A STATIC PROBABILISTIC MODEL OF IMMIGRATION AND ECONOMIC INTEGRATION

STATİK OLASILIKLI GÖÇ VE EKONOMİK ENTEGRASYON MODELİ

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ABSTRACT: In this paper, by using a probabilistic static model, a possible relationship between the desirability of economic integration and (illegal) immigration is studied. Using the framework developed in Levy (1997), it is shown that migration from a labour abundant country to a capital abundant country might lead to economic integration between the two countries. By reducing the median voter's utility in the capital abundant host country, migration induces voters in this country to support a free trade agreement with the labour abundant migrant sending country that will stop further immigration.

Keywords: Economic Integration, Free Trade Agreements, Inequality, International Trade, Median-voter.

ÖZET: *Bu makalede, statik olasılıklı bir model kullanılarak ekonomik entegrasyon ve (illegal) göç arasındaki muhtemel ilişki incelenmiştir. Levy (1997) modelinin ana hatları kullanılarak emek yoğun bir ülkeden sermaye yoğun bir ülkeye olan göçün bu iki ülke arasında ekonomik entegrasyona yol açabileceği gösterilmiştir. Modelde göç hareketi, göçmen alan sermaye yoğun ülkedeki medyan seçmenin fayda düzeyini azaltarak, bu ülkedeki seçmenlerin, göçmen gönderen emek yoğun ülkeden gelebilecek daha fazla göçü engelleyecek bir serbest ticaret anlaşmasını desteklemelerine yol açmaktadır.*

Anahtar Kelimeler: *Ekonomik Entegrasyon, Serbest Ticaret Anlaşmaları, Eşitsizlik, Uluslararası Ticaret, Medyan-seçmen.*

1.Introduction

The two major economic blocks, NAFTA and EU, seem to be centres of attraction for migration. It is not far-fetched to assume that in the absence of immigration costs and restrictions, these economic blocks would have to absorb huge sizes of poor immigrants who would change the economic and ethnic compositions of these blocks radically. It is no wonder that the average citizen in these blocks is against immigration. It is also reasonable to expect that illegal immigration from developing countries to the high-income countries will intensify in the future. In the case of economic blocks some of the source countries of this illegal immigration might be possible candidates to these economic blocks. Then a natural question arises: "Does illegal immigration from a candidate country to an economic block increase or decrease the chance of being accepted to that block?" This article deals with this question.

According to the Immigration and Naturalization Service (INS) in January 2000, there were 7 million illegal aliens living in the United States. It is estimated that this number is increasing by half a million a year (Centre for Immigration Studies, 2004). Therefore the illegal alien population in the beginning of 2005 must be around 9.5 million. INS also reports a close link between legal and illegal immigration, which is reflected by the fact that 1.5 million green cards were given to illegal aliens in 1990s.

The largest share of illegal immigrants to the United States comes from Mexico. As shown in Table 1, in 1998, 54% of all illegal immigrants in the US were from Mexico. Given this fact it is not surprising that one of the aims of NAFTA was to reduce migration from Mexico to the United States by stimulated economic growth. Although general agreements on migration were explicitly not part of the NAFTA, leaders of both Mexico and the United States supported NAFTA under the expectation that in the long run trade would substitute migration.

Table 1. Undocumented immigrants in the US, by country of origin, 1998

Country of origin	Total number of undocumented immigrants	Percentage of total undocumented population
Total	4,700,000	100.0
Mexico	2,538,000	54.0
El Salvador	315,000	6.7
Guatemala	155,000	3.3
Canada	113,000	2.4
Haiti	99,000	2.1
Philippines	89,000	1.9
Honduras	85,000	1.8
The Bahamas	66,000	1.4
Nicaragua	66,000	1.4
Poland	66,000	1.4
Colombia	61,000	1.3
Other	1,047,000	22.3

Source: Rivera-Batiz (2001)

The NAFTA debate emphasizes the question of whether free trade could stop unwanted migration from less developed countries to developed ones. The standard comparative static analysis gives the answer that migration of labour without the existence of trade tends to decrease and end because of the adjustment of wages. Migration decreases wages in the receiving country and it increases wages in the sending country. The Heckscher-Ohlin trade model concludes that trade and migration are substitutes. Trade, by equalizing factor prices, eliminates the reason why people migrate.

An interesting question here is that if migration helps to lead to the creation of FTAs, then should we regard migration and trade complements rather than substitutes? If the Mexican immigration had not occurred over the years and if there were no threat of further (illegal) immigration, would NAFTA get enough support in

the United States? Or in the European Union context, could the possibility of further unwanted migration from Eastern Europe and Turkey be one of the reasons why these regions are in the European enlargement perspectives?

