Do Immigrants Make Us Safer? A Model on Crime, Immigration and the Labour Market

Thomas Bassetti, y Luca Corazzini, z Darwin Cortes, x Luca Nunziata

This version: October 2012

Abstract

We present a two-country equilibrium model with search costs in which the relationship between immigration and crime depends on the structural characteristics of the labour markets in the two economies. The main result of the model is that countries with a flexible labour market are likely to be associated with a negative relationship between immigration and crime. By combining data from the European Social Survey with the OECD Employment Protection Index, we find supporting evidence in favour of this theoretical prediction. Finally, we show how labour market policies can help in reducing crime.

Keywords: Crime Rate, Labour Market, Immigration.

JEL classification: J61, J64, K42.

*For useful comments, we thank Carlo Altomonte, Raphael Boleslavsky, Christopher Cotton, Bryan Engelhardt, Carlos Flores, Laura Giuliano, Francesco Passarelli, Dario Maldonado, Oscar Mitnik, Alberto Motta, Christopher Parmeter, Lorenzo Rocco, Francesco Sobrio, participants at the 2012 Workshop on Immigration and Crime organized by the University of Goettingen, the 2010 Spring Meeting of Young Economists, the 2011 BOMOPA Economics Meeting, the 2011 PET Conference and the lunch seminar at the University of Miami.

1 Corresponding author. University of Padua and CICSE. Department of Economics and Management "Marco Fanno," via del Santo, 33, 35123, Padova, Italy. emailto: thomas.bassetti(at)unipd.it

2 University of Padua and ISLA, Bocconi University. Department of Economics and Management "Marco Fanno," via del Santo, 33, 35123, Padova, Italy. emailto: luca.corazzini(at)unipd.it

3 Universidad del Rosario and CEIBA. Facultad de Economia. Carrera 5, No. 15-37, of. 601 Edificio Dávila, 110321, Bogota, Colombia. emailto:darwin.cortes(at)urosario.edu.co

4 University of Padua and IZA. Department of Economics and Management "Marco Fanno," via del Santo, 33, 35123, Padova, Italy. emailto: luca.nunziata(at)unipd.it
1 Introduction

‘Do immigrants make us safer?’ Among the "hot" issues faced by policymakers in industrialised countries, the relationship between immigration and crime is one of the most controversial. Natives in host countries generally perceive immigration as a source of criminality. By analysing data from the National Identity Survey during the period 1995-2003, Bianchi et al. (2012) report that the majority of the population in OECD countries is worried that immigrants increase crime, with the proportion of respondents in line with this view ranging from a low of 40% in the United Kingdom to a high of 80% in Norway (see also Martinez and Lee, 2000; Bauer et al. 2000).

Despite public opinion, the sign of the relationship between immigration and crime is still an open question for social scientists. While in some cases migration inflows are found to be positively correlated with the crime rate of the host country (Borjas et al, 2006; Alonso et al, 2008), several other studies report opposite conclusions (Bianchi et al, 2012; Sampson, 2008; Butcher and Piehl, 2007; Reid et al, 2005; Moehling and Piehl, 2007). On the other hand, the current theoretical literature does not provide any insight to explain the puzzling evidence as existing models either study the relationship between (un)employment and crime or focus on the economic determinants of the agents’ decision to migrate. In light of traditional theories of rational choice (Becker, 1968; Sah, 1991), agents decide to engage in criminal activities when the expected earnings from crime overcome the associated expected costs. Similarly, agents migrate to foreign countries when the expected net benefits from moving abroad are greater than the expected earnings from remaining home and participating in the domestic labour market. As far as we know, there are no theoretical contributions that build up a unified framework to analyse the simultaneous interplay between immigration, crime and the labour markets. In addition to make the setting more realistic, introducing both migration and crime as alternative economic opportunities to detrimental labour conditions allows us to study how the relationship between immigration and crime depends on the structural characteristics of the labour market in both the native and the host countries. Intuitively, it is reasonable to expect that the probability of an immigrant to commit a crime is affected by the flexibility of the labour market in the host country: indeed, the higher the capacity of the labour market "to absorb" new job-seekers, the lower the (economic) incentive of an immigrant to engage in

---

We present a two-country search model\(^2\) in which wages, migration flows and crime rates are simultaneously determined by the interplay between crime and the structural characteristics of the labour markets in the two countries. This study is aimed at providing a simple and intuitive theoretical framework to analyse the determinants of migration flows and to study how the labour market conditions of the two countries affect the relationship between immigration and crime.

Our main result is that immigration is beneficial for countries characterised by a (sufficiently) flexible labour market as, in these economies, migration inflows are likely to reduce the domestic crime rate. The intuition behind this result is simple. If there are positive agglomeration externalities from population density (Diamond 1982), migration inflows increase the tightness of the labour market. This change has two main consequences. First, by reducing the unemployment duration, it increases the expected benefits from participating in the domestic labour market. Second, as better economic conditions represent new crime opportunities, a higher tightness increases the net expected profit from crime. If the variation in the tightness is sufficiently high, then the positive effects on the labour market overcome the higher attractiveness of crime and immigrants will prefer participating in the labour market of the host country rather than engaging in criminal activities.

We find empirical support for the main theoretical implication of the model. In particular, we use European Social Survey data from 13 European countries and the OECD Employment Protection Index to assess how the relationship between crime victimisation and migration penetration in the area of residence is affected by the flexibility of the domestic labour market. We find that while countries with flexible labour markets are more likely to exhibit a negative relationship between migration inflows and crime, the opposite holds for countries with strong rigidities.

Ortega (2000) is probably the closest contribution to ours. The author presents a two-country labour matching model, with no crime, in which migrating abroad imposes positive mobility costs on agents. Based on this framework, the author shows two main results. First, depending on the characteristics of the labour markets of the two countries, the model admits multiple equilibria that differ from each other in the migration intensity (no-migration,\(^3\)

\(^2\)See Mortensen (1986) and Mortensen and Pissarides (1999) for excellent surveys on standard search models.
full-migration and partial-migration equilibria). Second, the equilibria can be Pareto-ranked according to the corresponding migration intensity, with the full-migration and the no-migration equilibria respectively representing the Pareto-superior and Pareto-inferior outcomes. We present a generalization of Ortega (2000) in which agents face both migration and crime as alternative economic activities to non favourable labour conditions. This allows us to study the sign of the relationship between immigration and crime and to assess how this interplay depends on the structural characteristics of the labour markets of the two countries.

Leaving aside agents’ decision to migrate, Burdett et al. (2003) present a one-country search model to investigate the interaction between crime, inequality and unemployment. Crime is introduced as an opportunity to steal others’ resources. The probability of an agent to engage in criminal activities depends on both her labour conditions and the (fixed) probability of being arrested. Finally, all the agents face the risk of crime victimisation. Given this framework, introducing crime as an alternative economic activity has two implications. First, it generates wage dispersion among homogeneous workers. Second, it introduces multiple equilibria in terms of combinations of crime and unemployment rates.3 There are relevant differences between this model and our setting. First, unlike Burdett at al. (2003), we model crime as a reversible choice: at any instant, an agent can change her status and switch from criminal activities to job-seeking. Second, we deal with a two-country setting with migration flows. In this perspective, agents can decide to migrate because they observe either better labour conditions or more remunerative criminal activities in the host country.

Engelhardt et al. (2008) present a search model in which crime represents an alternative economic opportunity for all agents, irrespective of their employment status. As shown by the authors, in equilibrium, the probability of an agent to commit crime depends on her bargaining power in the labor market, with unemployed agents being the most likely to engage in criminal activities. On the basis of their model, the authors analyse the effects of labour and crime policies on the crime rate. While labour policies (such as unemployment insurance, minimum wage subsidies, hiring subsidies) reduce the crime rate to the cost of altering the labour market conditions, crime policies significantly affect the crime rate, implying only negligible effects on the labour market. Although based on a similar structure of the labour market, our model focuses on the relationship between immigration and crime and offers insights on how migration

3In a subsequent paper (Burdett et al. 2004), the authors extend their model to a setting with on-the-job search.
as well as labour market policies affect the probability that migration inflows increase the crime rate of the host country.

The rest of the paper is organised as follows. In the next section, we introduce our model. Section 3 presents supporting empirical evidence in favour of the main theoretical prediction of our model. Finally, Section 4 concludes.

2 The model

Consider an open economy with two countries A and B. Each country has population $P_i$, with $i = A, B$, made of a continuum of agents. Since the territory size of each country is fixed, $P_i$ also measures the population density of the country. Agents live forever and can be either employed ($L_i$), unemployed ($U_i$) or criminals ($N_i$). It follows that $P_i = L_i + U_i + N_i$. Time is continuous, and agents who are not working choose whether to participate in the labour market as job-seekers or commit crime at any instant of time.

In Subsection 2.1, we describe the structure of the labour market in country $i$. Then, in Subsection 2.2, we analyse the crime decision made by agents of country $i$. Finally, in Subsection 2.3, we present the main equilibrium results of the two-country model.

2.1 The labour market

The labour market of country $i$ is characterised by search frictions. This means that, due to some source of imperfect information in the labour market, the matching process between vacancies and job-seekers is costly in terms of time as well as other economic resources. Given these costs, the interaction between firms and job-seekers generates an equilibrium level of frictional unemployment. We assume the following matching function in the labour market:

$$M_i = M_i(U_i, V_i), \quad \frac{\partial M_i}{\partial U_i}, \frac{\partial M_i}{\partial V_i} > 0,$$

where $V_i$ is the number of vacancies available in each instant in country $i$. Since time is continuous, $M_i(U_i, V_i)$ can be seen as the flow rate of matches. Following the standard literature, we assume that the matching function is homogenous of degree one. Therefore,

---

4Here, we do not explicitly model the incarceration flows. Nonetheless, $P_i$ can be considered as the fraction of total population that is not in a jail, assuming that, at each instant, the fractions of captured criminals and released prisoners are the same.
\[ m_i = \frac{M_i}{V_i} = q_i(\phi_i), \]  

(2)

where \( \phi_i = \frac{V_i}{U_i} \) measures the tightness of the labour market. Since \( M_i \leq V_i \) and \( M_i \leq U_i \), \( q_i(\phi_i) \) represents the probability of a vacancy to be covered, and it is decreasing in \( \phi_i \). Therefore, the corresponding instantaneous probability of covering a vacancy is \( q_i(\phi_i)dt \). Assuming a Poisson distribution, the average arrival time of a match for a vacancy is \( \frac{1}{q_i(\phi_i)} \).

Similarly, the probability of finding a job in country \( i \) is \( F_i(\phi_i) = \phi_i q_i(\phi_i) \), with an instantaneous probability of \( F_i(\phi_i)dt \) that is increasing in \( \phi_i \). By the previous considerations, the average time for finding a job is \( \frac{1}{F_i(\phi_i)} \).

