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TRADE FLOWS AND FACTOR MOBILITY

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Introduction

The purpose of this report is (a) to analyze the interaction of international factor movements primarily of labor, with the structure of production and trade and (b) to study the corresponding implications for policy. Going over the relevant literature one is surprised to find how limited it actually is, despite many theoretical and empirical studies on the determinants of trade or the determinants of interregional and (less so) international factor movements.[1] This can be partially attributed to a growing interest and emphasis on monetary rather than real-side phenomena but also to a prevalent perception that most of the theoretical questions have already been settled. While this report does not attempt to present a consistent, fully-worked out framework for analyzing the interaction of trade and factor mobility, it will hopefully shed light on some of the interesting questions that remain unanswered and provide some insight into the interdependence of policies.

Section 1 of the report focuses on the existing degree of "substitutability" between trade and international factor movements. The central questions that are posed here are the following: (a) why do factor movements take place in a world characterized by commodity trade; (b) what are the implications of either trade or factor movements for intercountry differences in factor prices, and finally, (c) what are the probable effects of factor movements on the volume of trade.

Section 2 analyzes these implications in a dynamic framework and discusses the likely impact of U.S. immigration on the U.S. trade balance. Finally Section 3 focuses on the substitutability of policies aimed at restricting the free flow of commodities or factors.

The main objective of breaking up the analysis into these three parts is to describe the principal components of a continuous process of dynamic adjustment where differences in economic structures and policies across countries both determine and are determined by trade flows and factor movements. This process continues until that time when cross-country commodity and factor prices move closely enough together so that there are no more advantages to be gained from trading commodities or relocating factors.

The emphasis of this report is placed on labor rather than capital movements; yet it is important to realize that the effects of labor migration on the structure of production and trade crucially depend on what happens to capital movements. Similarly, while the analysis is cast in terms of the receiving country, the effects of factor movements on the country of origin can have important implications for the terms and volume of trade, especially if the country is not "small" in world markets.

Despite these and other shortcomings, the analysis in this report points to a number of interesting conclusions:

1) Both real wage differentials and employment opportunities seem to be important determinants of labor mobility with the latter being probably the dominant factor.

2) The simultaneous occurrence of trade and factor mobility can thus be explained both within and outside the framework of the "factor-price equalization" (FPE) theorem. Not only will relaxation of any one of its assumptions give rise to cross-country real-wage differentials in the presence of trade, but differences in employment opportunities and/or other economic characteristics will give rise to differences in the present discounted value of the net benefits that are expected to be derived in each location, and hence will induce migration.

3) The degree of substitutability of trade and factor mobility crucially depends on cross-country similarities in production and consumption.

4) Given the United State's trade structure, where exports are primarily human-capital intensive while imports are unskilled-labor intensive (Kenen, 1965; Branson and Monoyios, 1977), large inflows of unskilled labor relative to skilled labor will have an anti-trade bias and cause an improvement in the terms of trade unless capital moves in an offsetting manner or overall consumption shifts towards importables.

Finally,

5) Trade policy and regulation of factor movements are interdependent and cannot be exercised independently of each other especially in the context of a country such as the U.S. which is open to both commodity and factor flows. The effectiveness of trade policy will depend on the degree of international factor mobility while the success of immigration policies will depend on both capital movements and trade patterns.

1. "Substitutability" of Trade and Factor Movements

The theory of comparative advantage states that the fundamental determinant of trade between countries is differences in relative costs of production. This proposition is by now widely accepted and empirically validated regardless of the existence of preferential trade agreements, custom unions or bilateral trade clearings in which cases non-economic criteria may dominate. It states that a country will export those goods which in autarchy would have a relative price (relatively that is, to an arbitrarily chosen numeraire) lower than its potential trading partners and correspondingly import those goods which in autarchy would have a relative price higher than its potential trading partners. The direction of trade is thus independent of the sources of comparative advantage in the sense that what matters is the ratio of relative prices between countries and not the underlying reasons for these differences. Thus there exist a number of explanations of trade patterns between countries and as a consequence a number of theoretical models. Comparative advantage has been attributed to differences in factors' productivity or the existing technology of production (Ricardo, 1911; Jones, 1979) to differences in tastes (Robinson, 1947) and relative factor endowments (Heckscher, 1949; Ohlin, 1933) or finally to the presence of economies of scale in production (Krugman, 1978).