Although the demand for foreign workers in Europe ended abruptly in 1974 after the oil shocks, as White (1984) and King (1995) pointed out many migration flows continued until 1975. After that migration did not come to a halt, rather the character of the flows changed. The migration of single (mainly male) workers was replaced by the migration of family members. Also, since Western European economies no longer sought foreign workers, for those who want to emigrate to Western Europe illegal immigration and political asylum options became more important.

Table 2. Inflows of foreign population into selected European countries
1990-2000 (thousands)

	1990	1992	1994	1996	1998	2000
Austria	-	-	-	-	59.2	66.0
Belgium	50.5	55.1	56.0	51.9	50.7	68.6
Czech Republic	-	-	-	7.4	7.9	4.2
Denmark	15.1	16.9	15.6	24.7	21.3	-
Finland	6.5	10.4	7.6	7.5	8.3	9.1
France	102.4	116.6	91.5	75.5	139.5	119.3
Germany	824.4	1207.6	774.0	708.0	605.5	648.8
Greece	-	-	-	-	38.2	-
Hungary	37.2	15.1	12.8	12.8	12.3	-
Ireland	-	-	13.3	21.5	20.8	24.1
Italy	-	-	-	-	111.0	271.5
Luxemburg	9.3	9.8	9.2	9.2	10.6	10.8
Netherlands	81.3	83.0	68.4	77.2	81.7	91.4
Norway	15.7	17.2	17.9	17.2	26.7	27.8
Portugal	-	13.7	5.7	3.6	6.5	15.9
Sweden	53.2	39.5	74.7	29.3	35.7	33.8
Switzerland	101.4	112.1	91.7	74.3	74.9	87.4
United Kingdom	-	203.9	193.6	216.4	258.0	288.8
EU (*)	-	1756.5	1309.5	1224.9	1238.7	1310.6

(*): Above countries only (excluding Austria, Greece and Italy)
Sources: Geddes (2003), OECD (2003)

Following the collapse of the Communist block in Eastern Europe, a new wave of migration from East to West emerged. Legal migration of ethnic minorities, like German speaking people from former USSR, and illegal immigration from the former Communist block countries caused by economic collapse took place. The humanitarian catastrophe caused by civil wars in former Yugoslavia led to huge increases in the number of asylum seekers into Western European countries in the early 1990s. Tables 2 and 3 present a statistical overview of immigration and the number of asylum seekers into European countries throughout 1990s. The mere fact

that the influx of foreign populations into Europe has never been less than 1 million annually throughout the 1990s indicates the importance of immigration for Europe.

**Table 3. Inflows of asylum seekers into selected European countries
1992-2001 (thousands)**

	1992	1994	1996	1998	2000	2001
Austria	16.2	5.1	7.0	13.8	18.3	30.1
Belgium	17.6	14.7	12.4	22.1	42.7	24.5
Bulgaria	0.2	-	0.3	0.8	1.8	2.4
Czech Republic	0.9	1.2	2.2	4.1	8.8	18.0
Denmark	13.9	6.7	5.9	5.7	10.3	12.4
Finland	3.6	0.8	0.7	1.3	3.2	1.7
France	28.9	26.0	17.4	22.4	38.7	47.3
Germany	438.2	127.2	116.4	98.6	78.6	88.4
Greece	2.0	1.3	1.6	2.6	3.1	5.5
Hungary	0.9	0.4	0.7	7.4	7.8	9.6
Ireland	-	0.4	1.2	4.6	10.9	10.3
Italy	2.6	1.8	0.7	11.1	24.5	9.8
Luxemburg	0.1	0.2	0.3	1.6	0.6	0.7
Netherlands	20.3	52.6	22.9	45.2	43.9	32.6
Norway	5.2	3.4	1.8	8.5	10.8	14.8
Poland	0.6	0.6	3.2	3.4	4.4	4.5
Portugal	0.5	0.6	0.2	0.3	0.2	0.2
Romania	0.8	-	0.6	1.2	1.4	2.4
Slovak Republic	0.1	0.1	0.4	0.5	1.5	8.2
Spain	11.7	12.0	4.7	6.8	7.9	9.2
Sweden	84.0	18.6	5.8	12.5	16.3	23.5
Switzerland	18.0	16.1	18.0	41.3	17.6	20.8
United Kingdom	32.3	42.2	37.0	58.0	98.9	92.0
EU	672.0	310.0	234.1	306.7	398.1	388.1

Sources: Geddes (2003), OECD (2003)

The main idea of this article is that although unwanted migration hurts the median voter in the receiving country, free trade with the sending country that will stop migration might be preferable to further migration without free trade. The article constructs a Heckscher-Ohlin-Samuelson type model in which illegal migration from a labour abundant country to a capital abundant country leads to economic integration (free trade) between the two countries. The model suggests an ambivalent answer to the question of whether goods trade and factor mobility are substitutes or complements. On the one hand, the motivation for migration (factor mobility) is the absence of goods trade (if there were goods trade, then we would have factor price equalization and no labour movement). Furthermore, when countries switch from autarky to free trade, labour migration no longer occurs. Thus, factor mobility and goods trade seem to be substitutes. On the other hand, the reason for free trade is the labour migration, which suggests that factor movements and goods trade are complements.

