Immigration Policy with Partisan Parties

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Abstract

This paper analyzes the political economy of immigration when the salient electoral issue is the level of immigrants and the relevant immigration policy is the expenditure in immigration control. We consider that immigration affects voters' welfare through economic and non economic factors. We model political competition *à la* Wittman with the ideology of parties endogenously determined at equilibrium. At equilibrium, parties propose different levels of immigration, located to the left and to the right of the median voter's ideal point, and combine skilled and unskilled workers among their constituencies. Numerical simulations provide the levels of immigration proposed by the two parties and the composition of parties' constituencies as we vary the efficacy of immigration control and the intensity of immigration aversion.

Keywords: Immigration, ideological parties, unskilled and skilled labor.

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1 Introduction

For most developed countries, immigration control has become a highly relevant issue in the political debate. Examples such as the increase in government expenditure on the Mexico-US border enforcement, or the concept of an integrated and comprehensive "border strategy" for the EU (presented by the president of European Commission) reveal the increased support for strengthening the control of external borders.

This paper analyzes the political economy of immigration when the relevant electoral issue is the control of immigration and the relevant immigration policy is the expenditure in border control.[1] For that purpose, we consider a politico-economic model with two partisan parties whose ideologies are endogenously determined at equilibrium.

Many recent empirical studies, such as Bauer et al. (2000), Mayda (2006), or Dustmann and Preston (2005), have found that natives' attitudes towards immigrants are motivated by economic and non-economic factors. In this paper we consider both factors. Among the economic effects of immigration, we focus on the impact of immigration on domestic labor market conditions, as it has been widely analyzed by empirical and theoretical papers (Borjas et al., 1996, 1997). Two theoretical models are commonly used: the Heckscher-Olin trade model and the factor-proportion analysis model (see Scheve and Slaughter, 2001, for a descriptive summary of both models). These two models differentiate between low skilled and high skilled workers as production factors. The competitive labor market implies that an increase in the relative less skilled labor supply increases the skill premium, increasing inequality in earnings between skilled and less-skilled workers. Following these approaches, we allow natives to be either skilled or unskilled workers. The two different types of labor are the only production factors and they are complementaries. Immigrants are considered unskilled workers, so that an increase in the number of immigrants reduces unskilled wage but increases skilled wage. Regarding the non-economic factors we follow the evidence that less skilled workers tend to be less pro-immigration because of non-economic reasons (Dustmann and Preston, 2005; Mayda, 2006).

With respect to the political process we adopt the Endogenous Party Wittman Equilibrium (EPWE), an extension of the Wittman Equilibrium proposed by Roemer (2001). Two ideological parties compete in an election by proposing two immigration policies. Voters vote sincerely for their preferred policy and the party with the highest share of the vote wins the election and implements the announced policy. The ideology of each party is endogenously determined by aggregating the preferences of its voters.

Three papers have studied a political competition model with an EPWE: Ortuño-Ortín and Roemer (2000), who investigate the classical political economy of financing a public good; De Donder and Hindriks (2007), who focus on the political economy of social insurance programs; and Lee and Roemer (2005), who analyze the changes in coalition

[1]Immigration has recently topped the list of relevant issues in several countries. According to the Eurobarometer 66 (Autumn 2006) immigration was the the most important issue facing U.K. citizens. A YouGov survey in UK (September 2009) also shows immigration as the top issue for both Labour and Tory voters. In the U.S., voters of some border states, like California and Arizona, have reported immigration as their top issue of concern (see the Public Policy Institute of California Survey in March 2007 and the Grand Canyon State Poll in Fall 2005).

formation between workers of different skills who have to choose the structure of the labor market. Our analysis is closer to the latter because both papers consider workers with different skills, but we enrich the trait space by incorporating a second dimension, namely the non-economic aversion to immigration.

This paper continues the previous work in Solano (2006), where parties' ideology on immigration was treated exogenously. More precisely, parties were committed to fixed levels of immigration and competed *à la* Downs on the progressivity of the tax scheme in order to win the elections. Only the non-economic effects of immigration were considered and it was assumed that all workers with the same skill shared the same attitudes toward immigration. This paper relaxes the previous assumptions by incorporating a competitive labor market and assuming heterogeneity of attitudes towards immigration among the workers with the same skill. The cost to pay is the absence of a closed form solution, and we need to rely on numerical simulations to find political equilibria.

At equilibrium the two parties, labelled L and R, form along the immigration issue, combining skilled and unskilled workers among their constituencies. In contrast to the Downsian approach, we find that parties differentiate their proposals, and the optimal level of immigration for the median voter lies always in-between parties' proposals.

A more efficacious immigration control policy leads parties to propose a lower level of immigration in equilibrium. More interestingly, they both focus on obtaining more votes from their majority group of voters (i.e. party R aims at getting more votes from unskilled workers and party L aims at getting more votes from skilled workers), and constituencies become more homogeneous. Thus, more anti-immigration parties will tend to improve the efficacy of the immigration control policy in order to generate a higher support for tighter immigration policies.

We also analyze the equilibrium as skilled and unskilled workers polarize on their non-economic aversion to immigration. We observe an increase in the identification of each party with a skill group. Immigration policies relax as skilled workers, being more homogeneous regarding preferences on immigration and favoring a higher immigration level, become less sensitive to non-economic aspects of immigration. If we fix skilled workers distribution and radicalize the preferences of unskilled workers against immigrants, we find that parties announce tighter immigration policies. Nevertheless, parties' constituencies still become more homogenous. In both scenarios the most anti-immigration party increases its probability of victory.

The rest of the paper is organized as follows. Section 2 describes the economic model. In section 3 we derive voters' preferences on immigration policy, present the political competition model, and define the concept of EPWE. Section 4 specifies and calibrates the model. In section 5 we use numerical simulations to compute political equilibria and run comparative statics. Section 6 concludes.

2 The Economic Model

2.1 Natives and Immigrants

Consider a country with a continuum of natives of mass $n > 1$. Natives have direct preferences over consumption (x) and the number of immigrants who reside in the country at a certain time (m). Immigration has a direct effect on the utility of natives which must be understood in a broad sense as any disutility derived from social conflict, xenophobia or native's perception of a link between immigration and insecurity. Importantly, the direct social impact is distinct from any economic effect of immigration. The social impact is assumed to be increasing, at an increasing rate, in the number of immigrants. Formally, we take the utility of a native to be

$$V(x, m) = x - \gamma m^2, \tag{1}$$

where $\gamma > 0$ measures a native's sensitivity towards the social impact of immigration.

For simplicity, we assume that natives inelastically provide one unit of labor. However, they differ in the efficiency units that they are capable of delivering in one unit of time.[2] Let e be the endowment of effective units of labor. Hence, a native is characterized by the pair (γ, e) ,with $\gamma \in \Gamma$ and $e \in \Sigma$.