While the direction of trade is independent of the sources of comparative advantage, the effects of trade on domestic production and on relative factor prices is not. If the main source of comparative advantage for example is differences in labor productivity (in a

one factor two-goods world) free trade will probably lead to complete specialization in production[2] while the ratio of relative real wages in the two countries (defined in terms of the home good) will equal the ratio of the fixed output-labor coefficients. Thus if the main explanation for trade between countries is existing differences in invariant output--labor coefficients, one would not expect factor prices to be equalized through trade. If, however, the principal reason that trade takes place is differences in relative factor endowments, then in this simple two-factor, two-commodities, two-country world and under a series of restrictive assumptions, which are listed below, free trade will lead to factor-price equalization not only in relative but also in absolute terms. Within a Heckscher-Ohlin framework, trade will lead a country to export that good that uses intensively its physically abundant (and hence low-price) factor;[3] the production of that good will consequently increase and the return of the factor which is used intensively in its production will rise relatively to the return of the other factor. Thus relative factor prices will tend to become equalized across countries provided that there is perfect competition in commodity and factor markets, that the factors of production are perfectly mobile within each country, that production functions are identical and the factor intensity of each industry is invariant to scale or relative factor returns; if in addition to these assumptions, there are no tariffs or other impediments to trade and no complete specialization in production then relative factor prices will be equalized. If now production functions are also characterized by constant returns to scale then there will be

equalization of absolute factor returns as well. This is the essence of the absolute FPE (AFPE) theorem expounded by Samuelson in a series of articles on trade and factor prices. (Stolper and Samuelson, 1941; Samuelson, 1949).

Whether or not therefore trade equalizes absolute factor returns depends on a set of restrictive assumptions about the structure of production and markets. What is now the relationship between trade and international factor movements and in what sense are commodity and factor flows "perfect substitutes"? On the one hand, they are both assumed to depend on cross-country differences in relative prices; on the other hand either trade or factor movements is expected to have the same influence on cross-country relative prices. Each of these propositions can be challenged in a variety of ways in an effort to question the operational if not theoretical validity of the "perfect substitutability" characterization while emphasizing the relevance of "partial substitutability" both for theory and policy-purposes.

1a. Factor Movements in the Presence of Commodity Trade

Most of the economic literature on migration stresses the importance of "economic attractiveness" of a place in the decision to migrate (Cebula, 1979; Greenwood, 1975). Yet most authors would probably not accept without qualifications Hick's statement that "... differences in net economic advantages, chiefly differences in wages, are the main causes of migration...." (1932, p. 76; italics added). The empirical literature on interregional migration has shown that a number of other variables besides wages (nominal or real) determine

the direction of migration. Among non-economic variables one finds that quality of life considerations which include both natural or social characteristics are important determinants of human migration (Cebula, 1979, p. 27). Among economic variables, a long list of costs and benefits which are associated with specific locations have been shown to be statistically significant. These include government services, tax structures, expected growth of income, transfer payments etc. (Cebula, 1979, p. 74; Fields, 1979; Greenwood 1975). Two additional elements of the migration decision make it qualitatively different from trade: the introduction of time and uncertainty. In recent years, it has become increasingly common to analyze the migration decision as an investment decision. Following T. W. Schultz (1961) and G. S. Becker (1962) a number of studies that adopt this framework argue that geographic migration is generated only when there is a positive present discounted value of the expected real net benefits from mobility (Sjaastad, 1962; Cebula 1979). Thus even if there exists a factor-price differential between two areas, factors might not be willing to move unless the differential is sufficiently large to make the total discounted value of future net benefits positive. Alternatively even if present real rates of return are equalized, permanent migration might still take place if there are substantial differences in the expected <u>future</u> stream of benefits.[4]

In addition to the time element, interregional migration is also affected by uncertainty about employment opportunities. In a series of articles written in the context of developing countries a number of authors (Todaro, 1969; Harris and Todaro, 1970; Stiglitz, 1974)

have underlined the importance not of the actual but of the expected income (or real-wage) differential between regions which incorporates the probability of being employed into the migration decision. Both the actual level of unemployment and the probability of being selected from the pool of unemployed become important explanatory variables of migration. It is interesting to note that in the context of several empirical studies, the unemployment variable has been found to be either statistically insignificant or supposedly of the wrong sign (i.e. positive) in explaining migration flows. This result should not be surprising within the context of a Harris-Todaro model, since migrants will trade off the probability of remaining unemployed with the probability of getting a higher-paying jobs. It has actually been shown (Hall 1970, 1972) that at least within the U.S., there is a positive correlation across cities between real wages and unemployment rates. In that case, the expected sign of unemployment in a migration equation with only unemployment as the independent variable should be ambiguous.

Most of the recent theoretical and empirical literature on migration focuses on interregional rather than international labor flows with the exception of a series of studies on the brain drain and the welfare implications of labor mobility (Bhagwati, ed. 1976; Bhagwati and Ramaswami, 1977) as well as a limited number of empirical studies that focus on time-series data (for a review see Thomas, 1973, also Magnussen and Sigveland, 1978). One would not expect, however, that the fundamental determinants of migration, namely expected real income differentials, differences in the present discounted value of other net benefits and locational characteristics,

that might affect the quality of life, would be substantially different across countries in their effect on migration than they are across regions. There is still need for empirical work on an international scale to determine (a) the differential effects of "push" and "pull" factors (b) the potential separability of the decision to emigrate from the choice of final destination point, (c) the proper specification of the equations to be estimated and (d) problems in estimation due to the possible synchronization of international economic activity. A preliminary investigation into the determinants of Greek and Italian migration to the United States seems to yield encouraging results. Table 1 gives an aggregate picture of migration flows across countries for the period 1960-1975. It reports the flows of migrants into each of three major destinations points for a number of countries that are listed on the top of the table. Immigration from these selected countries accounted on average for 36.8 percent of total immigration into the United States for the period 1971-1975. As it can be readily seen from the above table the choice of final destination varies both across countries and across time. Thus while only 3.6 percent of the total average annual flow of Greek emigrants came to the United States in the period 1960-1965, that percentage rose to 17.9 percent by 1971-1975. Similarly, for Japan the average annual flow of emigrants to the United States rose from 33.5 percent of total Japanese emigration in 1960-1965 to 56.9 percent in the period 1971-1975.