The plan of this article is as follows. In the next section the related literature of illegal immigration, substitutability and complementarity of factor movements and goods trade, and political economy of economic integration is described. Section 3 then analyzes free trade and immigration in the static Heckscher-Ohlin framework.

2. Literature Review

To our knowledge, there is no earlier work about the linkage between economic integration and illegal immigration.

Among the earlier works on the illegal immigration it is worth to mention Ethier (1986), Bond and Chen (1987), Bucci and Tenorio (1996) and Yoshida (2000), all of which include static models.

In Ethier (1986), a simple equilibrium model with border interdiction is developed and host country policy toward illegal immigration is analyzed. A detailed analysis of how a combination of interdiction and internal enforcement can deal with the illegal immigration problem is presented.

By extending Ethier model, Bond and Chen (1987) examine the optimal level of enforcement for the host country in a two-country model and consider the effects of capital mobility. They derive a formula for the optimal level of enforcement against firms that hire illegal workers. They also show that the presence of enforcement costs makes the policy less efficient than a wage tax. When capital mobility is allowed, foreign workers gain from an increase in enforcement in the home country because capital is driven out of the home country.

Bucci and Tenorio (1996) on the other hand examine the effects of financing internal enforcement on the host country's welfare by introducing a government budget constraint similar to Ethier's into a small-country model. Yoshida (2000) by using Bond and Chen (1987) and Bucci and Tenorio (1996) models reassess the welfare effects of the enforcement policy in terms of the welfare of the host country, the foreign country and the world.

In our model the term illegal immigration is used by two reasons. First, median voter in the rich country does not want migration, i.e. majority of the rich country does not want these immigrants in their country. Second, immigrants from the poor country do not posses voting rights in the rich country. They are not legal citizens of the rich country and they are not allowed to participate in voting for a possible free trade agreement between the country in which they live and the country from which they have come.

Since our major aim is to capture the relationship between migration and economic integration, rather than welfare effects of various enforcement policies as in most of the illegal immigration literature, we do not follow the aforementioned papers to model illegal immigration. In our model the illegal aspect of migration is represented by the high cost of migration before the economic integration.

The question of whether goods trade and factor mobility are substitutes or complements has been discussed since Mundel's classical paper (1957), in which Mundel shows that tariff-generated factor movements have the effect of reducing trade in the Heckscher-Ohlin-Samuelson model. Markusen (1983) examines a number of situations, such as differences in production technology and external economies of scale, and shows that goods trade and factor mobility may be complements if the cause of trade is not factor endowment differences. Generalizing Heckscher-Ohlin theorem, Svensson (1984) compares the goods trade patterns with and without factor trade. He concludes that factor trade and goods trade tend to be

substitutes (complements) if traded and non-traded factors are "cooperative" ("non-cooperative"). In their joint paper, Markusen and Svensson (1985) develop a general model of trade caused by international differences in production technology and examine factor mobility within the context of this model. They show that factor mobility leads to an increase in the correlation between goods and factor trade, indicating a reinforcement of the pattern of goods trade relative to the no-factor trade situation. Thus, they conclude that factor trade and commodity trade are complements. Wong (1986) on the other hand develops a 2x2x2 general equilibrium framework of the world which allows differences in tastes and technologies between the trading countries. He derives the necessary and sufficient condition for substitutability and complementarity. Lately Neary (1995) develops a two country model of trade and factor mobility in which capital was sector-specific but internationally mobile. His model, unlike Heckscher-Ohlin-Samuelson model, avoids the indeterminacy of the level of trade and factor flows and the propensity to specialize in production and trade.

Our political economy analysis was mainly motivated by Levy (1997). In this paper Levy compares the desirability of a bilateral trade agreement with multilateral trade liberalization. He models countries' decisions on trade relations as binary choices. Countries first choose whether to join a free trade agreement with another country or a group of countries, and then they choose whether to participate in a broader multilateral agreement. Individuals in each country have different holdings of capital and labour and for this reason they have different reactions to any given proposal. The decisions of countries are characterized by the decisions of their median voters (the individual with the median capital-labour ratio). Levy uses two models, Heckscher-Ohlin and Differentiated Product, in his paper. In the former setting, he shows that there can be no politically feasible bilateral trade agreements that would prevent a politically feasible multilateral trade agreement. However in the latter, a bilateral free trade agreement can weaken the support for a multilateral trade agreement by offering the median voter a huge product variety gain with relatively small adverse price loss that will raise the utility of the median voter above the one offered by the multilateral agreement. In our model, we use the Heckscher-Ohlin framework of the first part of Levy's paper. As in Levy's paper we allow individuals to have different holdings of capital so that their reactions to a free trade agreement are different. We also retain the majority rule, i.e. the median voter's preference is the chosen policy.