There are two types of labor, skilled and unskilled, labeled by $h = s, u$, respectively. Type-h workers are distributed according to the joint distribution $F^h(\gamma, e)$. Let $F^h_\gamma(e)$ be the marginal distribution of labor ability among type$-h$ workers, with mean $\overline{e}_h = \int_\Sigma dF^h_\gamma(e)$ and median $e^m_h = \left[F^h_\gamma\right]^{-1}(1/2)$. Without loss of generality, we assume that $\overline{e}_s > \overline{e}_u$. Also, denote by $F^h_e(\gamma)$ the marginal distribution of the sensitivity towards immigration among type-h workers, with mean $\overline{\gamma}_h = \int_\Gamma dF^h_e(\gamma)$ and median $\gamma^m_h = \left[F^h_e\right]^{-1}(1/2)$. Finally, normalize the mass of skilled workers to one, so that we can express the mass of unskilled workers by $\eta = n - 1$. In addition to natives, there is a mass m of immigrants in the country. Because we focus on mass migrations, we take all immigrants to be unskilled workers and assume for simplicity that they share the same distribution of effective units as native unskilled workers.

Let w_u and w_s denote the salaries per efficiency unit of labor. A worker endowed with e_h efficiency units obtains an income $y(e_h) = e_h w_h$, $h = u, s$.

2.2 Production and Labor Market Equilibrium

There is a single consumption good produced from efficiency units of unskilled (u) and skilled (s) labor according to the Cobb-Douglas production function

$$G(u, s) = u^{\alpha} s^{1-\alpha}, \qquad \text{with } \alpha \in (0, 1).$$

Normalize the price of the output to one. Competition in the labor market implies

[2]For our purpose, this assumption is equivalent to taking a utility function on consumption, labor and immigration of the form $V(x, L, m) = x^\beta (1 - L)^{1-\beta} - \gamma m^2$.

that inputs are paid their marginal productivity. Letting $\mu = \eta\ \bar{e}_u/\bar{e}_s$ be the fraction of unskilled over skilled efficiency units of labor, we have

$$\begin{aligned} w_u(\mu) &= g'(\mu) = \alpha\mu^{\alpha-1} \text{ and} \\ w_s(\mu) &= g(\mu) - g'(\mu)\ \mu = (1-\alpha)\mu^{\alpha}, \end{aligned} \tag{2}$$

where $g(\mu) = \mu^{\alpha}$ is the output per efficiency unit of skilled labor.

Notice that if the amount of unskilled labor compared to its relative participation on production is large enough, i.e. $\mu > \alpha/(1-\alpha)$, then there exists a skill premium, that is $w_s(\mu) > w_u(\mu)$.

Workers' income can be written as

$$\begin{aligned} y(e_u) &= w_u(\mu)\ e_u = \alpha\mu^{\alpha-1}e_u, \text{ and} \\ y(e_s) &= w_s(\mu)\ e_s = (1-\alpha)\mu^{\alpha}e_s, \end{aligned} \tag{3}$$

depending on the type of labor they hold.

2.3 The Economic Effects of Immigration

Immigrants alter the proportion of unskilled over skilled efficiency units of labor (μ) which affects wages. Since immigrants are all unskilled and follow the same distribution of ability than unskilled natives, a mass m of immigrants provides $m\bar{e}_u$ efficiency units of unskilled labor. Then,

$$\mu(m) = \frac{(m+\eta)\overline{e}_u}{\overline{e}_s}. \tag{4}$$

From (2) and (4), and abusing notation, we obtain

$$w_u(m) = \alpha\ \mu(m)^{\alpha-1},, \text{ and} \tag{5}$$

$$w_s(m) = (1-\alpha)\ \mu(m)^{\alpha}. \tag{6}$$

By the concavity of g, we find the standard result that immigration reduces unskilled wage and increases skilled wage (see Borjas and others 1996, 1997):

$$w'_u(m) = g''\left(\mu\left(m\right)\right)\frac{\overline{e}_u}{\overline{e}_s} \leq 0, \tag{7}$$

$$w'_s(m) = -g''\left(\mu\left(m\right)\right)\mu\frac{\overline{e}_u}{\overline{e}_s} = -\mu(m)w'_u(m) \geq 0. \tag{8}$$

Nevertheless, immigration is beneficial for natives as well as for the economy as a whole. Natives total income equals $y_n(m) = \eta w_u(m)\overline{e}_u + w_s(m)\overline{e}_s$. Computing the derivative with respect to m and using (8) and (4), we obtain: $y'_n(m) = -w'_u(m)\overline{e}_u m > 0$.

Let $y_T(m)$ represents total income in the economy for the immigration level m:

$$y_T(m) = (m\ +\eta)w_u(m)\overline{e}_u + w_s(m)\overline{e}_s. \tag{9}$$

Then immigration increases total income, although at a decreasing rate:[3]

$$y_T'(m) = w_u(m)\bar{e}_u > 0, \text{ and } y_T''(m) = w_u'(m)\bar{e}_u < 0.$$

2.4 Immigration Policy

Immigration policy aims at maintaining a certain level of immigration. Let $\bar{w}^o$ be the salary per efficient unit of unskilled labor in the country of origin. Unless the government imposes restrictions on immigration, migrants will continue to enter insofar they expect to earn more than in their country of origin, or equivalently, until $w_u(m)e_u = \bar{w}^o e_u$. For a given $\bar{w}^o$, let $\bar{m}$ be the unique level of immigration that equates wages. (Uniqueness is guaranteed by the monotonicity of $w_u(m)$ –see expression (7)). Using (4) and (5) we obtain

$$\bar{m}(\bar{w}^o) = \frac{\bar{e}_u}{\bar{e}_s}\left(\frac{\alpha}{\bar{w}^o}\right)^{\frac{1}{1-\alpha}} - \eta \tag{10}$$

Controlling immigration is costly. Define $E(m)$ as the expenditure necessary to keep immigration at level m, with $E'(m) < 0$ and $E''(m) > 0$. That is, a tighter policy requires a higher expenditure, and the cost increases at an increasing rate. We assume that it is unfeasible to completely stem the inflow of immigrants (that is, $E(0) = \infty$), reflecting the natural impossibility of a country to perfectly seal its borders. Finally, with no border control immigration would reach the level $\bar{m}$: $E(\overline{m}) = 0$).

The government finances immigration policy with a proportional tax t imposed on income. A balanced budget constraint implies[4]

$$E(m) = t\, y_T(m).$$

Since immigration increases total income and relaxing border control reduces government expenditure, the tax rate needed to finance immigration control is a decreasing function of the immigration level allowed to enter the country,

$$t(m) = \frac{E(m)}{y_T(m)} \quad \text{and} \quad t'(m) = \frac{E'(m)y_T(m) - y_T'(m)E(m)}{y_T(m)^2} < 0.$$

Total income sets a lower bound $\underline{m}$ on immigration control, reflecting the mass of immigrants when all resources are spent on immigration control $E(\underline{m}) = y_T(\underline{m})$.[5] Therefore,

[3]By the Cobb Douglas specification, the income of workers is a fraction of the domestic income, and so $y_T(m) = \overline{e}_s/\left(1-\alpha\right) w_s(m)$. From (5) and (6), $w_s(m) = \left(1-\alpha\right)/\alpha\ \mu(m)w_u(m)$. Therefore, $y_T(m) = \overline{e}_s/\alpha\ \mu(m)w_u(m)$. Differentiating with respect to m and simplifying, $y_T'(m) = w_u(m)\overline{e}_u > 0$. Using (7), $y_T''(m) = w_u'(m)\overline{e}_u < 0$.

