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Abstract

This paper investigates the welfare effects of developed countries with heterogeneous and uncoordinated immigration policies. We build a simple three country model where two rich countries with different immigration policies receive immigrants from the third developing country. We consider the effects of economic integration in the form of free mobility of native workers and show that under certain conditions, wage gap between two develop countries is crucial whether integration ends in win-win or lose-lose.

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1. Introduction

Migration flows are a powerful source of economic and social change in both destination and origin countries. As a result, the regulation of international migration flows is a highly delicate policy area, almost exclusively the purview of domestic policymakers with limited scope for multilateral policymaking. Even within the European Union's highly integrated economic and social system, immigration policy harmonisation has been confined to the establishment of uniform rules on specific issues, such as asylum,[1] and the definition of broad principles.

Unconnected sovereign immigration policies within an interdependent economic area such as the EU might raise concern if this heterogeneity were to generate economic distortions and policy externalities. Indeed, EU policymakers have long recognised the need to set common rules: policy objectives and the main components of a common immigration policy were defined at the Tampere European Council in October 1999. Almost a decade later, in October 2008, a European Pact on Immigration and Asylum was concluded by the European Council. Despite this, EU member countries still retain a significant degree of freedom in defining their immigration policies.[2] The only observable common pattern in national immigration policies within the EU and, more generally, among most OECD countries is a general trend towards more restrictive rules; these aim to limit the number of immigrants from non-EU countries, often using observable 'desirable characteristics' of would-be migrants as screening criteria.

Within the EU, national immigration policies differ markedly in many respects, including restrictiveness, selectivity, citizenship acquisition rules, and the extent of illegal migrant inflows. Certain countries such as the UK, the Netherlands, and Austria (effective from October 2008, January 2009, and July 2011, respectively)[3] have introduced points-based systems that are designed to restrict entry to highly qualified migrants. Other countries have introduced rules that simplify the process of labour migration for narrowly defined categories of potential immigrants, such as students in Germany and executives and management professionals in Belgium. Potential

[1] The recent (ca. 2014) large increase in migration from the North African coast to Italy shows the difficulties of enforcing common rules and coordinating control of the European Union's external borders.
[2] EU directive 2009/50/EC introduced the so-called European Blue Card, aimed at facilitating the movement of qualified third-country nationals and their families. However, only a few countries' national legislations have thus far effectively adopted the directive.
[3] The Austrian points-based system replaced the former immigration quota system starting in July 2011. The new policy is meant to attract highly skilled individuals and those working in fields with labour shortages.

destination countries also often impose minimum language requirements with the intention of selecting immigrants who are more likely to achieve full economic and social integration.[4] Immigration is primarily governed by quota systems in countries such as Switzerland, Italy, Spain, Greece, Portugal, and France,[5] whereas the Swedish system has been entirely demand-driven since late 2008. In the latter case, the immigration rate reflects the needs of the labour market, and entry requirements are defined by employers only. EU countries also vary widely in terms of the regularity of their migration flows.

These policy differences demonstrate that sovereignty over immigration policies has not changed substantially despite the increasingly deep economic integration between EU countries—and, more generally, within the league of rich countries. In this paper, we thus present a simple theoretical framework that allows for analysis of the interdependence of autonomously and exogenously determined immigration policies in a context of labour market integration due to greater international economic integration. We consider a three-country model: citizens of a large developing country emigrate to a federation of states composed of two developed countries with autonomous immigration policies. In this case study, immigration is governed by heterogeneous policies that are rooted in different non-economic effects of immigration on the welfare of citizens in the two host countries (i.e. the so-called *compositional amenities* effect or social costs associated with immigration inflows; Card et al. 2012).

In our analysis, we focus on the case in which one destination country adopts selective immigration regulation, instituting immigration screening in the form of a minimum level of skill or ability that must be acquired by potential immigrants before obtaining legal entry. The country, however, is unable to fully control its borders and suffers from illegal immigration. The alternative destination country, in contrast, adopts a quota system that maximises the impact of immigration on its own welfare and suffers no illegal immigration. As an empirically relevant example, one can think of these two stylised destination countries as the UK, where a points-based system coexists with one of the largest number of illegal immigrants among EU countries (Vollmer 2011), and

[4] In Austria, for instance, the 2009 National Integration Plan stipulated that low-educated family-reunification immigrants require a basic knowledge of German language prior to arrival. France adopted a similar regulation in 2008: as a condition for family reunification, applicants must pass a pre-arrival French language and culture test. A language test is required in some other countries (like Italy and Denmark) in order to obtain a long-term residence permit. The UK government has recently issued a new regulation, which imposes an English language test also for migrants' partners. In points-based systems, language abilities are either compulsory (UK, Australia, New Zealand) or highly important within the assessment process (Denmark, Netherlands, Canada).

[5] Numerical limits to immigration, equivalent to explicit quotas, can also be imposed indirectly by modifying acceptance procedures.

Sweden, with an open immigration policy driven purely by employers' needs and with very limited illegal immigration (OECD-SOPEMI 2010).[6]

Our aim is to investigate the effects of autonomous changes in immigration regulation (i.e. policy externalities) on the countries' federation and the welfare consequences of domestic citizens' free mobility when immigration policies are heterogeneous and uncoordinated. Our results show that economic integration between the two destination countries in the form of free mobility for native workers (as in the EU) can lead to interesting welfare effects. Depending on the wage differential between the two host countries before labour market integration – which determines the direction of intra-area migration flows – both win-win and lose-lose outcomes are possible. In particular, labour market integration might be detrimental for both countries when natives migrate from the country with imperfect control of illegal migration and a qualitative restriction (e.g. the UK) toward the country adopting an optimal quantitative restriction (e.g. Sweden).

Our study is the first, to our knowledge, to address the important issue of full labour market integration between countries that are confronted with third-country immigration and adopt different immigration policies. This paper is related to the pioneering study of Djajic (1989), which considered the effect of qualitative restrictions on international migration. In his model, potential immigrants are required to have a minimum skill level in order to obtain permission to enter the host country; there is an inverse relationship between a worker's ability to acquire skills and the age at which he qualifies as a legal migrant. A similar structure applies in our framework, within which potential immigrants' abilities and characteristics are seen to affect not only their labour market performance but also their integration into host country society; this minimises the social costs of immigration. Kondoh (2000) extended Djajic (1989) by considering the possibility of illegal migration. This paper is also related to theoretical analyses (e.g. MacDougal (1960), Ramaswami (1969), and other subsequent studies), which investigate the welfare effect of immigration in the host country. These studies emphasise that immigration quotas (jointly set by means of an entry tax) improve welfare with respect to free international migration flows.

Our paper contributes to a small but growing literature concerning migration policy externalities. Using data on a panel of OECD countries from 1980 to 2005, Brücker and Schröder (2010) find evidence of a neighbourhood effect for skill-selective

[6] Admittedly this is not the only empirically relevant case, since countries adopting quota systems could also be characterised by having a large number of illegal migrants (and vice versa). We leave the analysis of alternative scenarios to future work.

immigration policy: the introduction of such a policy in one country increases the likelihood of a similar one being adopted by its neighbours. Bertoli et al. (2009) consider a three-country model in which strategic interactions arise in the setting of immigration quotas. The authors show that the outcome, uncoordinated setting of immigration policy, is inefficient due to negative externalities imposed on the other country in terms of lower levels of human capital embedded in migration inflows. Fernandez-Huertas Moraga (2008) investigates policy externalities between origin and destination countries; in his theoretical model, bilateral immigration agreements emerge as a means of internalising these externalities.

The paper is organised as follows. In Section 2, we present a simple three-country model of migration, as elucidated above. In Section 3, we describe and discuss the effects of economic integration between the two host countries in the form of free mobility of labour. Concluding remarks are presented in Section 4.

