distribution and free trade approval. Section V describes the gains from trade as a function of the trade partner's relative factor abundance and derives conditions for the existence of an interval of relative factor abundances for which trade is rejected in the rich country. Section VI describes how the rejection interval is affected by changes in inequality, size and substitutability. Section VII concludes.

II. THE BASIC MODEL

Our two-factor, two-good model is an adaptation of Krugman's [1981] model. Factor 1 can be interpreted as skilled labor (or as human capital), while factor 2 should be thought of as un-

skilled labor. Industry 1 produces a number of varieties of a differentiated good out of a large universe of potential varieties in the industry. Industry 2 is a homogeneous good industry.

A. Production

The differentiated goods industry uses only skilled labor, while the homogeneous good industry uses only unskilled labor. Production in industry 1 requires a fixed setup cost and has constant marginal costs:

$$(1) \qquad l_{1i} = \alpha + \beta x_{1i}, \qquad i = 1, \ldots, n_1,$$

where l_{1i} is the amount of skilled labor used by firm i in industry 1 to produce x_{1i} units of variety i and n_1 is the actual number of varieties produced in sector 1. In the second industry we have perfect competition and no fixed costs so the amount of unskilled labor used to produce x_2 units of the homogeneous good is

$$(2) \qquad l_2 = \beta x_2.$$

B. Preferences

This is an economy with a continuum of agents indexed by $\sigma \in [0,1]$. All agents have similar preferences represented by

$$(3) \qquad U^\sigma = \ln\left(\sum_{i=1}^{N_1} (c_{1i}^\sigma)^\theta\right)^{1/\theta} + \ln c_2^\sigma, \qquad 0 < \theta < 1,$$

where c_{1i}^σ denotes the consumption of variety i of good 1 by agent σ and c_2^σ is the agent's consumption of the homogeneous good. N_1 is the number of potential products in industry 1. Not all of these products are actually produced in equilibrium. The specific varieties that are produced in equilibrium are indeterminate. When there are many varieties produced in industry 1, i.e., n_1 is a large number, the demand elasticity for each variety is $1/(1 - \theta)$.

All agents are endowed with one unit of unskilled labor and different amounts of skilled labor. The income of agent σ can be written as $w^\sigma = w_1 l_1^\sigma + w_2$, where l_1^σ is the amount of skilled labor she owns, and $w_j, j = 1,2$ is the wage for type j labor. Since agents are distinguished by the amount of skilled labor they possess, this economy has a nontrivial distribution of income. Since all agents have one unit of unskilled labor: $l_2^\sigma = 1$, for any $\sigma \in [0,1]$, we have

(4)
$$\int_0^1 l_2^\sigma \, d\sigma = 1.$$

Let z denote the average stock of skilled labor in the country, which, given that the number of agents adds up to one, equals the total amount of skilled labor; i.e.,

(5)
$$\int_0^1 l_1^\sigma \, d\sigma = z.$$

C. Equilibrium with Monopolistic Competition[5]

We assume that producers can differentiate their goods at no cost. Thus, each firm in industry 1 is the sole producer of each variety. Firms use a common markup that depends on the elasticity of demand for each variety. The symmetry of the model implies that all firms belonging to industry 1 produce the same quantities x_1 and set the same prices:

(6)
$$p_1 = \beta w_1/\theta,$$

where p_1 denotes the common price in industry 1. Free entry drives profits to zero:

(7)
$$p_1 x_1 - (\alpha + \beta x_1) w_1 = 0,$$

which determines output of each variety as

(8)
$$x_1 = \alpha\theta/[\beta(1 - \theta)].$$

Note that output of each variety depends only on taste and productivity parameters. The number of active firms in the differentiated goods industry is

(9)
$$n_1 = z/(\alpha + \beta x_1) = (1 - \theta)z/\alpha.$$

In industry 2 there is free entry and constant returns so price equals marginal cost:

(10)
$$p_2 = \beta w_2.$$

Since free entry implies that all firms earn zero profits, all the revenue in each industry is received by industry-specific labor. Moreover, given the utility function (3), consumers spend half of their income on the goods produced by each industry. Hence

5. For details of the derivations in this segment, see Krugman [1981].

the income received by skilled labor equals the income received by unskilled labor; i.e., $zw_1 = w_2$. This implies that the wage ratio is the reciprocal of relative factor abundance:

$$(11) \qquad w_1/w_2 = 1/z.$$

The symmetry of the model implies that all agents spend $1/2n_1$ of their income in each of the n_1 varieties in industry 1. The indirect utility function corresponding to (3) depends on the agent's income, the price of the homogeneous good, the common price in industry 1, and the number of varieties actually produced in the differentiated goods industry. More precisely, the indirect utility of agent σ is

$$(12) \qquad U^\sigma = -2\ln2 + \ln\left(\frac{w^\sigma}{p_1}\right) + \ln\left(\frac{w^\sigma}{p_2}\right) + \left(\frac{1-\theta}{\theta}\right)\ln(n_1).$$

