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## Migration policy in a small open economy with a dual labor market\*

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RRH: MIGRATION POLICY WITH A DUAL LABOR MARKET

LRH: Tobias Müller

### Abstract

This paper uses a two-sector efficiency-wage model to analyze the consequences of immigration for a small open economy with a dual labor market. Immigrants are characterized by an (exogenous) return probability. Legal regulations impose preferential hiring of natives or “old” immigrants. As a result, there is sectoral segregation between natives and immigrants, leading to discrimination of the type “equal pay for equal work, but unequal work”. In the short run (with sector-specific capital), immigration has a positive first-order impact on natives’ welfare if migration policy favors segregation through high return rates or restrictive hiring practices (“guest-worker” system). In the long run, its effect is only determined by factor intensities ( $2 \times 2$  model). Finally, the improved integration of migrants yields efficiency gains and improves aggregate welfare of all residents.

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## 1. Introduction

Immigrants often hold jobs characterized by low wages and bad working conditions. This observation is documented in many institutional studies, which emphasize the existence of dual labor markets and the temporary nature of migration (Piore, 1979; Hammar, 1985). In this context, immigration policy plays an important role. In countries with a “guest-worker” system, sectoral segregation between natives and migrants seems to be more pronounced than in countries favoring permanent immigration.<sup>1</sup> Moreover, the economic assimilation of immigrants seems to follow different patterns in these countries. By contrast to the United States, Dustmann (1993) and Licht and Steiner (1994) find that in Germany immigrants’ earnings do not catch up with natives’, even after a long stay in the host country.

The standard welfare analysis of immigration, however, neglects these institutional aspects by assuming a homogeneous labor market, where immigration affects the welfare of natives only through its impact on factor prices (Borjas, 1995). In such a framework, immigration yields only a second-order gain in terms of aggregate native welfare, but it has a detrimental impact on wages and adverse distributional consequences.

The objective of this paper is to explore the welfare consequences of different migration policies in the context of a dual labor market, taking the temporary nature of migration into account. If the labor market is segmented and characterized by “good” and “bad” jobs, immigration affects not only factor prices, as in the neoclassical model of immigration, but also employment opportunities of natives. Furthermore, if migration is perceived as temporary, firms exhibit discriminatory behavior against immigrants as a group. Discrimination is of the type “equal pay for equal work, but unequal work”. Hence, migrants have smaller chances of finding “good” jobs than natives. In such a context, immigration is likely to improve the natives’ job perspectives and thus to have a positive impact on their welfare.

In this paper I use an efficiency-wage model of a dual labor market in the tradition of Shapiro and Stiglitz (1984) and Bulow and Summers (1986). Segregation and discrimination against immigrants is not only a consequence of preferential hiring regulations, but also a result of firms' behavior and immigrants' incentives.<sup>2</sup> The distinctive characteristic of immigrants is their probability of return migration; in all other respects, they are assumed to be identical to natives. As firms perceive this difference between the two groups, this leads to discriminatory hiring behavior in an efficiency-wage model, because the incentive not to shirk depends on the expected time horizon of workers, and therefore on their return probability.<sup>3</sup> Since competition ensures that firms do not pay different wage rates to different groups of workers, discrimination against immigrants shows up as a lower probability of holding a primary-sector job.

Empirical evidence on the probability of return, a central parameter of the model, is scarce. Recent statistics on emigration, which are available in SOPEMI (1998) for European countries and Japan, indicate that return rates vary not only between countries, but also among different groups of migrants. Return rates can be calculated as the ratio between emigration by foreigners and their stock in the host country (or, if available, the stock of the foreign-born). In 1995, average return rates range from 1.5% (Netherlands) to 7.8% (Germany). Much higher values are attained for particular national groups (the return rate for Polish migrants in Germany is 25.6%) or for certain legal categories (the return rate for foreigners holding annual work permits in Switzerland is 10.3%). It should be emphasized that most temporary migrants are excluded from these statistics (such as workers holding short-term or seasonal permits, and frontier workers). Moreover, there are other categories of migrants who cannot expect to stay a long time in the host country. Immigrants entering illegally take the risk of being discovered and expelled at any moment. Asylum seekers are often granted the right to work upon arrival in the host country.

Given the low admission rates observed in recent years, their time horizon in the host country is limited.

Migration policy has three dimensions in the model of this paper. First, it is assumed that the government can determine the stock of immigrants by controlling net migration flows. Second, migration policy is assumed to influence the return probability of migrants. This probability may either reflect legal regulations, such as the existence of temporary work permits, or the government's attitude towards social and economic integration of immigrants. Third, migrants are granted equal rights in the host country's labor market only after a certain period of stay (the length of which is fixed by the government). Firms are compelled to prefer natives and "old" migrants over "new" migrants in their hiring decisions.

The third assumption tries to capture the typical trajectory of migrants. For many migrants who ultimately become permanent residents in the host country, temporary working permits (or even illegal immigration) are a privileged port of entry. This is not only true in European countries, where many "guest-workers" have become permanent residents, contrary to initial expectations. It can also be observed in Australia or the United States, where more than 50 percent of those foreigners who were admitted as permanent immigrants in 1996 formerly held temporary permits (SOPEMI, 1998). Since most host countries apply preferential hiring practices for natives and permanent immigrants, new migrants experience initially a period of legal discrimination.

