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Skills, Immigration and Selective Policies[a]

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Abstract: This paper analyzes the decision process that leads destination countries to introduce selective immigration policies based on skills requirements. We show that in absence of policy implementation costs, preferences in destination countries are polarized between complete openness or complete closure. However, this result changes if we take into account policy implementation costs. In presence of enforcement costs, selective immigration policies consist in positive quotas both for skilled and unskilled workers. This result fits the current scenario. We also show that the resulting policy depends on the capital endowment of the median voter: the richer, the less restrictive the immigration policy. Moreover, under mild assumptions, the rich are more biased in favour of skilled immigration than the poor.

Keywords: heterogeneous skills, immigration quotas, Condorcet winner

JEL classification: D72, F22, J24, J61

Introduction

In this paper, we analyze the decision process that leads the inhabitants of destination countries to choose immigration policies that discriminate between skilled and unskilled workers, through a voting system.

Globalization creates new opportunities and challenges for financial and human capital mobility across national borders. During the last decades, as a reflection of the increasing volume of transactions, labour markets have also experienced a significant enlargement. Policy makers and international organizations have first directed their attention towards the elimination of trade barriers and the liberalization of financial

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markets; then, the focus has been increasingly enlarged so as to account for the implications of liberalization on human capital mobility. For instance, the approval of NAFTA was the result of a long lasting debate on the possible repercussions on employment and factors mobility in the US. Also in Europe, free factor mobility is the outcome of a process that was started to facilitate trade. Nonetheless, the enlargement of the European Union constitutes nowadays a new challenge for European immigration policies.

Immigration policies are today a subject of great political debate in destination countries. Indeed, since the collapse of the Soviet Union, only few countries restrict their citizen the possibility to migrate (such as Cuba, Myanmar and North-Korea). A part from these few exceptions, migration restrictions are decided by destination countries. Immigration flows represent both a precious resource and a cost for destination countries. Immigrants provide part of the unskilled labour force, especially in light of the old aging of the population in many industrial countries. In fact, according to the IMF (2005, ch. 2), elderly dependency ratios in the advanced countries will nearly double by 2050. In addition, highly qualified immigrants can offer skills that are both scarce and critical. Finally, cultural diversity is at the root of skill complementarity and scientific progress.

However, cultural diversity is also associated with significant social costs due to the need of adapting institutions to an heterogeneous population; immigration inflows also imply an increase in public expenditure. Nannestad (2007) provides a detailed survey on the debate concerning the benefits and costs of migration inflows into welfare states. The analysis shows that the overall impact of migration on welfare crucially depends on the peculiar features of both immigrant workers and the welfare system. For the purpose of optimizing costs and benefits, immigration flows need to be regulated.

Selection criteria are nowadays an issue of great priority in the agenda of policy makers. In Australia, selection criteria are subject to a skill-assessment system and are imbedded in a well defined legislation that is articulated in several cases. The Canadian immigration system is very similar to the Australian one, while the US one is articulated less structured. Still, it is based on skills selection criteria. While the above countries have historically been mass destination countries, mass immigration flows towards Europe are a relatively recent phenomenon; in Europe, immigration policies are currently a big concern for policy makers and the enlargement of the European Union represents an additional challenge for coordinated policy-making.

Our work focuses on the decision process that leads destination countries to introduce selective immigration policies based on skill requirements. In our framework, selection criteria depend on skills:[1] each immigration policy is defined as a couple of probabilities to enter the country, that refer respectively to unskilled and skilled potential immigrants. Since any border closure implies entry rationing, a

restrictive policy simply represents, from migrants' point of view, a lower probability of entering.

In the destination country, natives choose their optimal immigration policy, by evaluating the effect of immigration flows on their income. For simplicity, we assume that potential immigrants do not own physical capital. The entry of immigrants have thus a positive impact on the income of capital holders (the rich), and a negative effect on the earnings of the poor. Indeed, given initial endowments, immigration inflows raise the interest rate and dampen wages. Moreover, the entrance of highly-intensive human capital (i.e., skilled workers) exacerbates this mechanism because of its stronger positive effect on capital income and its stronger negative effect on wages.

Immigration policies are not costless. When the entrance of immigrants is followed by an increase in government spending, migration inflows imply higher taxation and have a negative effect on natives' income.[2]

If the considered framework allows also for inter-generational dynamics, the costs of immigration can differ from generation to generation. In Razin et al. (2002), redistributive policies are more costly to the native-born as immigrants share the redistribution benefits with her/him. However, since immigrants become citizens, the result of a majority vote is also affected by their preferences towards both redistribution and immigration. Dolmas and Huffman (2004) and Ortega (2005) model the voting process over immigration quotas and redistributive taxation in a dynamic setup of overlapping generations; however, natives' preferences for immigration today are influenced by the prospect that tomorrow immigrants will be voting over future tax policy.