Focusing on Greek and Italian immigration into the U.S., the first hypothesis that was tested was that the choice of final destination, measured by gross migration to a given country as a percentage of total emigration from either Greece or Italy, depended on relative

Table 1: Direction of International Labor Flow for Selected Countries of Origin and Destination[1]

Selected Countries of Destination	Selected Countries of Origin	Mexico	Japan	Philippines	Greece	Italy	Norway	Portugal	Average annual immigration from selected countries as percentage of total immigration into the area
United States	1960-65	42,633 (65.1)	4,099 (33.5)	3,147	3,938 (3.6)	16,280 (4.1)	2,242 (18.5)	3,619 (4.8)	(26.6)
	1966-70	44,038 (60.6)	4,668 (55.7)	17,127 (30.4)	14,081 (15.9)	24,780 (9.3)	1,240 (15.9)	12,915 (13.6)	(31.8)
	1971-75	63,615 (60.3)	4,762 (56.9)	30,651 (26.1)	11,704 (17.9)	18,630 (8.6)	- (13.1)	13,255 (17.1)	(36.8)
West Germany	1960-65				57,427 (58.2)	200,450 (29.1)		3,135 -	(36.6)
	1966-70				62,706 (54.9)	181,337 (24.3)		10,652 (11.6)	(32.3)
	1971-75				39,303 (53.6)	116,458 (31.5)		21,653 (26.6)	(23.3)
Australia	1960-65		381 (.7)		12,849 (13.1)				(8.8)
	1966-70		865 (1.6)		11,794 (13.4)				(5.7)
	1971-75		1,316 (2.8)		7,666 (9.6)				(4.9)
Canada	1960-65	- (1.7)			- (4.4)				(-)
	1966-70	300 (2.1)			6,471 (7.0)				(3.0)
	1971-75	638 (1.8)			4,862 (6.8)				(3.3)
U.K.	1960-65								
	1966-70								
	1971-75								
Spain	1960-65	2,859[2] (4.3)							(-)
	1966-70	2,893[2] (4.7)							(-)
	1971-75	3,563[2,3] (5.0)							(-)
Japan	1960-65			929					(4.1)
	1966-70			766 (5.2)					(2.3)
	1971-75			783 (26.8)					(1.8)
Hong Kong	1960-65								(-)
	1966-70			904					(2.3)
	1971-75			781					(1.8)
Switzerland	1960-65					123,383 (38.1)			(-)
	1966-70					86,291[4] (37.4)			(-)
	1971-75					44,489 (34.9)			(-)
Denmark	1960-65						3,789 (23.9)		(17.3)
	1966-70						2,489[5] (17.2)		(8.1)
	1971-75						2,760 (17.8)		(8.0)
Sweden	1960-65						2,512 (22.9)		(8.9)
	1966-70						2,307 (20.3)		(6.6)
	1971-75						2,396 (16.8)		(6.5)
France	1960-65							21,235 (47.3)	(21.)
	1966-70							26,945 (33.2)	(22.5)
	1971-75							27,329 (24.6)	(14.8)
% to top three destinations	1960-65	(71.1)	(34.2)	(-)	(75.7)	(71.3)	(65.3)	-	
	1966-70	(67.4)	(57.3)	(55.6)	(91.2)	(71.0		(78.4)	
	1971-75	(67.1)	(59.7)	(84.9)	(87.9)	(79.9)	(87.7)	(68.9)	

able 1: Notes

2 See data are for period 1971-1974 only

3 Point of departure data.

4 For period 1971-1973 only

5 For 1966-1969 only

6 1967, 1970 data missing

Sources: Compiled from Table 29, "Long-Term Emigrants and Immigrants by country or area of last or intended long-term residence 1958-1976" in the United Nations Demographic Yearbook, 1977.

real wages and employment rates in each of the three main alternative destination points.

The theoretical model that underlines this specification is similar to that of Armington's (1969) in the trade literature, where it is assumed that the direction of trade is invariant to the overall volume of trade. In extending this model to migration flows, this would imply that the decision to emigrate is independent of the choice of final destination.