By using the constraint on the population size, \( L_i = P_i - U_i - N_i \) and by solving the dynamic equation of employment for \( U_i \), we obtain the following Beveridge Curve:

\[ u_i(n_i) = \frac{s_i(1 - n_i)}{s_i + F_i(\phi_i)}, \]  

(3)

where \( u_i = \frac{U_i}{P_i} \) and \( n_i = \frac{N_i}{P_i} \).

According to equation (3), the level of frictional unemployment is a function of the equilibrium crime rate and the usual measures of flexibility, namely the probabilities of finding and losing a job.

Let us consider the problem faced by a generic value-maximiser firm when entering the search process. Let \( J_{0,i} \) and \( J_{1,i} \) be the values of an uncovered and covered vacancy, respectively.\(^6\) The two no arbitrage conditions (i.e. hiring a job-seeker and firing a worker) faced by the firm are

\[
\begin{align*}
\begin{cases}
r_i J_{0,i} = q_i(\phi_i)(J_{1,i} - J_{0,i}) - c_i(P_i) \\
r_i J_{1,i} = H_i - w_i - s_i(J_{1,i} - J_{0,i}) - k_i n_i,
\end{cases}
\end{align*}
\]

(4)

where \( r_i \) is the interest rate, \( H_i \) is the productivity of labour assumed to be constant (see, e.g., Ortega, 2000), \( s_i(J_{1,i} - J_{0,i}) \) is the turnover cost in terms of the firm’s value, \( k_i n_i \)

\(^5\)Usually the crime rate is defined as the ratio of crimes in geographic area to the population size in that area. However, since in our model criminals are homogeneous and commit the same amount of crime, there is a one-to-one relationship between this definition and the ratio, \( \frac{N_i}{P_i} \).

\(^6\)Here, for the sake of simplicity, we abstract from the presence of physical capital. Our main results are not qualitatively affected by this assumption.
represents the victimisation cost that a firm bears after the match, \( c_i(P_i) > 0 \) is the cost of searching for a new employee, with \( H_i > c_i(P_i) \). By following Burdett et al. (2003), we assume that the victimisation cost linearly increases in the crime rate.\(^7\) Moreover, given the fact that an unfilled vacancy does not generate revenues, the victimisation cost associated with it is null.

Search costs decrease in the (average) distance between firms and job-seekers. More specifically, as in Diamond (1982), the search process is characterised by the presence of agglomeration externalities from population density, such that denser markets should be characterised by a lower degree of information imperfection. Similarly, Wheeler (2001) assumes that per-worker firm recruitment costs decrease with population density because of a higher arrival rate of potential workers.\(^8\) In our context, this means that search costs decrease in the population density, \( \frac{dc_i(P_i)}{dP_i} < 0 \).

Given the free entry condition in the market, the value of an uncovered vacancy, \( J_{0,i} \), must be null. Therefore, system (4) implies that the expected cost of hiring a job-seeker is equal to the present value of profit generated by the new worker:

\[
\frac{c_i(P_i)}{q_i(\phi_i)} = \frac{H_i - w_i - k_in_i}{r_i + s_i} \tag{5}
\]

From this condition, we obtain the (so-called) job-creation (JC) curve, that is, the relationship between the tightness of the labour market and the wages offered by the firms:

\[
w_i^d = H_i - k_in_i - \frac{(r_i + s_i)c_i(P_i)}{q_i(\phi_i)} \tag{6}
\]

Moving to the labour force, let \( W_{0,i} \) and \( W_{1,i} \) be the current values of being unemployed and employed, respectively. Thus, similarly to system (4), two no arbitrage conditions for unemployed agents can be explicited. The first imposes that the current value of being a job-seeker is equal to the expected value of finding a job. Similarly, the second condition imposes that the current value of being employed is equal to the expected value of losing the job and

\(^7\)Linearity is assumed for the sake of simplicity. However, this assumption can be relaxed using a general function, \( k_i(n_i) \). In particular, since \( k_i(n_i) \) enters revenues from crime and there is an upper limit on the amount of resources that can be subtracted by criminals in each instant, our setting can be modified by introducing a (more general) concave function. Our main results continue holding under concavity of \( k_i(n_i) \).

\(^8\)Of course in addition to agglomeration externalities, also congestion effects may occur (Petrongolo and Pissarides, 2001). To make the model tractable and in line with empirical observations (Di Addario, 2011), we assume that the effects on search costs of agglomeration externalities always exceed those exerted by congestion.
moving back to the status of job-seeker:

\[
\begin{aligned}
\begin{cases}
F_i(\phi_i)(W_{1,i} - W_{0,i}) - z_i - k_in_i, \\
W_{1,i} = w_i - s_i(W_{1,i} - W_{0,i}) - k_i n_i,
\end{cases}
\end{aligned}
\]  

(7)

where \( z_i \) is the search cost faced by an unemployed agent. Henceforth, we assume \( z_i = 0 \). Notice that, in (7), we assume both firms and individuals to bear the same victimisation cost. This assumption has two relevant consequences. First, it excludes the possibility that results are driven by differences in the victimisation cost. Second, since employed, unemployed and criminal can incur in a victimisation cost, occupations do not present differences in security such that individuals cannot choose to engage in criminal activities in order to obtain protection from crime.

The equilibrium expression of the wage in the labour market is the outcome of the negotiation between firms and job-seekers. Formally, by assuming a Nash bargaining process \((NBP)\), we have that

\[
w_i = \arg \max(W_{1,i} - W_{0,i})^{\gamma_i}(J_{1,i} - J_{0,i})^{1-\gamma_i}, \quad \gamma_i \in (0, 1),
\]

(8)

where \( \gamma_i \) measures the relative bargaining power of workers. Therefore, the total surplus \( \Omega_i = J_{1,i} - J_{0,i} + W_{1,i} - W_{0,i} \) is partitioned between job-seekers and firms as follows: \( W_{1,i} - W_{0,i} = \gamma_i \Omega_i \). By using this result and considering systems (4) and (7), we obtain the current value of a job-seeker:

\[
\omega_i(P_i, n_i) \equiv r_i W_{0,i} = \frac{\gamma_i}{1 - \gamma_i} \phi_i c_i(P_i) - k_i n_i.
\]

(9)

As shown by equation (9), the value of a job-seeker is increasing in both the tightness of the labour market and the bargaining power of workers. From equation (9) and the result of the maximization problem (8), we can express the labour supply curve in terms of \( \phi_i \) as follows:

\[
w_i^* = \gamma_i H_i + \gamma_i \phi_i c_i(P_i) - \gamma_i k_i n_i.
\]

(10)

From equations (10) and (6), we obtain the following equilibrium condition:
\[
\gamma_i H_i + \gamma_i \phi_i c_i(P_i) - \gamma_i k_i n_i = H_i - k_i n_i - \frac{(r_i + s_i) c_i(P_i)}{q_i(\phi_i)}. \tag{11}
\]

Equation (11) implicitly defines the equilibrium level of \( \phi_i \) as a function of \( c_i(P_i) \) and \( n_i, \phi_i(P_i, n_i) \). The following lemma characterises this function when positive agglomeration externalities take place.\(^9\)

**Lemma 1.** \( \phi_i(P_i, n_i) \) is increasing in \( P_i \) and decreasing in \( n_i \).

The intuition behind the lemma is that by reducing the search costs of the firm, a higher population density induces firms to post more vacancies. This implies that both the tightness and the probability of finding a job increase. On the contrary, as long as firms have a positive bargaining power, a higher crime, by increasing the victimization cost, induces firms to post a smaller number of vacancies.

The description of the labour market is completed by the wage equation,

\[
w_i(P_i, n_i) = \gamma_i H_i + \gamma_i \phi_i(P_i, n_i) c_i(P_i) - \gamma_i k_i n_i. \tag{12}
\]

### 2.2 Crime decision

As anticipated, an agent engages in criminal activities when the expected profit from crime exceeds the expected value of being a job-seeker. The expected revenue of a criminal is expressed by the ratio between the total victimisation cost, \( k_i n_i(P_i + L_i) \), and the number of criminals, \( N_i \).\(^{10}\) An agent who decides to commit a crime bears the expected cost of being incarcerated, where the risk of incarceration linearly increases in the revenues from crime. Given the previous considerations, the expected profit from committing a crime net of the victimisation cost is

\[
\pi_i(P_i, n_i) \equiv r_i \Pi_i(P_i, n_i) = (1 - d_i)(2 - u_i - n_i)k_i - k_i n_i, \tag{13}
\]

where \( d_i k_i \), with \( d_i > 0 \), is the marginal expected cost of incarceration. Given the Beveridge curve in (3) and the fact that the probability of finding a job is increasing in the tightness, it follows that \( \pi_i(P_i, n_i) \) is increasing in \( \phi_i(P_i, n_i) \). In other words, a higher tightness of the labour market leads to a larger economic activity and, therefore, a higher expected profit from crime.

\(^9\)All proofs are presented in the appendix.

\(^{10}\)We assume that \( k_i \leq \min \left\{ H_i - w_i, \frac{r_i}{1 - \gamma_i} \phi_i(P_i, n_i) c_i(P_i) \right\} \), such that revenues from crime cannot exceed the gross wealth owned by their victims.
Lemmas 1 implies the following result.

**Lemma 2.** \( \pi_i(P_i, n_i) \) is decreasing in \( n_i \) and increasing in \( P_i \).

Thus, there is a negative relationship between the crime rate and the expected profit from crime. This is due to the fact that a higher crime rate, through the victimisation cost, implies a smaller fraction of productive firms, reducing the number of potential victims. On the contrary, an increase in the size of the population, by lowering the search costs, facilitates economic and criminal activities.

### 2.3 Equilibrium

Now, we move to the equilibrium analysis of the two-country model. Suppose that the world population, \( P \), is fixed. Thus, the size of the population in country \( B \) can be expressed as \( P_B = P - P_A \). Inhabitants of country \( A \) can move to country \( B \) and vice versa. Migration has two implications. First, the size of a country population is not fixed: it increases if the country registers migration inflows and decreases when residents migrate abroad. Second, in addition to participate to the domestic labour market and engaging in crime in their own country, agents can also decide to carry out these activities abroad.

We separate the analysis into two steps. First, we study how a domestic equilibrium reacts to migration flows. Second, we derive the conditions under which the domestic equilibria of the two countries are associated to an international equilibrium, namely a situation in which no agent has an incentive to migrate abroad. In order to conduct our analysis, we develop two theoretical tools: the domestic and the international loci (denoted, henceforth, with superscripts \( D \) and \( I \), respectively).