In this paper, we do not analyze the manifold links between immigration inflows, taxes and public spending. We focus instead on the immigrations policies and their costs of implementation that we assume to be financed by the citizens of the destination country only.

In order to have a concrete idea of implementation costs, one can think about the current debate on US southern frontiers and the recent (costly) proposals to reinforce the borders. When voting over immigration policies, rational individuals take into account the costs of implementing restrictions: the stricter the restrictions, the higher the enforcement costs (free factor mobility implies zero costs). In our model, we assume for simplicity that implementation costs are financed through a flat tax on capital income and enter the utility function additively.

In absence of implementation costs, we recover Benhabib (1996) pioneering result. The political outcome over immigration policies depends on the distribution of capital: if the median voter is sufficiently rich, the optimal policy consists in keeping frontiers open; if the median voter is relatively poor, borders are kept closed.

The introduction of enforcement costs can affect this result and prevent countries' frontiers from complete closure. In presence of policy enforcement costs, Magris and Russo (2005) generalize Benhabib (1996) and obtain an interior solution; this also rules out a complete closure of borders. However, their model does not account for heterogeneity in skills.

Heterogeneity in skills is of twofold interest: it entails different degrees of complementarity between labor and physical capital and it allows to differentiate the costs of screening workers.[3]

Our work allows to explain both the emergence of immigration quotas and the existence of distinct quotas for heterogeneous immigrants. When enforcement costs are positive for both the types of immigrants, there is no room for selecting one category only; indeed, if border controls are marginally relaxed, enforcement costs significantly fall and the total impact on income is positive. Moreover, while adding realism, introducing different quotas provides an additional policy instrument to the policy maker.

Our framework allows us thus to generalize Benahbib (1996) by introducing a two-dimensional decision space (i.e. heterogeneity in skills and quotas for skilled and unskilled workers) and to extend Magris and Russo (2005) by introducing distinct enforcement costs.

The individual optimal decision is eventually incorporated in policy-making through a political decision process. All possible policies are proposed to voters, pair by pair, in a voting process a la Condorcet. The winner policy (i.e., the policy that wins against any possible alternative: the Condorcet winner) coincides with the choice of the median voter: the richer the median voter in terms of physical wealth, the less restrictive immigration regulations. Under mild assumptions, we show that the rich prefer skilled workers while the poor prefer the unskilled ones. On the one hand, skilled workers have a stronger positive effect on the income of capital owners, because of a higher degree of factor complementarity; on the other hand, skilled immigrants have a stronger dampening effect on wages.

The article is organized as follows. The fundamentals are presented in the next section. Section 3 focuses on the immigration policies, while the voting system is defined in section 4. Section 5 concludes. Notice that for the sake of a shorter exposition, both Proofs of Proposition 1, 2, and 5, and Proofs of Lemma 3 and 4 have been here omitted. The interested reader can refer to Iliopulos (2008)[4].

The model

We consider two open economies in a static framework: the source country and the destination country (from now on, S and D, respectively). Both countries are closed

in every way but one: labor is mobile across countries. Country D is characterized by a positive aggregate level both of physical and human capital, while country S by a positive level of human capital only. A consumption good is produced under constant returns to scale. In country D, it is produced by using two factors: capital and efficient units of labour. In country S, using only labour. We assume that wages in country D are strictly higher than wages in country S. Rational agents in S maximize their income and are always willing to migrate from country S to country D.

First, D-country inhabitants choose the optimal immigration policy, which takes into account its effects on capital and labour income. Then, a fraction of Scountry inhabitants successfully migrates to country D. Immigration policies are an endogenous outcome of the interactions between D-country and S-country inhabitants.

Destination Country

Country D is populated by natives who earn their income from labour and capital. As in Benhabib (1996), they are indexed by the level of capital they are endowed with, that we denote by k.[5] Each native is endowed with a unit of labour, which is supplied inelastically in a perfectly competitive labour market. An homogeneous consumption good is produced according to a CRS aggregate production function F (K, L), where K and L are aggregate capital and efficient units of labour, respectively. The production function satisfies usual neoclassical assumptions. Workers' average productivity is $f(\kappa)$ where $\kappa \equiv K / L$ denotes the capital intensity.

Assumption 1. $f : R_+ \to R_+$ *is* C^2*, strictly increasing and strictly concave.*

The density of natives is given by a continuous function n (k) defined over [0, ∞). Thus, the aggregate capital in D is given by:

$$K = \int_0^\infty n(k) k dk$$

while the total population is:

$$N = \int_0^\infty n(k) dk$$

The median voter in the native population is endowed with an amount of capital k_m solving:

$$\int_0^{k_m} n(k) k dk = N / 2$$

The competitive interest rate, r, and the competitive wage, w, are, respectively: $r = f'(\kappa)$ and $w = w(\kappa) = f(\kappa) - f'(\kappa)\kappa$.