Benhabib's (1996) paper uses a similar setting to the model used here. He studies how immigration policies that impose capital and skill requirements would be determined under majority voting when native agents differ in their wealth holdings and vote to maximize their income. He shows that the population will be polarized between those who would want an immigration policy that will maximize capital-labour ratio and those who would want an immigration policy that will minimize it. We used Benhabib's notation to describe population sizes and capital stocks in the two countries in our model. Another similarity is the majority rule. In Benhabib's paper, as in our model, natives with high capital endowment in the capital abundant country benefit from labour immigration whereas natives with low capital endowment suffer from it.

Surprisingly there is nothing much in the literature on what is behind the decision of a group of countries to bilaterally liberalize factor flows. Giovanni Facchini's (2002)

paper titled "Why does a country join an FTA?" represents a first attempt at answering this question. It develops a theory of the endogenous formation of a common market in a three country, n-factor model. Import restrictions/subsidies are determined by direct democracy, i.e. by the decision of the median voter. The decision to join a common market is modelled as a simultaneous move game between the two prospective members. It is shown that differences in subsidies before the vote do not affect the decision of the median voter. For a common market to be established the ex-post factor flows must be balanced. In other words, if most of the factor flows are in one direction, then the median voter in the country which receives most of the factor flows will be negatively affected. Finally the possibility that a common market will be established increases in the number of factors enjoying ex post enhanced protection, which indicates the potential tension between social desirability and political feasibility of the common market.

This article tries to model the linkage between (illegal) migration and economic integration. As we have seen above, almost all illegal immigration literature concerns with welfare(s) of the host country and/or source country. Also no political economy paper seems to have dealt with migration and free trade areas jointly. Although Facchini's (2002) model states the importance of ex-post factor flows in FTA decision, it assumes no factor flow before the establishment of the common market. So far, to our knowledge, there has been no attempt to model the linkage between (ex-ante) migration and economic integration, which is surprising given the fact that one of the well known reasons of NAFTA was to stop illegal migration from Mexico to the US by increasing trade and economic growth in Mexico. By showing how the median voter's decision to join an FTA is affected by unwanted migration from a relatively poor country, we provide a model which links the decision to join an FTA directly to migration.

3. The Model

There are two countries: relatively labour abundant poor country *(P)* and relatively capital abundant rich country *(R)*. *R* could be interpreted as an attractive economic block and *P* as a candidate to this block. Each country satisfies the standard Heckscher-Ohlin assumptions: capital and labour are used to produce two goods, a labour-intensive good, Q_L, and a capital-intensive good, Q_K, by means of constant-returns technologies, and there is no joint production. These technologies are identical across countries. Consumer preferences for the two goods are homothetic and also identical across countries. All markets are competitive. People spend their full income on the two goods. Labour intensive good Q_L is the numeraire; p_P is the price of Q_K in terms of Q_L in the poor country and p_R is the price of Q_K in terms of Q_L in the rich country. Under an autarky equilibrium, p_P exceeds p_R , since the labour-abundant poor country produces more Q_L relative to Q_K. As a result, the Stopler-Samuelson theorem implies that the real wage in the rich country exceeds the real wage in the poor country.

Economic integration is defined as a free trade agreement that will equalize factor prices across the two economies. With free trade, the integrated economy that would result from factor mobility will be achieved instead through trade flows. To make things simple it is assumed that tariffs are either zero or prohibitive, so without free trade both countries are in autarky. If two countries establish a free-trade area, the

resulting relative price will be between the autarky prices in the two countries and the capital-abundant rich country will export Q_K and import Q_L.

Initially the only linkage between the two economies is illegal migration from *P* to *R*. We assume that country *P* already applied for economic integration with *R*.

Individuals in each country possess different endowments of labour and capital and therefore have different views about the desirability of free trade. For simplicity, assume that everyone supplies one unit of labour but differs in their ownership of capital. Individuals are indexed by the units of capital that they own, k. As in Benhabib (1996), the number of individuals is given by the density function $N_j(k)$, defined on $[0, \bar{k}_j]$. We have two countries (poor and rich), so *j=P,R*. The density function $N_j(k)$ is continuous in $(0, \bar{k}_j]$, but for the poor country at 0 we allow a positive mass of individuals that have no capital. Call this number of individuals who do not posses capital Z. These people represent potential migrants.

The initial capital stocks, K_j for *j=P,R*, are given by

$$K_j = \int_0^{\bar{k}_j} N_j(k)\, k\, dk \ . \tag{1}$$

The initial population sizes, $L_{P,0}$ and $L_{R,0}$, are

$$L_{P,0} = Z + \int_0^{\bar{k}_P} N_P(k)\, dk \tag{2}$$

$$L_{R,0} = \int_0^{\bar{k}_R} N_R(k)\, dk \ . \tag{3}$$

The country R is relatively capital abundant such that $K_R/L_{R,0} > K_P/L_{P,0}$.