D. The Pattern of Trade

We consider trade with a partner country (II) that has the same preferences and technology as the local country (I). We begin by parameterizing the aggregate endowments of country II as follows:

$$(4') \qquad \int_0^\tau l_2^{\sigma'}\, d\sigma' = \tau,$$

and

$$(5') \qquad \int_0^\tau l_1^{\sigma'}\, d\sigma' = \tau z',$$

where variables with primes refer to the foreign country; i.e., z' represents the foreign country's average stock of skilled labor, and $\tau > 0$ denotes its size relative to country I. For our purposes, this version of Krugman's [1981] model has two advantages. First, it allows us to separate the effects of changes in the size of the partner (a change in τ), from the effects of changes in its relative endowment (a change in z'). Second, it admits a characterization of rich and poor countries. For our purposes, the skilled-labor-abundant country is the rich one.

Let asterisks denote free trade values and superscript a denote autarky values. If the number of varieties produced in each country is large, the elasticity of demand does not change after

the introduction of trade. Therefore, trade does not modify the pricing policy of firms, and we have

$$(13) \qquad \begin{aligned} p_1^* &= \beta w_1^*/\theta, & p_2^* &= \beta w_2^*, \\ p_1^{*\prime} &= \beta w_1^{*\prime}/\theta, & p_2^{*\prime} &= \beta w_2^{*\prime}. \end{aligned}$$

Free trade implies that prices of all goods produced by each industry must be equal, independently of the country where they are produced; i.e., $p_j^* = p_j^{*\prime}$, $j = 1,2$. Hence wages are the same across countries; that is, $w_j^* = w_j^{*\prime}$, $j = 1,2$. The world average stock of skilled labor is given by

$$(14) \qquad z_\tau = (z + \tau z')/(1 + \tau).$$

The world relative factor endowments lies between the average stocks of skilled labor of the two countries; that is, $z_\tau \in [z', z]$. In the free trade world economy, this parameter plays the role of the average stock of skilled labor z for a closed economy. Since (i) wages are equal across countries, (ii) free entry implies that all revenues accrue to labor in each industry, and (iii) spending in the two goods is equal, we have $(z + \tau z')w_1^* = (1 + \tau)w_2^*$. Then

$$(15) \qquad w_1^*/w_2^* = 1/z_\tau.$$

Trade affects neither firm size nor the number of firms in each industry, since firm size is given by (8), which depends only on the production parameters of the model. It follows that the world number of varieties in industry 1 is

$$(16) \qquad n_1^* = n_1 + n_1{}' = (1 + \tau)z_\tau/(\alpha + \beta x_1).$$

Recall that each agent spends half of her income on differentiated goods. Furthermore, she spends equal amounts on each one of the n_1^* differentiated goods. Therefore, the fraction of income of country I falling on foreign differentiated goods is $n_1'/2n_1^*$. Conversely, the fraction of income of country II that falls on imported differentiated goods is $n_1/2n_1^*$.

Define X_j as the exports of good j by country I and M_j as the imports of good j by country I. The net exports of goods in each industry can be written as $|X_j - M_j|$. Since there is no two-way trade in the homogeneous goods industry, net trade equals total trade in this industry. Consider the following index of intraindustry trade [Grubel and Lloyd 1975]:

$$(17) \qquad I = 1 - \frac{\sum_{j=1}^2 |X_j - M_j|}{\sum_{j=1}^2 |X_j + M_j|}.$$

This index takes the value one when all trade is intraindustry and the value zero when all trade is interindustry. The larger the proportion of trade falling in sector 2, the lower the intraindustry trade index, because trade in this sector is unidirectional.

We examine the behavior of this index in some extreme situations. Consider first the case of trade between a rich country, say country I, and a very poor country, country II. The index of intraindustry trade is close to zero, because the poor country imports differentiated goods and mainly exports the homogeneous good. In the case when country II has no skilled labor, the index of intraindustry trade is zero because all trade is interindustry.