2. A Simple Three-Country Model of International Migration

Let us consider a stylised world economy composed of three large countries: two identical rich countries, *A* and *B*, and a large developing country, *C*. Each country produces the same good, *X*, using labour and capital inputs under perfect competition. The price of the good is the numeraire. We assume that each country is endowed with a fixed amount of capital ($K_{A,}$ K_B, and K_C, respectively) and that in every period a constant number of individuals, N_j, is born in each country ($j = A, B, C$) and lives for a lifespan equal to *T* periods. In the absence of migration, the total number of workers in country *j* can thus be expressed as $L_j=TN_j$.

The production function is $X_j = K_j L_j - \frac{a}{2} L_j^2 - \frac{b}{2} K_j^2$, where we assume that the following conditions are satisfied before and after international migration: $a < \frac{K_j}{L_j}$ and $b < \frac{L_j}{K_j}$. With perfect competition in both factor markets, we have $\partial X_j / \partial K_j = L_j - bK_j = r_j > 0$, $\partial X_j / \partial L_j = K_j - aL_j = w_j > 0$, $\partial^2 X_j / \partial K_j^2 = -b < 0$,

$\partial^2 X_j \big/ \partial L_j^2 = -a < 0,$ and $\partial^2 X_j \big/ \partial L_j \partial K_j = 1 > 0$, where r_j and w_j denote, respectively, the rental price of capital and the wage rate in country *j*.

To better focus our analysis on the effects of international migration, we assume that the countries are equally endowed with immobile stocks of capital (i.e. $K_A = K_B = K_C \equiv K$) but differ in their labour endowments. Countries *A* and *B* have identical endowments of labour, but both countries have significantly smaller populations and lower birth rates (i.e. less newly born labour in each period) than country *C*. In autarky, wage rates in the three countries will reflect these different endowments: $w_A^0 = w_B^0 > w_C^0$, where w_j^0 denotes the autarkic wage rate in country *j*. The wage gap implies that the two developed countries might attract an inflow of workers from country *C*. On the other hand, since $w_A^0 = w_B^0$, there is no wage incentive in the initial state of the world for workers to move between the two developed countries. For the sake of simplicity, we also assume that migration between *A* and *B* is impossible in the initial state. (In Section 2.5, we will consider the effects of deeper labour market integration between the two countries in the form of free mobility of native workers.)

Our main focus is on analysing the welfare consequences of adopting heterogeneous and uncoordinated immigration policies. In the model proposed here, we capture policy heterogeneity in a simple way: we assume that the two host countries differ in their immigration preferences and ability to enforce immigration policy. Country *B* is assumed to be more concerned with the economic impact of immigration and more able to control immigration flows than country *A*, whereas country *A* also considers (as part of its objective function) the social impact of immigration and is subject to illegal migration flows. These two differences motivate the adoption of heterogeneous policies, as explained in the next section.

Suppose that two policy tools are available to the receiving countries. The first is a qualitative requirement—i.e. a selective immigration policy. In order to minimise possible social costs related to immigration, the receiving country aims to grant legal entry to individuals who have better ability to integrate. Certain observable characteristics or abilities can be used to screen potential immigrants; individuals from country *C* must thus pass an ability threshold to enter. The legal entry requirements are therefore correlated with characteristics seen as desirable by receiving country policymakers in terms of reducing the social and cultural distance between immigrants and natives. For this reason, we define the ‘quality’ of a potential immigrant as his or her ability to match these requisites and, more generally, adapt to the socioeconomic environment of the receiving country. Here, we consider the case in which these abilities/characteristics affect an individual's productivity in the host country (beyond allowing legal entrance) but not in the origin country.

The second policy instrument is the adoption of an optimal immigration quota (quantitative restriction) that maximises host country welfare. Following former contributions (e.g. MacDougal (1960)), we model this policy instrument as an optimally chosen entry tax on immigrants (e.g. a visa), which jointly determines the number of incoming foreign workers (quota).[7]

In the remainder of this section, we describe the details of the model, beginning by analysing the welfare effect of immigration (Section 2.1). Afterwards, we analyse the alternative (legal and illegal) emigration strategies for individuals in origin country *C* (Sections 2.2 to 2.4). Finally, we consider the setting of optimal policy in a strategic framework and analyse policy externalities in the case of the adoption of heterogeneous policies (Section 2.5).

2.1 Immigration and welfare in the receiving country

Migrant inflows generate welfare effects via both market and non-market mechanisms. Host country natives experience economic gains or losses from migration via changes in factor prices.[8] In addition, natives' immigration preferences usually also depend on non-economic factors, such as the utility (or disutility) derived from cultural and ethnic diversity, social trust, and shared values. Indeed, immigration policy is often influenced more by these non-market effects than by its economic consequences.[9] Examining data on 21 host countries, Card et al. (2012) found that non-economic factors are significantly more important (by a factor of 2 to 5) than economic factors in explaining the variation in attitudes toward immigration policy. These non-economic factors prove particularly crucial when the host country is confronted with an immigrant population

[7] Our results do not depend on the setting of an optimal quota and/or the imposition of a visa. Similar results can be obtained by considering free immigration as the alternative policy. Under this simple alternative, host countries would not maximise the welfare effects of immigration flows, and migration from country *C* would continue until wages were equalised.

[8] In this simple model, we do not consider welfare effects resulting from changes in final good prices.

[9] Japan is an emblematic example of the dominance of non-market forces in determining immigration policy. It is well known to policymakers that increased immigration would be economically beneficial in a country with a rapidly shrinking working-age population. However, highly restrictive immigration policies arise due to public worries over the potential social consequences of immigration into a largely homogenous society.

that is widely different, in social and economic terms, from the native population and therefore less likely to integrate smoothly into host country society.

To capture both sets of immigration policy drivers, we define the welfare function of a host country as the sum of national income (including immigration tax revenues), a disutility term capturing indirect non-economic effects of immigration,[10] and fixed enforcement spending:

$$W_j = r_j K + w_j L_j + R_j - h_j(\hat{Q}_j) - \bar{C}_j \tag{1}$$

where R_j denotes the income generated by the collection of the immigration-tax, $\hat{Q}_j$ denotes the average quality of immigrants into country *j*, measured in terms of an observable ability or skill of migrants (e.g. host country language proficiency), and $\bar{C}_j$ denotes the cost of internal and external border control enforcement to detect and deport illegal workers. For simplicity, we assume that border control enforcement spending is constant regardless of the number of illegal workers due to rigidities in government budget allocations.[11] With this formulation, we consider a disutility (essentially a negative externality from immigration) that is decreasing in the average quality of immigrants. In fact, we assume $h_j' < 0$ and $h_j'' > 0$.

Given our interest in analysing the consequences of heterogeneous immigration policies, we consider the case of host-country differences in the disutility of immigrant inflows. We assume that country *A* is more concerned than country *B* about the social consequences of immigration; hence $h_A(\hat{Q}) > h_B(\hat{Q})$ for all $\hat{Q}$.

Note that in this simple neo-classical model, an increase in immigration has a positive effect on the host country's national income – i.e. the standard *immigration surplus* related to the dominance of capital holders' gains over native workers' losses.[12]

[10] In their recent paper on immigration attitudes, Card et al. (2012) define this non-economic set of immigration policy determinants as 'compositional amenities', i.e. changes in utility derived from social interactions (through neighbourhoods, schools, or workplaces) that are directly related to immigration.
[11] We thank an anonymous referee for suggesting the inclusion of enforcement spending in the welfare function. In this version of the model, we assume, without loss of generality, that the costs of external and internal border control are fixed. At least in the short run this is likely to be the case, since most such expenditures are related to policies that are unlikely to change rapidly as a consequence of changes in the number of immigrants.
[12] In the extreme case in which natives do not experience negative social consequences from migration,

When the chosen immigration policy is a qualitative restriction, the immigration tax revenue in eq. (1) is $R_j = 0$. Increasing immigration generates economic benefits yet simultaneously increases social costs due to the decreasing quality of the immigrants. When the immigration policy consists of a quantitative restriction (quota), the average quality of the immigrants is independent of the quota level, since all origin country individuals are equally likely to migrate, irrespective of their characteristics/abilities. In this case, $R_j > 0$ and the host country will choose the quota that maximises the economic benefit of immigration. Note that the average quality of immigration into a given country depends on not only its own immigration policy but also that adopted in the alternative destination (i.e. there is an immigration policy externality). When deciding which alternative policy option to adopt, a given host country government will strategically consider the other government's decision.