## **2. A model of dual labor markets and migration**

In the model, the migrants' probability of return to their home country  $\theta$  is assumed to be constant through time. Thus, the migrants' expected time of stay in the host country is  $(1/\theta)$ .<sup>4</sup> Moreover, at any instant of time, new immigrants arrive and replace those who leave, such that the total stock of migrants remains constant

(steady-state assumption).

The dual labor market is modeled in a standard efficiency-wage framework. Work conditions in the primary and the secondary sectors are not identical. The primary sector offers jobs with good working conditions, stable employment relationships and good chances for internal promotion. By assumption, workers in this sector cannot be perfectly monitored. Thus, firms prefer to pay wages above market-clearing levels in order to induce workers to supply effort. As a consequence, jobs are rationed in the primary sector and workers are queuing up for them. However, they can always find jobs in the secondary sector. These jobs are much less attractive and consist in repetitive tasks that can be monitored without cost. The wage rate is set competitively in this sector. There is no unemployment.

Workers are assumed to be risk-neutral and to have identical instantaneous utility functions, of the following form:  $u(c_1, c_2, e) = \mu(c_1, c_2) - e$ , where  $c_1$  and  $c_2$  are the consumption levels of the two traded goods,  $\mu$  is a homothetic quasi-concave function, and  $e$  denotes effort. The variable  $e$  can take only two values: 0 if the worker does not make an effort (i.e., if he “shirks”), and  $e > 0$  if he does not shirk. A worker’s indirect utility function is given by:

$$v(p_1, p_2, w, y_o, e) = [(w + y_o)/\pi(p_1, p_2)] - e, \quad (1)$$

where  $\pi$  is a price index dual to  $\mu$ ,  $p_1$  and  $p_2$  are goods prices,  $w$  is the wage rate, and  $y_o$  is income from other sources (e.g., capital income). Workers are assumed to maximize expected utility over their infinite life horizon, using discount rate  $r$ . A worker who shirks faces a probability  $d$  of being discovered and fired. Moreover, there is an exogenous probability  $q$  for each primary-sector job to end. A migrant’s probability of leaving the country is  $\theta$  (natives can be characterized by  $\theta = 0$ ).

The problem of a worker in the primary sector, who has to decide whether to shirk or not, can be analyzed by relating the utility levels that he can attain in the

two cases. Let  $V_1^s$  ( $V_1^n$ ) denote the expected present value of utility of a shirking (non-shirking) worker holding a primary-sector job. Let  $V_2$  denote the present value of utility of a secondary-sector job and  $V^*$  the exogenous utility of living in the home country (only for migrants). To relate these situations, I follow the asset-equation approach introduced by Shapiro and Stiglitz (1984). If a worker has a job in the primary sector, he receives wage  $w_1$ . If he quits his job, with probability  $q$ , he loses in terms of utility, the difference between  $V_1^n$  and  $V_2$ . Leaving the country implies a loss of  $(V_1^n - V^*)$ . If a worker does not shirk, the return to a primary-sector job is therefore equal to:

$$rV_1^n = [(w_1 + y_o)/\pi(p_1, p_2)] - e - q(V_1^n - V_2) - \theta(V_1^n - V^*). \quad (2)$$

If the worker decides to shirk, his instantaneous utility is greater because he does not supply any effort. However, he faces a higher probability of losing his job in the primary sector since he might be detected as a shirker and fired. For a shirking worker, the return to a primary sector job is therefore given by:

$$rV_1^s = [(w_1 + y_o)/\pi(p_1, p_2)] - (q + d)(V_1^s - V_2) - \theta(V_1^s - V^*). \quad (3)$$

A worker in the primary-sector does not shirk if  $V_1^n \geq V_1^s$ . Using equations (2) and (3), this condition can be rewritten as follows:

$$d(V_1^n - V_2) \geq e. \quad (4)$$

The term on the left represents the cost of shirking, equal to the expected utility loss of a shirker whose probability of being detected and fired is equal to  $d$ . A worker does not shirk if this cost is greater than the immediate benefit of shirking, which consists in avoiding any effort. The return to a job in the secondary sector is equal

to:

$$rV_2 = [(w_2 + y_o)/\pi(p_1, p_2)] - e + \alpha (V_1 - V_2) - \theta (V_2 - V^*), \quad (5)$$

where  $\alpha$  is the probability of moving from a secondary-sector to a primary-sector job. Using (2) and (5), the no-shirking condition (4) can also be expressed as:

$$(w_1 - w_2)/\pi(p_1, p_2) \geq (e/d)(r + \theta + \alpha + q). \quad (6)$$

Primary-sector firms choose to pay wages that satisfy condition (6) for each group of workers (natives, migrants) they hire. At equilibrium, condition (6) holds with equality, since there is no reason for a primary-sector firm to pay a higher wage.

### 3. Migration policy, segregation and discrimination

Migration policy influences the migrants' incentives and therefore the degree of segregation and discrimination against immigrants. Because of the probability of return migration, the migrants' no-shirking constraint differs from the natives'. Thus primary-sector firms are reluctant to hire migrants and the probability of finding a primary-sector job is smaller for migrants than for natives. The firms' behavior results in sectoral segregation: compared to natives, migrants are under-represented in the primary sector. As a consequence, there is discrimination in the sense that the migrants' average wages are lower than the natives'.