#### 2.3.1 The domestic locus

The domestic locus of country \( i \) includes the combinations \( (P_i, n_i) \) that satisfy the following (domestic) equilibrium condition:

\[
\pi_i(P_i, n_i) = \omega_i(P_i, n_i). \tag{14}
\]

According to (14), within country \( i \), committing a crime is as profitable as being a job-seeker
such that neither criminals, nor job-seekers have an incentive to change their status.\footnote{We have proved the existence, stability and uniqueness of a domestic equilibrium. These additional results refer to the autarkic economy, and they are available upon request from the corresponding author.}

Implicitly, the domestic locus describes the relationship between the population size of country $i$ and the corresponding (domestic) equilibrium crime rate. With no loss of generality, we focus on the domestic locus of country $A$. By totally differentiating equation (14), we obtain the sign of the relationship between $n^D_i(P_i)$ and $P_i$:

$$
\frac{dn^D_i}{dP_i} = \frac{\partial \omega_A(P_A, n_A)}{\partial P_A} - \frac{\partial \sigma_A(P_A, n_A)}{\partial n_A}. \tag{15}
$$

The denominator of (15) is always negative and the domestic locus is a continuous function of $P_A$.\footnote{See the technical appendix on the autarkic equilibrium available online at unipd.academia.edu/ThomasBassetti.} Therefore, since $\frac{\partial \sigma_A(P_A, n_A)}{\partial P_A}$ is positive (Lemma 2), the sign of $\frac{dn^D_i}{dP_i}$ depends on the sign of $\frac{\partial \omega_A(P_A, n_A)}{\partial n_A}$. In other words, the sign of the relationship between $n_A$ and $P_A$ depends on the characteristics of the domestic labour market.

**Proposition 1.** The relationship between $n^D_A(P_A)$ and $P_A$ is negative if and only if the tightness of the labour market is sufficiently elastic with respect to the population density.

Suppose that the population of country $A$ increases. By lowering the search cost of firms in country $A$, $c_A(P_A)$, the change in the population size causes an increase in the tightness of the labour market and an increase in the value of a job-seeker. If this change overcomes the positive effect of the increase in the population size on the profit from crime, then the crime rate decreases.

It is worth noticing that proposition 1 only provides a local condition, as the effects of a change in $P_A$ on $n_A$ depends on the specific forms of $c_A(P_A)$ and $q_A(\phi_A(P_A, n_A))$. Nevertheless, from proposition 1, the following corollary follows.

**Corollary 1.** If $c_A(P_A)$ is always positive, decreasing and convex in $P_A$, then, as $P_A$ increases, the relationship between the size of the population and the domestic crime rate tends to vanish.

Corollary 1 is based on three assumptions on $c_A(P_A)$. First, for any level of $P_A$, search costs are strictly positive. Second, agglomeration externalities always exceed congestion effects. Third, as the population density increases, the effects of agglomeration externalities on the search costs tend to vanish. This implies that, in the limit, profit from crime, the number of
new vacancies and the probability of finding a job are not affected by the size of the population and, consequently, immigration does not modify the relative profitability of participating in the labour market with respect to crime.

Corollary 2 shows how the sign of \( \frac{d n_A^D(P_A)}{dP_A} \) affects the relationship between the size of the population and the value of a job-seeker. Corollary 2 will be used to interpret the results presented in the next subsections.

**Corollary 2.** If there is a negative relationship between \( n_A^D(P_A) \) and \( P_A \), then the value of a job-seeker is increasing in the population size.

Other additional results qualify the expression of the domestic locus. For instance, there is a negative relationship between \( H_A \) and the domestic crime rate.\(^{13}\) When individuals differ in terms of skills, firms have to choose what type of vacancy to open before meeting a worker. That is, skilled \((h)\) and unskilled \((l)\) workers may compete in the same market or not. In the first case, it is important to know whether immigration increases or decreases the average productivity in country \( A \). If immigration reduces the average productivity, the crime rate of country \( A \) will increase, for any population size, \( P_A \). Moving to the second case and following Burdett et al. (2004), one can assume that the value of being a job-seeker is greater than the profit from crime for skilled workers: \( \omega^h_A(P^h_A, n_A) > \omega^l_A(P^l_A, n_A) = \pi_A(P^h_A, P^l_A, n_A) \). Since the victimisation cost does not affect the decision to engage in criminal activities, the statement of Proposition 1 applies to the labor market for the unskilled workers.\(^{14}\)

### 2.3.2 The international locus

The international locus of country \( A \) represents the combinations \((P_A, n_A)\) that, given the domestic equilibrium in \( B \), guarantee the absence of migration flows between the two countries. In other words, together with (14), the international locus of country \( A \) includes the combinations \((P_A, n_A)\) that satisfy the following conditions:

\[
\omega_A(P_A, n_A) = \omega_B(P_B, n_B). \tag{16}
\]

\(^{13}\)This result is part of the autarkic equilibrium analysis, and it is available upon request.

\(^{14}\)Notice that when the labour productivity of unskilled workers increases, the value of being a job-seeker in country \( A \) increases and the corresponding domestic crime rate decreases. This happens when skilled immigrants apply for unskilled positions, as \( \omega^A_h > \omega^B_h \). Vice versa, if skilled immigrants participate to the labour market of skilled workers, then, due to better crime opportunities, \( \pi_A \) and the crime rate increase. This effect depends on the specific form of the the search cost function.
\[
\pi_A(P_A, n_A) = \pi_B(P_B, n_B).
\] (17)

Expressions (16) and (17) prescribe no arbitrage between countries: when the value of a job-seeker and the profit from crime are the same in the two countries, agents are indifferent between migrating and remaining home. We restrict our attention to situations in which either (16) or (17) are not satisfied such that agents have an incentive to migrate.\footnote{Notice that, given the population constraint, one equation of the system including condition (14) for the two countries, (16) and (17) is always redundant.} If, say, \(\omega_A(P_A, n_A) > \omega_B(P_B, n_B)\), agents will migrate from country B to country A, because both committing a crime and looking for a job are more profitable in the other country.

By combining conditions (14) and (16), we obtain the formal expression for the international locus of country A,

\[
\omega_A(P_A, n^I_A) = \omega_B(P - P_A, n^D_B(P - P_A)),
\] (18)

From equation (18), the crime rate of country A can be expressed as a function of the corresponding population size, \(P_A\): \(n^I_A(P_A)\). Since \(\omega_B(\cdot)\) and \(n^D_B(\cdot)\) are continuous functions, the international locus always exists. Moreover, by continuity of the domestic locus of country B the international locus of country A is continuous in the same interval. By totally differentiating equation (18), we obtain the relationship between \(n^I_A(P_A)\) and \(P_A\):

\[
\frac{dn^I_A(P_A)}{dP_A} = -\frac{\partial \omega_B(P - P_A, n^D_B(P - P_A))}{\partial(P - P_A)} \frac{\partial \omega_A(P_A, n_A)}{\partial n_A} - \frac{\partial \omega_B(P_A, n_A)}{\partial P_A} \frac{\partial n^D_B(P - P_A)}{\partial n_A}.
\] (19)

By Lemma 1 and equation (9), the denominator of (19) is negative and the sign of \(\frac{dn^I_A(P_A)}{dP_A}\) only depends on the sign of the numerator in the right hand side.

Notice that the specification of the international locus is sufficiently general to include potential mobility costs borne by agents when they migrate to the other country.\footnote{For the sake of simplicity, suppose that only migration from B to A is costly. The no arbitrage condition (16) becomes: \(\omega_A(P_A, n^I_A) = \omega_B(P - P_A, n_B(P - P_A)) + m_B\) where \(m_B\) represents the cost borne by an agent when she migrates from country B to country A. In other words, wages in country A must be equal to wages in country B plus the migration cost.} In this case, for any \(P_A\), when the migration costs to move from B to A increase, then the equilibrium value of being a job-seeker in country A increases, and the crime rate associated with the international locus decreases.
2.3.3 The international equilibrium

We now state the definition of an international equilibrium,

**Definition 1.** Given the size of the (world) population, $P$, an international equilibrium is a list $\{P_i^*, n_i^*, \phi_i(P_i^*, n_i^*), w_i(P_i^*, n_i^*)\}$, with $i = A, B$, such that $u(P_i^*, n_i^*)$, $\phi_i(P_i^*, n_i^*)$ and $w_i(P_i^*, n_i^*)$ satisfy equations (3), (11) and (12), $\{P_i^*, n_i^*\}$ is the domestic equilibrium in country $i$ and one of the following conditions holds: 

(i) $\omega_A(P_A^*, n_A^*) = \omega_B(P_B^*, n_B^*)$; 
(ii) $\omega_A(P_A^*, n_A^*) > \omega_B(P_B^*, n_B^*)$ and $P_A^* = P$; 
(iii) $\omega_A(P_A^*, n_A^*) < \omega_B(P_B^*, n_B^*)$ and $P_B^* = P$.

In terms of the previous conditions, an international equilibrium is associated with a combination of $P_A^*, P_B^*, n_A^*$ and $n_B^*$ such that (14) for both countries, (16) and (17) are simultaneously satisfied. In other words, an international equilibrium is a situation in which there are no migration flows and, within each country, no agent has an incentive to switch from the labour market to crime and vice versa.

By definition, a pair $(P_A^*, n_A^*)$ is associated with an international equilibrium if it simultaneously belongs to both the domestic and the international loci of country $A$, namely $n_A^D(P_A^*) = n_A^I(P_A^*)$. Moreover, since for given population size, the domestic equilibrium in one country is always unique and stable\(^{17}\), by symmetry $(P_A^*, n_A^*)$ is associated with one (and only one) combination $(P_B^*, n_B^*)$ that describes a domestic equilibrium in country $B$. Finally, notice that (ii) and (iii) in definition 1 characterise two (symmetric) corner solutions. When $\omega_A(P_A^*, n_A^*) > \omega_B(P_B^*, n_B^*)$, $P_A^* = P$ and $P_B^* = 0$ where the pair $\{P, n_A^*\}$ is associated (by definition 1) with the domestic equilibrium in country $A$. Similarly, when $\omega_A(P_A^*, n_A^*) < \omega_B(P_B^*, n_B^*)$, then $P_B^* = P$, $P_A^* = 0$ and the pair $\{P, n_B^*\}$ is associated with the domestic equilibrium in country $B$. The first proposition refers to the existence of an international equilibrium.

**Proposition 2.** An international equilibrium always exists.

Two observations on the international equilibria of our model are worth noticing. First, depending on the parameters of the model, equilibria with full migration are admissible. For instance, when full migration from country $B$ to country $A$ occurs, $P_A^* = P$, $P_B^* = 0$ and $n_A^* > 0$, the two-country model collapses into the one-country model. Second, given the structure of the search costs, the model can generate multiple equilibria. Under multiplicity, it is crucial to study the stability properties of the equilibria in order to provide insights on which solution is

---

\(^{17}\)See the technical appendix on the autarkic equilibrium available online at unipd.academia.edu/ThomasBassetti.
more likely to emerge. In this respect, the next proposition states the condition for the stability of an interior international equilibrium. In line with traditional matching models, the implicit assumption behind the next proposition is that, during the adjustment process towards the international equilibrium, condition (14) is always satisfied for each country.