Trade between two similar countries leads to a high index of intraindustry trade. The first term in the denominator of (17) is large, a reflection of the fact that trade occurs mainly within industry 1. The numerator in (17) is small. The reason for this is that net trade in industry 1 will be close to zero due to the similarity in relative factor endowments. Hence, net trade in industry 2 must also be close to zero for trade balance to occur. Therefore, the intraindustry trade index is close to one. When the relative factor abundances are identical, trade is balanced in sector 1, there is no trade in sector 2, all trade is intraindustry, and the index takes the value 1.[6]

III. The Effects of Trade

In this section we examine the effect of free trade on individual agents. We decompose the welfare effect of trade into two parts: a variety effect and a real income effect. We show that the real income effect depends on the agent's stock of skilled labor, the trade partner's relative skilled labor abundance, and its relative size. The variety effect depends on the partner country's relative skilled labor abundance, its relative size, and the degree of substitutability among differentiated goods. Next, we analyze how changes in the independent variables influence the variety and real income effects. Finally, we illustrate the gains from trade in the special case when the countries have the same relative factor endowment.

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6. When the two countries are rich, there will be a large amount of trade, most of it in the differentiated sector. In the case of two poor countries ($0 \le z, z' \ll 1$), the amount of trade between the two countries is very small and tends to zero as the amount of skilled labor decreases.

Consider the change in utility of agent σ when the countries move from autarky to free trade, i.e., the effect of trade on agent σ. From (12) we may write (omitting the superscript σ)

(18)

$$\Delta U = U^* - U^a = \ln\left(\frac{w^*p_1^a}{w^a p_1^*}\right) + \ln\left(\frac{w^*p_2^a}{w^a p_2^*}\right) + \left(\frac{1-\theta}{\theta}\right)\ln\left(\frac{n_1^*}{n_1^a}\right),$$

where w^* denotes the agent's income in free trade regime and w^a denotes the agent's income in autarky. In this expression the last term corresponds to the welfare gains due to increased availability of varieties (the variety effect), while the first two terms reflect the effects on welfare caused by changes in relative prices due to trade (the real income effect). Next we make this expression more manageable by resorting to (13) and the definitions of w^* and w^a to simplify the components of the real income effect:

$$\frac{[w_1^* l_1^\sigma + w_2^*] p_1^a}{[w_1^a l_1^\sigma + w_2^a] p_1^*} = \frac{l_1^\sigma + z_\tau}{l_1^\sigma + z},$$

(19)

$$\frac{[w_1^* l_1^\sigma + w_2^*] p_2^a}{[w_1^a l_1^\sigma + w_2^a] p_2^*} = \frac{l_1^\sigma + z_\tau}{l_1^\sigma + z}\frac{z}{z_\tau}.$$

In addition, since $n_1^*/n_1 = (1 + \tau)z_\tau/z$, the change in utility due to trade can be rewritten as

(20) $$\Delta U^\sigma = \ln\left(\frac{(l_1^\sigma + z_\tau)^2 z}{(l_1^\sigma + z)^2 z_\tau}\right) + \frac{1-\theta}{\theta}\ln\left((1+\tau)\frac{z_\tau}{z}\right),$$

where the first term corresponds to the real income effect and the second term corresponds to the variety effect.

A. Real Income Effect

It follows from (20) that the real income effect on an individual depends on her stock of skilled labor and on the world average stock of skilled labor. Given the size of the country, the world average stock of skilled labor depends on the size of the partner country and on its average stock of skilled labor. We now show how changes in these variables influence the real income effect. Differentiating the real income effect, which we denote U_i^σ, with respect to z' results in

(21)
$$\frac{dU_i^\sigma}{dz'} = \left(\frac{z_\tau - l_1^\sigma}{(l_1^\sigma + z_\tau)\,z_\tau}\right)\frac{\tau}{1 + \tau},$$

which states that, ceteris paribus, a marginal increase in the trade partner's average stock of skilled labor reduces (raises) the real income of agents with a skilled labor endowment above (below) the world average. The intuition for this result is that for those agents with a skilled labor endowment above (below) the world average, an increase in the stock of skilled labor of the partner country raises the world relative abundance of skilled labor and thereby lowers the price of the factor in which they are relatively well (poorly) endowed.

We now examine the real income effect, as a function of z'. For any agent σ the real income effect is zero when $z = z'$ (the two countries have equal relative factor endowments). In conjunction with (21) it implies that the real income effect as a function of z' has a single minimum, at which it is negative.[7] Assuming that the minimum is interior, it is attained at z' such that $z_\tau = l_1^\sigma$. Let this value of z' be denoted z_1'. We focus on agents with a stock of skilled labor below their country's average. The previous results imply that the real income effect is a decreasing function of z' in the range $[0, z_1']$ and an increasing, negative, function of z' in the range $[z_1', z]$. The real income effect can become positive for low values of z', i.e., for poor trade partners.[8] It is also easy to see that

(22)
$$\frac{dU_i^\sigma}{d\tau} = \left(\frac{l_1^\sigma - z_\tau}{(l_1^\sigma + z_\tau)z_\tau}\right)\left(\frac{z_\tau - z'}{(1 + \tau)^2}\right),$$

implying that a marginal increase in the size of the trade partner is beneficial to agents with skilled labor endowments above the world average if the country is relatively skilled labor abundant. For future reference note that the influence of a change in size is decreasing as the average stocks of skilled labor of the two countries come closer together. The intuition is simple: the real income effect is small when the countries have similar relative factor endowments.