The probability of moving from a secondary-sector to a primary-sector job can be related to the parameters of the model by considering the flows between the two sectors in a steady-state equilibrium. Consider first the situation of native workers ( $\theta = 0$ ). The flow out of the primary sector is  $qL_1$ , where  $L_1$  is native employment in the primary sector. The flow into the primary sector is  $\alpha(L - L_1)$ , where  $L$  is total native employment. At equilibrium, these two must be equal. Thus, for natives  $\alpha$

is given by  $qL_1/(L - L_1)$ , and their no-shirking condition becomes:

$$(w_1 - w_2)/\pi(p_1, p_2) \geq (e/d)[r + qL/(L - L_1)]. \quad (7)$$

Now turn to the situation of migrants. As mentioned above, it is assumed that the host country applies the principle of priority for natives and “old” migrants over new migrants with respect to employment. In the context of the present model, this implies that new migrants cannot obtain primary-sector jobs, since firms are forced by law to prefer native secondary-sector workers or “old” migrants. The government determines the time period  $T$  after which a new immigrant becomes eligible for primary-sector jobs. Since the return probability  $\theta$  is constant, the share of immigrants who arrived more than  $T$  years ago is  $\exp(-\theta T)$ . Thus the number of immigrants eligible for primary sector jobs is  $\bar{L}^* = L^* \exp(-\theta T)$ , where  $L^*$  is the total number of immigrants.

For migrants, the probability of moving from a secondary-sector to a primary-sector job is thus determined as follows. The flow out of the primary sector is  $(q + \theta)L_1^*$ , where  $L_1^*$  is immigrant employment in the primary sector. The flow into the primary sector is  $\alpha(\bar{L}^* - L_1^*)$ . Thus,  $\alpha$  is equal to  $(q + \theta)L_1^*/(\bar{L}^* - L_1^*)$ , and the no-shirking condition for immigrants is given by:

$$(w_1 - w_2)/\pi(p_1, p_2) \geq (e/d) \left[ r + (q + \theta)\bar{L}^*/(\bar{L}^* - L_1^*) \right]. \quad (8)$$

Competition ensures that natives and migrants are paid the same wages. Assuming that wages are determined by natives’ behavior such that (7) holds with equality, it is clear from (8) that for migrants not to shirk, the following condition must hold:  $qL/(L - L_1) \geq (q + \theta)\bar{L}^*/(\bar{L}^* - L_1^*)$ . This condition can be restated as a relation between the share of migrants in the primary sector and the share of natives in the

primary sector, as follows:

$$\frac{L_1^*}{L^*} \leq e^{-\theta T} \left[ \left( 1 + \frac{\theta}{q} \right) \frac{L_1}{L} - \frac{\theta}{q} \right] \quad (9)$$

It can be inferred from this condition that primary-sector firms only hire immigrants if  $L_1/L > \theta/(q + \theta)$ . This inequality is assumed to be satisfied in the remainder of the paper. More generally, condition (9) reveals the unequal access of natives and migrants to primary sector-jobs and highlights the role of migration policy in that process. Figure 1 illustrates this issue by depicting condition (9), holding with equality, for different values of the policy parameters.

Consider first the extreme case of a “melting-pot” system where migration is permanent ( $\theta = 0$ ). In the steady state, there is no discrimination against migrants, since  $L_1^*/L^* = L_1/L$ . This is illustrated in Figure 1 by the dotted diagonal. By contrast, in an extreme “guest-worker” system, migrants are forced to return home after some time ( $\theta > 0$ ) and they are never granted equal rights on the labor market ( $T = \infty$ ). In this case, their chances of obtaining a primary-sector job are zero (thick horizontal line). Mixed policies are represented by the dashed and thin lines, which cross the X-axis at  $\theta/(q + \theta)$ .

It is obvious from Figure 1 that in all cases (except the extreme “melting-pot” case) there is sectoral segregation between natives and migrants. How can the extent of segregation be measured? The most frequently used indices of segregation are the dissimilarity index and the Gini-segregation index (Silber, 1989).<sup>5</sup> These indices vary between 0 in the absence of segregation and 1 if segregation is complete. In the simple case with two sectors considered here, both indices are identical and are given by  $I_s = L_1/L - L_1^*/L^*$ . In Figure 1,  $I_s$  is equal to the vertical distance between the line representing equation (9) and the dotted diagonal, measured at the observed ratio  $L_1/L$ .

Finally, the link between segregation and discrimination against immigrants can

be seen by considering the difference between the natives' average wage,  $\bar{w}$ , and the migrants',  $\bar{w}^*$ :

$$\bar{w} - \bar{w}^* = \frac{L_1}{L}w_1 + \frac{(L - L_1)}{L}w_2 - \left[ \frac{L_1^*}{L^*}w_1 + \frac{(L^* - L_1^*)}{L^*}w_2 \right] = I_s(w_1 - w_2). \quad (10)$$

To sum up, the higher the return probability and the longer the period during which equal rights are denied to migrants, the more pronounced is sectoral segregation and thus discrimination against immigrants.