The following logarithmic equation was thus estimated for the period 1960-1976 on Greek and Italian emigration data:

$$\ln \left(\frac{E_{ij}}{E_i}\right)_t = A + \left(\sum_j \alpha_j \ln w_j\right)_{t-k} + \left(\sum \beta_j \ln \left(\frac{N}{L}\right)_j\right)_{t-k} + u_t, \quad (1)$$

$$k = 0, 1$$

where,

E_{ij} = gross migration from country i to country j, where i = Greece or Italy and j = United States, Germany, Australia or Switzerland

E_i = total emigration from country i

w_j = index of hourly earnings or total hourly compensation in each country j deflated by the country's CPI and expressed in country i's home-currency units

$\left(\frac{N}{L}\right)_j$ = civilian employment in country j as a percentage of that country's labor force.

The null hypothesis that was tested was that the relative flow of immigrants into each country is positivaly correlated with that country's real wage level and employment opportunities. The

results which are presented in Appendix 1 did not turn out to be satisfactory mainly due to two factors: (a) great variability of total emigration flows from each of the two countries which could not be explained by the independent variables chosen and (b) the presence of collinearity between the independent variables. Thus most coefficients turned to be insignificant if not of the wrong sign, even though the overall explanatory power of the regression turned out in most cases to be relatively high.

In addition, the correlation coefficients between the independent variables also reported in Appendix 1 seem to suggest (a) that Hall's observation about the positive correlation between real wage and unemployment rates across U.S. cities seem to hold equally well across countries and (b) that there is sufficient synchronization of economic activity at least across the major industrialized countries to make the choice of final destination point dependent on a number of other factors besides expected income differentials. In that case, distance, transportation costs, information flows and other locational characteristics would tend to be the discriminating factors. On the basis of the above evidence it seems reasonable to suggest that there is no clear separability of the decision to emigrate from the choice of final destination; instead an individual's decision to relocate seems to depend on both origin and destination conditions.

This is also the hypothesis put forward by Fields (1979) who uses it to analyse migration flows between regions. The underlying model behind Field's specification is a polytomous logistic model developed by McFadden (1974) and applied to migration initially by

Schultz (1977), where migration is taken to be a linear function in the logarithms of the origin and destination conditions as well as of the distance between the two regions. The application of this analysis to Greek and Italian emigration into the United States, Germany, Australia, and/or Switzerland would suggest that gross emigration from each of these two places would be positively related to real wage and employment levels in each of the various countries of destination and negatively related to real wage and employment opportunities in the country of origin. The following equation was thus estimated for the period 1960-1976 under various lag distributions:

$$\ln E_{ij_t} = A + \alpha_1 \ln w_{j_{t-k}} + \alpha_2 \ln w_{i_{t-k}} + \beta_1 \ln \left(\frac{N}{L}\right)_{j_{t-k}} + \beta_2 \ln \left(\frac{N}{L}\right)_{i_{t-k}} \quad (2)$$

The null hypothesis is that coefficients α_1, and β_1 are positive, while coefficients α_2 and β_2 are negative.

Immigration data come from the Annual Reports of the Immigration and Naturalization Service and the U.N. Demographic Yearbook, 1977; the real wage series was computed by deflating hourly earnings by the relevant CPI's and converting the series into home currency units via application of the appropriate bilateral exchange rate. The main sources of data for this series were the OECD's Main Economic Indicators and the IMF's, International Financial Statistics. OECD's Main Economic Indicators is also the principal source for the employment series which refers only to employment in manufacturing. Table 2 reports the values of the estimated coefficients from equation 2. All the statistically significant ones (t-ratios are reported in parentheses) have the expected

Table 2. Elasticity Estimates of Gross Migration Flows to Origin and Destination Conditions

Gross Migration From:	A	α_1	α_2	β_1	β_2	R^2	SSE
A. Greece							
to United States	9.669	9.325	0.553	6.427*	-4.196*	.908	.359
	(1.137)	(2.369)	(0.545)	(4.833)	(3.172)		
Germany	-15.503	2.891	0.255	6.845	-7.545*	.868	.457
	(0.351)	(0.708)	(0.169)	(2.179)	(1.783)		
Australia	-64.399	-0.171	-3.316	12.214*[2]	-6.713*	.794	.230
	(1.254)	(0.083)	(1.583)	(1.870)	(2.707)		
B. Italy							
to United States	30.855	8.549	-1.494	1.826*	-3.135*	.710	.532
	(1.134)	(2.644)	(1.599)	(1.318)	(1.019)		
Germany	-31.614	1.872	-1.686	8.195	-3.534	.889	.269
	(1.650)	(1.237)	(1.615)	(6.137)	(-1.843)		
Switzerland	-15.999	-4.100	-0.734	4.072*[2]	-0.574	.991	.037
	(2.047)	(3.456)	(2.329)	(5.181)	(0.892)		

Notes
1. An asterisk indicates a one year lag.
2. Percent change in civilian employment

sign with the sole exception of the a_1 coefficient in the case of Italian-Swiss migration which is significantly negative. The following conclusions can be derived from the preliminary tests.

a. In both the Greek and the Italian case, the real wage proves to be a significant determinant for emigration to the United States contrary to the case for Germany. The Italian-Swiss case is harder to explain due to the negative sign of the coefficient.

b. The real wage at the original location, tends to be insignificant with the sole exception again of the Italian-Swiss case.

c. Employment rates in the countries of destination are uniformly significant with the exception this time of the Italian--U.S. case. All coefficients have a positive sign as expected.

d. Greater domestic employment opportunities seem to reduce the incentives to migrate in both cases but the internal employment rate is a statistically significant determinant of emigration only in the Greek case.