In what follows, we first analyse the migration choice of individuals residing in origin country *C* under the two alternative immigration policy settings: qualitative restrictions with imperfect border control and a quantitative restriction with perfect border control.[13] We postpone discussion of the strategic aspects of policy-setting to Section 2.5.

2.2 Legal migration into the country with qualitative restrictions

Due to the existence of a wage gap, workers, if permitted, will migrate from country *C* to countries *A* and *B*. Let us consider the case where the government of country *j* (*A* or *B)* sets an observable ability threshold, $\overline{Q}$, as a minimum entry requirement—this would refer to required destination-specific capabilities, such as language proficiency. For the sake of simplicity, we assume that the capabilities' worth lies only in enabling

i.e. $h(\hat{Q}_j) = 0$, the welfare function is equivalent to national income; hence, countries will only maximise the economic benefits from migration.

[13] In what follows, we overlook the other two possible policy options: qualitative restrictions with perfect border control and quantitative restriction with imperfect border control. Given our interest in analysing the effects of heterogeneous policies, these alternatives appear less relevant. A qualitative restriction with perfect border control precludes any immigration policy externalities between the host countries, implying *de facto* isolation of the host country adopting it. On the other hand, a quantitative restriction with imperfect border control is essentially a 'free immigration' scenario, even less relevant for the purposes of our study. The reasons for this choice will become clearer in Section 2.5, when we discuss in more detail the two countries' strategic choices.

legal entry into the host country and can be acquired by would-be migrants at a cost equal to μ.[14]

As in Djajic (1989), newly born individuals in country C differ in their capacities to acquire the requisite abilities, $\overline{Q}$, needed to obtain an entry permit.[15] These inborn capacities can be measured by a continuous function, $p(i)$, where $p'(i) > 0$. Under a selective immigration policy the government is interested in allowing legal entry only to immigrants who possess a higher innate ability—i.e. those whom we define as high-quality immigrants. Let us assume that these capacities are continuously and uniformly distributed in country C in the interval $i \in [0,1]$. The accumulation of the required abilities by individual i at age $t(0 \le t \le T)$ is assumed to be given by:

$$Q(i,t) = p(i)q(t)\,, \qquad (2)$$

where $q(0) = 1, q'(t) > 0, q''(t) < 0$, and T denotes the retirement age. Individuals with a greater potential to learn can meet the requisite skill threshold faster and hence migrate at a younger age to country *j*, which adopts a qualitative restriction; in other words, they enjoy a longer post-migration life in the host country.

Once individuals have attained the required skill level, they depart immediately to country *j*. The following equation expresses the migration age for a legal migrant, τ, as a function of the required skill level and the individual's innate learning abilities $\overline{Q}, i$:

$$\tau = \Psi\left(i, \overline{Q}\right) \qquad (3)$$

where $\Psi_1 < 0$, $\Psi_2 > 0$ and τ is decreasing in i and increasing in $\overline{Q}$. The relationship between an individual's learning abilities and his or her age at migration is depicted by the $\overline{Q}\overline{Q}$ schedule in Figure 1.

[14] In the current framework, we restrict our analysis to the case in which the requisite skills are acquired only before migration. To simplify the model, we abstract without loss of generality from the possibility of acquiring the required level of ability while in the host country.
[15] Each generation is an exact replica of the previous one such that the distribution of skill-development within the population is constant over time. As the population in the origin country, N_C, is by assumption sufficiently large, we can treat every age group as a continuum of individuals with different abilities.

FIGURE 1 – ABOUT HERE

Given the autarkic capital/labour ratio, the wage for a worker in country *C*, w_C, is lower than that in country *j*; we also assume it is used entirely for immediate spending and not saved to sustain future consumption. In other words, the desired minimum level of consumption per period is, by assumption, lower than or equal to w_C. In the case of successful legal migration into a country with a qualitative restriction (at time τ, i.e. as soon as the qualitative requirement is attained), the income of the immigrant in every period of his or her remaining working life $\left(T-\tau\right)$ is equal to the wage rate $w_j^M (> w_C^M)$, where w_j^M denotes the wage rate of country *j* after migration. Individuals in country *C*, whose innate abilities are comparatively low, would attain the requisite skill level $\overline{Q}$ only at a late age $\tau\left(\rightarrow T\right)$, yielding a reduced potential post-migration spell. In fact, for individuals below a critical learning ability threshold, the expected returns from migration will not compensate for the cost, μ, of acquiring the destination-specific skills required for entry. Let the *marginal legal migrant* be an individual with innate ability $\underline{i}$ such that he is indifferent between migrating legally to country *j* (and incurring learning costs μ to do so) and remaining in home country *C*. Formally, this becomes:

$$(w_j^M - w_C^M)[T - \tau(\underline{i}, \overline{Q})] - \mu = 0 \tag{4}$$

where for simplicity's sake, we assume no inter-temporal discount factor. Individuals with innate abilities below $\underline{\boldsymbol{i}}$ will not invest in obtaining the requisite skill level, $\overline{Q}$, established by the host government. The area L_1 in Figure 1 represents the total number of legal migrants at each point in time in country *C* who migrate to country *A* (the country adopting the qualitative entry requirement $\overline{Q}$). Note that an increase in $\overline{Q}$ – i.e. a more restrictive selection policy – will reduce the number of legal migrants and meanwhile increase their average quality, as captured by the imposed criteria.

2.3 Illegal migration into the country with qualitative restrictions

In the country adopting a qualitative entry restriction, country *A*, legal migration does not erase the wage gap between host and origin countries. In what follows, we consider the case of imperfect enforcement of the qualitative restriction. If an individual in country *C* is unable to migrate through the 'main door' (i.e. legally), he/she still has a positive chance of migrating through the 'windows' (i.e. illegally). (Alternatively, he/she could migrate to the alternative destination; see Section 2.4). Obtaining a legal work visa in country *j* is the preferred choice for migrants, but this option, as described above, is regulated by a minimum entry requirement in terms of an observable ability ($\bar{Q}$), which is acquired at a cost (μ).

We assume that individuals are risk-neutral when deciding whether to migrate illegally. In addition, as potential illegal immigrants have not accumulated sufficient ability (e.g. they cannot speak the host country language well), they are less productive than domestic workers or legal immigrants. Thus, their wage rate, which is equal to the value of their marginal product, is discounted by δ, $(0<\delta<1)$. Illegal immigrants attempt to disguise themselves as legal, but the government undertakes every effort to reduce illegal residency and enforce immigration rules. If detected while trying to enter the country or working, an illegal immigrant is dismissed and deported.

Let $\rho \in [0,1]$ be the probability of detection in every period, known to potential illegal immigrants. In country *A*, under the assumption of constant enforcement cost, $\bar{C}_j$, ρ is a decreasing function of the total number of illegal immigrants, L_2. In other words, we consider the realistic situation in which the government's efforts to limit illegal immigration are limited by budget constraints. Thus, the probability of detection for each individual illegal worker decreases as the total number of illegal workers increases. We include in our analysis a per-period cost, equal to θ, associated with being an illegal immigrant and suppose that this arises from the need to disguise oneself or occurs as a result of a general disutility related to illegal status.

In the steady state, the expected income in each period of illegal immigrants in country *j* would be equal to that of those remaining in the home country – i.e. the wage rate in country *C*. Formally, this is given by:

$$\tilde{w}_j^M \equiv (1-\rho(L_2))\delta w_j^M + \rho(L_2) w_C^M - \theta = w_C^M \tag{5}$$

where we assume for simplicity that the cost of migration (and return) is null.