Before proceeding, it is worthwhile to consider two possible extensions of this framework.<sup>6</sup> First, the heterogeneity of migration costs is a crucial ingredient in models explaining migration flows (Agiomirgianakis, 1999; Carrington et al., 1996). By analogy, it can be assumed in the present model that migrants are heterogeneous with respect to the probability of return migration. The results of this paper can be extended easily to this case by taking natives as a reference group. In particular, (9) implies that migrants characterized by a high probability of return migration suffer from more severe segregation and discrimination than others.

Second, empirical evidence suggests that the return probability decreases with the duration of stay in the host country. With this assumption the analysis cannot be carried out in a steady-state framework. However, it is clear from (6), which holds also in a dynamic version of the efficiency-wage model, that in this case the probability of finding a primary-sector job increases with the duration of stay. This feature of the model contributes to the explanation of the well-documented observation that the immigrants' wages rise with the duration of stay, a fact usually attributed to investment in country-specific human capital.

## 4. Welfare impact of immigration in the short run

The efficiency-wage model can now be embedded in a specific-factors (Ricardo-Viner) model, often believed to be the privileged model to study the impact of international trade or factor movements on income distribution. The specific factor is assumed to be capital. Both sectors produce traded goods and are characterized by constant returns to scale. Following the small country assumption, prices of traded goods are given. With profit maximization by firms, wage rates are equal to the marginal product of labor. Consequently, the wage differential can be written as:

$$w_1 - w_2 = p_1 f_L^1(K_1, L_1 + L_1^*) - p_2 f_L^2(K_2, L + L^* - L_1 - L_1^*), \quad (11)$$

where  $f^i$  is the production function of sector  $i$  and  $f_L^i$  denotes the partial derivative of  $f^i$  with respect to  $L$ . For simplicity, I assume that the capital stocks of both sectors are entirely owned by natives.

The equilibrium of the economy can be characterized by equations (7), (9), both holding with equality, and (11). Finally, a convenient choice for the numéraire is  $\pi(p_1, p_2) = 1$ . A graphical representation of the equilibrium in the labor market is given in Figure 2. The upward-sloping curve depicts the natives' no-shirking condition (7), the downward-sloping curve represents the difference between marginal products of labor in the two sectors (11). The intersection determines the equilibrium wage differential and native employment in the primary sector. Note that the employment of immigrants is considered exogenous in this diagram.

As noted by Bulow and Summers (1986), the equilibrium in the dual labor market is inefficient. The incentive problem introduces a distortion which can be corrected by subsidizing primary-sector workers, and thus by shifting the no-shirking constraint downwards such that equilibrium wage rates are identical in both sectors. Since subsidizing high-wage earners — who owe their high wages to luck — is likely

to cause strong political opposition, it is assumed, in the remainder of the paper, that this measure is not realized.

It is well known that in a model without distortions the impact of immigration on the welfare of the host country's residents is only of the second order. Thus, at the margin immigration has no impact on the natives' aggregate welfare if no immigrants are present at the initial equilibrium (Grubel and Scott, 1966). In the present model, however, immigration has a first-order effect on native welfare because of the inefficiency in the labor market. Indeed, the (marginal) welfare consequences of immigration only depend on the variation of native employment in the primary sector.<sup>7</sup> In other words, immigration makes natives better off if their probability of finding a primary-sector job increases. To see whether this is the case, consider again Figure 2. Immigration does not shift the natives' no-shirking constraint. Thus the question whether  $L_1$  increases with immigration reduces to the question whether the marginal-labor-product curve shifts upwards. To derive a condition which would ensure such an outcome, differentiate (11), assuming  $L_1$  constant. The curve shifts upwards if:

$$(p_1 f_{LL}^1 + p_2 f_{LL}^2) dL_1^* > p_2 f_{LL}^2 dL^*. \quad (12)$$

It remains to see how  $L_1^*$  reacts to a change in  $L^*$ . For given  $L_1$ , it is clear from equation (9) that  $dL_1^* = (L_1^*/L^*)dL^*$ . Therefore, condition (12) can be restated as:  $p_1 f_{LL}^1 L_1^*/L^* > p_2 f_{LL}^2 (L^* - L_1^*)/L^*$ . Assuming that no migrants are present at the initial equilibrium, it is shown in the appendix that this condition can also be expressed as:

$$\left(1 + \frac{I_s}{(\lambda - I_s)(1 - \lambda)}\right) > \frac{\sigma_2}{\sigma_1} \left(\frac{1 - s_L^1}{1 - s_L^2}\right) (1 + \Delta), \quad (13)$$

where  $\lambda = L_1/L$ ,  $\Delta = (w_1/w_2) - 1$  is the wage differential,  $s_L^i$  the share of labor in total cost of sector  $i$ , and  $\sigma_i$  the elasticity of substitution in sector  $i$  between capital

and labor.

Segregation plays a key role in condition (13). The expression on the left-hand side of the inequality is an increasing function of the segregation index. Thus, for given elasticities of substitution and factor shares, it is more likely that immigration increases the natives' aggregate welfare if migration policy results in segregation, i.e., if  $\theta$  and  $T$  take high values. The following two special cases may illustrate this result.

In an extreme “guest-worker” system, where migrants do not have access to the primary sector ( $I_s = \lambda$ ), the left-hand side of the inequality tends towards infinity. Hence immigration enhances the welfare of natives, since condition (13) is satisfied for any values of factor shares and elasticities of substitution.