In general, one can conclude that "pull" factors seem to dominate "push" factors and that both the real wage and employment opportunities affect significantly the decision to emigrate, as the application of the Harris-Todaro model in an open economy suggests. Such findings support Ohlin's comment that labor's "international mobility is reduced by all the ties that unite a citizen with his native land and its culture. The inevitable uncertainty as to his fortunes in a new country also tends to keep him from emigrating, especially if he is temperamentally disinclined to undertake risks" (Ohlin, 1933, p. 208). They also question the theoretical validity and usefulness of a strict

adherence to the "perfect substitutability" assumption between trade and factor mobility: cross-country absolute factor prices cannot be equalized except under very restrictive assumptions about the nature of trade and comparative advantage and even if they were, a number of other economic variables, such as employment opportunities, would still induce migration flows between countries. The proven sensitivity however, of both trade and migration flows to factor price differentials underlines the need for a joint consideration of trade and factor flows. As Ohlin succinctly stated, "a theory of international movements of factors of production can be built only in close contact with the theory of international commodity movements". (Ohlin 1977, p. 34).

1. b. Trade and Factor Mobility: Substitutability vs. Complementary

As we have seen in Section 1.a above, trade in a Hecksher-Ohlin world will tend to equalize relative commodity and factor prices and thus reduce some of the incentives for factor movements. Similarly factor movements will usually tend to make prices of factors and commodities more uniform across countries and thus eliminate some of the advantages of trade. For these reasons it is often argued that trade tends to displace factor movements and that factor movements tend to displace trade. Under the AFPE assumptions, trade and factor mobility would become "perfect substitutes". Alternatively, an increase

in trade impediments would stimulate factor movements and an increase in restrictions to factor movements would stimulate trade. The above proposition was proven rigorously by Mundell (1957) who showed that if capital is in fact perfectly mobile between countries the imposition even of a small tariff would eliminate trade completely since the movement of capital would equalize absolute factor returns; similarly, a tax on capital would stimulate trade.

The partial or total displacement of one type of flow by the other due to the tendency of both trade and factor movements to equalize relative prices have been challenged on various grounds.

On a theoretical level Olivera (1967) has argued that even if free trade and factor mobility completely equalized prices this would not necessarily mean that "they both equalize them at the same levels". In contrasting trade in consumer goods with labour migration he shows that factor prices would be equalized at different levels through trade than through labour migration if tastes change as a result of migration. Thus "perfect substitution" involves not only the same "atmosphere for production" but also the same "atmosphere for consumption" or that the countries are exact replicas of one another (Olivera 1967, p. 168).

A number of other authors have challenged the assumed substitutability of trade and factor movements on account of differences in the structure of production attributed either to the presence of third factors or differences in technology. Brinley Thomas has shown for example that throughout the 19th century, migration of labour from England to the United States was accompanied by increased trade between the two countries due to the presence of relatively productive land in the United States, i.e. a third factor of production (Thomas, 1961).

Similarly Ohlin has argued that the substitutability of trade by factor movements need not hold if "the quantity of certain productive factors in a country may be so small that an increased supply does not reduce but increases their prices" (Ohlin, 1933, 3rd ed., p. 215). For example, the presence of external economies as labor flows into a scantily populated country might cause wages to increase rather than be reduced as a result of migration. More generally in the presence of a third factor of production or for that matter external economies the productivity of a factor might be raised because of and despite an increase in its supply.

On a more rigorous level Purvis (1972), has shown that once technologies are assumed to differ between countries (a) free trade

is not sufficient to establish world efficiency in production while capital mobility is now a necessary condition for such efficiency, and (b) that the introduction of capital mobility into a free trade situation may serve to increase the volume of trade.

On similar grounds Schmitz and Helmberger (1970) argue that trade and international capital movements can be complements if there are sufficient differences in the productivity of a given factor across countries. Referring particularly to trade in primary commodities they, as well as Purvis, argue that the volume of trade may actually rise if, by allowing factor mobility, a product can become so much cheaper by being produced in a different country that "its total use has been expanded", (Schmitz and Helmberger, 1970, p. 764).

It follows that the degree of substitutability between trade and factor movements depends on the similarity of the production and consumption structures between the trading partners. If trade and factor mobility takes place between more or less similar countries then one would expect them to be substitutes; in the case of trade and factor mobility between dissimilar countries one would expect them to be complements. As we will see in Section 3, this has important implications for policy since trade impediments might increase or reduce factor movements or alternatively restrictions of factor mobility might increase or reduce the volume of trade.