The capital-labour ratios of median voters' in each country, k_j^{median} for *j=P,R*, satisfy the following condition:

$$\left(\int_0^{k_j^{median}} N_j(k)\, dk \right) / L_{j,0} = 0.5 \ . \tag{4}$$

At time *t* capital-labour ratios are $k_{P,t}=(K_P/L_{P,t})$ and $k_{R,t}=(K_R/L_{R,t})$, where $k_{j,t}$ is the capital-labour ratio in country *j* at time *t* and $L_{j,t}$ is the labour stock of country *j* at time *t*; *t=0* and *t=1* represent the period before migration and the period after migration respectively. Since P is relatively labour abundant, at the beginning (when *t=0*) we have $k_{P,0}=(K_P/L_{P,0}) < k_{R,0}=(K_R/L_{R,0})$. We do not have time subscripts on K_P

and K_R , since it is assumed that capital endowments of the two countries are constant. The overall capital-labour ratio in P and R together is k_U, $k_U=(K_P+K_R)/(L_{P,0}+L_{R,0})$, which is between $k_{P,0}$ and $k_{R,0}$. Again we do not need time subscript for k_U, since total number of individuals in both countries after migration $(L_{P,1}+L_{R,1})$ is equal to the total number of individuals in both countries at the beginning $(L_{P,0}+L_{R,0})$.

Since individuals in each country possess only one unit of labour, but different endowments of capital, they have different views about the desirability of free trade. The utility of an agent i in country j with a capital endowment k^i, is a function of income, $w_j + r_j k^i$ and product price p_j: $V(w_j + r_j k^i, p_j)$. However, factor prices are determined by p_j in the Heckscher-Ohlin model (assuming no factor-intensity reversals), and p_j is determined by the economy's capital-labour ratio, k_j, where the relevant economy is either the country of residence in the case of autarky or the "integrated economy" in the case of free trade. The resulting utility function can therefore be defined, $v(k^i, k_j) = V(w(k_j) + r(k_j)k^i, p(k_j))$. As Levy (1997) showed, this function is strictly quasi-convex in k_j and has a unique minimum when the agent's capital-labour ratio is equal to that of the economy.
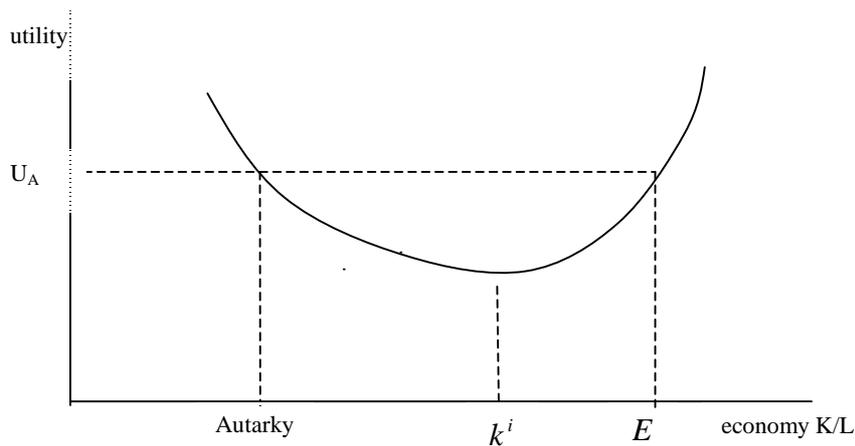
Figure 1. The strictly quasi-convex utility of an agent with a given capital-labour ratio as a function of the economy's capital-labour ratio.

Figure 1 shows the strictly quasi-convex utility of an agent with a given capital-labour ratio as a function of the economy's capital-labour ratio. Levy (1997) uses this figure to illustrate his proposition. If this represented the median voter in a country, he would reject trade agreements which resulted in economy capital-labour ratios in the range (Autarky, E). Outside of that range, utility increases as the distance from Autarky increases.

Figure 2 depicts the utility function for the median voter in the poor country. We have the usual assumption that the ownership of capital is skewed, $k_P^{median} < k_{P,0}$, implying that the median voter would suffer a welfare loss if the economy's capital labour ratio fell towards k_P^{median} . On the other hand, the median voter would gain by a free-trade agreement with the rich country, because the integrated economy's