At the other extreme, in the “melting-pot” case (no segregation,  $I_s = 0$ ), the left-hand side of condition (13) is equal to unity, and the welfare impact of immigration depends in particular on relative labor intensities and on the elasticities of substitution. If the latter are identical in the two sectors, the condition reduces to:  $s_L^1 - \Delta(1 - s_L^1) > s_L^2$ . In this case, immigration is beneficial for natives only if the primary sector is (much) more labor-intensive than the secondary sector. Given the description of the two sectors usually given in the literature, this seems rather unlikely.

Consider finally the case where capital is sector-specific, but internationally mobile (Neary, 1995). If capital is perfectly mobile in one of the two sectors, the small-country assumption implies that the wage in that sector is entirely determined by the rental rate of capital and the output price, both exogenous. Hence labor demand becomes infinitely elastic and condition (13) is always (never) satisfied if there is perfect capital mobility in the primary (secondary) sector.

## 5. Welfare impact of immigration in the long run

Traditionally, the specific-factors model has been interpreted as a short-run version of the  $2 \times 2$  model. In the latter capital is mobile between the two sectors and total capital stock is fixed. By contrast to the specific-factors model, factor prices are not affected by immigration in a standard  $2 \times 2$  model of a small country. However, the existence of efficiency wages and a dual labor market changes this characteristic of the model. Indeed, wage differentials are linked to the distribution of workers in the two sectors. Consequently, a reallocation of labor, as predicted by the Rybczynski theorem, cannot take place without changing the wage differential.

What is then the impact of immigration on the welfare of natives? Assume without loss of generality that no immigrants are present at the initial equilibrium. Differentiating a dual version of the model (see appendix) yields the following result:

$$dL_1/dL^* = (\kappa/C) [\lambda^*(K_1/L_1) + (1 - \lambda^*)(K_2/L_2)], \quad (14)$$

where  $\lambda^* = L_1^*/L^*$ ,  $\kappa = (K_2/L_2) - (K_1/L_1)$  and  $C$  is given by:

$$C = \left( \frac{\sigma_1 K_1}{s_L^1} + \frac{\sigma_2 K_2}{s_L^2} \right) \frac{(e\pi/d)}{r_K} \frac{qL}{(L - L_1)^2} + \kappa^2 > 0. \quad (15)$$

Obviously, the sign of  $dL_1/dL^*$  is equal to the sign of  $\kappa$ . The following qualitative result can thus be stated. Immigration increases primary-sector employment for natives, and therefore native welfare, if (and only if) the primary sector is relatively labor-intensive. It is remarkable that this qualitative result does not depend on the host country's migration policy.

The intuition for this result can be gained by considering the implications of the Rybczynski theorem. Assume that the secondary sector is relatively labor-intensive. As a consequence of the Rybczynski theorem, immigration increases the secondary

sector's labor demand by more than the number of immigrants, and diminishes labor demand in the primary sector. Therefore even an extreme "guest-worker" policy, where immigrants are forced to work in the secondary sector, cannot succeed in rising the natives' primary-sector employment and welfare.

Beyond the qualitative result, equation (14) shows also that migration policy may affect the quantitative impact of immigration. If the primary sector is relatively labor-intensive, immigration produces a higher gain for natives if migration policy favors segregation (because  $\lambda^*$  is small in that case). Conversely, if the primary sector is relatively capital-intensive, immigration produces a smaller loss for natives if migration policy favors segregation.

It is interesting to see that this model mimics, with respect to the reaction of factor prices, the characteristics of a model with more factors than goods. Assume first that the secondary sector is relatively labor-intensive, such that immigration reduces native primary-sector employment. According to the no-shirking condition (7), the wage differential between the two sectors diminishes. Since the capital-labor ratio is higher in the primary than in the secondary sector, the return to capital increases.<sup>8</sup> Because of constant returns to scale, a rise in the return to capital implies that the wage level decreases in both sectors. On the other hand, if the secondary sector is relatively capital-intensive, immigration increases native primary-sector employment and thus diminishes the wage differential between the two sectors. Because of relative factor intensities, the return to capital increases also in this case and wage levels fall in both sector.

These results should, however, be taken with caution, because Neary's (1978) criticism of the  $2 \times 2$  model is very relevant in the context of migration. Since immigration is likely to induce additional investment, there is indeed no reason to expect that the total capital stock remains constant in the long run. As there does not yet exist an alternative long-run model of the small open economy that

is generally accepted, I will only sketch a steady-state argument along the lines of Markusen and Manning (1993). Assume that the rental rate of capital  $r_K$  is fixed in terms of the numéraire. For fixed goods prices, wage rates in both sectors are implicitly given by  $p_i = c^i(w_i, r_K)$ , where  $c^i$  are unit cost functions. The non-shirking conditions (7) and (8) then determine the primary-sector employment shares  $L_1/L$  and  $L_1^*/L^*$ . In this case, immigration does not have any effect on native primary-sector employment in the long run.<sup>9</sup>

## 6. “Guest-worker” immigration and protection

Bhagwati (1982) argued that immigration into countries of the North could be interpreted as a policy response to the pressure of import competition from developing countries in “declining” industries such as textile, clothing, footwear. In a specific-factors model, such increased import competition leads to a reduction in the return to capital in the imported goods sector. Hence, entrepreneurs of that sector can be expected to ask for protection. Bhagwati (1982) emphasized, however, that protection is not the only policy response for which entrepreneurs in this sector are likely to lobby; immigration might be an alternative.