[4]This formulation assumes that unskilled immigrants pay taxes, but our findings do not depend on this assumption. As part of a sensitivity analysis, we have computed equilibria under the opposite scenario, where immigrants do not pay taxes (that is, $E(m) = ty_n(m)$). Parties propose slightly higher levels of immigration since control policy is more expensive now, but we find only marginal effects on equilibrium policies and electoral outcomes.

[5]Because $y_T(m) - E(m)$ is a continuous, strictly increasing function with $y_T(0) - E(0) = -\infty$ and $y_T(\overline{m}) - E(\overline{m}) = y_T(\overline{m}) > 0$, there exists a unique $\underline{m} > 0$ such that $y_T(\underline{m}) = E(\underline{m})$.

we obtain the range of feasible immigration policies to be the interval $[\underline{m}, \overline{m}]$.

3 The Political Model: Wittman Equilibria with Endogenous Parties

3.1 Natives' Preferences on Immigration

Substituting the economic effects of immigration (5) and (6) into the utility function (1), the preferences over immigration policies for a worker of type (γ, e_h) can be represented by the utility function

$$v_h(m; \gamma, e_h) = (1 - \frac{E(m)}{y_T(m)})\ w_h(m)\ e_h - \gamma\ m^2. \tag{11}$$

It follows from the Kunh-Tucker conditions that ideal immigration policies only depend on the ratio between the sensitivity to the social cost of immigration and the level of ability, $m_h^*(\gamma/e_h)$. Furthermore, utility is strictly increasing for natives with a very low γ/e_h, strictly decreasing for natives with a very high γ/e_h, and single-peaked with an interior maximum for the rest.

Proposition 1 *The ideal immigration policy for a worker of type (γ, e_h) is a function of her ratio γ/e_h. Furthermore, there exist values β_h and ζ_h, with $\beta_h \leq \zeta_h$, such that*

$$m_h^*(\gamma/e_h) = \begin{cases} \overline{m} & \text{if } \gamma/e_h \leq \beta_h \\ \tilde{m}\left(\frac{\gamma}{e_h}\right) \in (\underline{m}, \overline{m}) & \text{if } \gamma/e_h \in (\beta_h, \zeta_h) \\ \underline{m} & \text{if } \gamma/e_h \geq \zeta_h \end{cases},$$

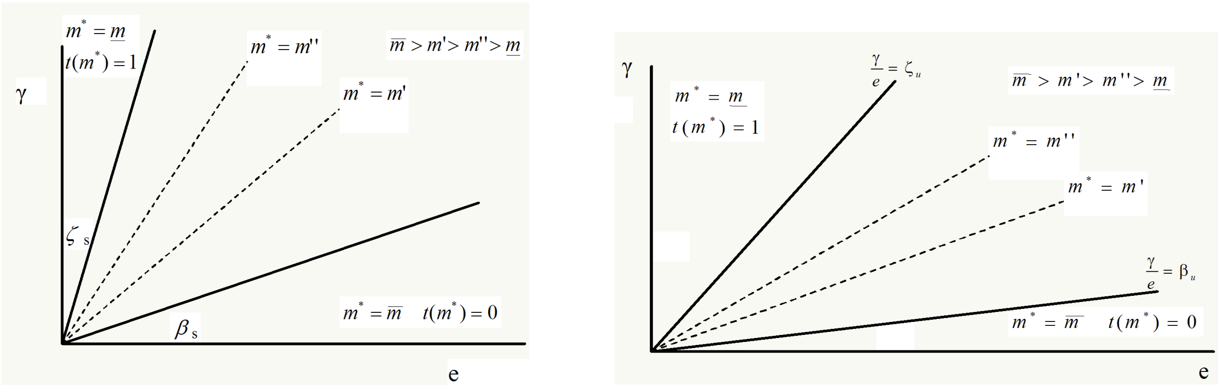
where $\tilde{m}(\gamma/e_h)$ is implicitly defined as the unique solution to

$$\frac{\gamma}{e_h} = \frac{\left[-t'(m) - (1 - t(m))\frac{k_h}{m+\eta}\right] w_h(m)}{2m}, \text{ with } k_u = 1 - \alpha \text{ and } k_s = -\alpha.$$

Proof:
See the Appendix. □

Optimal policies of skilled and unskilled workers are depicted in figure 1, showing that: (i) as the ratio γ/e increases, workers prefer less immigrants; (ii) workers with a sufficiently large γ/e prefer the lower bound level of immigration; and (iii) workers with a sufficiently small γ/e prefer the upper bound level of immigration.

Secondly, among each group of workers (skilled and unskilled), the optimal level of immigration is negatively correlated with the sensitivity towards immigration and positively correlated with ability.



(a) Skilled workers' optimal immigration level (b) Unskilled workers' optimal immigration level

Figure 1: Workers' optimal immigration level

Proposition 2 *Among each group of workers, skilled and unskilled,*

i) keeping ability constant, the higher the sensitivity to the social cost of immigration the lower the optimal level of immigration, and

ii) keeping the sensitivity to the social cost of immigration constant, the higher the ability the higher the optimal level of immigration.

Proof:
See the Appendix. □

Finally, controlling for their characteristics, unskilled workers prefer a lower optimal level of immigration than skilled workers.

Proposition 3 *For a given ratio γ/e, unskilled workers have a lower or equal optimal immigration level than skilled workers. That is, for any γ/e, $m_u^*(\gamma/e) \leq m_s^*(\gamma/e)$.*

Proof:
See the Appendix. □

In this society, the median policy is the policy preferred by natives with the median value of γ/e, which, generically, does not coincide neither with the median unskilled worker, nor with the median skilled worker. In fact, if immigration policy were determined by the median voter, the resulting level of immigration would be, in general, lower than the optimal policy for the median skilled worker and higher than the optimal policy for the median unskilled worker.[6] However, describing the political process as a competition between parties with preferences over the political issues (that is, with ideology) is more appropriate than resorting to the median voter and provides a richer framework of analysis. We choose

[6]The assumption that the median value of γ/e for unskilled workers is larger than that for skilled workers is consistent with the empirical literature on attitudes towards immigration (Mayda, 2006; Dustmann and Preston, 2005). It follows then that the optimal level of immigration for the median voter is larger than the optimal immigration level for the median unskilled worker and lower than the optimal immigration level for the median skilled worker.

to define the equilibrium policy as the outcome of an Endogenous Party Wittman Equilibrium (EPWE), proposed by Roemer (2001) as an extension of the Wittman equilibrium in which parties' preferences are endogenously determined.[7]

3.2 Wittman Equilibria with Endogenous Parties

There are two parties (denoted by L and R) competing under majority rule. Parties simultaneously announce their immigration policies. Natives vote for their preferred policy, but parties face uncertainty about the exact distribution of the electorate. The party with the most votes wins and implements the policy announced during the campaign.