Using eq. (5), we can express W_j as a function of the legal entry requirement, $\bar{Q}$:

$$\begin{aligned} W_j &= r_j^M(L_1, L_2)K + w_j^M(L_1, L_2)L_j - h(\hat{Q}_j(L_1, L_2)) - \bar{C}_j \\ &= K(L_j + L_1 + \delta L_2) - \frac{a}{2}(L_j + L_1 + \delta L_2)^2 - \frac{b}{2}K^2 - h(\hat{Q}_j(L_1, L_2)) - \bar{C}_j \\ &\equiv W_j(\bar{Q}) \end{aligned} \tag{6}$$

where $L_1 = L_1(\bar{Q}),\ L_2 = L_2(L_1(\bar{Q}))$, and $\partial L_1 / \partial \bar{Q} < 0$.[16] Note also that $\partial L_2 / \partial L_1 < 0$, since a decrease in the number of legal workers leads to an increase in the number of illegal ones. In fact, a higher L_1 reduces the wage gap between country *j* and *C* and, in turn, L_2. This latter effect is only partly mitigated by a change in the probability of detection, $\rho(L_2)$. For this reason, in our approach legal and illegal flows are substitutes: an attempt to reduce legal immigration is likely to increase the number of illegal immigrants and vice versa.

Equation (6) allows us to consider how an increase in the legal entry requisite skill level $\bar{Q}$ affects welfare in the host country. This overall effect can be decomposed into two parts. On the one hand, a change in average worker quality in the host country will have potential welfare implications. On the other hand, the policy change will affect the total stock of (legal and illegal) immigrant labour and thus impact the economic welfare of native workers (i.e. via the immigration surplus). In our one-final-good model with two factors of production, following MacDougal (1960), the effect of an immigration-caused change in total labour supply on national income in the host country is straightforward: the host country's economic welfare increases or decreases in tandem with the total labour supply. In fact, an expansion of the labour supply generates positive gains for capital owners that always outweighs the negative effects experienced by the native workforce.

The overall effect of a change in legal entry requirements will hence depend on the relative size and direction of two effects: the negative externality associated with a

[16] From eq. (3) we know that an increase in the requisite skill level $\bar{Q}$ increases the migration age τ for all individuals *i* and thus reduces L_1.

change in immigrants' quality and the labour market gains (or losses) due to immigration.

Returning to eq. (6), the effect of a change in $\overline{Q}$ on the average quality of all immigrants is ambiguous. In fact, immigrants' average quality is increasing in L_1 and decreasing in L_2: respectively, $\partial\hat{Q}_j / \partial L_1 > 0$ and $\partial\hat{Q}_j / \partial L_2 < 0$. The effect of a change in $\overline{Q}$ on the national income of country *j* might be positive or negative depending on the magnitude of two opposing effects. Increasing $\overline{Q}$ leads to a negative effect, as there is a decrease in the labour offered by legal immigrants, but also a positive effect through the increase in labour offered by illegal immigrants.

From eq. (5), recalling that $dw_j^M / dL_2 = \delta(dw_j^M / dL_1)$ and $dw_C^M / dL_2 = dw_C^M / dL_1$, and assuming a sufficiently small $\rho'(L_2)$ and sufficiently large δ (close to 1), we can obtain the total derivative of a change in L_1 on L_2:

$$-\frac{1}{\delta} > \frac{dL_2}{dL_1} = -\frac{\Omega}{\tilde{\Omega} - \rho'(\delta w_j^M - w_C^M)}, \text{ or } -1 > \frac{d\delta L_2}{dL_1} \qquad (7)$$

where $\Omega \equiv (1-\rho)[\partial(\delta w_j^M - w_C^M) / \partial L_1] < 0$

and $\Omega < \tilde{\Omega} \equiv (1-\rho)[\partial(\delta w_j^M - w_C^M) / \partial L_2] = (1-\rho)[\partial(\delta^2 w_j^M - w_C^M) / \partial L_1] < 0$ [17].

Considering eq. (7), we note an interesting effect of a more selective immigration policy. If the government increases the entry skill threshold $\overline{Q}$, the resulting decrease in L_1 will indeed lead to an increase in the wage gap between country *j* and country *C*. From eq. (5), we know that this increased wage gap will encourage illegal immigration, thereby producing an increase in L_2. The decrease in the number of legal immigrants, L_1, is more than compensated for by an increase in the efficiency of labour offered by illegal immigrants, δL_2. We label this increase in total migration resulting from an increase in requisite legal entry skills as the '*boomerang effect*'. The magnitude of this effect is larger when $\rho(L_2)$, i.e. the probability of detection with respect to L_2, is

[17] Total differential of (5) with respect to L_1 on L_2 yields
$\{-\rho'(\delta w_j^M - w_C^M) + (1-\rho)[\partial(\delta w_j^M - w_C^M) / \partial L_2]\} dL_2 + (1-\rho)[\partial(\delta w_j^M - w_C^M) / \partial L_1] dL_1 = 0$.

relatively elastic. A corollary of this effect is the enhancement of national income in country *j* due to an increase in the skill level required for legal entry.

Turning to the latter results and therefore assuming an elastic $\rho(L_2)$, we can express the welfare effect of a change in $\bar{Q}$ from eq. (6), as follows:

$$\frac{\partial W_j}{\partial \bar{Q}} = \frac{\partial L_1}{\partial \bar{Q}}\{(1+\frac{d\delta L_2}{dL_1})[K - a(L_j + L_1 + \delta L_2)] - \frac{\partial h_j}{\partial \hat{Q}_j}(\frac{\partial \hat{Q}_j}{\partial L_1} + \frac{\partial \hat{Q}_j}{\partial \delta L_2}\frac{\partial \delta L_2}{\partial L_1})\},$$

where the second term within the braces, $-\frac{\partial h_j}{\partial \hat{Q}_j}\frac{d\hat{Q}_j}{dL_1} = -\frac{\partial h_j}{\partial \hat{Q}_j}(\frac{\partial \hat{Q}_j}{\partial L_1} + \frac{\partial \hat{Q}_j}{\partial \delta L_2}\frac{\partial \delta L_2}{\partial L_1})$, is positive in sign and, from eq. (7), the first term within the braces is negative. Recalling the assumption that $h_j' < 0$ and $h_j'' > 0$, we can assert that as long as $h_j'' > 0$ is sufficiently large there exists an optimal skill level, $\bar{Q}*$, which satisfies the optimality condition $W_j'(\bar{Q}*) = 0$ and eq. (8):

$$w_j^M(1+\frac{d\delta L_2}{dL_1}) - [\frac{\partial h_j}{\partial \hat{Q}_j}\frac{d\hat{Q}_j}{dL_1}] = 0\,. \tag{8}$$

2.4 Migration into the country with a quantitative restriction

We now consider the case of a host country (country *B* in our stylised example) adopting a quantitative restriction – i.e. an immigration quota – that is jointly determined by the application of an *entry tax* (i.e. a work visa fee). Suppose that the government of the receiving country is able to extract rents from immigrants in order to maximise natives' economic welfare, i.e. the national income. Let us assume that, for this purpose, the entry tax is imposed at the beginning of the migration spell and is a necessary prerequisite for immigrating to country *j* (where $j \in [A, B]$). In other words, we are assuming that one country is able to fully enforce the entry tax and avoid illegal immigration.[18] In equilibrium, the following equation must hold:

$$T(w_j^M - w_C^M) = v \tag{9}$$

where *v* is the tax rate (i.e. the work visa fee). Equation (9) implies that the equilibrium wage differential between host and origin countries in each period should equal *v/T*. Furthermore, the entry tax will jointly determine the immigration quota, i.e. the number of individuals who migrate from country *C* to country *j*.[19]

FIGURE 2 – ABOUT HERE

Wages are set in competitive markets, and marginal products of labour are given by decreasing functions of the equilibrium labour stock. This is shown in Figure 2, which represents the case of country *j* adopting an immigration quota. The *BB'* (*CC'*) line depicts the relationship between labour input and marginal product of labour in country *j* (country *C*). In the figure, OO^* equals the total joint labour endowment of countries *j* and *C*, where we assume that the origin country, *C*, is large (i.e. $L_j < L_C$). The host country's optimal immigration quota, set jointly with the entry tax *v*/T, is defined as L_3 (see Figure 2) and, from a welfare perspective, is preferable to allowing free immigration.[20]

[18] In principle, country *A* – the country that we assumed less able to enforce border controls – could choose a quantitative restriction. We do not discuss this case here, since the ensuing result is relatively straightforward and does not qualitatively change our results. The quota would be rather ineffective and determined by the following expression (similar to eq. (5)) defining the marginal illegal immigrant: $\tilde{w}_j^M \equiv (1-\rho(L_2))\delta w_j^M + \rho(L_2) w_C^M - \theta = w_C^M = w_j^M - v/T$

In other words, the tax that can be imposed cannot exceed the expected income of an illegal immigrant (which in equilibrium is also equal to the equilibrium wage in the origin country). Note also that, for a country with a welfare function that weighs the social costs associated with low-quality immigration relatively highly, the choice of a quota is sub-optimal. This will be discussed further in the next section.