Without immigration, w and r are respectively: $r = f'(\kappa_0)$, where $\kappa_0 \equiv K / N$, is the pre-immigration capital-labour ratio. The total preimmigration income, ρ_k, of individual k depends upon κ_0 and k:

$$\rho_\kappa = w(\kappa_0) + f'(\kappa_0)k \tag{1}$$

Given the static nature of the model, agents consume their whole income. Therefore, for each native, utility coincides with her/his total income; preimmigration utilities can be thus ranked with respect to capital endowments, according to (1).

Source Country

Natives of country S do not own physical capital, but are characterized by two different levels of human capital, respectively h_1 and h_2.[6] We do not focus on human capital accumulation: the endowments are exogenously given and satisfy $h_1<h_2$. We will refer to agents with human capital h_1 as unskilled workers, whereas to those with human capital h_2 as skilled workers. The human capital in country S before migration is given by $n_1 h_1 + n_2 h_2$, where n_2 refers to the number of skilled individuals and n_1 refers to the number of the unskilled ones.

In absence of migration, country-S inhabitants dispose of a linear technology converting one unit of human capital in one unit of consumption (human capital heterogeneity does not affect the technology). We will assume in the following that, even under a complete migration, the wage in country D remains higher than that earned in country S:

Assumption 2.

$$w\left(\frac{K}{N + n_1 h_1 + n_2 h_2}\right) > 1 \tag{2}$$

Since the utility of S-country inhabitants coincides with their labor income, Assumption 2 implies that they will always try to migrate to country D. In particular, it implies that each S-native will find profitable to migrate to D for any number of other S-natives who migrate successfully.[7] Contrary to Dustmann (2001), we assume

that the utility immigrants derive from consumption in country S is equal to the utility they derive from consumption in country D. Introducing different degrees of utility would not affect our main results: indeed, we focus on a two-step process of immigration policy-making and we prevent the immigrants from coming back home in the long run.

Immigration Policy

Migration is a sensitive subject in every rich country. Voters are concerned in particular in those areas where immigrants have been arriving in large numbers. In Australia, immigration inflows are regulated by a well defined legislation which is articulated in 72 cases. In order to obtain a permanent visa, potential candidates aiming at working in Australia are subject to an assessment process that evaluates their skills: the higher the score, the higher the chances to enter the country. Canada is one of the world main destination countries with about 200,000 immigrants coming every year subject to the rules of its immigration system. The Canadian immigration system is similar to the Australian one and is articulated in two categories: skilled work and business immigration. The skills assessment depends on factors as: the level of education of the candidate; her/his French or English ability; her/his work experience; age; the arranged employment; adaptability. US immigration policies are based on a complicated system of visas, which is articulated in more than 60 temporary visas and some permanent ones. A part from Family Relations Visas, permanent visas are issued only as last step of a long process that starts with a job offer. 'Aliens with extraordinary abilit(ies)' can apply for the permanent residence permit (the Green Card). Other categories of workers need to obtain first a 'Labour Certification' and pass through a sophisticated bureaucratic process. Where the labour certification has demonstrated any particular type of skills shortages in US, it is possible to be granted a Green Card. However, where the workers are not officially deemed to be skilled, the process may take several years.

While the above countries have historically been mass destination countries, mass immigration flows towards Europe are a relatively recent phenomenon. In Europe, immigration policies are currently a big concern for policy makers and the enlargement of the European Union represents an additional challenge to coordinate the policy-making.

While the Schengen agreement allows foreigners in Europe to freely circulate amongst the members, permanent residency is generally regulated by national policies. The debate on selective immigration policies is currently an issue of great concern and several countries are trying to introduce selection rules based on skills and labour shortages considerations. UK has recently introduced a number of new

immigration visas and work category visas based on skill-selection criteria. In France, selective immigration policies are currently under debate. The focus of the discussion is on the introduction of policy regulations that would allow France to choose its immigrants according to foreigners' skills and the needs of its economy: high skills and experience in sectors with scarce labour force will be the selection criteria. In Germany, there are currently no structured selective policies; however, the worrisome scarcity of skilled labour in IT sectors has prompted the necessity to facilitate the arrival of skilled immigrants.