Finally, we differentiate the expression for the real income effect with respect to the amount of skilled labor owned by the agent:

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7. The minimum can occur at $z' = 0$ or at an interior point. The condition for an interior solution is $l_1^\sigma > z_\tau$ at $z' = 0$; i.e., $l_1^\sigma > z/(1 + \tau)$.

8. The value of z' at which the real income effect becomes positive is $((l_1^\sigma)^2 (1 + \tau) - z^2)/(\tau z)$.

$$(23) \qquad \frac{d(\Delta U^\sigma)}{dl_1^\sigma} = \frac{2}{l_1^\sigma + z_\tau} - \frac{2}{l_1^\sigma + z}.$$

Since the world relative endowment of skilled labor z_τ lies between the two countries' relative endowments, the real income effect increases with the amount of skilled labor owned by an agent in the skilled-labor-abundant country, while the opposite occurs in the poor country. The explanation for this result is immediate. Trade raises the relative price of skilled labor in the rich country, increasing relatively more the real income of agents with more skilled labor. Trade lowers the reward to skilled labor in the poor country, affecting more severely agents who own relatively more skilled labor.

B. Variety Effect

The second term on the right-hand side of equation (20) represents the variety effect, which is always positive (except for the extreme case in which the trade partner has no skilled labor).[9] This term is positive because trade leads to an increase in the number of varieties available to consumers. From equation (20) the variety effect depends on the size and on the relative abundance of skilled labor in the trade partner, and on the degree of substitutability among differentiated goods.

Given the relative factor abundance in the trade partner, the variety effect is increasing in the partner's size. Similarly, given the size of the trade partner, an increase in its average stock of skilled labor increases the variety effect. The intuition is that in both cases, the total stock of skilled labor in the trade partner increases and the larger stock leads to a greater variety of differentiated goods produced and exported.[10]

The effect of a change in the substitutability of differentiated goods is

$$(24) \qquad \frac{d(\Delta U_v^\sigma)}{d\theta} = -\frac{1}{\theta^2} \ln\left((1 + \tau)^{\frac{z_\tau}{z}} \right) = -\frac{1}{\theta^2} \ln\left(\frac{z + \tau z'}{z} \right) < 0.$$

This result means that trade becomes more beneficial as θ falls. The reason for this result is that a lower value of θ indicates that varieties are more differentiated, thus increasing the benefit

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9. Note that $(1 + \tau)z_\tau/z = (z + \tau z')/z \geq 1$.
10. More formally, let U_v denote the variety effect, then

$$\frac{d(\Delta U_v^\sigma)}{d\tau} = \frac{(1 - \theta)z'}{\theta(1 + \tau)z_\tau} > 0 \quad \text{and} \quad \frac{d(\Delta U_v^\sigma)}{dz'} = \frac{\tau(1 - \theta)}{\theta(1 + \tau)z_\tau} > 0.$$

of having more varieties. Trade increases the number of varieties available to a consumer, so the benefits of trade increase as θ falls.

C. The Case of Equal Factor Abundances

We examine the expression for the gains from trade (20) in the special case of equal factor abundances. In this case, $z = z'$, so $z_\tau = z$ and

(25) $\Delta U^\sigma = [(1 - \theta)/\theta]\ln(1 + \tau) > 0.$

The expression is positive, which implies that all agents benefit from trade when the two countries have equal relative endowments. In this case there is no interindustry trade, so trade does not change relative factor prices, and the real income effect is zero. All the welfare effects of trade derive from the variety effect, which is always positive.

IV. INCOME DISTRIBUTION AND THE BENEFITS FROM TRADE

The first result of this section is the standard conclusion that an individual who owns the average skilled labor stock in her country is made better off by free trade. This result, in conjunction with our assumption that the distribution of skilled labor is skewed to the right, leads to this section's main result. In the labor-abundant country the median voter always votes for free trade, while in the skilled-labor-abundant country the choice of the median voter depends on whether, in her case, the negative income effect outweighs the positive variety effect.