Proposition 3. An interior international equilibrium is locally stable if and only if \( \frac{dn_A^n(P_A^*)}{dP_A} > \frac{dn_A^I(P_A^*)}{dP_A} \).

Suppose that, in equilibrium, \( \frac{dn_A^D(P_A^*)}{dP_A} < 0 \). Let the population of country \( A \) decrease. By the stability condition in proposition 3, the crime rate implied by the domestic locus of country \( A \), \( n_A^D(P_A - \varepsilon) \), must be lower than that associated with the international locus, \( n_A^I(P_A - \varepsilon) \). Then, the value of a job-seeker becomes higher in country \( A \) than in country \( B \). Thus, agents migrate from country \( B \) to country \( A \) and the economy moves back to the initial international equilibrium along the domestic locus of country \( A \). During the adjustment process, the crime rate of country \( A \) decreases.

As stated in the next corollary, the uniqueness of the international equilibrium implies its stability.

Corollary 3. If the international equilibrium is unique, then it is stable.

Using propositions 1 and 3, we can state sufficient conditions for an international equilibrium to be unstable.

Corollary 4. If \( \frac{dn_A^D(P_A^*)}{dP_A} < 0 \) and \( \frac{dn_B^D(P_B^*)}{dP_B} < 0 \), then the international equilibrium is unstable.

According to the previous corollary, in order to be stable, an international equilibrium must be associated with a situation in which the relationship between the crime rate and the population density in (at least) one country is positive (i.e. the domestic locus of at least one country is upward sloped).

Given these results, we now discuss under which conditions migration flows are mutually beneficial for the two countries in terms of crime reduction. In particular, the following proposition highlights the relevance of the characteristics of the labour markets in assessing the effects of migration flows on the crime rates in the two countries.

Proposition 4. Migration flows from a country characterised by a rigid labour market to a country characterised by a flexible labour market, are mutually beneficial in terms of crime reduction. Vice versa, opposite migration flows increase the crime rates of both countries.
In order to explain the intuition behind the previous result, let us consider a situation in which country A is characterised by a (sufficiently) flexible labour market while country B presents strong work rigidities. Also assume that \( \omega_A(P_A, n_A) > \omega_B(P_B, n_B) \), such that agents in country B have an incentive to migrate to country A. Given the assumptions on the flexibility of the labour market, by proposition 1, country A is associated with a negative relationship between \( n^D_A(P_A) \) and \( P_A \). This means that, due to the positive effects on the tightness (corollary 2), migration inflows will imply an increase in the value of a job-seeker. By the stability of the international equilibrium and corollary 4, also the value of a job-seeker in country B must increase. Thus, in both countries, some agents will switch from crime to the labour market causing a reduction of the domestic crime rate. Figure 1 offers a graphic intuition of the previous result.

Let \( D_i \) and \( I_i \) represent the domestic and international loci of country \( i = A, B \). Given the constraint on the population, the intersection of the two curves represents the international equilibrium in the space \((P_i, n_i)\). Assume an initial situation in which population in country A is \( P_A \) and population in country B is \( P - P_A \). In this case the crime rate implied by the domestic locus of country A, \( n^D_A(P_A) \), is lower than that associated with the international locus, \( n^I_A(P_A) \). Therefore, the expected benefits from participating in the labour market as a job-seeker are higher in country A than in country B. This means that agents in country B will migrate to country A. Given the assumption that domestic markets adjust faster than
international markets, the economy moves towards the international equilibrium, $E_1$, along
the domestic locus of country $A$. During this adjustment process, the crime rate of country
$A$ decreases. Moreover, since $\frac{dn_1^B(P_B)}{dP_B} > 0$ (corollary 4), the migration outflows from $B$ will
imply a reduction of the domestic crime rate. In other words, migration flows from countries
with strong work rigidities to countries characterised by (sufficiently) flexible labour markets
are mutually beneficial in terms of reducing the corresponding crime rates.

By taking advantage of figure 1, we can also discuss the effects of specific policy interventions
on the international equilibrium. In general,\textsuperscript{18} policies can be categorised into two groups:
labour market and migration policies. Labour market policies include interventions on labour
productivity and search costs, whereas migration policies, by affecting the size of mobility costs,
are addressed to facilitate (or prevent) migration flows between countries.

For instance, let us consider a (labour market) policy aimed at stimulating the labour
productivity in country $A$. Starting from the initial international equilibrium $E_1$ in figure 1,
for any population level, an increase in $H_A$ implies a reduction in the domestic crime rate
and an increase in the value of being a job-seeker in country $A$. In terms of figure 1, the
domestic locus $D_A$ shifts down. This change will generate new migration flows from country $B$
to country $A$. As a final result, by proposition 4 and given the situation depicted in figure 1,
in the new international equilibrium both countries will experience a reduction of the domestic
crime rates. In addition, the positive effects on crime reduction can be magnified by combining
the previous labour intervention with a migration policy, as a reduction in the mobility costs
from $B$ to $A$ causes a shift of the international locus on the right.

3 Empirical evidence

In this section, we provide evidence in favour of the main theoretical predictions of our model.
In particular, we aim at testing whether the relationship between immigration and crime is neg-
ative in countries where the labour market is sufficiently flexible, by considering the probability
of being a victim of a crime (burglary or assault) in the last 5 years as a function of migration
penetration in the area of residence plus a set of controls. The econometric analysis is based on
the approach implemented by Nunziata (2011). We depart from the original study as we are
\textsuperscript{18}It is worth noticing that we do not introduce any specific assumption on the configuration of parameters in
the two countries.
mainly interested in assessing how the characteristics of the labour market of the host country influence the interplay between immigration and crime. We use European Social Survey data collected every two years from 2002 to 2008 in a number of European countries. We distinguish between rigid and flexible countries according to the time varying OECD Employment Protection Index (EPL), which measures regulations on regular and temporary contracts as well as collective dismissals (Venn, 2009). Controls include educational attainment, gender, age, age squared, and a dummy assuming value 1 if the main source of respondent’s income is financial. In line with proposition 1 and corollary 1, in our analysis we explicitly consider the population density of respondent’s place of residence. In particular, we run two separate sets of regressions, one using data from respondents in less dense areas (towns, small cities, country villages or farms or homes in countryside) and one based on subjects living in more dense areas (big cities and suburbs or outskirts of big cities).

All the estimated models include regional and country-specific year fixed effects and standard errors are clustered by regions. Regions are defined at different levels of geographical aggregation, according to the ESS standards. In what follows, we report Probit marginal effect estimates from a series of models of the type:

\[
\Pr(\text{crime}_{i r c t} = 1|m_{r c t}, X_{i t}) = \Phi(\beta m_{r c t} + \lambda X_{i t} + \mu_r + \mu_{ct}),
\]

where \(\text{crime}_{i r c t}\) is a dummy variable indicating whether the individual \(i\), living in region \(r\) of country \(c\) at time \(t\) has been victim of a crime, \(X_{i t}\) is a matrix of individual characteristics, \(\mu_r\) are regional fixed effects and \(\mu_{ct}\) are country-specific time dummies. The variable of interest is migration penetration in logs which is calculated by using labour Force Survey data at regional level. Migrants are defined as those individuals born abroad.

Columns (1) and (2) of Table 1 present estimates for the most flexible countries (UK and Ireland) characterised by the lowest level of employment protection (\(EPL \leq 1.5\)). Columns (3) and (4) are based on the most rigid countries (Portugal and Spain) that are associated with the highest level of protection (\(EPL > 3\)). Finally, columns (5) and (6) refer to the intermediate countries (Switzerland, Denmark, Austria, Belgium, Finland, the Netherlands, Sweden, France,

---

19 Data description and summary statistics are presented in the appendix.
20 The regional classification is NUTSII for AT, CH, DK, FI, IE, NO, PT, SE and NUTSIII for BE, DE, ES, FR, IT, LU, NL, GR, GB.
21 The results remain qualitatively unchanged when, instead of Probit models, we estimate linear probability models (results provided in the appendix).
Greece and Norway).\footnote{Similar conclusions are drawn when the intermediate countries are divided into three categories according to the level of \( EPL \): low/intermediate (Switzerland and Denmark) with \( 1.5 < EPL \leq 2 \); intermediate (Austria, Belgium, Finland, the Netherlands, Sweden) with \( 2 < EPL \leq 2.5 \); low/intermediate (France, Greece and Norway) with \( 2.5 < EPL \leq 3 \).}

<table>
<thead>
<tr>
<th>( \text{Pr}(\text{crime victim}) )</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \log(\text{IMM/POP}) )</td>
<td>-0.247***</td>
<td>0.587</td>
<td>0.103**</td>
<td>0.080</td>
<td>0.007</td>
<td>0.048</td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>(0.535)</td>
<td>(0.043)</td>
<td>(0.088)</td>
<td>(0.035)</td>
<td>(0.059)</td>
</tr>
<tr>
<td>( \text{male} )</td>
<td>0.021***</td>
<td>0.029*</td>
<td>0.012</td>
<td>0.001</td>
<td>0.010**</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.015)</td>
<td>(0.009)</td>
<td>(0.019)</td>
<td>(0.003)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>( \text{fin. wealth} )</td>
<td>0.064</td>
<td>-0.011</td>
<td>0.079</td>
<td>0.233</td>
<td>0.043</td>
<td>0.117**</td>
</tr>
<tr>
<td></td>
<td>(0.074)</td>
<td>(0.141)</td>
<td>(0.111)</td>
<td>(0.165)</td>
<td>(0.033)</td>
<td>(0.047)</td>
</tr>
<tr>
<td>( \text{Pseudo} - R^2 )</td>
<td>0.052</td>
<td>0.041</td>
<td>0.051</td>
<td>0.049</td>
<td>0.060</td>
<td>0.047</td>
</tr>
<tr>
<td>( \text{Obs.} )</td>
<td>7027</td>
<td>3058</td>
<td>8563</td>
<td>3954</td>
<td>58511</td>
<td>24036</td>
</tr>
<tr>
<td>( \text{EPL} )</td>
<td>( \text{Low} )</td>
<td>( \text{Low} )</td>
<td>( \text{High} )</td>
<td>( \text{High} )</td>
<td>( \text{Int.} )</td>
<td>( \text{Int.} )</td>
</tr>
<tr>
<td>( \text{Pop. Density} )</td>
<td>( \text{Low} )</td>
<td>( \text{High} )</td>
<td>( \text{Low} )</td>
<td>( \text{High} )</td>
<td>( \text{Low} )</td>
<td>( \text{High} )</td>
</tr>
</tbody>
</table>

Probit marginal effect estimates. Columns (1) and (2) refer to countries with \( EPL < 1.5 \). Columns (3) and (4) consider countries with \( EPL > 3 \). Columns (5) and (6) refer to country with \( 1.5 \leq EPL \leq 3 \). Columns (1), (3) and (5) are estimated on individuals living in less dense areas (towns, small cities, country villages or farms or homes in countryside). Columns (2), (4) and (6) focus on individuals living in more dense areas (big cities and suburbs or outskirts of big cities). Regions are \textit{NUTSII} for \( \text{AT, CH, DK, FI, IE, NO, PT, SE} \) and \textit{NUTSI} for \( \text{BE, DE, ES, FR, NL, GR, GB} \). Regional and country-specific year fixed effects are included. Other controls include educational attainment, age, age squared, if main source of income is financial. Standard errors (in parentheses) are clustered by regions.