[19] In the real world, several countries do extract rents from immigrants by imposing (often very high) visa fees, such as for special visas granted to investors. Examples include the Canadian Investor program and the UK's Tier 1 Investor Visa.

[20] Let us consider the case where *j*=*B*. In this case, the national income of country *B* is simply equal to the sum of domestic capital income and labour income. As we focus on income generated by native factors of production, immigrants' income is not included. In autarky, domestic labour income and capital income are given by the Areas *ODER* (= $w_B^A L_B^A$, where w_B^A denotes autarkic wage rate) and *BDE*, respectively, in Figure 2. Therefore, the total national income is equal to the Area *OBER*. In the case of free migration,

Note that the optimal entry tax set by the government of host country *j* is:

$$v^* = \frac{1}{3} aT(L_C - L_j) \tag{10}$$

v^* is represented in Figure 2, where the area *EMNH* represents the welfare benefits to the host country from immigration.[21]

The immigration quota L_3 (i.e. the number of immigrants flowing from country *C* to the host country adopting a quantitative restriction) and the economic welfare of the host country, W_j, can be written respectively as:

$$L_3 = \frac{1}{3}(L_C - L_j) \tag{11}$$

$$W_j = r_j K + w_j L_j + T - h(\hat{Q}_j) - \bar{C}_j = -\frac{a}{2} L_j^2 + (K - \frac{a}{6}) L_j + \frac{a}{6} L_C - h(\hat{Q}_j) - \bar{C}_j \tag{12}$$

Note that in the absence of migrant flows from country *C* to the alternative destination (i.e. country *A*), the average innate ability of foreign workers in the country adopting the

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immigration from *C* to *B* will equalise wages in equilibrium to $w_B^{FM} = w_C^{FM}$. Thus, the total number of immigrants will be L_3^{FT}. In the case of free migration, domestic labour and capital income will respectively be given by Areas *OPVR* (= $w_B^{FM} L_B$) and *BPQ*. National income (given by Area *EVQ*) will be larger than in the case of autarky. It is widely known that under the MacDougal (1960) model, both host and source countries benefit from free factor mobility compared with autarky. Nevertheless, MacDougal (1960) and subsequent contributions highlight that if the goal is maximising host country national income (or welfare), an optimal tax on immigrants' income is welfare-improving and superior to the free immigration case. As shown in Figure 2, the intuition behind this result is straightforward. In the case of an entry tax, the host country is able to 'extract' part of the gains achieved by immigrants. From eq. (9), a difference in gross wage rates between countries *B* and *C* will exist after controlled immigration, but there is no difference in net income for an immigrant in the two countries. In case of an optimal quota/entry tax, the total income of domestic labour is given by Area *OFGR* (= $w_B^M L_B$), whereas Areas *BFH* and *GHNM* give the capital income and total tax revenue collected from immigrants, respectively. National income can then be expressed by Area *OBHNMR*. Compared with the case of free immigration, national income under well-controlled immigration is larger by Area (*VWNM* – *HQW*), which can be maximised by setting an optimal tax rate.

[21] In Figure 2, the segments *RE*, *SH*, and *RM* are, respectively, $K - aL_B$, $K - a(L_B + L_3)$, and $K - a(L_C - L_3)$. Therefore, the size of area S can be expressed as $aL_3(L_c - L_B - 3L_3/2)$, which is a function of L_3. The optimal level of L_3, which maximises S, is given by $(L_C - L_B)/3$.

quantitative restriction, $\hat{Q}_j$, will be constant and equal to that in country *C* (i.e. ½, assuming a uniform and continuous distribution over the interval $i \in [0,1]$). We must also note that the cost of complete border control, $\overline{C}_j$, which guarantees the ability to apply the entry tax, is also constant. By assumption, the likelihood of obtaining an entry visa is independent of individual abilities and hence does not vary with the number of immigrants, L_3.

2.5 On the optimal choice of the immigration policy instrument

The two host countries differ with respect to the disutility derived from the immigration of low-skill individuals as well as in their capacity to enforce border controls and avoid illegal immigration. In particular, the weight of the 'social cost' of immigration inflows is higher in country *A* than in country *B* (i.e. $h_A\left(\hat{Q}\right) > h_B\left(\hat{Q}\right)$).

Each country will choose between the two alternative policy regimes analysed above: selective immigration policy based on an observable skill threshold in would-be immigrants, $\overline{Q}*$, and the (indirect) quota, $v*$. The decisions are not wholly independent: a given country's immigration policy affects the migration choices of individuals in origin country *C*, thus generating externalities for the alternative destination country. This implies that the policy choice can be analysed in a strategic setting, as represented in Table 1, in which there are four possible equilibria. We will use subscripts *s* and *q*, respectively, to denote the selective immigration policy and the immigration quota. Each equilibrium is represented by a policy choice pair, $xy \in [ss, sq, qs, qq]$, where the first choice is that made by country *A* and the second that of country *B*.

Table 1 – The set of immigration policies in the host countries

	Country *B*	
Country *A*	***ss*** *Selective policies in both countries ($\overline{Q}^*_{A,ss} > \overline{Q}^*_{B,ss}$)*	***sq*** *Selective policy in A ($\overline{Q}^*_{A,sq}$); Migration quota in B ($v^*_{B,sq}$)*
	qs *Migration quota in A ($v^*_{A,qs}$); Selective policy in B ($\overline{Q}^*_{B,qs}$);*	***qq*** *Migration quotas in both countries ($v^*_{A,ss} = v^*_{B,ss}$)*

The optimal policy choice in each country will depend on the values of several parameters in the model specified above, such as the importance of negative externalities related to immigrants' skills, the effectiveness of law enforcement against illegal migrants, and the relative size of country *C's* population.

Given our interest in analysing the role of the heterogeneous disutility of immigration (the term $h\left(\hat{Q}\right)$ in the welfare function above), the average quality of immigrants under the four possible equilibria plays a crucial role in the strategic policy decision. Table 2 presents a matrix of average immigrant quality in both host countries. Note that the optimal requisite skill level for legal entry will be higher for country *A*, $\overline{Q}^{*}_{A,ss} > \overline{Q}^{*}_{B,ss}$. In contrast, if both countries adopt a quota (*qq*), their optimal choices will be identical, since in that case immigrant quality will be constant (at ½) and independent of the size of the migrant inflows ($v^{*}_{A,ss} = v^{*}_{B,ss}$).

Based on our assumption that $h_A\left(\hat{Q}\right) > h_B\left(\hat{Q}\right)$, we can rule out the policy pair ***qs*** as a Nash equilibrium. Country *A* has a stronger incentive than country *B* to prioritise high-skill immigrants, particularly when *B* also implements a selective policy. In fact, if country *B* sets its legal entry requisite skill level to $\overline{Q}_B$ (which is relatively low, given the marginal importance attached to the social characteristics of migrants' in the welfare function) and country *A* employs a quota, then the average innate ability level of immigrants to *A* would be $\underline{i}_B / 2$. Hence, only very-low-ability individuals would migrate to country *A*, generating a high disutility level for the native population. The more able immigrants migrate to the country with the qualitative restriction policy, since the expected post-migration income (equal to w^M_A minus the cost of acquiring the requisite skills) is higher than the alternatives (i.e. the expected income for illegal immigrants to country *A*, $\tilde{w}^M_A$, the after-entry-tax income obtained by migrating to country *B* under a quota, $w^M_B - v/T$, or the labour income earned by staying in country *C*,

w_C^M).[22] Therefore, if country *B* adopts a quota, individuals with innate abilities $i \in [\underline{i}, 1]$ will migrate to country *A*, and the average quality of immigrants to country *B* would be $\underline{i}/2$.