The above evidence suggests that immigration policies in several countries are based on skills selection criteria. Potential immigrants are generally allowed to enter destination countries according to quotas (that depend on the skills of potential newcomers). In practice, the effectiveness of immigration restrictions is weakened by the existence of illegal immigration. For simplicity, we assume that both legal and illegal immigrants earn the same wage. Thus, both legal and illegal immigrants affect the capital-labour ratio in the same way. Having said that, illegal immigration can have significant and peculiar effects on wages: the phenomenon carries in fact manifold implications. However, in our paper we focus the attention on how selective policies are determined. We proxy quotas as a probability to entry successfully the destination country; this accounts for the possibility that individuals may entry illegally.

In general, the optimality of an immigration policy critically depends on the perspective one adopts. Clearly, if we assumed the point of view of a source country, the migration of skilled workforce could be a matter of concern when associated with a loss of human capital;[8] on the other hand, the benefits deriving from remittances should also be considered. According to World Bank data, in some very poor countries remittances account nowadays for about the 50% of GDP (The Economist, 2008). Indeed, costs and benefits need to be optimally balanced.

Since we assume the perspective of destination countries, we aim at optimizing their welfare only. In our model, welfare is proxied by the revenue of its citizens[9]. Each citizen makes her/his optimal choice (i.e., chooses the optimal policy) by maximizing her/his income. Eventually, the immigration policy is the result of aggregating citizens' preferences through the voting system.

We define the immigration policy chosen in the D-country as a vector $\pi \equiv (\pi_1, \pi_2)$ belonging to $[0, 1]\times[0, 1]$, which for every $i = 1, 2$ fixes the probability π_i of a successful migration for a candidate migrant with human capital endowment h_i. For simplicity, we can describe the model as a two-step process with the following timing: (1) natives choose an immigration policy π, (2) nature randomly chooses a fraction π_i, $i = 1,2$ of successful migrants of type h_i.

Aggregate labour supply and the capital-labour ratio after migration in the D-country become:

$$L = N + \pi_1 n_1 h_1 + \pi_2 n_2 h_2$$
$$\kappa \equiv K / L = K / (N + \pi_1 n_1 h_1 + \pi_2 n_2 h_2) \tag{3}$$

When the fundamentals are given (exogenous distributions of physical and human capital in both countries) the capital per unit of labour only depends on the immigration policy $\pi: \kappa = \kappa(\pi)$. Finally, notice that $\kappa_0 = \kappa(0)$. The increase in immigration quotas lowers the capital-labor ratio $\kappa(\pi)$, raises capital income and dampens labor wages.

Immigration Policy without Enforcement Costs

Assume that no enforcement costs are associated to the implementation of any policy π. It follows that, for a given immigration policy π, the income of an individual endowed with an amount of capital k is given by:

$$\rho_k(\pi) \equiv w(\kappa(\pi)) + kf'(\kappa(\pi)) \tag{4}$$

An individual endowed with k maximizes (4) with respect to π. The optimal choice of each agent is a function of her/his endowments of capital: clearly, the richer (in capital endowments) the agent, the higher the incentive to let immigrants coming in.

Arrow's (1963) Impossibility Theorem pointed out the limits of preferences aggregation in a world populated by heterogeneous agents. In order to avoid Arrow's paradox and find an optimal policy, we need to define a simple voting mechanism in country D. In a voting procedure a la Condorcet, immigration policies are compared two by two. This mechanism selects the policy that wins against any other alternative, pair by pair, and assures that the larger share of the population is satisfied. The political outcome coincides with the choice of the median voter. Such an optimal policy is defined as the Condorcet winner.

Let now

$$\tilde{k} \equiv \frac{w(\kappa(0,0)) - w(\kappa(1,1))}{f'(\kappa(1,1)) - f'(\kappa(0,0))} \tag{5}$$

The following Proposition identifies the Condorcet winner in absence of implementation costs and generalizes Benhabib's (1996) result by considering a two-dimensional decision space. As in Benhabib (1996), the optimal policy depends on k_m, the median voter's capital endowment.

Proposition 1: *Without enforcement costs, the Condorcet winner is* $\pi^{**}=(0,0)$ *if* $k_m<\widetilde{k}$ *and* $\pi^{**}=(1,1)$ *if* $k_m>\widetilde{k}$*, where* k_m *denotes the median voter's capital endowment.*

For a proof see Iliopulos (2008).

Proposition 1 proves that, if the median voter is rich in capital (i.e., richer than a benchmark level, $\widetilde{k}$), the optimal policy in the destination country consists in welcoming all potential immigrants; to the contrary, if the median voter is poor, frontiers are kept closed.

This result can help to understand why capital accumulation and technical progress have eventually prompted frontier openness and challenged protectionist mainstreams. Economic growth, sustained by endogenous technical progress, raises capital intensity and promotes the opening of borders.