The present model sheds new light on these issues, by demonstrating that the choice of immigration as a policy response to increased import competition is more likely to be made in countries with a “guest-worker” system. To see this, consider first the impact of protection in the specific-factors model with a dual labor market. Protection increases the relative domestic price of the secondary sector good. As a result, the marginal-product-of-labor schedule in Figure 2 shifts downwards and primary-sector employment of natives falls. Hence, in countries with a “guest-worker” system, governments might favor immigration over protection because immigration produces a first-order welfare gain, by contrast to the welfare loss implied by protection.

Moreover, the model also predicts that entrepreneurs in the secondary sector will gain more from immigration in a “guest-worker” system than with a policy of permanent immigration. As Figure 2 illustrates, the welfare gain from the “guest-worker” system is accompanied by a widening of the wage differential. Hence the fall in secondary-sector wages, and the corresponding increase in the return to capital in that sector, are more pronounced in a “guest-worker” system than with a “melting-pot” policy.

Finally, even native workers are less likely to oppose immigration in a “guest-worker” system. It can be inferred from (2) and (4) that the utility of native workers who do not hold any capital depends only on primary-sector wages. Because of the widening wage differential in the “guest-worker” system, the fall of the primary-sector wage is less pronounced than with a “melting-pot” policy. Moreover, immigration enables some secondary-sector workers to find a primary-sector job.

## 7. Economic and social integration of migrants

In most countries having adopted a “guest-worker” system, the failure of the policy of “rotation” appeared after some time. Instead of returning to their home country, as had been expected, many immigrants decided to stay on in the host countries. Most governments decided not to force migrants to return to their home countries; thus the probability of return diminished.

In the framework of the specific-factors model, this evolution can be interpreted as follows. By contrast to the preceding analysis, assume that  $L^*( > 0)$  migrants are present at the initial equilibrium. Now consider a fall in the return probability  $\theta$ . Then segregation between natives and migrants diminishes as the line representing condition (9) shifts towards the diagonal in Figure 1.<sup>10</sup> The effect of this change on the equilibrium in the labor market is depicted in Figure 2. The downward-sloping curve shifts to the left and reduces native primary-sector employment. Hence it

is not surprising that in several countries such a *de facto* shift from temporary to permanent migration met with resistance from natives.

The economic intuition for this result can be described as follows. A reduction in the return probability decreases the migrants' effective rate of discount. As a consequence, they are less inclined to shirk at given wage rates. Thus primary-sector employers agree to hire more migrants. This leads to a reduction in the wage differential and, because of the no-shirking constraint, to lower native employment in the primary sector.

If immigrants are expected to become permanent residents, economic policy decisions should take their welfare into account. Aggregate welfare increases if total primary-sector employment rises. Does a reduction in the return probability lead to such an outcome? Consider again the downward-sloping curve in Figure 2. If the wage differential remained unchanged with the shift of the curve, total primary-sector employment would be constant. In this case, native employment in the primary sector would be given by  $L'_1$ . At the new equilibrium, however, the natives primary-sector employment,  $L''_1$ , is greater than  $L'_1$ . This implies, together with the reduction in segregation, that total primary-sector employment unambiguously rises.

Note that in the short run all policies reducing  $\theta$  or  $T$ ,<sup>11</sup> and thus favoring economic and social integration of migrants, yield the same outcome: an increase in efficiency (or aggregate welfare) and a reduction in segregation and wage inequality. In the long run (as captured by the model à la Markusen and Manning (1993) described above), a reduction in  $\theta$  or  $T$  improves the situation of migrants without changing the incomes of natives. Indeed, a change in  $\theta$  or  $T$  does not affect the wage differential nor  $L_1/L$ . On the other hand, the immigrants' chances of holding a primary-sector job improve.

## 8. Concluding remarks

This paper uses an efficiency-wage model of a dual labor market to analyze the welfare consequences of different migration policies. In this model, policies favoring high probabilities of return migration and restrictive hiring regulations lead to sectoral segregation between natives and migrants. Hence discrimination against immigrants is of the type “equal pay for equal work, but unequal work”. In the short run, the consequences of immigration for natives depend on the extent of segregation and discrimination and, therefore, on the type of migration policy. A “guest-worker” system, with high return probabilities and restrictive hiring practices, yields higher gains for natives than a “melting-pot” policy of permanent immigration.

However, this gain comes at the expense of overall efficiency. By channeling immigrants into the secondary sector, a “guest-worker” policy enables some natives to find better jobs, but it also increases the share of the secondary sector in total employment. Hence the “guest-worker” system is based on the narrow criterion of natives’ welfare. If the situation of migrants is also taken into account, a policy of economic and social integration is superior.