Before drawing policy conclusions on the basis of these considerations we should look at the main conclusions of the "growth and trade" literature regarding the effects of growth in factor supplies on the terms and volume of trade.

2. Growth in Factor Supplies and Trade

There is by now an extensive literature on the effects of growth on trade (Rybczynski, 1955; Findlay and Grubert 1959; Johnson, 1958, 1962; for a good review see Heller, 1968). There are two sets of assumptions that play an important part in the outcome of the analysis: (1) whether or not the country can affect its terms of trade and (2) if economic growth is generated by changes in factor endowments or in production functions, i.e. technology.

Since the objective of this section is to study the effects of factor movements on a country like the U.S., the analysis will be restricted to changes in factor endowments in a "large" country setup. It will also be assumed that the other countries are price takers, i.e., "small" in commodity and factor markets so that factor movements affect only their output composition.

Changes in the factor endowments of a country might result in pro-trade or anti-trade biases in consumption and production with different implications for the terms and volume of trade, depending on how growth affects the production and consumption of the exportable and importable commodities. It is thus important to introduce a "dynamic " element in the discussion of section 1 which assumed that the national income in each country was about the same as it was before the factor movements. Alternatively, the expansion of output and incomes due to increases in the domestic supply of labor and capital might lead to an increase in trade even if trade and factor movements are considered substitutes in the short-run, (Ohlin, 1933, p. 215).

Assuming that X_1 is the exportable labor-intensive commodity and X_2 is the importable, capital-intensive commodity, an increase in the overall capital-labor ratio of a country in the same proportion as the capital-labor ratio in X_1 will result in an increase in production of X_1 but will not affect production of X_2. Since X_1 is the exportable commodity, the resulting bias in production, will be a "pro-trade" bias. If the change in factors is such that production of X_2 actually decreases, then we talk about an "ultra pro-trade bias" in production. This will be the case for example if there is only an increase in labor due to immigration with no corresponding movements in capital. On the consumption side, a pro-trade bias implies that the change in overall factors would result in an increase of the marginal propensity to import above the average. Similarly an "ultra pro-trade bias" in consumption implies a greater than unity marginal propensity to import. This will be the case for example if there is a shift in consumption towards importables as a result of immigration due to strong preference for the home good on the part of the immigrants.

The combination of trade biases in production and consumption due to changes in factor endowments affect both the volume and the terms of trade of a large country. Table 3 summarizes the main conclusions of the growth and trade literature as to production and the terms of trade. A "+" indicates an improvement and a "-" indicates a worsening of the terms of trade. A question mark indicates that the movement of the terms of trade is ambiguous.

Table 3:

Growth and Trade

Growth Bias in Production	Production Effects	Growth Bias in Consumption: Ultra Pro-Trade MPI > 1	Pro-Trade MPI >API	Neutral MPI = API	Anti Trade MPI < API	Ultra Anti-Trade MPI < 0
Ultra Anti-Trade $\frac{\Delta K}{\Delta L} > (\frac{K}{L})_2$	$\Delta X_2 > 0$ $\Delta X_1 < 0$	?	+	+	+	+
Anti-Trade $\frac{K}{L} < \frac{\Delta K}{\Delta L} \leq (\frac{K}{L})_2$	$\Delta X_2 > 0$ $\Delta X_1 \geq 0$	-	?	?	?	+
Neutral $\frac{\Delta K}{\Delta L} = \frac{K}{L}$	$\Delta X_2 > 0$ $\Delta X_1 \geq 0$	-	-	-	?	+
Pro-Trade $\frac{K}{L} > \frac{\Delta K}{\Delta L} \geq (\frac{K}{L})_1$	$\Delta X_2 > 0$ $\Delta X_1 > 0$	-	-	-	?	+
Ultra Pro-Trade $\frac{\Delta K}{\Delta L} < (\frac{K}{L})_1$	$\Delta X_2 < 0$ $\Delta X_1 > 0$	-	-	-	-	?

Table 3 can provide a starting point for the dynamic analysis of the effects of immigration on the structure of production and trade.

It is by now widely accepted that U.S. exports tend to be human capital intensive while U.S. imports tend to be unskilled labor intensive. (Keesing, 1966, 1968; Waehrer 1968; Kenen 1965). In a recent article, for example, Branson and Monoyios (1977) have shown that while there is a significant positive correlation between human capital measures and net exports in the United States, the correlation is significantly negative for unskilled labor and still negative but only marginally significant for physical capital.

Given this trade structure and in the absence of offsetting capital movements, the effects of immigration on the terms of trade will depend on the skill composition of U.S. immigrants. Table 4 below classifies legal immigrants into broad skill categories according to the occupations they held at the country of origin. Immigrants who held technical, professional and administrative jobs are classified under category 1, the highest skill category. Category 2 includes immigrants who held clerical jobs as well as those who reported to be salesmen, craftsmen, operatives and farmers. Category 3 includes unskilled laborers and service workers. The first three columns of Table 4 report both the actual number and the percentage of each skill category of immigrants to the total number of immigrants in the labor force. Column 4 reports the total number of immigrants each year while the last column gives the percentage of immigrants in the labor force (that is excluding dependents).