Immigration Policy with Enforcement Costs

According to Ortega (2004), individuals choose their optimal immigration policy taking into account its impact on future generations. Their optimization problem considers the political costs related to the entrance of immigrants endowed with complementary skills.

We will instead assume that mitigating the flows of immigrants is costly: the stricter the restrictions, the higher the costs. Stricter restrictions imply more controls, and thus, more public expenditure. One can have an idea of these costs thinking of tighter controls at the frontiers or more infrastructures to delimit borders.

We also suppose that costs are additive in the two components of the migration policy. It is in fact reasonable to think that the suitability of unskilled workers cannot be evaluated according to the same criteria used for skilled immigrants; applications for different visas are in fact evaluated according to different protocols and, generally, by different directorates. Moreover, clandestine workers are often unskilled. Monitoring illegal flows and carrying illegal immigrants beyond the borders, possibly in the original country, is very expensive. We assume that enforcement costs are determined as follows.

$$C(\pi)\equiv C_1(\pi_1)+C_2(\pi_2)$$

For each i = 1, 2, the function $C_i(\pi_i)$, satisfies the following properties:

Assumption 3. $C_i(0)>0, C_i(1)=0, C_i'(1)=0$ *and* $C_i'(\pi_i)<0$, $C_i''(\pi_i)>0$ *for every* $\pi_i\in(0,1), i=1,2$.

Assumption 4. $C_i^{'}(0) = -\infty$, $i = 1,2$

$C_i(0) > 0$ means that the costs of a complete closure are positive, while $C_i(1) = 0$ says that no restrictions for a given type of immigrant yields zero costs. Condition $C_i^{'}(\pi_i) < 0$ ensures that the enforcement cost is decreasing in each of its arguments. $C_i^{''}(\pi_i) > 0$ states the convexity of the cost: the progressive closure of frontiers entails increasing marginal costs.

Conditions $C_i^{'}(0) = -\infty$ is sufficient to rule out a complete closure. Eventually notice that $C_i^{''}(0) = -\infty$ is a less restrictive assumption than $C_i(0) = +\infty$: a complete frontier closure is technically feasible, but not economically rational.

Individual Preferences

The immigration policy is financed by a flat tax on capital income:[10] $C(\pi) = \tau f'(\kappa)K$, where κ is given by (3) and τ is the constant tax rate. The amount of tax paid by an individual owing an amount of capital equal to k is therefore:
$c_k(\pi) = \tau f'(\kappa)k = C(\pi)/K$.

On aggregate, natives' capital income is sufficient to entirely finance the equilibrium policy. Under the above assumptions, the income of a native endowed with k in the D-country is:

$$\sigma_k(\pi) \equiv \rho_k(\pi) - c_k(\pi) = w(\kappa(\pi)) + kf'(\kappa(\pi)) - C(\pi)k/K \tag{6}$$

Let now

$\underline{k} \equiv \max_i \max_{\pi_j} \frac{n_i h_i f''(\kappa_i)\kappa_i^3}{C_i^{'}(0) + n_i h_i f''(\kappa_i)\kappa_i^2}$, with $\kappa_i(\pi_j) \equiv \frac{\kappa}{N + \pi_j n_j h_j}$

$\bar{k} \equiv \min_i \min_{\pi_j} \frac{n_i h_i f''(\kappa_i)\kappa_i^3}{C_i^{'}(1) + n_i h_i f''(\kappa_i)\kappa_i^2}$, with $\kappa_i(\pi_j) \equiv \frac{\kappa}{N + n_i h_i + \pi_j n_j h_j}$

and the following assumption holding:

Assumption 5. $\underline{k} < \bar{k}$

Assumption 5 is not merely a technical assumption: it defines an interval for individual capital. Clearly, the above inequality is satisfied only in presence of enforcement costs.

We first consider agents with small capital endowments whose optimal policy in the absence of costs was (0,0); one can note that in presence of marginal implementation costs, their optimal immigration policy may change. They will in

fact choose to depart from the initial optimal policy so as to avoid part of the costs. However, if the marginal cost in zero is very high, a very small departure from the policy (0, 0) will dramatically increase their revenues: the higher the marginal cost, the more significant the increase in income. Moreover, the lower bound of the interval of capital endowments including interior solutions is lower as soon as the marginal cost in zero is higher.

As we will prove in the next proposition, a native with capital endowments between $\underline{k}$ and $\bar{k}$ will choose an interior solution for program (6) ($0<\pi_i^*<1, i=1,2$). On the one hand, a native who is endowed with capital $k>\underline{k}$ does not find profitable to vote for complete closure (notice that Assumption 4 entails $\underline{k}=0$, that is, always $k>\underline{k}$). On the other hand, a capital endowment below $\bar{k}$ prevents the native from choosing complete openness.