It is easy to see that an agent with the country's average amount of skilled labor always benefits from trade. To show this, note that the gains from trade for an agent with the average amount of skilled labor can be obtained by replacing l_1^σ in (20) by z, the mean value of l_1^σ. The expression for the change in utility for an agent with average endowments is

(26) $\Delta U^\sigma = \ln\left(\frac{(z + z_\tau)^2}{4z\, z_\tau}\right) + \frac{1 - \theta}{\theta} \ln\left((1 + \tau)\frac{z_\tau}{z}\right).$

Since the variety effect is always positive, we only need to show that the real income effect (the first term) is also positive in this case. But this term is nonnegative by the binomial inequality. As a corollary, observe that if all agents own the average endow-

ment, i.e., if there is no inequality in a country, we obtain the classical result that all agents benefit from trade.[11]

In the remainder of the paper we assume that country I is the rich country, i.e., $z > z'$. We also assume that the distribution of skilled labor is positively skewed in both countries so that the majority of agents own below-average skilled labor endowments. This implies that the median is smaller than the mean of the distribution of skilled labor.

Consider the poor country first. By (23) the lower the stock of skilled labor of an agent in country II, the more beneficial trade is for the agent. It follows that trade improves the welfare of the agent with median income in country II since the agent with mean income is better off. Consequently, country II always votes in favor of trade. In country I, the skilled-labor-abundant country, the gains from trade of an agent increase with her endowment of skilled labor. Since the skilled labor endowment of the median voter is smaller than the country average, the possibility of trade rejection cannot be eliminated.

V. CONDITIONS FOR FREE TRADE IN THE RICH COUNTRY

In this section we obtain the main result of this paper. We focus our attention on the rich country, the country that can potentially reject trade. We show that, for certain parameter values and endowments of the median voter, country I accepts a free trade agreement with another country only if the endowments of the two countries are similar or very different. The intuition is that agents in the rich country who own small amounts of skilled labor can be made worse off by trade so that if these agents represent a majority, trade will be rejected. This situation occurs when the variety effect is relatively small, whereas the drop in real income is substantial.

We examine the conditions under which the rich country rejects trade with middle-income countries by analyzing the effect of trade on the median voter in the rich country (and for that matter, for any individual) as a function of the trade partner's skilled labor average endowment z', given the sizes of both coun-

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11. In classical models, for any distribution of wealth, the gains from trade can always make all agents better off under a suitable system of lump sum taxes and subsidies. In this paper we have assumed away the possibility of these lump sum taxes and subsidies because they are not common in the real world.
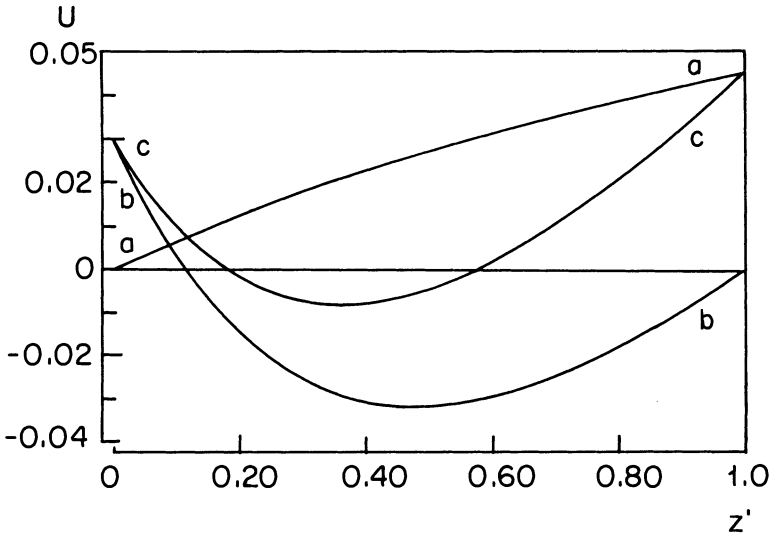
FIGURE I
Real Income, Variety, and Total Trade Effects

tries and the degree of substitutability between the differenti-
ated goods.

Consider first the variety effect. We already know that for all
agents the variety effect is nonnegative, but it becomes smaller
as the trade partner's average skilled labor endowment declines.
In Figure I line aa depicts the typical pattern of the gains from
variety in country I as a function of country II's average stock of
skilled labor (in the example, $\theta = 0.95$ and $\tau = 1.35$).[12]

From the previous section we know that the real income ef-
fect can be either negative for all values of z' or it may become
positive for low average stocks of skilled labor of the trade part-
ner. In Figure I, bb represents the case where the real income
effect for the median voter, as a function of z', becomes positive
for low values of z'.[13] Let l_I^m denote the stock of skilled labor
of the median voter. This schedule is derived for $\tau = 1.35$ and

12. We have chosen this size of a partner country to reduce the relative im-
portance of the variety effect. The relative importance of the variety effect can
also be reduced by modifying the utility function. In all figures $z = 1$; a lower
value for this parameter would also reduce the variety effect.
13. For the agent having a stock l_I^i, the value of z' at which the real income
effect becomes positive is $((l_I^i)^2 (1 + \tau) - z^2)/(\tau z)$. For all trade partners with aver-
age stocks of skilled labor lower than this value, the real income effect is positive
for this agent.