The symmetric policy choices – i.e. policy pairs ***ss*** or ***qq*** – will be Nash equilibria either if both countries attach little or no weight in the welfare function to the negative externality from immigration ($h_A\left(\hat{Q}\right), h_B\left(\hat{Q}\right) \square\ 0$) or if both countries' welfares are highly dependent on immigrants' skill/ability levels.

Table 2 – Immigration policy choices and the average quality of immigrants

		Country B	
Country A		*Selective policy (s)*	*Migration quota (q)*
	Selective policy (s)	$\frac{\left(1+\underline{i}_{A,ss}\right)L_{1,ss}^A+\underline{i}_{B,ss}L_{2,ss}^A}{2\left(L_{1,ss}^A+L_{2,ss}^A\right)};\frac{\left(1+\underline{i}_{A,ss}\right)L_{1,ss}^A+\left(\underline{i}_{A,ss}+\underline{i}_{B,ss}\right)\left(L_{1,ss}^B-L_{1,ss}^A\right)+\underline{i}_{B,ss}L_{2,ss}^B}{2\left(L_{1,ss}^B+L_{2,ss}^B\right)}$	$\frac{\left(1+\underline{i}_{A,sq}\right)L_{1,sq}^A+\underline{i}_{A,sq}L_{2,sq}^A}{2\left(L_{1,sq}^A+L_{2,sq}^A\right)};\frac{\underline{i}_{A,sq}}{2}$
	Migration quota (q)	$\frac{\underline{i}_{B,qs}}{2};\frac{\left(1+\underline{i}_{B,qs}\right)L_{1,qs}^B+\underline{i}_{B,qs}L_{2,qs}^B}{2\left(L_{1,qs}^B+L_{2,qs}^B\right)}$	½; ½

In the extreme case where country *B*'s welfare does not depend on the quality of immigrants ($h_B\left(\hat{Q}\right) \square\ 0$), then country *B*'s dominant strategy is to adopt an optimal quota. In this situation, country *A* can attract higher-quality immigrants by adopting a selective immigration policy and choosing a legal entry requisite skill level that satisfies the following condition[23]: $\overline{Q}_A \equiv \underline{i}_A > L_2^A / \left(L_1^A + L_2^A\right)$.

In what follows, we investigate the case in which the two host countries select different policy options: country *A* adopts a selective policy, whereas country *B* adopts an immigration quota (i.e. policy pair ***sq*** in Table 1). This policy outcome will be the Nash equilibrium of the strategic policy game whenever, as assumed here, country *A*'s government is highly sensitive to immigrants' quality or country *B* is strongly motivated by the standard economic gains from immigration.[24]

[22] In equilibrium, these three alternative expected incomes are identical.

[23] This condition is obtained by considering the average quality of migrants in the two policy pairs ***sq*** and ***qq,*** as given in Table 2, i.e. $\frac{\left(1+\underline{i}_A\right)L_1^A+\underline{i}_A L_2^A}{2\left(L_1^A+L_2^A\right)} > \frac{1}{2} \Rightarrow \underline{i}_A > \frac{L_2^A}{L_1^A+L_2^A}$

[24] As mentioned above, we focus on the interesting – and probably more realistic – case of host countries implementing heterogeneous immigration policies. As argued in the introduction, governments have

Before proceeding to the analysis, given the existence of two alternative destinations for potential migrants from country *C*, we redefine eqs. (10)-(12) as follows:

$$v^* = \frac{1}{3} aT(\tilde{L}_C - L_B), \tag{10'}$$

$$L_3 = \frac{1}{3}(\tilde{L}_C - L_B), \tag{11'}$$

$$W_B = -\frac{a}{2} L_B^2 + (K - \frac{a}{6}) L_B + \frac{a}{6} \tilde{L}_C - h(\hat{Q}_B) - \bar{C}_B, \tag{12'}$$

where $\tilde{L}_C = L_C - L_1 - L_2$ (i.e. the population in country *C* net of legal and illegal migrants to country *A*) and $\hat{Q}_B = \underline{i}/2$ is the average quality of immigrants in country *B*, which adopts the quantitative restriction.

We now have the following system:

$$(1 - \rho(L_2))(\delta w_A^M - w_C^M) = \theta, \tag{5'}$$

$$[K - a(L_1 + \delta L_2)](1 + \frac{d\delta L_2}{dL_1}) - [\frac{\partial h_A}{\partial \hat{Q}_A} \frac{d\hat{Q}_A}{dL_1}] = 0, \tag{8}$$

where the wage rates in countries *A* and *C* are endogenously determined and depend upon the distribution of population between the three countries:

$$w_A^M = K - a(L_A + L_1 + \delta L_2), \tag{13}$$

$$w_C^M = K - a(L_C - L_1 - L_2 - L_3) = K - a(\frac{2}{3} L_C - \frac{2}{3} L_1 - \frac{2}{3} L_2 + \frac{1}{3} L_B). \tag{14}$$

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different attitudes toward immigration flows and hence implement alternative policy regimes. Other policy settings can be analysed via the same modelling framework; for instance, one could consider a case in which both countries adopt a skill-selective immigration policy or one in which illegal migration is possible in both countries. We leave this analysis for future work.

Substituting eqs. (13) and (14) into eq. (5'), we obtain two equations with two endogenous variables, L_1 and L_2.[25] The system above will determine the immigration outflows from country *C* to country *A*. Under given values of the exogenous parameters L_A, L_B, L_C, μ, and θ, the requisite skill level $\bar{Q}$ is determined by:

$$L_1 = L_1(\bar{Q}, \mu, w_A^M, w_C^M), \tag{4'}$$

Finally, the wage rate in country *B*, w_B^M, is determined by the following equation, which completes the model:

$$w_B^M = K - a(L_B + L_3) = K - a(\frac{4}{3}L_B - \frac{1}{3}L_C + \frac{1}{3}L_1 + \frac{1}{3}L_2). \tag{15}$$

3. Economic integration and free mobility of native workers

In this section, we consider the consequences of deeper economic integration between the alternative host countries. In the analysis above, the initial state of the world prior to migration from country *C* assumed that internal mobility was neither allowed nor desirable for immigrants due to identical wages in the two developed countries. We now examine the welfare effects of native workers' mobility between country *A* and country *B*, which adopt heterogeneous immigration policies as specified above. Namely, we consider the case in which a common economic area between countries *A* and *B* allows for internal migration flows. When immigration takes place from country *C*, heterogeneous immigration policies translate into a divergence in wage rates, $w_A^M \neq w_B^M$, and hence induce internal mobility between countries *A* and *B*, if

[25] Equation (7) can also be rewritten as follows: $\frac{d\delta L_2}{dL_1} = -\frac{-\delta\frac{5a}{3}(1-\rho)}{-\frac{(3\delta+2)a}{3}(1-\rho) - \rho'(\delta w_A^M - w_C^M)}$ and we can conclude $\frac{d\delta L_2}{dL_1} < -1$ in case that $\rho' < 0$ and δ is close to 1.

permitted after economic integration. Post-integration, as in the current EU, citizens of any member state can move freely within the common economic area's boundaries.

In our model, two possible scenarios unfold according to the direction of migration flows between the two host countries (*A* and *B*) after immigration from country *C* has taken place:

Case 1: $L_A + L_1 + \delta L_2 < L_B + L_3$,
Case 2: $L_A + L_1 + \delta L_2 > L_B + L_3$.