Significance levels are denoted as follows: *\( p < 0.1 \), **\( p < 0.05 \), ***\( p < 0.01 \).

The results reported in Table 1 confirm the main theoretical implications of our model. Indeed, our estimates show that the sign and the magnitude of the relationship between migration and crime strongly depends on the degree of flexibility of the labour market. By looking at
column (1), a change in migration penetration seems to affect the probability of being a crime victim only in less dense areas. In flexible countries, the effect is negative and highly significant (at the 1 percent level) with a 10 percent increase in immigration reducing the likelihood of being a crime victim by 2.5 percentage points. On the other hand, as shown by column (3), in rigid countries the relationship between immigration and crime is positive and significant at the 5 percent level. No significant effects of immigration on crime are found for countries with an intermediate level of flexibility of the labour market. As expected, the relationship between immigration and crime becomes less pronounced in areas characterised by a high population density. Estimates are robust to different specification strategies. In particular, as shown in the appendix, results remain qualitatively unchanged when, instead of Probit models, we estimate linear probability models.

4 Conclusion

Does immigration cause crime? In order to analyse the interplay between immigration and crime, we have presented a two-country search model in which, in addition to participate in the labour market in their own country, agents can also engage in criminal activities or migrate abroad. Our results highlight the importance of the structural characteristics of the labour market in determining the sign of the relationship between immigration and crime. In particular, our main finding is that, in countries characterised by flexible labour markets, immigration reduces the domestic crime rate. We find empirical evidence in favour of this prediction. Using a database that merge data from the European Social Survey with the OECD Employment Protection Index, we find that countries with low degree of employment protection exhibit a negative correlation between immigration and crime. On the contrary, countries with high labour rigidities show a positive correlation between immigration and crime.

Our model provides additional policy insights. First, as long as search costs decrease in the population size, migration flows from countries with strong work rigidities to societies characterised by more flexible labour markets are mutually beneficial as they reduce crime rates of both countries. Second, although highly stylised, our results contribute to the debate on the effects of restrictive policies that impose severe constraints on the admissibility and

\[23\text{Engelhardt (2010) studies the effects of rigidities of the labor market on the incarceration rate. He finds that unemployed are incarcerated two times faster than low wage workers and four times faster than high wage workers.}\]
permanence of immigrants in the host country. Specifically, our model raises doubts on the effectiveness of prohibitive laws by sharing the idea that ‘to crack down on crime, closing the nation’s doors is not the answer.’ Rather than implementing restrictive migration laws, policy interventions aimed at increasing labour flexibility are crucial to prevent crime.

Several aspects of our model are worthy of further research. It might be interesting to study the case of organised crime in order to understand how migration policies affect the "market power" of criminal organizations. Moreover, considering a setting in which the job-destruction rates endogenously determined by the characteristics of heterogeneous firms and job-seekers represents a natural follow up of our research.

\footnote{The controversial "Bossi-Fini" law (July 30th, 2002, n. 189) aimed at reforming the Italian immigration system is a valid example of such institutional interventions. According to the law, only those immigrants who prove they have a regular and permanent job in Italy are entitled to apply for a visa.}

\footnote{R. Sampson, New York Times, March 11th, 2006.}
Appendix

A Proofs of the results in the paper

Proof of Lemma 1. From equation (11), we can define

\[ G_i \equiv \gamma_i H_i + \gamma_i \phi_i c_i(P_i) - \gamma_i k_i n_i - H_i + k_i n_i + \frac{(r_i + s_i) c_i(P_i)}{q_i(\phi_i)}. \]  \hspace{1cm} (A1)

Applying the implicit function theorem we obtain

\[ \frac{\partial \phi_i}{\partial P_i} = -\frac{\partial G_i/\partial P_i}{\partial G_i/\partial \phi_i} = -\frac{(r_i + s_i) + \gamma_i \phi_i}{c_i(P_i)} \frac{\frac{d\phi_i}{dP_i}}{\frac{d\phi_i}{d\phi_i}} \]  \hspace{1cm} (A2)

and

\[ \frac{\partial \phi_i}{\partial n_i} = -\frac{\partial G_i/\partial n_i}{\partial G_i/\partial \phi_i} = -\frac{(1 - \gamma_i) k_i}{c_i(P_i)} \left( \gamma_i - (r_i + s_i) \frac{d\phi_i}{d\phi_i} \right). \]  \hspace{1cm} (A3)

Since \( \frac{d\phi_i}{dP_i}, \frac{d\phi_i}{d\phi_i} < 0 \) and \( \gamma_i \in (0, 1) \), then \( \frac{\partial \phi_i}{\partial P_i} > 0 \) and \( \frac{\partial \phi_i}{\partial n_i} < 0. \)

Proof of Lemma 2 Plugging equation (3) into equation (13) we have:

\[ \pi_i(P_i, n_i) \equiv (1 - d_i) \left( 2 - n_i - \frac{s_i(1 - n_i)}{s_i + F_i(\phi_i(P_i, n_i))} \right) k_i - k_i n_i. \]  \hspace{1cm} (A4)

Since \( n_i < 1 \) and \( \frac{\partial F_i(\phi_i(P_i, n_i))}{\partial \phi_i(P_i, n_i)} > 0 \), Lemma 1 implies that \( \frac{\partial \pi_i(P_i, n_i)}{\partial P_i} > 0 \) and \( \frac{\partial \pi_i(P_i, n_i)}{\partial n_i} < 0. \)

Proof of proposition 1. A domestic equilibrium is stable when in a neighborhood of the equilibrium \( \frac{\partial \pi_A(P_A, n_A)}{\partial n_A} - \frac{\partial \pi_A(P_A, n_A)}{\partial n_A} < 0 \), therefore, from (15), we have that \( \frac{dn_A}{dP_A} < 0 \) if and only if \( \frac{\partial \pi_A(P_A, n_A)}{\partial n_A} > \frac{\partial \pi_A(P_A, n_A)}{\partial P_A} \). This inequality can be written as follows:

\[ \frac{\gamma_A}{1 - \gamma_A} \frac{d\Gamma_A(P_A, n_A)}{dP_A} > \frac{(1 - d_A)(1 - n_A)}{(s_A + F_A(\phi_A(P_A, n_A)))^2} \frac{dF_A(\phi_A(P_A, n_A))}{dP_A} k_A s_A, \]  \hspace{1cm} (A5)

where \( \Gamma_A(P_A, n_A) \equiv \phi_A(P_A, n_A)c_A(P_A) \) and \( F_A(\phi_A(P_A, n_A)) \equiv \phi_A(P_A, n_A)q_A(\phi_A(P_A, n_A)) \).

Since \( F_A(\phi_A(P_A, n_A)) \) is the probability of finding a job and \( \frac{dF_A(\phi_A(P_A, n_A))}{dP_A} \) is its conditional distribution, from Lemma 1 we know that the right hand side is always finite and non-negative.

Isolating \( \frac{\partial \phi_A(P_A, n_A)}{dP_A} \) from (A5) we obtain
\[ \frac{d\phi_A(P_A, n_A)}{dP_A} > T \equiv \frac{\gamma_A}{1-\gamma_A} c_A(P_A) - \frac{1-d_A(1-n_A)k_A}{(s+P_A(\phi_A(P_A, n_A)))} q_A(\phi_A(P_A, n_A))(1-n_A(\phi_A(P_A, n_A))) \]

Therefore, for \( \frac{d\phi_A(P_A, n_A)}{dP_A} > T \), (A6) holds and \( \frac{dn_A^D(P_A)}{dP_A} < 0 \).

**Proof of corollary 1.** The numerator of (15) can be written as:

\[ \frac{dc_A(P_A)}{dP_A} \left( \frac{\partial\omega_A(P_A, n_A)}{\partial c_A(P_A)} - \frac{\partial\pi_A(P_A, n_A)}{\partial c_A(P_A)} \right). \]

Now, if \( c_A(P_A) \) is always positive, convex and decreasing in \( P_A \), we will have that \( \lim_{P_A \to \infty} \frac{dc_A(P_A)}{dP_A} = 0 \) and then \( \frac{dn_A^D(P_A)}{dP_A} \) goes to zero.

**Proof of corollary 2.** If \( \frac{dn_A^D(P_A)}{dP_A} < 0 \) and the equilibrium is stable, we must have \( \frac{\partial\omega(P_n)}{\partial P} > \frac{\partial\pi(P_n)}{\partial P} \geq 0 \).

**Proof of proposition 2.** By Definition 2, an equilibrium is associated to both a population size, \( P_A^* \), and a crime rate, \( n_A^* \). Since the domestic locus of country \( A \) is continuous on \( (0, P) \times [0, 1) \) and the international locus is defined on \( [0, P) \times [0, 1) \), three cases are possible:

1) \( \exists P_A^* \in (0, P) : n_A^I(P_A^*) = n_A^I(P_A^*) \). Thus \( (P_A^*, n_A^*) \) will be an interior international equilibrium.

2) \( n_A^I(P_A) > n_A^I(P_A), \forall P_A \in (0, P) \). Since \( n_A^I(P_A) \) represents the crime rate of country \( A \) that satisfies the no migration condition (16) for given population \( P_B = P - P_A \) and crime rate \( n_B^D(P - P_A) \) in country \( B \), then it follows that \( \omega_A(P_A, n_A^D(P_A)) < \omega_A(P_A, n_A^I(P_A)) = \omega_B(P - P_A, n_B^D(P - P_A)), \forall P_A \in (0, P) \). Therefore, \( \omega_A = \omega_B = \omega_{A \rightarrow B} = \omega_{B \rightarrow A} \) for \( \omega_A = \omega_B \), \( \forall P_A \in (0, P) \). Therefore, the migration flows from country \( A \) to country \( B \), the international equilibrium is a situation in which \( P_B^* = P \) and the crime rate of country \( B \) is determined by the domestic locus, \( n_B^D(P) \).