$l_1^m = 0.7z$; i.e., when the stock of skilled labor of the median voter is equal to 70 percent of her country's average.

The trade effect is obtained as the sum of the variety and the real income effect. In Figure I, cc represents the trade effect on the median voter as the sum of the variety and real income effects and corresponds to the case where there is an intermediate range of factor endowments for which trade is rejected.

When country II's average skilled labor endowment is close to the domestic relative factor abundance, the variety effect is positive and significant, while the income effect is negative but small. Hence the country always accepts trade with countries that are not too different. The trade effect can be studied further by differentiation of the expression for the change in utility due to trade (20). In the case of the median voter, we have

$$(27) \qquad \frac{d(\Delta U^m)}{dz'} = \left(\frac{z_\tau - (2\theta - 1)\, l_1^m}{(l_1^m + z_\tau)z_\tau\, \theta} \right) \frac{\tau}{1 + \tau}.$$

We derive a taxonomy of the trade effect from (27). Note that this expression shows that the benefits from trade for the median voter, as a function of the trade partner's relative factor abundance, have at most one interior minimum in $(0,z)$. We analyze only the cases where the minimum is interior, since the cases where the minimum is attained at $z' = 0$ lead to conclusions similar to those of the first two cases below.

The first possibility is that the minimum of the trade benefit function is positive, in which case the median voter is in favor of trade, independently of the average skilled labor stock of the trade partner, for a fixed size of the trade partner. This is depicted by schedule aa in Figure II. The second possibility is that the real income effect is always negative, in which case the trade benefit function cuts the horizontal axis only once. When this happens, the median voter is willing to trade if the trade partner is similar in relative endowments, but rejects trade if the partner country has a low average stock of skilled labor. This case is depicted by schedule bb in Figure II.

The final possibility occurs if the real income effect is positive when the trade partner has a low average stock of skilled labor. In this case the trade benefit function crosses the horizontal axis twice, giving rise to an intermediate range of stocks of skilled labor in the trade partner that would lead the median voter to reject trade. This situation is depicted by schedule cc in Figure
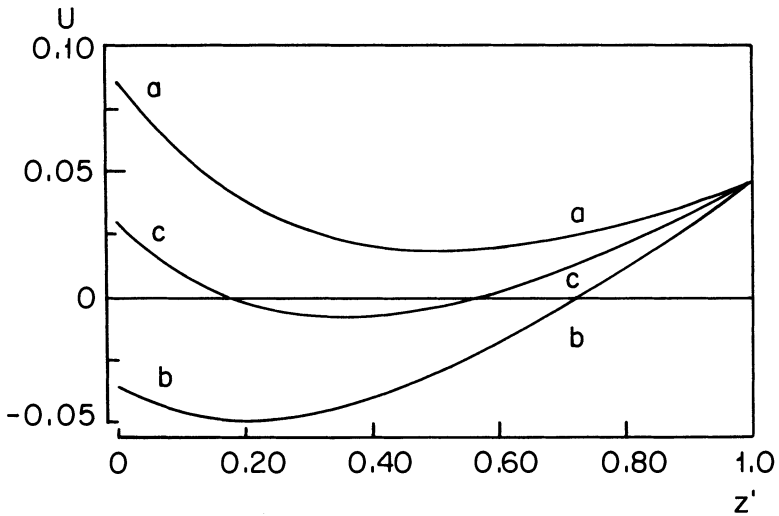
FIGURE II
Three Possible Configurations of the Trade Benefit Function

II. The existence of such an interval, which explains the stylized facts described in the introduction, is the main result of this paper.

The conditions for an interval of trade rejection are derived in the Appendix. Its existence depends on the interplay between the variety and the real income effect, which in turn depends on the various parameters of the model. It is important to note that the relative importance of the variety effect can be altered by multiplying the term corresponding to the homogeneous good in the utility expression (3) by a constant parameter. By adjusting this "free" parameter, we can relax the conditions on the remaining parameters in order to obtain a rejection interval.