Formally, given a pair of policy announcements m_L and m_R, let $\Omega_h(m_L, m_R)$ be the set of voters within the labor group h who prefer m_L to m_R. That is:

$$\Omega_h(m_L, m_R) = \{(\gamma, e_h) \in \Gamma \times \Sigma : v_h(m_L; \gamma, e_h) \geq v_h(m_R; \gamma, e_h)\}$$

Using (11), and for $m_L > m_R$, we have

$$\Omega_h(m_L, m_R) = \left\{(\gamma, e_h) \in \Gamma \times \Sigma : \frac{\gamma}{e_h} \leq \Psi_h(m_L, m_R)\right\}, \tag{12}$$

where $\Psi_h(m_L, m_R) = \frac{(1-t(m_L))w_h(m_L)-(1-t(m_R))w_h(m_R)}{m_L^2-m_R^2}$ represents the dividing voter of type h.

Let $\Phi_h(m_L, m_R)$ be the proportion of type$-h$ natives voting for party L, corresponding to the measure of the set $\Omega_h(m_L, m_R)$. Hence, we can compute

$$\Phi_h(m_L, m_R) = \int_{\Omega_h(m_L,m_R)} \mathrm{d}F^h(\gamma, e) = \int_\Gamma \int_{\Psi_h(m_L,m_R)} f^h(\gamma, e)\ \partial e\ \partial\gamma.$$

We know that skilled workers prefer a higher level of immigration than unskilled workers, since not only they benefit from the complementarity of immigration as a production factor, but also they bear a larger share of the fiscal cost of immigration control (Proposition 3). Thus, it is not surprising that, for $m_L > m_R$, $\Psi_s(m_L, m_R) > \Psi_u(m_L, m_R)$ whenever there is at least one unskilled worker with an interior optimal level of immigration.[8] Nevertheless,

[7] An interesting alternatively model of political competition with endogenous parties is presented in Poutvaara (2003). Poutvaara differentiate between voters and party members by including an expressive motivation for party membership. We decide to follow Roemer's (2001) to avoid calibration issues related with expressive behavior and the distribution of voters.

[8] For $m_L > m_R$, $\Psi_s(m_L, m_R) > \Psi_u(m_L, m_R)$ if and only if

$$(1-t(m_L))w_s(m_L) - (1-t(m_R))w_s(m_R) > (1-t(m_L))w_u(m_L) - (1-t(m_R))w_u(m_R).$$

From (5) and (6), $w_s(m) = \frac{1-\alpha}{\alpha}\mu(m)w_u(m)$. Then we can rewrite the previous inequality as

$$\left(\frac{1-\alpha}{\alpha}\mu(m_L) - 1\right)(1-t(m_L))w_u(m_L) - \left(\frac{1-\alpha}{\alpha}\mu(m_R) - 1\right)(1-t(m_R))w_u(m_R) > 0,$$

which is satisfied whenever $(1-t(m))w_u(m)$ is an increasing function of m, a necessary condition for having

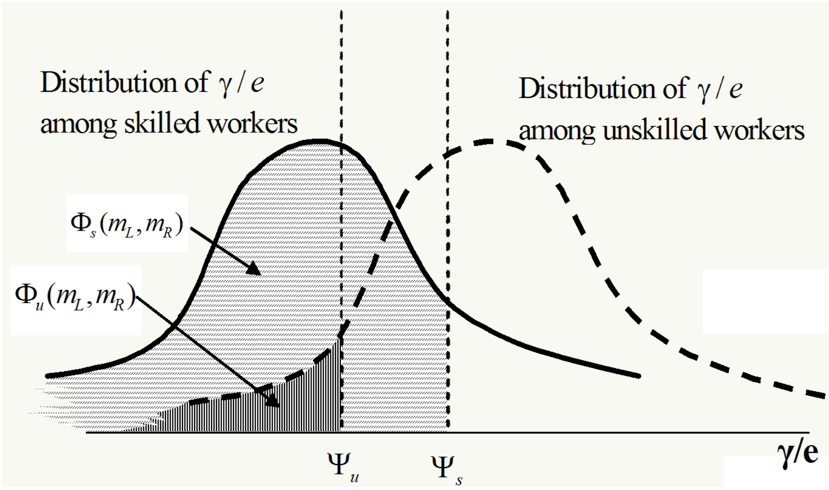


Figure 2: Allocation of votes when unskilled workers are on average more averse to immigration than skilled workers and $m_L > m_R$

party L (proposing a less tight immigration policy) may also receive the support of some unskilled workers. This is also true even when unskilled workers are on average more averse to immigration than skilled workers (see figure 2).

Therefore, generically, each party will receive votes from both skilled and unskilled workers. Denote by $\Phi^L(m_L, m_R)$ the total fraction of native voters preferring m_L to m_R. Then,

$$\Phi^L(m_L, m_R) = \frac{1}{1+\eta}(\Phi_s(m_L, m_R) + \eta\ \Phi_u(m_L, m_R)).$$

Parties face electoral uncertainty, in the sense that they know the pool of their supporters but can only forecast the share of the vote they will receive with a margin of error. Formally, we follow the "error-distribution model" presented in Roemer (2001, p.45). Let parties L and R propose m_R and m_L, respectively. Then, the proportion of votes that party L expects to receive is a random variable uniformly distributed on the interval $\left(\Phi^L(m_L, m_R) - \Delta,\ \Phi^L(m_L, m_R) + \Delta\right)$, for some $\Delta > 0$. It follows that the probability that party L defeats party R is given by

$$p(m_L, m_R) = \begin{cases} 0 & \text{if} \quad \Phi^L(m_L, m_R) + \Delta \leq 1/2 \\ \frac{\Phi^L(m_L, m_R) + \Delta - 1/2}{2\Delta} & \text{otherwise} \\ 1 & \text{if} \quad \Phi^L(m_L, m_R) - \Delta \geq 1/2. \end{cases}$$

And party R defeats party L with probability $1 - p(m_L, m_R)$.

Parties have policy preferences representing the average utility of their members (Wittman, 1973). Constituents of party L are denoted by the sets of voters Ω_u^L and Ω_s^L, and constituents of party R are denoted by the sets of voters Ω_u^R and Ω_s^R. Thus, the average utility function of party J's constituents for a policy m is given by:

at least an unskilled worker with an interior optimal level of immigration $m \in (\underline{m}, \overline{m})$.

$$V^J(m) = \frac{1}{1+\eta}\left(\eta \int_{\Omega_u^J} v_u(m;\gamma,e)dF^u(\gamma,e) + \int_{\Omega_s^J} v_s(m;\gamma,e)dF^s(\gamma,e)\right)$$

Given a distribution of voter preferences, a political equilibrium provides: *i*) a partition of the polity into two parties, labeled by L and R respectively; *ii*) the platform that each party proposes; and *iii*) the expected vote share of each party.

Both parties simultaneously choose the platform that maximizes their expected utility, given the platform proposed by the other party. At equilibrium, the following two conditions must be satisfied: (1) no party prefers to change its platform given both the platform of the other party and the partition of the polity; and (2) no party's constituent wants to change its membership given the two parties' platforms.