3) \( n_A^I(P_A) > n_A^D(P_A), \forall P_A \in (0, P) \). Since \( n_A^I(P_A) \) represents the crime rate of country \( A \) that satisfies the no migration condition (16) for given population \( P_B = P - P_A \) and crime rate \( n_B^D(P - P_A) \) in country \( B \), then it follows that \( \omega_A(P_A, n_A^D(P_A)) > \omega_A(P_A, n_A^I(P_A)) = \omega_B(P - P_A, n_B^D(P - P_A)), \forall P_A \in (0, P) \). Therefore, through the migration flows from country \( B \) to country \( A \), the international equilibrium is a situation in which \( P_A^* = P \) and the crime rate of country \( A \) is determined by the domestic locus, \( n_A^D(P) \).

**Proof of proposition 3.** From (19), we get
\[-\frac{\partial \omega_B(P - P_A, n_B^n(P - P_A))}{\partial (P - P_A)} = \frac{\partial \omega_A(P_A, n_A^n(P_A))}{\partial P_A} + \frac{\partial \omega_A(P_A, n_A^n(P_A))}{\partial n_A^n(P_A)} \frac{dn_A^n(P_A)}{dP_A}. \tag{A7}\]

At the same time, it follows that:

\[\frac{\partial \omega_A(P_A, n_A^D(P_A))}{\partial P_A} = \frac{\partial \omega_A(P_A, n_A^D(P_A))}{\partial P_A} + \frac{\partial \omega_A(P_A, n_A^D(P_A))}{\partial n_A^D(P_A)} \frac{dn_A^D(P_A)}{dP_A}. \tag{A8}\]

Suppose that in a neighborhood of a stable international equilibrium, \(\omega_A(P_A^*, n_A^D(P_A^*)) > \omega_B(P - P_A^*, n_B^D(P - P_A^*))\). By the stability of the international equilibrium, migration flows must reduce this gap: \(\frac{\partial \omega_A(P_A^*, n_A^D(P_A^*))}{\partial P_A} < -\frac{\partial \omega_B(P - P_A^*, n_B^D(P - P_A^*))}{\partial (P - P_A)}\). Given the fact that \(\omega_A(P_A, n_A)\) monotonically decreases in the crime rate, the previous condition implies \(\frac{dn_A^D(P_A^*)}{dP_A} > \frac{dn_A^D(P_A^*)}{dP_A}\). The proof concerning the case in which \(\omega_A(P_A^*, n_A^D(P_A^*)) < \omega_B(P - P_A^*, n_B^D(P - P_A^*))\) proceeds in an analogous way.

**Proof of corollary 3.** By contradiction, suppose that the unique international equilibrium is unstable. If this equilibrium is an interior solution, we have

\[\frac{dn_A^D(P_A^*)}{dP_A} < \frac{dn_A^I(P_A^*)}{dP_A}. \tag{A9}\]

Then, \(\forall \varepsilon \in (0, P - P_A^*)\), we get \(n_A^D(P_A^* + \varepsilon) < n_A^I(P_A^* + \varepsilon)\). This implies \(\omega_A(P_A^* + \varepsilon, n_A^D(P_A^* + \varepsilon)) < \omega_B(P - P_A^* - \varepsilon, n_B^D(P - P_A^* - \varepsilon))\) such that full migration from country B to country A occurs. Thus, the model admits another equilibrium in which \(P_A^* = P\) and \(n_A^* = n_B^D(P)\). If the unique equilibrium is characterised by full migration, say \(P_A^* = P\) and \(n_A^* = n_B^D(P)\), and this equilibrium is unstable, it follows that \(\omega_A(P - \varepsilon, n_A^D(P - \varepsilon)) < \omega_B(\varepsilon, n_B^D(\varepsilon))\), \(\forall \varepsilon \in (0, P)\). Therefore, another full migration equilibrium in which \(P_A^* = 0\) exists, contradicting uniqueness. The proof concerning the case in which the unique unstable equilibrium is \(P_A^* = P\) and \(n_A^* = n_B^D(P)\) proceeds in an analogous way.

**Proof of corollary 4.** By contradiction, suppose that the international equilibrium \((P_A^*, n_A^*)\) is stable and \(\frac{dn_A^D(P_A^*)}{dP_A} < 0\) for \(i = A, B\). Therefore, by Lemma 1 and (9), we know that \(\frac{\partial \omega_B(P - P_A^*, n_B^D(P - P_A^*))}{\partial (P - P_A)} > 0\), at the same time, we also know that \(\frac{\partial \omega_A(P_A^*, n_A^*)}{\partial n_A^*} < 0\) and \(\frac{\partial \omega_A(P_A^*, n_A^*)}{\partial n_A^*} > 0\) when \(\frac{dn_A^D(P_A^*)}{dP_A} < 0\). However, equation (19) implies \(\frac{dn_A^I(P_A^*)}{dP_A} > 0\), and then \(\frac{dn_A^I(P_A^*)}{dP_A} > \frac{dn_A^D(P_A^*)}{dP_A}\). This contradicts the stability condition stated by proposition 3.
Proof of proposition 4. With no loss of generality, suppose that country $A$ is sufficiently flexible and $B$ is sufficiently rigid. Then, from proposition 1, we know that $A$ is characterised by a negative relationship between $P_A$ and $n_A$, namely it must be $\frac{dn_A}{dP_A} < 0$ in a neighborhood of the international equilibrium. At the same time, from corollary 4, we know that local stability requires $\frac{dn_B}{dP_B} > 0$. Therefore, migration flows from country $B$ to country $A$ reduce the crime rates of both countries. Vice versa, migration flows from $A$ to $B$ lead to higher crime rates in both countries. ■

B Descriptive statistics and linear probability models

Data description.

Crime victimisation: whether the respondent or household member has been a victim of assault or burglary in the last 5 years. Years: 2002, 2004, 2006, 2008. Source: ESS.


Table B.1. Summary statistics, by country (mean and standard deviation)

<table>
<thead>
<tr>
<th>country</th>
<th>crime victim</th>
<th>log(IMM/POP)</th>
<th>age</th>
<th>male</th>
<th>fin. wealth * 100</th>
<th>educ. yrs</th>
<th>EPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>0.10</td>
<td>2.60</td>
<td>43.78</td>
<td>0.46</td>
<td>0.29</td>
<td>12.30</td>
<td>2.18</td>
</tr>
<tr>
<td></td>
<td>(0.30)</td>
<td>(0.49)</td>
<td>(17.90)</td>
<td>(0.50)</td>
<td>(5.37)</td>
<td>(3.09)</td>
<td></td>
</tr>
<tr>
<td>BE</td>
<td>0.25</td>
<td>2.28</td>
<td>44.44</td>
<td>0.49</td>
<td>0.44</td>
<td>12.31</td>
<td>2.50</td>
</tr>
<tr>
<td></td>
<td>(0.44)</td>
<td>(0.38)</td>
<td>(18.59)</td>
<td>(0.50)</td>
<td>(6.64)</td>
<td>(3.73)</td>
<td></td>
</tr>
<tr>
<td>CH</td>
<td>0.17</td>
<td>3.18</td>
<td>47.42</td>
<td>0.46</td>
<td>0.78</td>
<td>11.50</td>
<td>1.60</td>
</tr>
<tr>
<td></td>
<td>(0.38)</td>
<td>(0.26)</td>
<td>(18.06)</td>
<td>(0.50)</td>
<td>(8.81)</td>
<td>(3.66)</td>
<td></td>
</tr>
<tr>
<td>DE</td>
<td>0.10</td>
<td>3.18</td>
<td>46.46</td>
<td>0.50</td>
<td>0.42</td>
<td>13.14</td>
<td>2.38</td>
</tr>
<tr>
<td></td>
<td>(0.30)</td>
<td>(0.25)</td>
<td>(17.87)</td>
<td>(0.50)</td>
<td>(6.46)</td>
<td>(3.35)</td>
<td></td>
</tr>
<tr>
<td>DK</td>
<td>0.25</td>
<td>2.01</td>
<td>46.91</td>
<td>0.49</td>
<td>0.57</td>
<td>13.06</td>
<td>1.84</td>
</tr>
<tr>
<td></td>
<td>(0.43)</td>
<td>(0.26)</td>
<td>(17.81)</td>
<td>(0.50)</td>
<td>(7.55)</td>
<td>(4.34)</td>
<td></td>
</tr>
<tr>
<td>ES</td>
<td>0.22</td>
<td>2.18</td>
<td>45.15</td>
<td>0.48</td>
<td>0.10</td>
<td>10.99</td>
<td>3.02</td>
</tr>
<tr>
<td></td>
<td>(0.41)</td>
<td>(0.55)</td>
<td>(19.25)</td>
<td>(0.50)</td>
<td>(3.19)</td>
<td>(5.34)</td>
<td></td>
</tr>
<tr>
<td>FI</td>
<td>0.31</td>
<td>0.85</td>
<td>46.23</td>
<td>0.48</td>
<td>0.44</td>
<td>12.39</td>
<td>2.11</td>
</tr>
<tr>
<td></td>
<td>(0.46)</td>
<td>(0.39)</td>
<td>(18.80)</td>
<td>(0.50)</td>
<td>(6.65)</td>
<td>(4.11)</td>
<td></td>
</tr>
<tr>
<td>FR</td>
<td>0.26</td>
<td>2.24</td>
<td>46.61</td>
<td>0.46</td>
<td>0.33</td>
<td>12.15</td>
<td>2.89</td>
</tr>
<tr>
<td></td>
<td>(0.44)</td>
<td>(0.60)</td>
<td>(18.30)</td>
<td>(0.50)</td>
<td>(5.70)</td>
<td>(4.08)</td>
<td></td>
</tr>
<tr>
<td>GB</td>
<td>0.25</td>
<td>1.87</td>
<td>47.61</td>
<td>0.46</td>
<td>0.82</td>
<td>12.99</td>
<td>1.10</td>
</tr>
<tr>
<td></td>
<td>(0.43)</td>
<td>(0.12)</td>
<td>(18.83)</td>
<td>(0.50)</td>
<td>(9.00)</td>
<td>(3.65)</td>
<td></td>
</tr>
<tr>
<td>GR</td>
<td>0.18</td>
<td>1.73</td>
<td>49.87</td>
<td>0.44</td>
<td>0.66</td>
<td>9.83</td>
<td>2.90</td>
</tr>
<tr>
<td></td>
<td>(0.38)</td>
<td>(0.45)</td>
<td>(19.12)</td>
<td>(0.50)</td>
<td>(8.12)</td>
<td>(4.69)</td>
<td></td>
</tr>
<tr>
<td>IE</td>
<td>0.19</td>
<td>2.11</td>
<td>45.95</td>
<td>0.44</td>
<td>0.38</td>
<td>12.74</td>
<td>1.30</td>
</tr>
<tr>
<td></td>
<td>(0.39)</td>
<td>(0.03)</td>
<td>(17.90)</td>
<td>(0.50)</td>
<td>(6.11)</td>
<td>(3.45)</td>
<td></td>
</tr>
</tbody>
</table>
Table B.1. (cont’d). Summary statistics, by country (mean, standard deviation)