capital-labour ratio, k_U, is higher than the capital-labour ratio of the poor country, $k_{P,0}$.
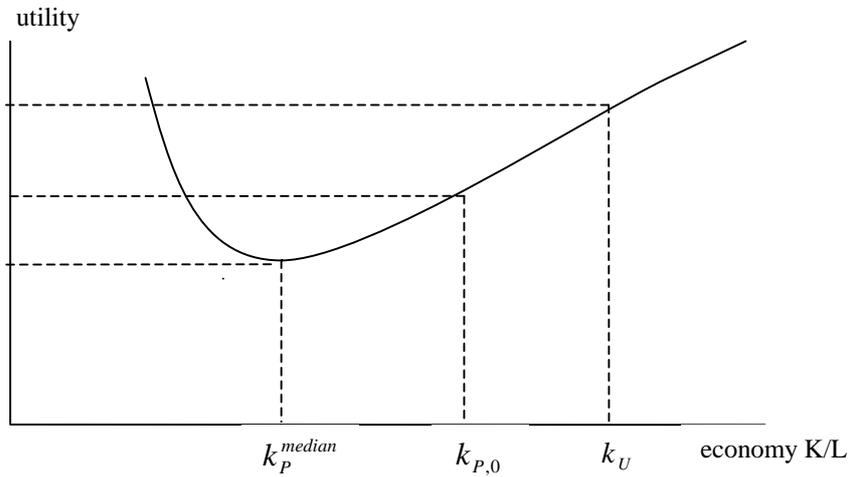
Figure 2. Utility of the median voter in P.
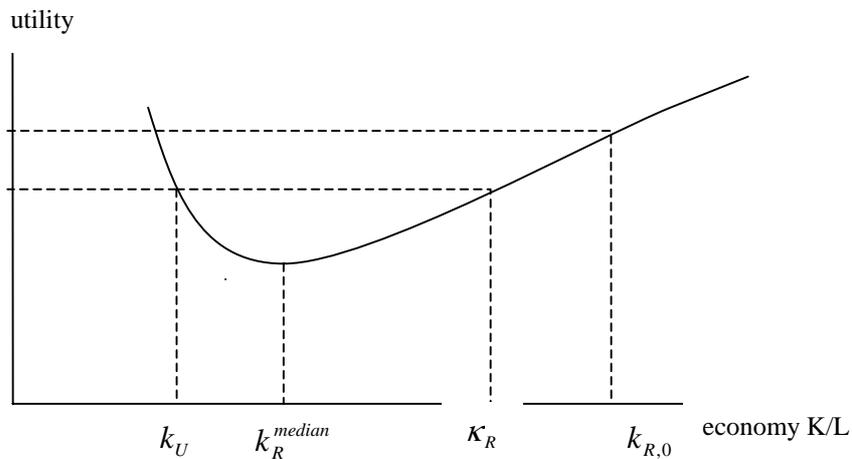
Figure 3. Utility of the median voter in R when $k_U < k_R^{median} < \kappa_R < k_{R,0}$.

We are interested in the case where the rich country turns down free trade in the absence of migration. This situation is illustrated in Figure 3. In Figure 3, we see the utility function for the median voter in the rich country. The symbol, κ_R represents the capital-labour ratio at which the median voter is indifferent between economic integration (free-trade) and autarky. It satisfies the following two conditions:

$$\kappa_R \neq k_U \,, \tag{5a}$$

$$V(w(k_U) + r(k_U) k_R^{median}, p(k_U)) = V(w(\kappa_R) + r(\kappa_R) k_R^{median}, p(\kappa_R)) \ . \quad (5b)$$

As it is seen, $k_U < k_R^{median} < \kappa_R < k_{R,0}$. The first inequality indicates the reasonable assumption that the rich country's median voter has more capital than the integrated economy's. The second inequality is implied by the first one, since the utility function is u-shaped. Finally, the last inequality reflects the assumption that the median voter prefers autarky over free trade in the absence of migration. In such a situation, the median voter's utility in his country under autarky is greater than the utility he would get living under the integrated economy. Therefore the median voter in the rich country opposes economic integration.

Since the median voter in the rich country rejects a free-trade agreement, there is no goods trade and no capital mobility. However, some workers find it possible and desirable to migrate from *P* to *R*, since real wages are higher in *R* than in *P*. We have already assumed that all migrants are endowed only their unit of labour but no capital. It seems appropriate to interpret migration as illegal for two reasons. First, the majority of voters in the rich country do not want immigration. Second, we assume that immigrants from the poor country do not possess voting rights in the rich country.