Remembering that $K_A = K_B$, the direction of intra-area migration in Case 1 will be from country *B* to country *A*, since $w_A^M > w_B^M$ at equilibrium. In Case 2, $w_A^M < w_B^M$ and domestic workers from country *A* will migrate to country *B*.

We now consider the effects of a change in the population distribution between countries *A* and *B* on immigration from the third country, *C*. Applying (5') and (8), the economic welfare of country *A* can be expressed as:

$$\begin{aligned}
&\frac{dW_A}{dL_A} - \frac{dW_A}{dL_B} \\
&\quad = \frac{\partial W_A}{\partial L_A} + \left(\frac{\partial W_A}{\partial (L_1 + \delta L_2)} + \frac{\partial W_A}{\partial \hat{Q}_A}\frac{\partial \hat{Q}_A}{\partial (L_1 + \delta L_2)}\right)\left[\frac{d(L_1 + \delta L_2)}{dL_A} - \frac{d(L_1 + \delta L_2)}{dL_B}\right] \qquad (16) \\
&\quad - w_A^M \\
&\quad = \frac{\partial W_A}{\partial L_A} - w_A^M = L_A \frac{\partial w_A^M}{\partial L_A} + w_A^M + K_A \frac{\partial r_A^M}{\partial L_A} - w_A^M = -aL_A + K_A > 0
\end{aligned}$$

(See the appendix for a detailed calculation of the sign of $\frac{d(L_1 + \delta L_2)}{dL_A} - \frac{d(L_1 + \delta L_2)}{dL_B}$).

The economic welfare of each country, eq. (1), is measured by national income, excluding immigrants' income but including that of citizens employed abroad.[26] Thus, eq. (16), which measures the welfare effect of immigration from country *B* to country *A*, consists of three parts: i) the direct effect of population increase on total GDP; ii) the indirect effect arising from the induced change in total immigration from country *C*; and iii) the (negative) immigrants' share of GDP. Because of country *A's* optimal welfare-

[26] In a previous version of this paper, available upon request, we consider the alternative case in which countries maximise domestic GDP rather than GNI.

maximising condition, eq. (8), which implies $\frac{\partial W_A}{\partial(L_1+\delta L_2)}+\frac{\partial W_A}{\partial \hat{Q}_A}\frac{\partial \hat{Q}_A}{\partial(L_1+\delta L_2)}=0$, and the properties assumed for the production function, the sign of (16) is always positive. We can thus conclude that in Case 1 (2), international migration of domestic workers from country *B* to country *A* (*A* to *B*) will improve (reduce) the economic welfare of country *A*.

From (12), we analyse the welfare change experienced by country *B* as follows:

$$\frac{dW_B}{dL_B}=-aL_B+K_B-\frac{a}{6}, \tag{17}$$

$$\frac{dW_B}{d(L_1+\delta L_2)}=-\frac{a}{6}-\frac{\partial h_B}{\partial \hat{Q}_B}\frac{\partial \hat{Q}_B}{\partial(L_1+\delta L_2)}, \tag{18}$$

$$\begin{aligned}\frac{dW_B}{dL_A}-\frac{dW_B}{dL_B}&=\frac{\partial W_B}{\partial L_B}+\frac{\partial W_B}{\partial(L_1+\delta L_2)}[\frac{d(L_1+\delta L_2)}{dL_A}-\frac{d(L_1+\delta L_2)}{dL_B}]-w_B^M\frac{\partial L_B^M}{\partial L_B^M}\\&=-aL_B+K-\frac{a}{6}+(-\frac{a}{6}-\frac{\partial h_B}{\partial \hat{Q}_B}\frac{\partial \hat{Q}_B}{\partial(L_1+\delta L_2)})[\frac{d(L_1+\delta L_2)}{dL_A}-\frac{d(L_1+\delta L_2)}{dL_B}]\\&\quad-w_B^M\\&=-\frac{a}{3}-\frac{\partial h_B}{\partial \hat{Q}_B}\frac{\partial \hat{Q}_B}{\partial(L_1+\delta L_2)}[\frac{d(L_1+\delta L_2)}{dL_A}-\frac{d(L_1+\delta L_2)}{dL_B}]\end{aligned} \tag{19}$$

where $\frac{\partial \hat{Q}_B}{\partial(L_1+\delta L_2)}>0$ since an increasing immigrant population in country *A* implies a lower average quality of immigrants in that country and a higher average quality in country *B*. The sign of (19) is generally ambiguous, but by assuming a sufficiently small a (marginal growth rate of the marginal product), we can assert that (19) should be positive. Thus, in Case 1 (2), country *B* also gains (loses) from migration between the two developed countries.

PROPOSITION: Consider the case of economic integration between two countries with free labour mobility for native workers; country *A* adopts a qualitative restriction on immigration that is sufficiently selective but imperfectly effective, and country *B* adopts a quantitative restriction. If wage rates diverge and migration occurs under certain conditions, then both countries will gain when individuals migrate from *B* to *A* but lose in the case of migration from *A* to *B*.

The above proposition suggests that internal migration between two developed countries implementing heterogeneous immigration policies can have either win-win or lose-lose results. The direction of the wage gap between the two countries is crucial for establishing the final outcome of internal migration.

This result can be intuitively explained as follows. In Case 1, if there is migration from country *B* to country *A*, wages in country *A* decrease, thereby reducing the incentive to legally migrate from country *C* and increasing the incentive to migrate illegally (as a consequence of the 'boomerang effect' described above). Thus, the overall number of immigrants from country *C* to country *A* increases, and their average quality declines. Country *A* can optimally re-adjust the entry requirement in order to neutralise the negative effects of low-quality immigrants; overall, however, country *A* gains from internal mobility due to increased national income. On the other hand, the marginal product of labour in country *B* should increase following the outflow of domestic workers. Thus, the *BB'* line in Figure 2 shifts upwards, making it possible to expand the (optimal) size of area *S*. If this positive effect is greater than the negative effect of a decreasing population (and national income), we can conclude that country *B* also gains.

4. Concluding Remarks

The past decades have witnessed increasing regional and multilateral harmonisation and coordination of economic and social policies related to global interactions, such as trade agreements, international financial regulations, international investment rules, and fiscal policy coordination. International migration flows are a key exception to this trend: wealthy countries show few signs of reducing their sovereignty over immigration policy, even in areas with strong policy integration, such as the European Union.

In this paper, we consider the relevant case of two developed destination countries that differ in their abilities to control illegal migration and have heterogeneous immigration policies. One imposes an immigration quota, while the other uses qualitative restrictions based on an entry requirement aimed at selecting immigrants with 'desirable characteristics' from the perspective of the host country. Using a simple three-country model, we investigate the welfare effects of native workers' mobility between the two developed countries. We find that internal migration, perhaps enhanced by labour market integration, can lead to a win-win or lose-lose situation depending on the wage gap between the two countries. The results have important policy implications, particularly for countries (such as EU member states) that have tightly integrated markets and represent alternative destinations for third-country citizens but continue to apply differential immigration policies toward them.