<table>
<thead>
<tr>
<th>country</th>
<th>crime victim</th>
<th>log(IMM/POP)</th>
<th>age</th>
<th>male</th>
<th>fin. wealth * 100</th>
<th>educ. yrs</th>
<th>EPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NL</td>
<td>0.19</td>
<td>2.44</td>
<td>47.85</td>
<td>0.44</td>
<td>0.48</td>
<td>12.89</td>
<td>2.24</td>
</tr>
<tr>
<td></td>
<td>(0.39)</td>
<td>(0.32)</td>
<td>(17.60)</td>
<td>(0.50)</td>
<td>(6.91)</td>
<td>(4.21)</td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>0.23</td>
<td>1.88</td>
<td>44.88</td>
<td>0.52</td>
<td>0.58</td>
<td>13.30</td>
<td>2.66</td>
</tr>
<tr>
<td></td>
<td>(0.42)</td>
<td>(0.46)</td>
<td>(17.70)</td>
<td>(0.50)</td>
<td>(7.58)</td>
<td>(3.70)</td>
<td></td>
</tr>
<tr>
<td>PT</td>
<td>0.16</td>
<td>1.73</td>
<td>48.72</td>
<td>0.40</td>
<td>0.18</td>
<td>7.45</td>
<td>3.27</td>
</tr>
<tr>
<td></td>
<td>(0.37)</td>
<td>(0.53)</td>
<td>(19.42)</td>
<td>(0.49)</td>
<td>(4.29)</td>
<td>(4.91)</td>
<td></td>
</tr>
<tr>
<td>SE</td>
<td>0.26</td>
<td>2.53</td>
<td>45.92</td>
<td>0.50</td>
<td>0.31</td>
<td>12.34</td>
<td>2.45</td>
</tr>
<tr>
<td></td>
<td>(0.44)</td>
<td>(0.38)</td>
<td>(18.94)</td>
<td>(0.50)</td>
<td>(5.57)</td>
<td>(3.57)</td>
<td></td>
</tr>
<tr>
<td>Tot.</td>
<td>0.21</td>
<td>2.16</td>
<td>46.50</td>
<td>0.47</td>
<td>0.45</td>
<td>12.01</td>
<td>2.29</td>
</tr>
<tr>
<td></td>
<td>(0.40)</td>
<td>(0.70)</td>
<td>(18.47)</td>
<td>(0.50)</td>
<td>(6.68)</td>
<td>(4.28)</td>
<td>(0.61)</td>
</tr>
</tbody>
</table>

Table B.2. Immigration and crime victimisation in EU countries (LPM)

<table>
<thead>
<tr>
<th>crime victim</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(IMM/POP)</td>
<td>$-0.140^*\pm 0.059$</td>
<td>0.600</td>
<td>0.101</td>
<td>0.066</td>
<td>0.007</td>
<td>0.048</td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td>(0.049)</td>
<td>(0.084)</td>
<td>(0.040)</td>
<td>(0.059)</td>
<td></td>
</tr>
<tr>
<td>male</td>
<td>0.021</td>
<td>0.029</td>
<td>0.012</td>
<td>0.001</td>
<td>0.009</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.015)</td>
<td>(0.010)</td>
<td>(0.019)</td>
<td>(0.003)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>fin. wealth</td>
<td>0.057</td>
<td>$-0.017$</td>
<td>0.075</td>
<td>0.209</td>
<td>0.040</td>
<td>0.115 **</td>
</tr>
<tr>
<td></td>
<td>(0.068)</td>
<td>(0.141)</td>
<td>(0.107)</td>
<td>(0.151)</td>
<td>(0.033)</td>
<td>(0.045)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.048</td>
<td>0.045</td>
<td>0.045</td>
<td>0.053</td>
<td>0.055</td>
<td>0.052</td>
</tr>
<tr>
<td>Obs.</td>
<td>7027</td>
<td>3058</td>
<td>8563</td>
<td>3954</td>
<td>58511</td>
<td>24036</td>
</tr>
<tr>
<td>EPL</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Int.</td>
<td>Int.</td>
</tr>
<tr>
<td>Pop. Density</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

Estimates from linear probability models. The same remarks of Table 1 apply.
C The autarkic equilibrium (not intended for publication)

Assuming the country’s population is fixed, an equilibrium in autarky is defined as follows:

**Definition C1.** Given the size of the population, \( P_i \), an autarkic equilibrium is a list \( \{n^*_i, \phi_i(P_i, n^*_i), w_i(P_i, n^*_i), u_i(P_i, n^*_i)\} \) such that \( u_i(P_i, n^*_i) \), \( \phi_i(P_i, n^*_i) \) and \( w_i(P_i, n^*_i) \) satisfy equations (3), (11) and (12), and \( n^*_i \) satisfies \( \omega_i(P_i, n^*_i) \geq \pi_i(P_i, n^*_i) \).

Intuitively, the economy is in equilibrium when no agent has an incentive to switch from the labour market to crime or vice versa. Proposition A1 states the existence of an equilibrium in the one country model.

**Proposition C1.** An autarkic equilibrium always exists.

**Proof of proposition C1.** The equilibrium crime rate, \( n^*_i \), is determined by the functions \( \pi_i(P_i, n_i) \) and \( \omega_i(P_i, n_i) \). As \( n_i \) goes to zero, \( \lim_{n_i \to 0} \pi_i(P_i, n_i) = (1 - d_i) \left( \frac{s_i + 2F_i(\phi_i(P_i, 0))}{s_i + P_i(F_i(\phi_i(P_i, 0)))} \right) k_i \), and \( \lim_{n_i \to 0} \omega_i(P_i, n_i) = \frac{\gamma_i c_i(P_i) \phi_i(P_i, 0)}{1 - \gamma_i c_i(P_i)} \), where \( \phi_i(P_i, 0) \) denotes the value of the tightness of the labour market when \( n_i = 0 \). From Lemma 2, \( \pi_i(P_i, n_i) \) is decreasing in \( n_i \), with \( \pi_i(P_i, 1) = (1 - d_i)k_i - k_i < 0 \); moreover, both functions \( \pi_i(P_i, n_i) \) and \( \omega_i(P_i, n_i) \) are continuous on the interval \( n_i \in [0, 1) \). Therefore, since an unemployed agent cannot lose more than her value of being a job-seeker, i.e. \( k_i n_i \leq \frac{\gamma_i c_i(P_i) \phi_i(P_i, n_i)}{1 - \gamma_i c_i(P_i)} \) \( \forall n_i \in [0, 1) \), two cases are possible:

(a) \( \exists n^*_i \in [0, 1) \) such that \( \omega_i(P_i, n^*_i) = \pi_i(P_i, n^*_i) \).

(b) \( \omega_i(P_i, n_i) > \pi_i(P_i, n_i) \), \( \forall n_i \in [0, 1) \).

In the first case, an interior equilibrium, \( n^*_i \), exists. Given the fact that \( d_i > 0, \pi_i(P_i, 1) < 0 \) and \( \lim_{n_i \to 1^-} \omega_i(P_i, n_i) = \frac{\gamma_i c_i(P_i) \phi_i(P_i, 1)}{1 - \gamma_i c_i(P_i)} k_i \geq 0 \), then \( (1 - d_i) k_i \geq \frac{\gamma_i c_i(P_i) \phi_i(P_i, 0)}{1 - \gamma_i c_i(P_i)} \left( \frac{s_i + P_i(F_i(\phi_i(P_i, 0)))}{s_i + 2F_i(\phi_i(P_i, 0))} \right) \) represents a sufficient condition for (a). The second case implies the existence of a corner solution in which the value of being job-seekers is higher than the expected profit from crime for any admissible and positive crime rate. Thus, it is profitable for all agents to engage in job searching implying \( n^*_i = 0 \).

If \( \omega_i(P_i, n_i) > \pi_i(P_i, n_i) \), \( \forall n_i \in [0, 1) \), then the model admits a (unique) corner solution in which \( n^*_i = 0 \) and our framework collapses into a standard job-search model with no crime. Moreover, the one-country model admits an interior equilibrium if the expected profit from crime when \( n_i = 0 \) is greater than a certain fraction \( \left( \frac{s_i + P_i(F_i(\phi_i(P_i, 0)))}{s_i + 2F_i(\phi_i(P_i, 0))} \right) \) of the value of being a job-seeker. That is, when criminal activities are sufficiently profitable, agents have an incentive to switch from the labour market to crime.
On the contrary, when \( n_i \) goes to 1, since profit from crime becomes negative and an unemployed cannot lose more than the value of being a job-seeker, individuals always have an incentive to switch from crime to job-seeking. The following corollary is directly implied by proposition A1.

**Corollary C1.** There are no countries where all individuals are criminals.

**Proof of corollary C1.** Given the fact that \( d_i > 0 \), \( \pi_i(P_i, 1) < 0 \) and \( \lim_{n_i \to 1^-} \omega_i(P_i, n_i) = \frac{\gamma_i}{1 - \gamma_i} c_i(P_i) \phi_i(P_i, 1) - k_i n_i \geq 0 \), the crime rate is (always) lower than one. ■

Thus, the only corner solution admitted by the one-country model is a situation in which \( n_i = 0 \). We now turn our attention to the stability of an autarkic equilibrium. The next proposition provides the condition under which an interior equilibrium is stable. Intuitively, an interior equilibrium is locally stable if a (sufficiently) small increase in \( n \) makes unemployment more valuable than crime. If not, a higher crime rate induces more agents to commit crime such that the economy diverges from the initial equilibrium.