## APPENDIX

**Specific-factors model.** Condition (13) can be derived from (12) as follows. From the definition of the elasticity of substitution,  $\sigma_i = f_L^i f_K^i / (f^i f_{LK}^i)$ , from the property of constant returns to scale,  $f_{LL}^i = -f_{LK}^i K_i / (L_i + L_i^*)$ , and from equation (11), it follows that  $p_i f_{LL}^i = -w_i (1 - s_L^i) / [\sigma_i (L_i + L_i^*)]$ . Substituting this expression into (12), using  $dL_1^* = (L_1^*/L^*)dL^*$ , yields:

$$\left( \frac{L^* - L_1^*}{L + L^* - L_1 - L_1^*} \right) \left( \frac{L_1 + L_1^*}{L_1^*} \right) > \frac{\sigma_2}{\sigma_1} \left( \frac{1 - s_L^1}{1 - s_L^2} \right) (1 + \Delta). \quad (\text{A1})$$

In order to link the left-hand side of (A1) with  $I_s$ , the following result is used:

$$\frac{L^* - L_1^*}{L + L^* - L_1 - L_1^*} - \frac{L_1^*}{L_1 + L_1^*} = I_s \frac{LL^*}{(L_1 + L_1^*)(L + L^* - L_1 - L_1^*)}. \quad (\text{A2})$$

Dividing (A2) by  $L_1^*/(L_1 + L_1^*)$  and using  $L^*/L_1^* = [(L_1/L) - I_s]^{-1}$  yields:

$$\left( 1 + \frac{I_s}{[(L_1/L) - I_s](L + L^* - L_1 - L_1^*)/L} \right) > \frac{\sigma_2}{\sigma_1} \left( \frac{1 - s_L^1}{1 - s_L^2} \right) (1 + \Delta). \quad (\text{A3})$$

If  $L^* = L_1^* = 0$ , condition (A3) is equal to (13) in the main text.

**2 × 2 model.** Equation (14) is derived using the dual form of the 2 × 2 model:

$$p_j = c^j(w_j, r_K), \quad j = 1, 2 \quad (\text{A4})$$

$$w_1 - w_2 = [e\pi(p_1, p_2)/d] [r + qL/(L - L_1)] \quad (\text{A5})$$

$$L_1 + L_1^* = c_w^1(w_1, r_K) z_1 \quad (\text{A6})$$

$$L + L^* - L_1 - L_1^* = c_w^2(w_2, r_K) z_2 \quad (\text{A7})$$

$$K = c_r^1(w_1, r_K) z_1 + c_r^2(w_2, r_K) z_2 \quad (\text{A8})$$

$$L_1^*/L^* = \exp(-\theta T) [(1 + \theta/q)(L_1/L) - \theta/q] \quad (\text{A9})$$

where  $K$  is the total stock of capital,  $r_K$  denotes the return to capital,  $z_j$  the output of sector  $j$ ,  $c^j$  is the unit-cost function of sector  $j$ ,  $c_w^j$  ( $c_r^j$ ) denotes the partial derivative of

$c^j$  with respect to  $w_j$  ( $r_K$ ). Differentiating (A4) and using Shephard's lemma yields:

$$dw_1 - dw_2 = \kappa dr_K, \quad \kappa = [K_2/(L_2 + L_2^*)] - [K_1/(L_1 + L_1^*)]. \quad (\text{A10})$$

Differentiating (A5) and combining with equation (A10) gives:

$$[e\pi(p_1, p_2)/d][qL/(L - L_1)^2]dL_1 = \kappa dr_K. \quad (\text{A11})$$

The impact of immigration on the return to capital and on output levels can be calculated from (A6), (A8) and (A9), using  $dw_j = -K_j/(L_j + L_j^*)dr_K$  (from (A4)) and  $c_{ww}^j = -(r_K/w_j)c_{wr}^j$  (from the homogeneity of the unit-cost function), to obtain:

$$\begin{aligned} (\sigma_1 K_1/w_1)dr_K + [(L_1 + L_1^*)/z_1]dz_1 &= \lambda^*dL^* + AdL_1 \\ (\sigma_2 K_2/w_2)dr_K + [(L_2 + L_2^*)/z_2]dz_2 &= (1 - \lambda^*)dL^* - AdL_1 \\ (\sigma_1 K_1 + \sigma_2 K_2) dr_K/r_K &= (K_1/z_1)dz_1 + (K_2/z_2)dz_2 \end{aligned}$$

where  $\lambda = L_1/L$ ,  $\lambda^* = L_1^*/L^*$ ,  $\iota = L^*/L$ ,  $A = 1 + \iota[1 + (\theta/q)] \exp(-\theta T)$ , and  $\sigma_j = c_{wr}^j p_j z_j^2 / [K_j(L_j + L_j^*)]$  is the elasticity of substitution between capital and labor. From this system of three equations, the following relation can be obtained:

$$\left( \frac{\sigma_1 K_1}{s_L^1} + \frac{\sigma_2 K_2}{s_L^2} \right) \frac{dr_K}{r_K} = \left( \frac{K_2}{L_2 + L_2^*} - \kappa \lambda^* \right) dL^* - \kappa AdL_1 \quad (\text{A12})$$

where  $s_L^j$  is the cost share of labor in sector  $j$ . Combining (A11) and (A12) finally yields:

$$dL_1/dL^* = B/C, \quad (\text{A13})$$

$$\begin{aligned} B &= \kappa [\lambda^* K_1/(L_1 + L_1^*) + (1 - \lambda^*) K_2/(L_2 + L_2^*)], \\ C &= [(\sigma_1 K_1/s_L^1) + (\sigma_2 K_2/s_L^2)][eqL\pi(p_1, p_2)]/[r_K(L - L_1)^2 d] + \kappa^2 A, \end{aligned}$$

where  $\text{sign}(B) = \text{sign}(\kappa)$ ,  $C > 0$ . If  $L^* = 0$ , (A13) reduces to (14) in the main text.