VI. EFFECTS OF CHANGES IN INEQUALITY, SUBSTITUTABILITY, AND SIZE

Next, consider how changes in the parameters affect the gains from trade as a function of country II's skilled labor relative abundance. We analyze how this curve shifts in response to changes in the substitutability of varieties, the wealth of the median voter, and the size of the partner country. These shifts help
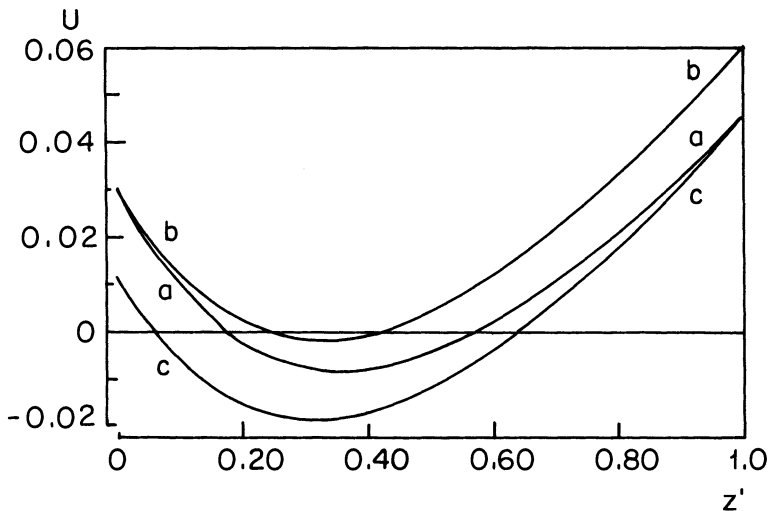
FIGURE III
Effects of Changes in the Substitutability of Varieties and in the Stock of Skilled
Labor of the Median Voter

us to understand the choices of the rich country as a function of the trade partner's relative factor endowments. The initial situation is described by schedule aa in Figure III.

First, consider the effect of an increase in the substitutability of varieties, i.e., a decrease in θ. This change increases the importance of the variety effect, which is always positive. In Figure III the schedule aa shifts up to bb as a result of the decrease in θ, thereby reducing the interval of rejection. This means that as varieties become more differentiated, there is a reduction in the range of relative factor endowments of the foreign country with which trade is rejected.

Next we consider the impact of a redistribution of wealth in country I which lowers the median of the distribution of skilled labor. From equation (23) a reduction in the skilled labor of the median voter shifts down the trade effect schedule, as shown by schedule cc in Figure III. The explanation is that, since trade raises the relative wage for skilled labor in country I, it is more likely to hurt the median voter, the smaller the amount of skilled labor she owns.

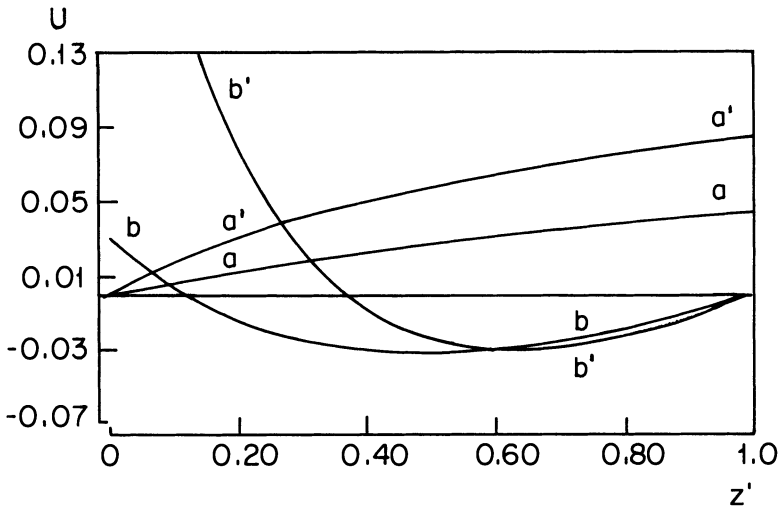Hence income inequality plays an important role in de-

FIGURE IV
Effects of Changes in the Size of the Trade Partner on the Variety and Real
Income Effects

termining the likelihood of free trade between two countries. The prospects for free trade are dimmer when increased inequality reduces the skilled labor stock of the median voter. Such regressive redistributions of income correspond to the observed decline of the middle class [Levy and Murnane 1992]. To sum up, the types of changes in income distribution in the United States in the last ten years (and in other developed countries—see Gottschalk [1993]) are precisely those that our theory predicts would lead to increased opposition to trade.

Finally, we consider the effect of an expansion in the trade partner, i.e., an increase in τ. An enlargement in the size of the partner country augments the variety effect for all nonzero values of z', shifting up the curve representing the variety effect as a function of z'. This is depicted by the movement of schedule aa to schedule aa' in Figure IV.