**Proposition C2.** An interior equilibrium is stable if and only if
\[
\frac{\partial \omega_i(P_i, n_i^*)}{\partial n_i} > \frac{\partial \pi_i(P_i, n_i^*)}{\partial n_i}.
\]

**Proof of proposition C2.** First, we focus on the sufficient condition. Let \( n_i^* \in (0, 1) \) be the equilibrium crime rate. Consider an increase from \( n_i^* \) to \( n_i^* + \varepsilon \), with \( \varepsilon > 0 \) small enough. If \( \omega_i(P_i, n_i^* + \varepsilon) > \pi_i(P_i, n_i^* + \varepsilon) \), at \( n_i^* + \varepsilon \), unemployment is more profitable than crime. Thus, both the number and the proportion of criminals decrease and the economy moves back to the initial equilibrium. Now, consider a reduction of the crime rate from \( n_i^* \) to \( n_i^* - \varepsilon \). It is easy to check that \( n_i^* \) is stable if \( \omega_i(P_i, n_i^* - \varepsilon) < \pi_i(P_i, n_i^* - \varepsilon) \). Since \( \omega_i(P_i, n_i^*) = \pi_i(P_i, n_i^*) \) and functions \( \omega_i(P_i, n_i) \) and \( \pi_i(P_i, n_i) \) are differentiable, we can take the limit of the fractional incremental ratio. The two conditions collapse into the following expression:

\[
\frac{\partial \omega_i(P_i, n_i^*)}{\partial n_i} > \frac{\partial \pi_i(P_i, n_i^*)}{\partial n_i} \quad \text{(C1)}
\]

Moving to the necessary condition, by contradiction, suppose that the domestic equilibrium is stable and that \( \frac{\partial \omega_i(P_i, n_i^*)}{\partial n_i} < \frac{\partial \pi_i(P_i, n_i^*)}{\partial n_i} \). Since the equilibrium is (locally) stable, after any small perturbation, the economy must go back to the initial equilibrium. Consider a negative perturbation that makes the economy to pass from \( n_i^* \) to \( n_i^* - \varepsilon \). Since the equilibrium is stable the proportion of criminals must increase from \( n_i^* - \varepsilon \) to \( n_i^* \). But since we have assumed that \( \frac{\partial \omega_i(P_i, n_i^*)}{\partial n_i} < \frac{\partial \pi_i(P_i, n_i^*)}{\partial n_i} \), the reduction in the value of unemployment, \( \omega_i(P_i, n_i) \), is smaller than
the reduction in the value of crime, \( \pi_i(P_i, n_i) \), i.e. \( \omega_i(P_i, n_i^* - \varepsilon) > 0 \). This contradicts the hypothesis of stability.

We are now able to characterise the autarkic equilibrium. According to the following proposition, the autarkic equilibrium is unique and, given the condition in proposition A2, stable.

**Proposition C3.** The autarkic equilibrium is always unique and stable.

**Proof of proposition C3.** First, we show that, in equilibrium, \( \frac{\partial \phi_i(P_i, n_i^*)}{\partial n_i} > \frac{\partial \pi_i(P_i, n_i^*)}{\partial n_i} \).

By simple algebra, \( \frac{\partial \phi_i(P_i, n_i^*)}{\partial n_i} = -\frac{c_i(P_i)(1-\gamma_i)k_i}{c_i(P_i)\gamma_i + (r_i+s_i)\frac{1}{\eta_i(P_i, n_i^*)}} \). Thus, in equilibrium, the inequality to prove becomes:

\[
\frac{k_i\gamma_i F_i(\phi_i(P_i, n_i^*))}{(1 - d_i)k_i F_i(\phi_i(P_i, n_i^*))} > \frac{(1 - d_i)k_i F_i(\phi_i(P_i, n_i^*))}{(s_i + F_i(\phi_i(P_i, n_i^*)))}\left[\left(1 - \frac{n_i^*}{s_i}\right)\gamma_i F_i(\phi_i(P_i, n_i^*))\right] + \frac{(1 - d_i)k_i F_i(\phi_i(P_i, n_i^*))}{(s_i + F_i(\phi_i(P_i, n_i^*)))^2},
\]

(C2)

where \( \eta_i(P_i, n_i^*) \) is the elasticity of the matching function with respect to the equilibrium unemployment rate: \( \eta_i(P_i, n_i^*) = \frac{d \phi_i(P_i, n_i^*)}{d n_i(P_i, n_i^*)} \).

By solving for \( \eta_i(P_i, n_i^*) \), we get

\[
\eta_i(P_i, n_i^*) >
\]

\[
\eta_i(P_i, n_i^*) > \frac{c_i\gamma_i (s_i + F_i(\phi_i(P_i, n_i^*)))(s_i + (2 - d_i)F_i(\phi_i(P_i, n_i^*))) - k_i(-1 + n_i^*)s_i(\gamma_i - 1)q_i(\phi_i(P_i, n_i^*)))}{(d_i - 1)(c_i(r_i + s_i)(s_i + F_i(\phi_i(P_i, n_i^*))) - k_i(-1 + n_i^*)s_i(\gamma_i - 1)q_i(\phi_i(P_i, n_i^*)))} + \frac{(1 - d_i)k_i s_i q_i(\phi_i(P_i, n_i^*))}{(1 - n_i^*)(\gamma_i - 1)k_i s_i q_i(\phi_i(P_i, n_i^*))} + (d_i - 1)(c_i(r_i + s_i)(s_i + F_i(\phi_i(P_i, n_i^*))) - k_i(-1 + n_i^*)s_i(\gamma_i - 1)q_i(\phi_i(P_i, n_i^*)))
\]

Notice that the numerator of the RHS is always positive. Hence, if the denominator is always negative, the last inequality will be always satisfied. Since \( d_i \leq 1 \), we must prove that \( c_i(r_i + s_i)(s_i + F_i(\phi_i(P_i, n_i^*))) - k_i(-1 + n_i^*)s_i(\gamma_i - 1)q_i(\phi_i(P_i, n_i^*)) > 0 \). In other words, we must prove that

\[
(1 - n_i^*)k_i < \frac{c_i(r_i + s_i)}{q_i(\phi_i(P_i, n_i^*))} \frac{s_i + F_i(\phi_i(P_i, n_i^*))}{s_i(1 - \gamma_i)}
\]

(C4)

From (6), we know that \( \frac{c_i(r_i + s_i)}{q_i(\phi_i(P_i, n_i^*))} = H_i - w_i - k_i n_i; \) at the same time, we have that
is also worth noticing that, when the following analysis we will mainly focus on the local properties of an interior equilibrium. It next section).

Suppose that, in the autarkic equilibrium,

\[
\frac{s_i + F_i(\phi_i(P_i, n_i^*))}{s_i(1 - \gamma_i)} > 1. 
\]

Hence, given the fact that \( H_i - w_i \geq k_i \), in equilibrium must be that

\[
\frac{\partial \omega_i(P_i, n_i^*)}{\partial n_i} > \frac{\partial \pi_i(P_i, n_i^*)}{\partial n_i}.
\]

Now, since \( \frac{\partial \omega_i(P_i, n_i^*)}{\partial n_i} > \frac{\partial \pi_i(P_i, n_i^*)}{\partial n_i} \) and \( \lim_{n_i \rightarrow 1^-} \pi_i(P_i, n_i) < \lim_{n_i \rightarrow 1^-} \omega_i(P_i, n_i) \), for the continuity of \( \pi_i(P_i, n_i) \) and \( \omega_i(P_i, n_i) \), two cases are possible:

a) \( \exists 1! n_i^* \in [0, 1) \) such that \( \omega_i(P_i, n_i^*) = \pi_i(P_i, n_i^*) \).

b) \( \omega_i(P_i, n_i) > \pi_i(P_i, n_i), \forall n_i \in [0, 1) \).

In both cases, the equilibrium (both the interior or the corner solution) is unique and stable.

Proposition A3 has important consequences for our model, because it guarantees the continuity of the domestic locus in the two-country analysis (a concept that will be defined in the next section).

Since the aim of the paper is to study the relationship between immigration and crime, in the following analysis we will mainly focus on the local properties of an interior equilibrium. It is also worth noticing that, when \( n_i^* = 0 \), our model collapses into a standard search model with no crime. The last result of this section refers to the relationship between labour productivity and crime.

**Proposition C4.** Suppose that, in the autarkic equilibrium, \( n_i^* > 0 \). When the labour productivity increases, the equilibrium crime rate decreases.

**Proof of proposition C4.** We must prove that \( \frac{dn_i^*}{dH_i} < 0 \). By totally differentiating the equilibrium condition \( \pi_i(P_i, n_i^*) = \omega_i(P_i, n_i^*) \) with respect to \( H_i \) and \( n_i \), we obtain:

\[
\frac{dn_i^*}{dH_i} = \frac{\frac{\partial \omega_i(P_i, n_i^*)}{\partial H_i} - \frac{\partial \pi_i(P_i, n_i^*)}{\partial H_i}}{\frac{\partial \omega_i(P_i, n_i^*)}{\partial n_i} - \frac{\partial \pi_i(P_i, n_i^*)}{\partial n_i}}. 
\]

From Proposition 2, we know that \( \frac{\partial \pi_i(P_i, n_i^*)}{\partial n_i} - \frac{\partial \omega_i(P_i, n_i^*)}{\partial n_i} < 0 \), therefore, in order to have \( \frac{dn_i^*}{dH_i} < 0 \), it must be that \( \frac{\partial \omega_i(P_i, n_i^*)}{\partial H_i} > \frac{\partial \pi_i(P_i, n_i^*)}{\partial H_i} > 0 \). Using equations (9) and (13) we can compute \( \frac{\partial \omega_i(P_i, n_i^*)}{\partial H_i} \) and \( \frac{\partial \pi_i(P_i, n_i^*)}{\partial H_i} \), and the previous condition can be rewritten as

\[
\frac{\gamma_i}{1 - \gamma_i} c_i(P_i) > -(1 - d_i)k_i d_{\phi_i(P_i, n_i^*)} F_i(\phi_i(P_i, n_i^*)) dF_i(\phi_i(P_i, n_i^*)) d\phi_i(P_i, n_i^*). 
\]

By multiplying both sides of the previous condition by \( \phi_i(P_i, n_i^*) \) the left hand side of the inequality becomes \( \omega_i(P_i, n_i^*) + k_i n_i \). Provided that \( \pi_i(P_i, n_i^*) = \omega_i(P_i, n_i^*) \), we need to prove that \( \pi_i(P_i, n_i^*) + k_i n_i > -(1 - d_i)k_i d_{\phi_i(P_i, n_i^*)} F_i(\phi_i(P_i, n_i^*)) dF_i(\phi_i(P_i, n_i^*)) d\phi_i(P_i, n_i^*) \). By using equations (3) and (13) and by recalling that

\[
F_i(\phi_i(P_i, n_i^*)) = q_i(\phi_i(P_i, n_i^*)) (1 - \eta_i(\phi_i(P_i, n_i^*))), 
\]

the previous inequality collapses into

\[
(2 - n_i^*) (s_i + F_i(\phi_i(P_i, n_i^*)))^2 > [s_i + F_i(\phi_i(P_i, n_i^*))(2 - \eta_i(\phi_i(P_i, n_i^*))) s_i (1 - n_i^*)]. 
\]

Since \( (2 - n_i^*) > (1 - n_i^*) \) and \( (s_i + F_i(\phi_i(P_i, n_i^*)))^2 > [s_i + F_i(\phi_i(P_i, n_i^*))(2 - \eta_i(\phi_i(P_i, n_i^*))) s_i \), then

\[
\frac{\partial \omega_i(P_i, n_i^*)}{\partial H_i} - \frac{\partial \pi_i(P_i, n_i^*)}{\partial H_i} > 0. \]
When labour becomes more productive, the value of being a job-seeker increases more than the profit from crime. This implies a reduction in the crime rate and, by the stability of the autarkic equilibrium, an increase in the profit from crime that compensates the effects of the initial shock on $\omega_i(P_t, n_t)$. This process drives the system to a new equilibrium that is associated with a lower crime rate.
References