Table 4: Immigrants Admitted by Major Category of Occupation

Year	Skill Categories 1		2		3		Total Number of Immigrants	Percentage of Immigrants in the Labor Force
1960	27249	(.222)	61571	(.502)	33737	(.275)	265398	.461
1961	26818	(.217)	59167	(.478)	37703	(.305)	271344	.456
1962	29264	(.217)	58041	(.430)	47519	(.352)	283763	.475
1963	33916	(.241)	62314	(.443)	44439	(.316)	306260	.459
1964	35578	(.271)	63558	(.485)	31962	(.244)	292248	.449
1965	35880	(.274)	63288	(.484)	31643	(.242)	296697	.441
1966	36812	(.287)	56365	(.439)	35156	(.274)	323040	.397
1967	49626	(.324)	57655	(.377)	45644	(.298)	361972	.422
1968	58189	(.278)	88636	(.424)	62206	(.297)	454448	.460
1969	45783	(.294)	64401	(.413)	45569	(.292)	358579	.434
1970	51980	(.330)	66978	(.426)	38231	(.243)	373326	.421
1971	55104	(.360)	56633	(.370)	41384	(.270)	370478	.413
1972	56635	(.360)	53045	(.337)	47561	(.302)	384685	.409
1973	50332	(.322)	56290	(.360)	49855	(.319)	400063	.391
1974	44689	(.295)	54428	(.360)	52150	(.345)	394861	.383
1975	48503	(.324)	60398	(.404)	40701	(.272)	386194	.388
1976	52703	(.341)	62896	(.407)	39059	(.252)	398613	.388
1977	48411	(.322)	67118	(.447)	34725	(.231)	358639	.419

The main source of data for Table 4 is Table 10A of the Annual Report of the Immigration and Naturalization Service.

It can be readily seen that the majority of immigrants in any given year are dependents or people who are not in the labor force. Thus while in 1960, categories 1-3 included 22.2, 50.2 and 27.5 percent of the total number of immigrants in the labor force, immigrants in the labor force included only 46.1 percent of the total number of immigrants that year. That percentage had dropped only slightly to 44.1 percent in 1965 and to 41.89 percent in 1977. It is thus reasonable to conclude that immigration in the United States involves an increase in the low-skill labor pool and an increase in the population that is not in the labor force at all.

From the analysis of Table 3 where now "K" stands for human-capital and "L" for unskilled labor, it follows that an inflow of unskilled immigrants will probably have an anti-trade or even an ultra anti-trade bias in production as the inflow of unskilled labor expands the production of the import-competing goods relatively to exportables. Ceteris paribus, the terms of trade will probably improve unless there is a shift in overall consumption preferences towards importables. This is rather unlikely since in many cases one of the fundamental reasons for migration into the United States is greater consumption of durable goods. Under these assumptions and unless there are off-setting capital flows, the volume of trade will probably decrease. If the production biases are negligible due to the small number of immigrants in the labor force, then one would expect the consumption bias, probably an anti-trade bias, to dominate with concomitant effects on the terms of trade.

It should be noted that the above analysis pertains only to the partial effects of immigration on the terms and volume of trade. In times of rapid domestic growth or in times of large capital movements these effects will tend to be relatively small. Furthermore, if immigration of unskilled labor coincides with capital outflows then the anti-trade bias in production will probably be strengthened; it will instead be dampened if immigration of unskilled labor coincides with capital inflows. Given the fact that for the past twenty years, there has been a steady increase in net long-term capital outflows from the United States (Branson, 1980), it is reasonable to conclude that both factor flows in the U.S. create anti-trade biases resulting in competitiveness losses as the terms of trade improve.

The analysis above rests on the assumption that the terms of trade are not affected by changes in factor endowments in the rest of the world. Given the importance of the United States in the world economy this assumption does not seem unwarranted.

3. Trade Policy and the Regulation of Factor Movements

The previous two sections analyzed the interaction of trade flows and factor mobility both in a static and dynamic framework. In both cases trade and factor mobility have been shown to be"substitutes" or "complements" depending on the underlying structural characteristics of each country as well as the similarities or differences between trading partners.

A given degree of substitutability between trade and factor movements implies a given degree of substitutability in policies as well. The symmetry and interdependence between commercial policy and the regulation of factor movements is often neglected with harmful consequences for the effectiveness of each policy not to speak of efficiency losses.