APPENDIX

This section presents a detailed calculation of the sign of $\frac{d(L_1+\delta L_2)}{dL_A}-\frac{d(L_1+\delta L_2)}{dL_B}$) in eq. (16). First, assume $\frac{\partial Q_A}{\partial L_j}$ is constant near equilibrium. Fully differentiating (5') and (8) yields the following matrix:

$$\begin{bmatrix} -a(1+\frac{d\delta L_2}{dL_1})+(w_A^M-\frac{\partial h_A}{\partial \hat{Q}_A}\frac{\partial \hat{Q}_A}{\partial \delta L_2})\Psi & -a(1+\frac{d\delta L_2}{dL_1})+(w_A^M-\frac{\partial h_A}{\partial \hat{Q}_A}\frac{\partial \hat{Q}_A}{\partial \delta L_2})\Phi \\ -\frac{5a}{3}(1-\rho)\delta & -\frac{3\delta+2}{3}a(1-\rho)-\rho'(\delta w_A^M-w_C^M) \end{bmatrix}\begin{bmatrix} dL_1 \\ d\delta L_2 \end{bmatrix} \quad \text{(A1)}$$

$$=\begin{bmatrix} 0 \\ a(1-\rho) \end{bmatrix} dL_A+\begin{bmatrix} 0 \\ -\frac{a}{3}(1-\rho) \end{bmatrix} dL_B,$$

where
$$\Psi=\frac{\partial^2 L_2}{\partial L_1^2}=\frac{-\frac{5a}{3}(1-\rho)\delta\rho'(\frac{\partial \delta w_A^M}{\partial L_1}-\frac{\partial w_C^M}{\partial L_1})}{\{\frac{3\delta+2}{3}a(1-\rho)+\rho'(\delta w_A^M-w_C^M)\}^2}$$

and
$$\Phi=\frac{\partial^2 L_2}{\partial L_1 \partial L_2}=\frac{-\frac{3\delta+2}{3}a(\rho')^2(\delta w_A^M-w_C^M)-\frac{3\delta+2}{3}a(1-\rho)\rho'(\frac{\partial \delta w_A^M}{\partial L_2}-\frac{\partial w_C^M}{\partial L_2})}{\{\frac{3\delta+2}{3}a(1-\rho)+\rho'(\delta w_A^M-w_C^M)\}^2}.$$

Remembering the assumptions that near the equilibrium point, $\frac{\partial \hat{Q}_A}{\partial L_1}$ ($\frac{\partial \hat{Q}_A}{\partial L_2}$) is positive (negative) in sign, ρ' is positive in sign and sufficiently small, as $\frac{\partial w_A^M}{\partial L_1}=\delta\frac{\partial w_A^M}{\partial L_2}$, and $\frac{\partial w_C^M}{\partial L_1}=\frac{\partial w_C^M}{\partial L_2}$, we can conclude that $\Psi>\Phi>0$ and thus that the determinant of the matrix of the LHS of (A1), Δ, is positive.

$$\frac{dL_1}{dL_A}-\frac{dL_1}{dL_B}=\frac{1}{\Delta}\begin{vmatrix} 0 & -a(1+\frac{d\delta L_2}{dL_1})+(w_A^M-\frac{\partial h_A}{\partial \hat{Q}_A}\frac{\partial \hat{Q}_A}{\partial \delta L_2})\Phi \\ \frac{4a}{3}(1-\rho) & -\frac{3\delta+2}{3}a(1-\rho)-\rho'(\delta w_A^M-w_C^M) \end{vmatrix}$$

$$=\frac{1}{\Delta}[a(1+\frac{d\delta L_2}{dL_1})-(w_A^M-\frac{\partial h_A}{\partial \hat{Q}_A}\frac{\partial \hat{Q}_A}{\partial \delta L_2})\Phi]\frac{4a}{3}(1-\rho),$$

(A2)

$$\frac{dL_2}{dL_A}-\frac{dL_2}{dL_B}=\frac{1}{\Delta}\begin{vmatrix} -a(1+\frac{d\delta L_2}{dL_1})+(w_A^M-\frac{\partial h_A}{\partial \hat{Q}_A}\frac{\partial \hat{Q}_A}{\partial \delta L_2})\Psi & 0 \\ -\frac{5a}{3}(1-\rho)\delta & \frac{4a}{3}(1-\rho) \end{vmatrix} \qquad \text{(A3)}$$

$$=-\frac{1}{\Delta}[a(1+\frac{d\delta L_2}{dL_1})-(w_A^M-\frac{\partial h_A}{\partial \hat{Q}_A}\frac{\partial \hat{Q}_A}{\partial \delta L_2})\Psi]\frac{4a}{3}(1-\rho),$$

$$\frac{dL_1+dL_2}{dL_A}-\frac{dL_1+dL_2}{dL_B}=\frac{1}{\Delta}[-(w_A^M-\frac{\partial h_A}{\partial \hat{Q}_A}\frac{\partial \hat{Q}_A}{\partial \delta L_2})(\Phi-\Psi)]\frac{4a}{3}(1-\rho)>0. \qquad \text{(A4)}$$

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Figure 1 – The Distribution of Labour Supply in Developing Country *C*

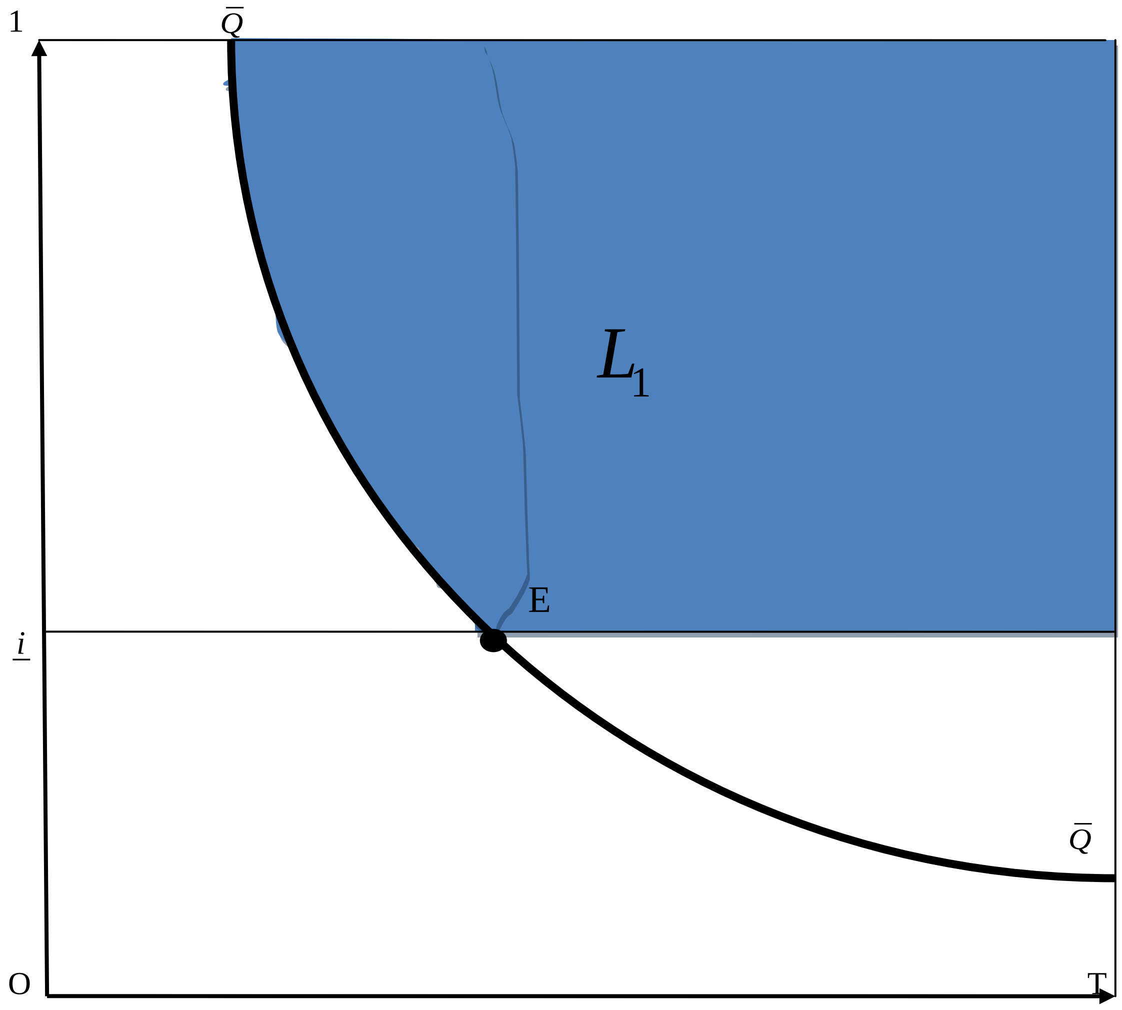

Figure 2 – Immigration Quota in Country *B*