The cost of migration is *C*. To keep the analysis simple, we use the "psychic" cost concept of Sjaastad (1962). Migration involves a psychic cost, because people are often genuinely reluctant to leave familiar surroundings, family, and friends. We might argue that in the case of illegal immigration psychic cost becomes more relevant, since immigrants' very presence is not welcomed by the majority of the host country citizens. In our model median voter is against immigration, since his real utility is decreasing because of immigration. Median voter with at least half of the population in R is against immigration. Living in a foreign country in which majority dislikes immigrants must not be very appealing to the potential migrants. As Sjaastad explained, psychic costs do not represent real resource costs:

> "…*Rather they are of the nature of lost consumer (or producer) surplus on the part of the migrant. Given the earnings levels at all other places, there is some minimum earning level at location i which will cause a given individual to be indifferent between migration and remaining at i. For any higher earnings at i, he collects a surplus in the sense that part of his earnings could be taxed away and that taxation would not cause him to migrate. The maximum amount that could be taken away without inducing migration represents the value of the surplus. By perfect discrimination, it would be possible to take away the full amount of the surplus, but in doing so leave resource allocation unaffected (other than through distributive effects). Hence, the psychic cost of migration involve no resources for the economy and should not be included as part of the investment in migration.*" (Sjaastad: 1962,85)

In this model, we have two stages. First, after free trade is rejected in the rich country, workers migrate. In the second stage, the rich country votes for free trade again. In equilibrium, potential migrants correctly anticipate the probability of a free-trade agreement.

Since migrants are not bringing capital out with themselves, migration will decrease the capital-labour ratio in the rich country, but it will not be enough to equalize

capital-labour ratios across the two countries. If they were equalized, then factor prices would also be equalized, implying that migrants incurred the cost of migration *(C)* without any benefit. Also, there would be no need to vote for free trade, since factor-price equalization would imply that all the benefits from free trade would already have been achieved. Therefore, migration brings the countries' capital-labour ratios closer to each other, but does not equalize them.

It is obvious that for a sufficiently high *C*, migration does not occur. For lower values of *C*, migrants move into the rich country until the expected difference in real wages falls to the level that offsets the cost of migration, leaving workers indifferent about migrating. In this case the only equilibrium number of immigrants is the number which will make the median voter in the rich country indifferent between economic integration and non-integration. In other words, after the migration wave in the first stage, in the second stage capital-labour ratio will be κ_R. The reason is simple. Let the number of immigrants that will make the median voter in the rich country indifferent between autarky and free trade be *T*. In symbols, the relationship between κ_R and *T* is $\kappa_R = K_R/(L_{R,0}+T)$. Any number of migrants greater than *T* will make the probability of economic integration equal to 1, since the capital-labour ratio in the rich country will be less than κ_R after migration and the median voter will strictly prefer economic integration in this case. But if the possibility of economic integration is 1, no one would want to immigrate and incur migration costs in the first place, since they can get all the benefits of economic integration by staying at home and not incurring the cost of migration. Therefore it is impossible that more than *T* workers will migrate. On the other hand, any number of migrants less than *T* will make the probability of economic integration equal to 0, since the capital-labour ratio in the rich country will still be greater than κ_R after migration and the median voter will strictly prefer autarky that is the possibility of economic integration is 0. But if the probability of economic integration is 0, then all workers (more than *T*) would migrate to enjoy the higher wages of R the second stage. Therefore it is impossible that less than *T* workers will migrate.

Then what is the possibility of economic integration when only *T* number of people immigrates to *R*? We know that the equilibrium level of migration should make workers in *P* indifferent between staying in *P* without incurring the cost *C* and migrating to *R* with incurring the cost *C*. Let κ_P denote the capital-labour ratio in *P* after the migration of *T* number of workers; in symbols $\kappa_P = K_P/(L_{P,0}-T)$. Finally, let $\beta(C)$ be the probability of a favourable vote for free trade, defined as a function of migration costs. This probability must then satisfy the following condition:

$$(1-\beta)V(w(\kappa_P), p(\kappa_P)) + \beta V(w(k_U), p(k_U))$$
$$= (1-\beta)[V(w(\kappa_R), p(\kappa_R)) - C] + \beta[V(w(k_U), p(k_U)) - C] \tag{6}$$

Proposition 1: There exists a $C^* = V(w(\kappa_R), p(\kappa_R)) - V(w(\kappa_P), p(\kappa_P)) > 0$, such that $\beta(C)$ is positive and decreasing in *C* for $0 < C < C^*$, $\beta(C) = 0$ for $C > C^*$, and $\beta(C)$ converges to 1 as *C* goes to zero.

This proposition can easily be proved by using equation (6). From equation (6), we get

$$\beta = 1 - \frac{C}{V(w(\kappa_R), p(\kappa_R)) - V(w(\kappa_P), p(\kappa_P))}. \tag{7}$$

From this equation, it is easy to see that for any C less than $V(w(\kappa_R), p(\kappa_R)) - V(w(\kappa_P), p(\kappa_P))$, β is positive for $0 < C < C^*$. Also, since β is negative in equation (7) for any C greater than $V(w(\kappa_R), p(\kappa_R)) - V(w(\kappa_P), p(\kappa_P))$, $\beta(C)$ must be 0 for $C > C^*$. Taking the derivative of β with respect to C gives us

$$\frac{\partial \beta}{\partial C} = -\frac{1}{V(w(\kappa_R), p(\kappa_R)) - V(w(\kappa_P), p(\kappa_P))}. \tag{8}$$

The fact that this derivative is negative indicates that $\beta(C)$ is decreasing in C for $0 < C < C^*$.