Section 1 of this paper analyzed the conditions under which trade and factor mobility are substitutes. This was generally the case of exchange between similar economies. Under such conditions, any factor of production within a country can be protected either through commercial policy or through barriers to additional factor inflows. Tariffs or other trade impediments in the United States have been often instituted to protect unskilled labor-intensive industries such as the textile or shoe industry and thus maintain the real incomes of workers that would have been threatened by outside competition. Immigration quotas or other impediments to labor inflow have often had similar objectives. Yet it is important to realize that the effectiveness of either of these two sets of

policies depend on the responsiveness of commodity or factor flows to the created price differentials. Thus, it is possible for commercial policy to become totally ineffective in maintaining a high relative real wage if the existence of a wage differential induces immigration; the same would hold true for tight immigration policies aimed at protecting unskilled labor domestically if in that case, there is a marked expansion of trade.

These conclusions need to be adjusted in the case of "complementarity" between trade and factor mobility. In such cases any given restriction of trade flows would result in greater protection of the scarce factor of production than it is normally expected, since it would also reduce factor inflows. It follows that commercial policy and control of international factor movements can be used either to substitute or to supplement each other. As a crude approximation one can argue that these policies are substitutes in the case of trade or factor movements between developed countries whereas they are complements in the case of trade or factor movements between developed and less developed countries.

The characteristics of the trading partners can also be important in figuring out the likely biases in production and consumption that would result from factor mobility. Thus if labor mobility takes place primarily within countries at the same stage of development and with similar characteristics one would expect, no radical shifts at least in consumption patterns. This would probably not be the case for labor mobility between countries at different stages of development.

It is thus important to note that the substitutability of policies as well as the substitutability of flows depends both on the underlying

economic structures as well as on the characteristics of the footloose factors. Policy measures that affect the free flow of factors and commodities need to be coordinated so that policy aims are not contradictory and policy measures are effective. Such coordination should be based on a clear understanding of the whole network of interdependencies between trade and factor mobility, elements of which have been presented here.

Appendix 1

Tables A.1 and A.2 below present the estimated values of the coefficients from equation 1. The share of emigration from country i to country j should be positively related to country j's real wage and employment rate but negatively related to economic conditions in alternative destinations. As can be seen from the two tables most of the coefficients turn out to be insignificant if not of the wrong sign.

Table A : Direction of Migration as a Response to Differences in Alternative Destination Conditions: Empirical Estimation of Equation 1 with No Lags

	Migration from:	A	a_1	a_2	a_3	b_1	b_2	b_3	R^2	SSE	dw
1.											
A.	Greece to U.S.	-13.182	-1.036	0.867	1.149	42.232	-18.165	-21.088	0.651	0.607	1.2
		(0.442)	(0.177)	(0.362)	(0.328)	(1.620)	(0.440)	(0.380)			
B.	Greece to Germany	-11.671	3.649	-0.187	-0.291	-16.547	47.767	2.237	0.812	0.188	1.5
		(1.261)	(2.006)	(0.251)	(0.267)	(2.046)	(3.730)	(0.130)			
C.	Greece to Australia	17.757	-3.869	0.179	-0.572	12.085	-26.012	6.939	0.896	0.236	2.4
		(2.231)	(2.474)	(0.281)	(0.612)	(1.737)	(2.362)	(0.468)			
2.											
A.	Italy U.S.	16.409	-4.105	3.257	-3.619	40.418	6.384	-52.029	0.707	0.272	2.7
		(1.369)	(1.907)	(2.335)	(1.627)	(2.787)	(0.356)	(1.719)			
B.	Italy to Germany	-6.900	0.553	-0.178	0.682	-10.013	14.661	4.325	0.857	0.065	1.9
		(2.432)	(1.085)	(0.540)	(1.294)	(2.916)	(3.454)	(0.603)			
C.	Italy to Australia	5.618	-0.168	0.046	-1.123	10.342	-20.213	3.378	0.824	0.147	1.5
		(0.869)	(0.144)	(0.061)	(0.935)	(1.321)	(2.089)	(0.207)			

Destination Countries:

1. U.S.
2. Germany
3. Australia

Table A.3 presents the correlation coefficients between some of the independent variables. The collinearity between the variables partially explains the poor nature of the results.

Table A.3: Correlation Coefficients Between Some of the Independent Variables

Independent Variables	Correlation Coefficient
1. $\ln(\frac{N}{L})_{US} - \ln(\frac{N}{L})_{G}$	.6693
2. $\ln(\frac{N}{L})_{US} - \ln w_{US}^{drchs}$	-.7402
3. $\ln(\frac{N}{L})_{US} - \ln w_{US}^{lira}$	-.5368
4. $\ln(\frac{N}{L})_{G} - \ln w_{G}^{drchs}$	-.7587
5. $\ln(\frac{N}{L})_{G} - \ln w_{G}^{lira}$	-.7724

Footnotes

[1]For a good overview see Thomas (1961, 1973), Greenwood (1975) and Cebula (1979).

[2]Unless one country is small relative to the other or more generally the terms of trade settle at the cost ratio of one of the countries.

[3]The relative factor intensity of trade is harder to ascertain in a world characterized by more factors than goods.

[4]It should be noted that the time element enters in the trade literature as well when trade in capital goods or inventory accumulation are considered. In such cases however there is no clear distinction between trade in commodities and factor movements.

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