Definition 1 *An **Endogenous Parties Wittman Equilibrium (EPWE)** is a pair of policies* $(m_L^*, m_R^*) \in [\underline{m}, \overline{m}]^2$ *and a partition of the polity* Ω_h^L, Ω_h^R *such that:*

1. *Given* Ω_h^L *and* Ω_h^R,

$$m_L^* = \arg\max\ p(m, m_R^*)V^L(m) + (1 - p(m, m_R^*))V^L(m_R^*),\ \textit{and} \tag{13}$$

$$m_R^* = \arg\max\ p(m_L^*, m)V^R(m_L^*) + (1 - p(m_L^*, m))V^R(m). \tag{14}$$

2. *Given* m_L^* *and* m_R^*,

$$\textit{if } (\gamma, e) \in \Omega_h^L,\ \textit{then } v_h(m_L^*;\gamma,e) \geq v_h(m_R^*;\gamma,e),\ \textit{and} \tag{15}$$

$$\textit{if } (\gamma, e) \in \Omega_h^R,\ \textit{then } v_h(m_R^*;\gamma,e) \geq v_h(m_L^*;\gamma,e). \tag{16}$$

The first-order conditions for the maximization problems (13) and (14) show the trade off between proposing a policy closer to the interests of each party's constituency and the corresponding decrease in the probability of victory:

$$\begin{aligned}
\left[p(m_L, m_R)\frac{\partial V^L(m)}{\partial m}\right] + \left[\frac{\partial p(m, m_R)}{\partial m}(V^L(m) - V^L(m_R))\right] &= 0 \\
\left[(1 - p(m_L, m_R))\frac{\partial V^R(m)}{\partial m}\right] + \left[-\frac{\partial p(m_L, m)}{\partial m}(V^R(m) - V^R(m_L))\right] &= 0
\end{aligned}$$

At equilibrium, the constituency of each party is determined endogenously by expressions (15) and (16). From (12), and given the equilibrium policies $m_L^* > m_R^*$, the constituency or each party is fully characterized by a pair (Ψ_u^*, Ψ_s^*), so that all type-h voters with $\gamma/e_h < \Psi_h^*$ constitute party L, while the rest constitute party R.

Therefore, finding an interior equilibrium requires solving the following systems of four equations in the four unknowns m_L, m_R, Ψ_u, and Ψ_s:

$$
\begin{aligned}
\left[p(m_L, m_R)\frac{\partial V^L(m)}{\partial m}\right] \quad &+ \quad \left[\frac{\partial p(m, m_R)}{\partial m}(V^L(m) - V^L(m_R))\right] = 0 \\
\left[(1 - p(m_L, m_R))\frac{\partial V^R(m)}{\partial m}\right] \quad &+ \quad \left[-\frac{\partial p(m_L, m)}{\partial m}(V^R(m) - V^R(m_L))\right] = 0 \\
\Psi_s \quad &= \quad \Psi_s(m_L, m_R) \\
\Psi_u \quad &= \quad \Psi_u(m_L, m_R)
\end{aligned}
$$

This system is highly non-linear and eludes analytical solutions. In the following sections we develop a computational model and use *Mathematica* to find equilibria.

4 Specification and Calibration

In this section we calibrate the model to existing empirical evidence and develop a computational model to illustrate our results and to perform comparative static analysis.

The calibration of the model requires specifying (i) an immigration control technology, and (ii) a distribution of ability and sensitivity towards the social impact of immigration for skilled and unskilled workers.

With respect to the immigration control technology we adopt the simplest functional form satisfying the conditions imposed on E:

$$
E(m) = \theta \frac{\overline{m} - m}{m},
$$

where θ stands for the efficacy of the immigration policy, and $\overline{m}$ is the potential mass of immigrants willing to enter the country. Both a larger θ and a larger $\overline{m}$ imply a more costly immigration control policy, as higher expenditure is needed to keep a given level of immigration. Taking the wage of unskilled work in the US to be twice the wage in the country of origin [9] and using the definition of $\bar{m}$ in (10), we obtain the value $\bar{m} = 1.92$. In the next section we analyze equilibria for different values of θ. We take $\theta = 3$ as a baseline, which results in an equilibrium level of immigration consistent with the current value used in our calibration (approximately 13% of total population).

For the calibration of the joint distribution of ability and sensitivity towards immigrants we proceed in steps. First, we take the participation share of unskilled labor in production from U.S. census data for 2002 ($\alpha = 0.32$), and the skill premium ($w_s/w_u = 1.8$) from He (2009).[10]

Second, we assume that e and γ are independent and presume that γ is uniformly distributed on $[0, \gamma_h^{\max}]$, where the subindex indicates that the distribution may be different

[9] Clemens et al. (2008) report a wage ratio of 1.99(PPP) for Mexico when comparing most similar workers: "foreign-born, foreign-educated (late-arrival) people on either side of the border, allowing education acquired abroad to have different returns than education acquired in the US" (page 11).

[10] We compute the skill premium as the ratio between the mean annualized real wage for 2002 (in terms of year 2000 US dollars) for college graduates and high school graduates, as reported in He (2009).

for skilled and unskilled workers. We will consider different values of $\gamma_s^{\max}$ and $\gamma_u^{\max}$ in the simulations.

We obtain the distribution of ability from the distribution of income (see (3)), which we assume to be distributed log-normal. To calibrate the distribution of income for skilled and unskilled workers we use the mean (\$55.8) and median (\$41.6) income for skilled workers and the mean (\$24.9) and median(\$19.9) income for unskilled workers, in thousands of dollars, from the U.S. census data for 2002 (see table 4 of the 2002 Current Population Survey).[11]

From the labor market equilibrium conditions, wages can be written as a function of the skill premium (see (2)):

$$\begin{aligned} w_u &= \alpha \left(\frac{\alpha}{1-\alpha} \frac{w_s}{w_u} \right)^{\alpha-1} = 0.36, \\ w_s &= (1-\alpha) \left(\frac{\alpha}{1-\alpha} \frac{w_s}{w_u} \right)^{\alpha} = 0.64. \end{aligned}$$

Since efficiency units of labor are proportional to income (from (3)),

$$\begin{array}{ll} \bar{e}_u = \frac{\bar{y}_u}{w_u} = 69.5, & e_u^{med} = \frac{y_u^{med}}{w_u} = 55.5, \\ \bar{e}_s = \frac{\bar{y}_s}{w_s} = 86.5, & e_s^{med} = \frac{y_s^{med}}{w_s} = 64.5. \end{array}$$

And from (4)-(6) we find the fraction of unskilled over skilled workers

$$m_0 + \eta = \frac{\alpha}{1-\alpha} \frac{w_s}{w_u} \frac{\bar{e}_s}{\bar{e}_u} = 1.055.$$

According to our normalization, skilled workers have measure 1, while total population has a measure of 2.055. Since US population is 309 million people, of which 40.5 millions are foreign born (U.S. Census 2000; 2004 Yearbook of Immigrant Statistics), then $m_0 = 40.5 \times 2.055/309 = 0.27$, and hence $\eta = 1.055 - m_0 = 0.785$.

We summarize the key parameters in table 1.