The effect of a marginal change in the size of the partner country on the real income effect of the median voter is described by (22). If the median agent owns more (less) skilled labor than the world average, this derivative is positive (negative). Hence an increase in the size of the partner country leads to a new curve that crosses the original curve. To the left of the intersection

point, the new curve stays above the old one, while it stays below the original to the right of the crossing. This is depicted by a movement from schedule bb to schedule bb' in Figure IV.

The shift in the curve that represents the trade effect is a combination of the movement due to the real income effect and the upward shift due to the variety effect. Hence the increase in τ moves the left border of the rejection interval to the right because in this range the curve representing the real income effect also shifts up. In the right border of the interval, the two effects move in opposite directions, so the shift in this border is ambiguous.[14] These observations imply that the median voter is less likely to reject trade with relatively poor countries when the countries are large. On the other hand, when considering trade with relatively well-endowed countries, the impact of size is uncertain. However, there is some evidence that leads us to believe that the rich country is less likely to reject trade with small rather than large, well-endowed countries.[15]

VII. CONCLUSIONS

This paper provides an explanation for two stylized observations about the trade of developed countries. First, we show that for certain wealth distributions and parameter values free trade is accepted only with countries that are substantially different or fairly similar in terms of factor endowments. When the partner country's endowments lie in an intermediate range, free trade is rejected. Our second result is that increases in inequality that lead to declines in the median income extend the range of partner countries with which free trade is rejected.

We believe that these results are not specific to models based on a love of variety and that they can be readily extended to alternative models of intraindustry trade, such as Helpman [1981] or Ethier [1982]. We also think it will be fruitful to embed the present model in a dynamic setting.

Majority voting models do not replace political economy models in explaining why a country grants preferences to another.

14. Note that the impact of an expansion of the trade partner on the real income effect is increasing in the difference in relative endowments $(z - z')$, implying that the trade rejection interval shrinks by more on the side of low z' than it grows on the side of high z', leading to an overall reduction in the length of the rejection interval.
15. Korea graduated from GSP with half the income per capita of Singapore, a much smaller country.

Neither are the choices facing voters restricted to granting or withholding trade preferences.[16] Nevertheless, these models provide guidance into the issues of public opinion that influence government behavior regarding trade issues. These forces depend on relative factor endowments, so trade is politically easy with very different or very similar countries. Moreover, the pressures against free trade mount when income inequality widens.

APPENDIX

In this Appendix we derive the conditions under which a majority in a rich country accepts trade with either rich or poor countries, but rejects trading with middle-income countries. We have shown that when the foreign trade has a similar relative factor endowment, the positive variety effect outweighs the real income effect and a majority favors free trade.

Consider the conditions under which the rich country accepts trade with poor countries. In the extreme case when the foreign country has no skilled labor ($z' = 0$), from equation (23) it follows that trade has a positive effect on the median voter if and only if

$$(28) \qquad l_1^m \geq z/(1 + \tau)^{1/2}.$$

Note that the world average skilled labor stock attains its minimum when the foreign country has no skilled labor. If the derivative of the trade effect (27) is positive at this point, i.e., if l_1^m is less than or equal to $z/[(1 + \tau)(2\theta - 1)]$, then it is positive for all values z', which implies that trade is always beneficial for the median voter. Hence a necessary condition to have an interval of trade rejection is

$$(29) \qquad l_1^m \geq z/[(1 + \tau)(2\theta - 1)].$$

Condition (29) ensures that there is an interval where the trade benefits for the median voter decline as the relative skilled labor endowment in the foreign country grows. The benefit from trade attains its minimum at the point where the derivative (27) equals zero, i.e., where $z_\tau = (2\theta - 1) l_1^m$. Hence, a condition for a rejection interval is that

16. Nor is our model restricted to the choice of the median voter. The results apply to any decisive percentile of the population as long as the deciding voter owns less than the mean wealth.

(30)

$$\Delta U^m = \frac{1 - \theta}{\theta} \ln\left(\frac{(1 + \tau)(2\theta - 1)\, l_1^m}{z}\right) + \ln\left(\frac{4\theta^2 l_1^m\, z}{(l_1^m + z)^2(2\theta - 1)}\right) < 0.$$

Rearranging terms in equation (30) leads to

(31) $$\frac{2\theta(1 + \tau)^{(1 - \theta)/2\theta}}{(2\theta - 1)^{1 - 1/2\theta}}\, (l_1^m)^{1/2\theta}\, z^{1 - 1/2\theta} < l_1^m + z.$$

If there exists a value of l_1^m satisfying (31) as an equality, all smaller l_1^m will continue to satisfy the inequality.

Taken together, (28), (29), and (31) represent necessary and sufficient conditions for the rich country to reject trade only with middle-income countries. Figure II indicates a set of parameter values for which all the conditions are satisfied.

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