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## Notes

1. Zimmermann (1994) documents this fact for the “guest-worker” countries Germany and Switzerland, where immigrants are heavily represented in construction and manufacturing, as opposed to the United States, where the sectoral distributions of natives and immigrants are very similar.

2. Other authors have accounted for discrimination in the analysis of immigration, though in a different framework. Ethier (1985) shows how the hiring of immigrants can insulate native workers from employment fluctuations. There is discrimination against immigrants in the sense that only natives have long-term, implicit labor contracts, whereas immigrants are hired freely at the current wage rate. Schmidt et al. (1994) analyze the impact of immigration in the presence of trade unions in the market for unskilled labor. Agiomirgianakis (1999) and Winter-Ebmer and Zweimüller (1996) use insider-outsider models of wage bargaining.

3. The migrants’ probability of return has other important consequences which are ignored here. Djajic (1989) and Galor and Stark (1990) discuss its impact on migrants’ savings decisions and labor supply. Dustmann (1999) examines the effects on migrants’ accumulation of human capital.

4. Note that this simplifying assumption is a continuous-time version of the hypothesis adopted by Galor and Stark (1990) in a discrete-time overlapping-generations framework.

5. In the general case with  $n$  sectors, the dissimilarity index  $I_d$  and the Gini-segregation index  $G_s$  are given by:

$$I_d = \frac{1}{2} \sum_{i=1}^n \left| \frac{L_i}{L} - \frac{L_i^*}{L^*} \right| \quad \text{and} \quad G_s = \sum_{i=1}^n \sum_{j>i} \left| \frac{L_i}{L} \frac{L_j^*}{L^*} - \frac{L_j}{L} \frac{L_i^*}{L^*} \right|.$$

6. I am grateful to an anonymous referee for having suggested these extensions.

7. If capital is distributed equally among native workers in the two sectors, immigration has the same effect on their utility in the steady state, since differentiating (4) yields:  $dV_2 = dV_1$ . Thus, the steady-state change in aggregate native welfare is obtained by differentiating (2):

$$L(dV_1) = [L/(r\pi)](dw_1 + dy_o) = [(L - L_1)/(r\pi)](dw_1 - dw_2),$$

where  $y_o = (f_K^1 K_1 + f_K^2 K_2)/L$ , and the second equality is implied by constant returns to scale. Differentiating (7) gives:  $[(L - L_1)/\pi](dw_1 - dw_2) = qL/(L - L_1)dL_1$ , which establishes that native welfare varies positively with  $L_1$ . If the new steady-state is reached immediately, one might want to add the transitional welfare effect, which depends also positively on the change in  $L_1$ , since  $(V_1 - V_2)dL_1 = (e/d)dL_1$ .

8. See equation (A10) in the appendix.

9. Note that in a  $2 \times 2$  model with perfect international capital mobility, migration has the same impact on wages and employment as in this steady-state model.

10. To see this, differentiate equation (9) with respect to  $\theta$  ( $L_1$  and  $L^*$  being assumed constant):

$$dL_1^*/L^* = - \left[ \lambda^* T + (e^{-\theta T}/q)(1 - \lambda) \right] d\theta \quad (14)$$

Thus for given  $L_1$ , a reduction in  $\theta$  leads to an increase in migrants' primary-sector employment.

11. A decrease in  $T$  has the same qualitative effects as a reduction in  $\theta$ , as equation (9) shows.



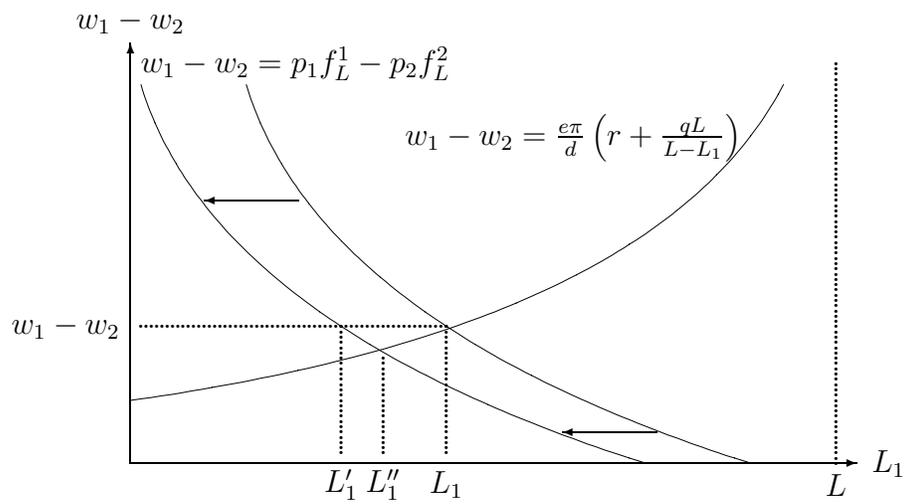


Figure 2. Labor market equilibrium and migration