5 Simulations

We use the model specified in the previous section to calculate the EPWE and perform comparative statics. For that purpose we take the distribution of workers to represent a larger non-economic effect of immigration for unskilled workers than for skilled workers (Dustmann and Preston, 2005; Mayda, 2006). We use as a baseline the values $\gamma_u^{\max} = 150$, $\gamma_s^{\max} = 100$, and a value of $\theta = 3$, which result in an expected immigration of 0.27 (or 13.25% of the total population), consistent with our calibrated value (see section 4). Parties propose differentiated immigration policies, with proposals located to the left and to the right of the median policy. A majority of skilled workers vote for party L while a majority

[11] We use all data from the year 2002 to be consistent with the values in He (2009)

parameter	value	units
α	0.32	share of unskilled labor in production
$\bar{e}_u$	69.5	mean efficiency units of skilled labor
e_u^{med}	55.5	median efficiency units of unskilled labor
$\bar{e}_s$	86.5	mean efficiency units of skilled labor
e_s^{med}	64.5	median efficiency units of skilled labor
m_0	0.27	immigrants per skilled worker ratio
η	0.785	unskilled workers per skilled worker ratio
$\bar{E}$	39.3	dollars per skilled worker in immigration control
θ	3	constant in the immigration control technology.

Table 1: List of parameter values

unskilled workers vote for party R (Proposition 3).

First, we analyze equilibria as the two groups diverge on their non-economic aversion to immigration. Next we study the impact of changes in the efficacy of immigration control policy. Equilibrium outcomes are reported in tables 2-4. Columns 2 and 3 (m_L^* and m_R^*) report the equilibrium immigration policies in terms of skilled workers for parties L and R, respectively. Column 4 shows the winning probability of party L: $p(m_L^*, m_R^*)$. Columns 5 and 6 display the proportion of skilled (Φ_s) and unskilled (Φ_u) workers voting for L, representing the composition of its constituency. Finally, the last column reports the expected level of immigration at equilibrium: $E[m^*] = p(m_L^*, m_R^*)\ m_L^* + (1 - p(m_L^*, m_R^*))\ m_R^*$.

Changes in the distribution of non-economic attitudes towards immigration.

We let skilled and unskilled workers diverge on their non-economic aversion to immigration. Equilibrium outcomes are reported in table 1. As we go down column 1, the two groups of voters move apart and both parties, L and R, propose a less tight immigration policy. In relation to their preferences on immigration, as $\gamma_u^{\max}$ and $\gamma_s^{\max}$ separate the group of skilled workers becomes more homogeneous than the group of unskilled workers. Hence, the distribution of γ/e concentrates for skilled workers, while it increases its dispersion for unskilled workers (see figure 2), inducing polarization between skilled and unskilled workers. Parties face a trade off between increasing the probability of winning and proposing policies closer to their average constituent. They react by offering a level of immigration that favors the most homogeneous group, namely, skilled workers. Parties' constituencies become more homogeneous regarding the skill, that is, party L is composed by a larger proportion of skilled to unskilled workers and, correspondingly, a larger proportion of unskilled to skilled workers support party R. Hence, parties increase their identification with one group of workers, either skilled or unskilled. Although competition shifts towards skilled workers, party R, proposing a more restrictive immigration policy than party L, is able to overcompensate the loss of votes from skilled workers with many more new votes from unskilled workers, benefiting from the split and increasing its probability of victory.

These effects are more evident on table 2, where only the dispersion of non-economic attitudes towards immigration for unskilled workers varies. We keep the distribution of γ/e

$\gamma_s^{\max} - \gamma_u^{\max}$	m_L^*	m_R^*	$p(m_L^*, m_R^*)$	$\Phi_s(m_L^*, m_R^*)$ (% of s-voters)	$\Phi_u(m_L^*, m_R^*)$ (% of u-voters)	$E[m^*]$
120-130	0.281	0.238	0.661	76.72	23.26	0.266
100-150	0.289	0.244	0.637	80.21	17.75	0.273
80-170	0.302	0.254	0.615	83.45	12.59	0.283
60-190	0.323	0.270	0.595	86.55	7.75	0.301
40-210	0.362	0.299	0.579	89.55	3.21	0.335

Table 2: Polarization of non-economic effects of immigration. The distributions of skilled and unskilled workers shift apart as we move down on the table. A shade represents the baseline scenario.

$\gamma_s^{\max} - \gamma_u^{\max}$	m_L^*	m_R^*	$p(m_L^*, m_R^*)$	$\Phi_s(m_L^*, m_R^*)$ (% of s-voters)	$\Phi_u(m_L^*, m_R^*)$ (% of u-voters)	$E(m^*)$
100-150	0.289	0.244	0.6369	80.21	17.75	0.273
100-250	0.278	0.236	0.6039	82.90	12.82	0.261
100-350	0.272	0.231	0.5871	84.38	10.17	0.255
100-450	0.267	0.228	0.5770	85.35	8.47	0.251

Table 3: Changes in the distribution of unskilled workers' non-economic attitude towards immigration. A shade represents the baseline scenario.

constant for skilled workers, and let the distribution for unskilled workers shift to the right (that is, unskilled workers favor, *ceteris paribus*, a more restrictive immigration policy). Party L tries to capture votes from the now more anti-immigrant unskilled workers and shifts its policy proposal towards lower immigration levels. On the other hand, Party R also announces a tighter policy, increasing the welfare of its constituency without sacrifices on its probability of victory. More interestingly, parties become more homogeneous organizations, with party R representing almost exclusively the interests of unskilled workers.

Changes in the efficacy of the immigration policy.

Recall that either a lower θ or a lower $\overline{m}$ imply a less costly immigration control policy and, hence, a more efficacious policy.[12] Table 4 shows that, as the efficacy of immigration control policy increases, parties propose lower levels of immigration. For technological improvements on immigration control makes all voters (skilled and unskilled workers) prefer less immigration.

Finally, observe that the efficacy of the immigration control policy has basically no effect on the probability of victory. Improvements on the efficacy of immigration control induce both constituencies to prefer a lower level of immigration without distorting parties' trade off between increasing their probability of winning and improving the utility of

[12] We only report the outcomes for different values for θ. For any change in $\bar{m}$ we can always find an equivalent change in θ.

θ	m_L^*	m_R^*	$p(m_L^*, m_R^*)$	$\Phi_s(m_L^*, m_R^*)$ (% of s-voters)	$\Phi_u(m_L^*, m_R^*)$ (% of u-voters)	$E[m^*]$
0.5	0.143	0.120	0.6472	91 %	4.46 %	0.135
1	0.192	0.161	0.6421	86.27 %	10.25 %	0.181
3	0.289	0.244	0.6369	80.21 %	17.75 %	0.273
5	0.345	0.293	0.6355	78.19 %	20.25 %	0.326
7	0.387	0.329	0.6349	77.14 %	21.56 %	0.365

Table 4: Changes in the efficacy of immigration control policy. A larger θ represents a less efficacious control policy. A shade represents the baseline scenario.

their constituencies. In other words, in response to a more effective immigration control technology, parties change their composition and their immigration policies, resulting in a similar probability of victory and expected utility for their constituencies. Nevertheless, the increase in the efficacy of immigration control results in more homogeneous parties, with party L representing a larger fraction of skilled workers and a smaller fraction of unskilled workers (see columns 5 and 6 in table 4).