Proposition 2. *Under the Assumption 1, 3 and 5, the optimal immigration policy* $\arg\max_\pi \sigma_k(\pi)$ *for the individual* $k\in(\underline{k},\bar{k})$, *is an interior solution* $\pi_k^*\in(0,1)\times(0,1)$.

For a proof see Iliopulos (2008).

We observe that Assumption 4 is not required in the proof of Proposition 2: for $k<\underline{k}$, the case of a poor individual who chooses complete closure is not ruled out. When $\underline{k}<k<\bar{k}$, a middle-class native votes a policy-mix consisting of allowing (at least) some immigrants (but not all workers willing to enter) coming in.

Numerical example.

Let us provide a numerical illustration of the results in Proposition 2. In the following, we relax Assumption 4, so as to allow for the poor to choose complete frontier closure. For simplicity, we assume that output is determined according to a Cobb-Douglas technology with reduced form:

$$f(\kappa)=\kappa^\alpha \tag{7}$$

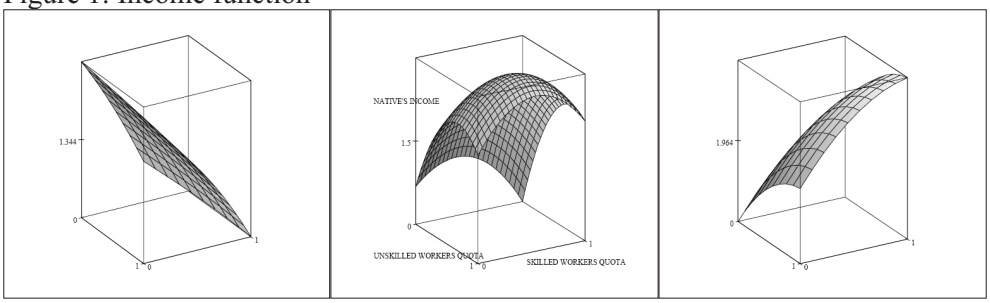
It follows that $r=\alpha\kappa^{\alpha-1}$, $w=(1-\alpha)\kappa^\alpha$. Assuming also that $C_i(\pi_i)\equiv\pi_i^2/2-\pi_i+1/2$, $i=1,2$, we obtain

$$\sigma_k(\pi)=\alpha k\kappa(\pi)^{\alpha-1}+(1-\alpha)\kappa(\pi)^\alpha-\left[(\pi_1^2+\pi_2^2)/2-\pi_1-\pi_2+1\right]k/K$$

where $\kappa(\pi)$ is given by (3).

Setting $\alpha=1/3$, $K=32$, $N=4$, $n_1=n_2=1$, $h_1=1/2$, $h_2=1$, we plot the income function.

Figure 1: Income function



The poor: k = 1 Middle class: k = 3 The rich: k = 9

We observe that the poor and the rich choose complete closure and complete openness, respectively. The individual with intermediate endowments of capital (denoted as middle class) prefers an interior solution for both quotas. For certain levels of capital endowments, the individual income optimization process implies interior solutions for both immigration quotas π_1 and π_2. This result fits realistically the empirical evidence and contributes to explain why selective policies generally imply positive quotas both for skilled and unskilled workers. The above results suggest also that the individual's optimal degree of frontier openness depends on her/his capital endowments.

Given the heterogeneity of capital endowments, natives are subject to diverse incentives and have different preferences toward the immigration policy. Before aggregating them, we thus need to prove the existence of a ranking of preferences which depends upon capital.

We now analyze the sensitivity of individual preferences with respect to wealth. In the following, the elasticity

$$\varepsilon_i \equiv (k / \pi_i^*) d\pi_i^* / dk \tag{8}$$

captures how the individual's preferences for openness varies with her/his wealth.

The second-order elasticity

$$\gamma_i(\pi_i) \equiv \pi_i C_i''(\pi_i) / C_i'(\pi_i) < 0 \tag{9}$$

resumes enforcement costs' convexity. Finally,

$$\nu_i \equiv \pi_i n_i h_i / (N + \pi_1 n_1 h_1 + \pi_2 n_2 h_2) \in [0,1) \tag{10}$$

denotes the share of skilled-workers in total human capital.

Consider now the inhabitants of country D. As previously set, the only source of heterogeneity is given by their endowment in physical capital; notice also that only D-country natives set the immigration policy. We thus proceed by characterizing D-country inhabitants' immigration preferences according to their endowment in physical capital. For simplicity, we introduce the following notation: $\pi < \pi'$ iff $\pi_i < \pi'_i$ for $i = 1, 2$.