With this proposition, we have established a political connection between free trade and migration: The lower the cost of migration, the higher the level of migration and the more likely is a free trade agreement. In this sense, migration and free trade seem to be complements.

Proposition 2: A more egalitarian income distribution in country R, characterized by an increase in capital endowment, increases the probability of free trade.

This proposition can be proved with the aid of Figure 4. As illustrated, the rise in the median voter's capital endowment shifts his utility curve up. As a result, it changes the autarky capital-labour ratio that would have to exist following migration to leave the median voter indifferent between autarky and free trade. As shown, this ratio rises from $\kappa_{R,a}$ to $\kappa_{R,b}$. The reason for this change is that the rise in the median voter's capital endowment can be shown to increase utility more at k_U than at $\kappa_{R,a}$, because the real return on capital is higher at the lower capital-labour ratio. As a result, the economy's capital-labour ratio must rise above $\kappa_{R,a}$ to provide the voter with the free-trade utility.

Thus, a more egalitarian income distribution lowers the migration needed to make the median voter indifferent between autarky and free trade, i.e. T decreases. With less migration, the difference between the two countries' real wages does not fall as much, i.e. $V(w(\kappa_R), p(\kappa_R)) - V(w(\kappa_P), p(\kappa_P))$ increases. Thus, the probability of a free-trade agreement passing (and therefore wages equalizing) can rise without reversing incentives to migrate, i.e. the increase in $V(w(\kappa_R), p(\kappa_R)) - V(w(\kappa_P), p(\kappa_P))$ leads to a lower β in equation (7).

utility

$$k_U \quad k_{R,a}^{median} \quad k_{R,b}^{median} \quad K_{R,a} \quad K_{R,b} \qquad \text{economy K/L}$$
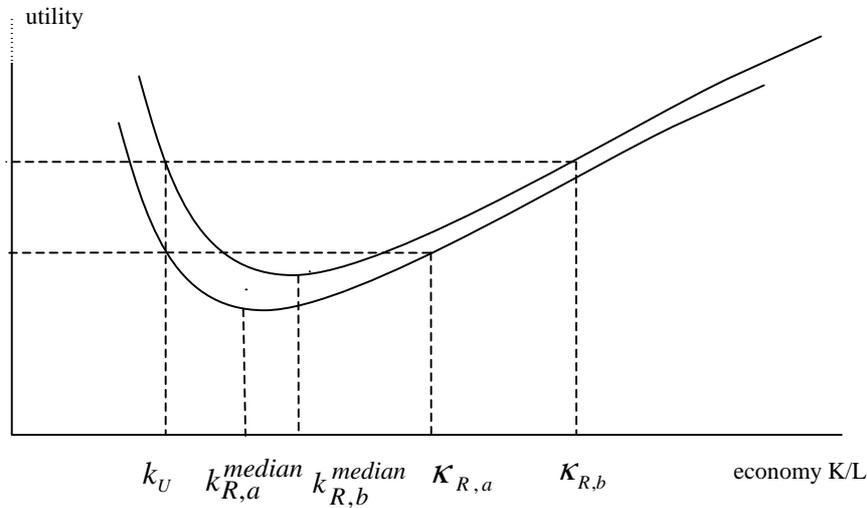
Figure 4. Utility of the median voter when his capital-labour ratio increases.

4. Conclusion

By presenting a two-good, two-factor, two-country static probabilistic model of migration and economic integration, we provided an analytical basis for studying the relationship between immigration and economic integration. As it is stated earlier, to our knowledge, there is no previous work in the literature which models migration as a cause of free trade agreements. Therefore the model presented in this article seems to be the first attempt in this direction.

It is shown that immigration might change the political economy equilibrium trade policy from autarky to free trade, which implies a complimentary relationship between factor movements and goods trade. This is an interesting result, because it conflicts with Mundel's (1957) classic conclusion that factor mobility in response to international factor price differences leads to the elimination of trade via the elimination of the factor proportions basis for trade, i.e. factor movements and goods trade are substitutes. This important difference is because of the political economy and illegal immigration aspects of our model. Illegal immigration changes the political economy equilibrium trade policy by changing the median voter's utility level and thus his preference about the trade policy.

Our result about the income distribution and the probability of free trade is in full compliance with Mayer's (1984) prediction about the political economy equilibrium trade policies in an unequal society (one in which the relative capital endowment of the median individual is less than the mean). These policies will be biased against capital owners. Mayer's framework indicates that an increase in inequality (the difference between the mean and the median capital-labour ratio), holding constant the economy's overall relative endowments, raises trade barriers in capital-abundant economies and lowers them in capital-scarce economies. We have found a result that is analogous to Mayer's in the context of free trade areas: An increase in inequality in a capital rich country decreases the probability of free trade.

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