6 Conclusions

This paper analyzes the political economy of immigration when the relevant electoral issue is the control of immigration and the relevant immigration policy is the expenditure on border control. Parties are ideological, and their ideologies are endogenously determined at equilibrium. Immigration has economic (via labor market) and non-economic (via social adaptation) effects on natives. In the economic dimension, immigrants compete with unskilled workers and lower the market wage, but complement skilled labor and increase skilled wage. At equilibrium, parties propose differentiated policies and combine skilled and unskilled workers among their constituencies, with the more anti-immigration party (party R) holding a majority of unskilled workers.

We find that, as immigration control technology becomes more efficacious, both parties propose a lower level of immigration. Moreover, political immigration proposals converge and the expected level of immigration decreases substantially. Thus, we should expect parties focusing on anti-immigration policies to invest in improving the efficacy of the immigration control policy.

We also find that, as the non economic attitudes towards immigration of unskilled workers become more intense relative to those of skilled workers, parties' policy proposal tend to converge to lower levels of immigration. In addition, the polarization of attitudes towards immigration increases Party R's probability of victory. Therefore, we should also expect parties focused on anti-immigration policies to have an interest in rising the concern about immigration among unskilled workers.

Finally, in a recent paper, Ortega (2010) compares pure temporary migration and permanent migration in a dynamic political-economy model where both income redistribution and the number of immigrants are chosen by majority vote. We believe that the political competition model designed in the current paper presents a good framework to analyze the decision to extend the franchise to immigrants in a context with endogenous party formation. We leave for future research to explore whether we find what Barberà et al. (2001) name 'voting for your enemy", that is, immigrants (unskilled workers) voting for the party with a constituency formed by a majority of skilled workers.

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Appendix

A Proof of Proposition 1

A type-h worker, characterized by the pair (γ, e_h), solves the following maximization problem:

$$\underset{m}{Max}\,(1-t(m))\,w_h(m)e_h - \gamma\ m^2$$
$$\text{s.t. } \underline{m} \leq m \leq \overline{m}$$

with $t(\underline{m}) = 1$ and $t(\overline{m}) = 0$.

The corresponding Lagrangian is:

$$\mathfrak{L}\,(m, \lambda_1, \lambda_2) = (1-t(m))\,w_h(m)e_h - \gamma m^2 + \lambda_1(\overline{m} - m) + \lambda_2(m - \underline{m}).$$

The FOC imply

$$-t'(m)w_h(m)e_h + (1-t(m))\,w_h'(m)e_h - 2\gamma m - \lambda_1 - \lambda_2 = 0 \tag{17}$$
$$\lambda_1\,(\overline{m} - m) = 0 \tag{18}$$
$$\lambda_2\,(m - \underline{m}) = 0 \tag{19}$$

plus the non-negativity constraints.

We only need to consider three cases.

case 1. $\lambda_1 > 0$.

From (18), $m = \overline{m} > \underline{m}$. From (19), $\lambda_2 = 0$. Using $t(\overline{m}) = 0$, we can rewrite (17) as

$$-t'(\overline{m})w_h(\overline{m})e_h + w_h'(\overline{m})e_h - 2\gamma\overline{m} = \lambda_1 > 0.$$

Manipulating this last expression we obtain that all workers satisfying

$$\frac{\gamma}{e_h} \leq \frac{-t'(\overline{m})w_h(\overline{m}) + w_h'(\overline{m})}{2\overline{m}} \equiv \beta_h \tag{20}$$

reach a corner solution and their optimal immigration level is $m^*\,(\gamma/e_h) = \overline{m}$.

case 2. $\lambda_2 > 0$.

From (19), $m = \underline{m} < \overline{m}$. From (18), $\lambda_1 = 0$. Using $t(\underline{m}) = 1$, we can rewrite (17) as

$$-t'(\underline{m})w_h(\underline{m})e_h - 2\gamma\underline{m} = -\lambda_2 < 0.$$

Manipulating this last expression we obtain that all workers satisfying

$$\frac{\gamma}{e_h} \geq \frac{-t'(\underline{m})w_h(\underline{m})}{\underline{m}} \equiv \zeta_h \tag{21}$$

reach a corner solution and their optimal immigration level is $m^*\,(\gamma/e_h) = \underline{m}$.

case 3. $\lambda_1 = \lambda_2 = 0$.

For the interior solutions, that is $m^* \in (\underline{m}, \overline{m})$, the FOC (17) implies that the optimal policy $m^*(\gamma/e_h)$ is the solution to

$$\frac{\gamma}{e_h} = \frac{-t'(m^*)w_h(m^*) + (1 - t(m^*))\, w_h'(m^*)}{2m^*}. \tag{22}$$

This last expression can be simplified by using the expressions of the salaries and their derivatives in (5)-(8). Observe that $w_h'(m) = -k_h/\left((m+\eta)\, w_h(m)\right)$, with $k_u = 1-\alpha$ and $k_s = -\alpha$. Thus, we can rewrite (22) as

$$\frac{\gamma}{e_h} = \frac{-t'(m^*) - (1 - t(m^*))\, \frac{k_h}{m^*+\eta}}{2m^*}\; w_h(m^*). \tag{23}$$

Finally, the second order condition (SOC) must be satisfied for the interior solution $m^*(\gamma/e_h) \in (\underline{m}, \overline{m})$ to be an optimal policy for a worker γ/e_h. Henceforth, to simplify notation, we omit the term γ/e_h when possible. That is, we need to show that $m^* \in (\underline{m}, \overline{m})$, obtained from the FOC (23), satisfies the following inequality:

$$-t''(m^*)\; w_h(m^*) - 2t'(m^*)\; w_h'(m^*) + (1 - t(m^*))w_h''(m^*) < 2\frac{\gamma}{e_h}. \tag{24}$$

We provide two separate proofs, one for unskilled workers and another one for skilled workers. But first we derive an expression of t'' in terms of t' that will become useful later. Differentiating $t(m) = E(m)/y_T(m)$ with respect to m we obtain

$$t'(m) = \frac{E'(m)\; y_T(m) - E(m)\; y_T'(m)}{y_T(m)^2}.$$

Differentiating again and simplifying,

$$t''(m) = \frac{E''(m)\; y_T(m) - y_T''(m)\; E(m)}{y_T^2(m)} - 2\frac{y_T'(m)}{y_T(m)}t'(m) \tag{25}$$

From the definition of $y_T(m)$ in (9), and using $w_s(m) = (1-\alpha)\,\alpha\,(m+\eta)\,(\overline{e}_u/\overline{e}_s)\, w_u(m)$, and $w_u'(m) = -\,(1-\alpha)\, w_u(m)/\,(m+\eta)$, we obtain

$$\begin{aligned} y_T(m) &= \frac{m+\eta}{\alpha}\, \overline{e}_u w_u(m), \text{ and} \\ y_T'(m) &= w_u(m)\; \overline{e}_u \end{aligned}$$

Plugging these last two expressions into (25):

$$t''(m) = A(m) - \frac{2\alpha}{m+\eta}t'(m), \tag{26}$$

with $A(m) = \left(E''(m)y_T(m) - y_T''(m)E(m)\right)/y_T(m)^2 > 0$.