It is possible to prove that the best immigration policy is non-decreasing in the capital endowment of each native. We know that π^*_k (where π^*_k denotes an optimal policy for the individual k) exists and, under the conditions of Proposition 2, it is interior. We need to prove that individuals endowed with more capital prefer to increase frontier openness so as to attire a more complementary factor. The first step is proving the following lemma.

Lemma 3. *Under Assumptions 1 and 3,* $signum\,\partial\pi^*_{1k} / \partial k = signum\,\partial\pi^*_{2k} / \partial k$. *Moreover, if* $\underline{\xi} < \xi < 0$ *or* $0 < \xi < \overline{\xi}$, *where*

$$\xi \equiv \kappa / (k - \kappa) \tag{11}$$

$$\overline{\xi} \equiv 2 + \varphi + (v_1 / \gamma_1 + v_2 / \gamma_2)^{-1} \tag{12}$$

and $\varphi(\kappa) \equiv \kappa f'''(\kappa) / f''(\kappa)$, *then*

$$\partial\pi^*_{ik} / \partial k > 0 \tag{13}$$

$i = 1, 2$.[11]

A stationary point such that $\partial\pi_{ik} / \partial k = 0$ *for i = 1, 2 is a local maximum* π^*_{ik} *if* $\xi > \overline{\xi}$ *and a saddle point if* $\xi < \overline{\xi}$.

For a proof see Iliopulos (2008).

Lemma 3 allows us to individuate a set of optimal choices, which is an upward-sloped curve in the π-plane; π^*_{2k} is in fact a strictly increasing function of π^*_{1k}. In addition, this curve points at $\pi = (1, 1)$ and, if the conditions for î in Lemma 3 are satisfied, the individually preferred policy moves to (1, 1) as k increases. Lemma 4 clarifies the link between the individual optimal policy and capital endowments.

Lemma 4. *Let* $\pi < \pi'$ *and* $k_1 < k_2$. *Then*

$$\sigma_{k_2}(\pi) > \sigma_{k_2}(\pi')\ implies\ \sigma_{k_1}(\pi) > \sigma_{k_1}(\pi') \tag{14}$$

$$\sigma_{k_1}(\pi') > \sigma_{k_1}(\pi)\ implies\ \sigma_{k_2}(\pi') > \sigma_{k_2}(\pi) \tag{15}$$

For a proof see Iliopulos (2008).

Lemma 4 highlights a non-decreasing relation between the physical wealth and the degree of frontier openness: if the poor prefer to increase frontier openness, the rich *a fortiori* do; if the rich prefer to strengthen frontier tightness, the poor *a fortiori* do. The reason is that an increase in labor dampens the capital-labour ratio and raises capital income.

The following assumption allows to analyze the relation between wealth and openness and individuate a positive link.

Assumption 6. *The costs are isoelasic (i.e.,* γ_i*'s are constant) and sufficiently convex, (i.e.,* $\gamma_i < -v_i(2+\varphi-\xi)$ *for i = 1, 2).*

The following Proposition allows us to conclude that individuals endowed with more capital prefer frontier openness.

Proposition 5. *Under Assumptions 1, 3 and 6, the individual solution increases with the capital endowment:* $k_2 > k_1$ *implies* $\pi^*_{ik_2} > \pi^*_{ik_1}$ *with i = 1, 2.*
For a proof see Iliopulos (2008).

Aggregated Preferences (the Condorcet winner)

In the above sections we have individuated, for each agent, the relation between her/his capital endowments and her/his preferences over immigrations. In order to define the immigration policy that will be implemented, preferences need to be aggregated. Immigration policies are an issue of great debate in most of industrial countries. The reason why the public opinion is intensively involved in the discussion is that their effects are immediate and visible.

We now show that, as in the case with no implementation costs, the median voter sets the optimal policy.

Proposition 6. *Under the Assumptions 1, 3, 6, the median voter's choice is the Condorcet winner.*

Proof. Consider now the median voter's optimal immigration policy, $\pi^*_{k_m}$, and compare it with any $\pi_a > \pi^*_{k_m}$. Since the median voter is the richest of all the voters on her/his left, implication (14) holds and $\pi^*_{k_m}$ is voted by these voters and the median voter her/himself, that is by a majority.

Consider now the comparison between $\pi^*_{k_m}$ and any $\pi_b < \pi^*_{k_m}$. The median voter is poorer than any voters on her/his right. In this case, the implication (15) is verified and $\pi^*_{k_m}$ is voted by a majority (median voter and voters on the right).

Therefore, $\pi^*_{k_m}$ is the Condorcet winner . ■

The following proposition shows that, under a plausible assumption[12], if the poor prefers skilled immigrants, the rich has an even stronger bias for skilled workers; instead, if the rich prefers unskilled immigrants, the poor has a stronger preference for unskilled workers. Proposition highlights that rich natives have a sort of relative preference for skilled immigrants, while, on the contrary, the poor have a preference for unskilled immigrants.

Proposition 7. *Assume (13) holds and* $\gamma_1 < \gamma_2$. *If a given individual h chooses at optimum* $\pi^*_{\hat{k}}$, *with* $\pi^*_{1\hat{k}} < \pi^*_{2\hat{k}}$, *then all individuals with k > h will choose* $\pi^*_{1k} < \pi^*_{2k}$. *Symmetrically, if the individual h chooses at optimum* π^*_h, *with* $\pi^*_{1h} > \pi^*_{2h}$, *then all individuals with k < h will choose* $\pi^*_{1k} > \pi^*_{2k}$.

Proof. $\gamma_1 < \gamma_2$ implies $1/\gamma_1 < 1/\gamma_2$ and, under the conditions ensuring (13), we get $\varepsilon_1 < \varepsilon_2$ or, equivalently, we obtain $\varepsilon_2 - \varepsilon_1 = d\ln(\pi_2/\pi_1)/d\ln k > 0$. If $\pi^*_1 < \pi^*_2$, then a higher capital endowment increases the gap $\pi^*_2 - \pi^*_1$. ■

Concluding Remarks

This article focuses on the process that leads destination countries to implement selective immigration policies based on skill selection criteria. If the enforcement of the immigration policy is not associated with costs, we recover Benhabib (1996) pioneering result and we generalize it so as to account for immigrants heterogeneity in skills. As in Benhabib (1996), we find that individuals' preferences are polarized between complete frontier openness and complete closure according to their capital endowments. Preferences are then aggregated through a voting system a la Condorcet and all immigration policies are confronted, couple by couple. The resulting policy, the Condorcet winner, depends on the capital endowment of the median voter: if s/he is rich, frontiers are let completely open. If s/he is poor, they are kept closed.

Policy implementation costs can affect this result and allow for interior solutions. Implementation costs are a positive function of the associated border controls and a burden on natives' income: the stricter the policy, the higher the costs. We show that in presence of enforcement costs there is a range of agents who prefer to let some (but not all) potential immigrants come in. By accounting for different costs and skill heterogeneity, our framework extends Magris and Russo (2005). We show that skill heterogeneity implies different degrees of capital-labor complementarity; native capital-owners find profitable to attract highly intensive labor. To the contrary, poor natives prefer unskilled workers.

We prove that for an range of capital endowments, natives vote distinct and interior quotas both for skilled and unskilled workers. This interval of capital

endowments (and thus, of individuals) increases with the marginal costs of policy implementation. Preferences are eventually aggregated through a voting system a la Condorcet. The policy outcome depends on the median voter: the reacher, the larger the shares of welcomed workers.

NOTES

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[1] Other authors introduce different selection criteria. For instance, in Storesletten (2000) selection depends on age.

[2] See Nannestad (2007) for an overview of literature.

[3] One can think that enforcement costs for the skilled differ from the ones for unskilled workers, when clandestine immigrants are unskilled.

[4] Proofs are available upon request. To this purpose, contact eleni.iliopulos@univ-evry.fr.

[5] Capital endowment is the only source of heterogeneity across natives.

[6] A depart from this assumption would not alter the migration outcome as long as, on average, newcomers in country D are endowed with less physical capital than natives.

[7] More precisely, all the natives of the S-country will try to migrate, if the individual income in the D-country after migration is higher than the income in the S-country: $wh_i > h_i$, $i = 1, 2$. Since the wage after migration depends positively on the new capital-labor ratioand the lowest possible ratio is $K/(N + n_1h_1 + n_2h_2)$ (when all the natives of the S-country migrate), we obtain (2) as a sufficient condition.

[8] For some discussion about the brain-drain danger, see among others Beine et al. (2001), Bhagwati and Hamada (1974), Carrington and Detriagiache (1998), Reichlin and Rustichini, (1999), Schiff (2005), Wong and Hip (1999). See also Mountford (1997), Stark et al. (1997) and Stark and Wang (2001) for some discussion on possible 'brain gains' related to migration.

[9] For a recent survey on the impact of migration flows into welfare states see Nannestad (2007) and Borjas (1994).

[10] Taxing also wages would not affect the main results as long as D-country natives supply the same amount of labor.

[11] In the Cobb-Douglas case (7), the elasticity φ and the critical point $\bar{\xi}$ simplify to $\varphi = \alpha - 2 \in (-2,-1)$ and $\bar{\xi} \equiv \alpha + (\nu_1 / \gamma_1 + \nu_2 / \gamma_2)^{-1}$, respectively.

[12] $\gamma_1 < \gamma_2$ means that a more restrictive regulation entails higher marginal costs for unskilled than for skilled workers.

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