SOC for unskilled workers.

Manipulating the expressions of w_u and w_u' in (5) and (7) we can write

$$\begin{aligned} w_u'(m) &= -\frac{(1-\alpha)}{m+\eta} w_u(m), \text{ and} \\ w_u''(m) &= \frac{(1-\alpha)(2-\alpha)}{(m+\eta)^2} w_u(m). \end{aligned}$$

Using the previous expressions, we can write (24) for $h = u$ as

$$\frac{\gamma}{e_u} > \frac{-t''(m^*) - 2t'(m^*)\frac{1-\alpha}{m^*+\eta} + (1-t(m^*))\,\frac{(1-\alpha)(2-\alpha)}{(m^*+\eta)^2}}{2} w_u(m^*). \tag{27}$$

Using the FOC in (23), $m^* \in (\underline{m}, \overline{m})$ satisfies (27) if and only if

$$\begin{aligned} &-t'(m^*)\frac{m^*+\eta+2m^*(1-\alpha)}{m^*+\eta} - \\ &\qquad (1-t(m^*))\,\frac{1-\alpha}{m^*+\eta}\frac{m^*+\eta+(2-\alpha)m^*}{(m^*+\eta)} > -t''(m^*)\ m^*. \end{aligned} \tag{28}$$

Substituting (26) into (28) and simplifying, we have that

$$-t'(m^*)\frac{3m^*+\eta}{m^*+\eta} - (1-t(m^*))\,\frac{1-\alpha}{m^*+\eta}\frac{(3-\alpha)m^*+\eta}{(m^*+\eta)} > -A(m^*)\ m^*. \tag{29}$$

Since the RHS of (29) is negative, it is sufficient to show that its LHS is positive. But observe that

$$\begin{aligned} -t'(m^*)\frac{3m^*+\eta}{m^*+\eta} - (1-t(m^*))\,\frac{(1-\alpha)}{m^*+\eta}\frac{(3-\alpha)m^*+\eta}{m^*+\eta} &> \\ -t'(m^*) - \frac{(1-\alpha)}{m^*+\eta}(1-t(m^*)) &= \frac{2m^*}{w_u(m^*)}\frac{\gamma}{e_u} > 0, \end{aligned} \tag{30}$$

where the last equality obtains directly from the FOC in (23).

SOC for skilled workers.

From (27), FOC for skilled workers implies

$$-t'(m^*)\ w_s(m^*) - (1-t(m^*))\,w_s(m^*)' - 2m^*(m^*)\frac{\gamma}{e_u} = 0. \tag{31}$$

The SOC requires that

$$-t''w_s - 2t'w_s' + w_s''(1-t) - 2\frac{\gamma}{e_u} < 0. \tag{32}$$

From (6) and (8),

$$\begin{aligned} w_s'(m) &= \frac{\alpha}{m+\eta} w_s(m) \text{ and} \\ w_s''(m) &= \frac{-\alpha(1-\alpha)}{(m+\eta)^2} w_s(m). \end{aligned} \tag{33}$$

Substituting the previous expressions into (32) we have that $m^* \in (\underline{m}, \overline{m})$ maximizes unskilled workers' utility if and only if:

$$\frac{\gamma}{e_s} > \frac{-t''(m^*) - 2t'(m^*)\frac{\alpha}{m^*+\eta} - (1-t(m^*))\frac{\alpha(1-\alpha)}{(m^*+\eta)^2}}{2} w_s(m^*).$$

From (31) and (33),

$$\frac{\gamma}{e_s} = \frac{-t'(m^*) - \frac{\alpha}{m^*+\eta}(1-t(m^*))}{2\ m^*} w_s.$$

Plugging this last expression in the LHS of (24), $m^* \in (\underline{m}, \overline{m})$ maximizes skilled workers' utility if and only if:

$$\begin{aligned} &-t'(m^*) - \frac{\alpha}{m^*+\eta}(1-t(m^*)) > \\ &\quad \left(-t''(m^*) - 2t'(m^*)\frac{\alpha}{m^*+\eta} - (1-t(m^*))\frac{\alpha(1-\alpha)}{(m^*+\eta)^2}\right) m^*. \end{aligned} \tag{34}$$

Observe that the RHS of (34) is negative while, by (30), the LHS is positive. Thus the inequality always holds. □

B Proof of Proposition 2.

Let $m^*(\gamma/e_h)$ be the optimal immigration policy for a worker with γ/e_h, as defined in the proof of proposition 1. For internal solutions, the FOC (22) implies

$$F(m^*, \gamma/e_h) \equiv \left(-t'(m^*) - (1-t(m^*))\frac{k_h}{m+\eta}\right) w_h(m^*) - 2\frac{\gamma}{e_h} m^* = 0.$$

By the Envelope Theorem,

$$\frac{\partial m^*}{\partial(\gamma/e_h)} = -\frac{\partial F/\partial(\gamma/e_h)}{\partial F/\partial m} < 0,$$

since $\partial F/\partial(\gamma/e_h) = -2m^* < 0$ and, by the SOC, $\partial F/\partial m < 0$. Thus we have proved both (i) and (ii). □

C Proof of Proposition 3.

Let $m_h^*(\gamma/e)$ be the optimal policy of a type-h worker characterized by γ/e_h. We need to show that $m_s^*(\gamma/e) \geq m_u^*(\gamma/e)$ for all γ/e. We proceed in three steps.

1. First, we show that $\beta_u < \beta_s$. From the definition of β_h (20) and using the relationship $w_h'(m) = -k_h/(m+\eta)w_h(m)$, we obtain that $\beta_u < \beta_s$ if and only if $w_u(\overline{m}) < w_s(\overline{m})$, which is true. Thus $m_s^*(\gamma/e) = \overline{m} \geq m_u^*(\gamma/e)$ for all $\gamma/e < \beta_s$.

2. Second, we show that $\zeta_u < \zeta_s$. It follows from the definition of ζ_h (21) that $\zeta_u < \zeta_s$ if and only if $w_u(\overline{m}) < w_s(\overline{m})$. Thus $m_u^*(\gamma/e) = \underline{m} \leq m_s^*(\gamma/e)$ for all $\gamma/e > \zeta_u$.

3. Finally, those workers with $\beta_s < \gamma/e < \zeta_u$ have interior optimal policies defined by the condition (22). Define $q_h(m)$, for $m \in (\underline{m}, \overline{m})$, as the γ/e_h such that $m^*(\gamma/e_h) = m$, that is the type-h workers whose optimal immigration policy is m. Observe that $q_h(m)$ must satisfy (22). It follows that $q_s(m) > q_u(m)$ for all interior m, since $w_s(m) > w_u(m)$. By proposition 2, $q_h(m)$ is a decreasing function. Therefore, $m_s^*(\gamma/e) > m_u^*(\gamma/e)$, as we wanted to prove. $\square$