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DO IMMIGRANTS MAKE US SAFER? A MODEL ON CRIME, IMMIGRATION AND THE LABOR MARKET

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November 2010
Revised September 2013

"MARCO FANNO" WORKING PAPER N.121

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

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This version: August 2013

Abstract

We present a two-country equilibrium model with search costs in which the structural characteristics of the labor market in each economy affects the relationship between immigration and crime. The main result of the model is that countries with flexible labor markets are likely to see 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 favor of this theoretical prediction. A policy implication of our study is that migration from a country with a rigid labor market to a country with a more flexible labor market is mutually beneficial in terms of reducing crime rates.

Keywords: Crime Rate, Labor 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, Tsuyoshi Shinozaki, Francesco Sobbrio, 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, the 2013 IIPF congress and the lunch seminar at the University of Miami.

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1 Introduction

'Do immigrants make us safer?'[1] Among the "hot" issues policymakers in industrialized countries face, the relationship between immigration and crime is one of the most controversial, as the native population often perceives immigration as a source of criminality. By analyzing data from the National Identity Survey during the period 1995-2003, Bianchi et al. (2012) report that much of the population in $OECD$ countries - from a low of 40 percent in the United Kingdom to a high of 80 percent in Norway - is concerned that immigrants increase crime (see also Martinez and Lee, 2000; Bauer et al., 2001).

Despite public opinion, however, the sign of the relationship between immigration and crime is an open question for social scientists. While in some cases immigration is 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). The current theoretical literature provides no explanation for this puzzling evidence, as existing models study either the relationship between (un)employment and crime or the economic determinants of the agent's decision to migrate. In 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 of moving abroad are greater than the expected net benefits of remaining at home and participating in the domestic labor market. As far as we know, no theoretical contributions have built a unified framework with which to analyze the simultaneous interplay among immigration, crime and the labor markets. Introducing both migration and crime as economic alternatives to detrimental labor conditions allows us to study whether the relationship between immigration and crime depends on the structural characteristics of the labor market in the native and the host countries. It is reasonable to expect that the probability that an immigrant will commit a crime is affected by the flexibility of the labor market in her host country, as the greater the capacity of the host country's labor market to absorb new job-seekers, the lower the immigrant's (economic) incentive to engage in criminal activity.

This paper provides a simple and intuitive theoretical framework with which to analyze the determinants of migration flows and how the labor market conditions of the two countries

[1] New York Times Magazine, December 3, 2006.

affect the relationship between immigration and crime. We present a two-country search model in which wages, inward and outward migration flows, and crime rates are simultaneously determined by the interplay among immigration, crime and the structural characteristics of the labor markets in the two countries. As in the standard matching theory, in each country the labor market is characterized by the search costs for workers and firms. These costs lead to frictional unemployment and imperfectly competitive wages that are the result of a (Nash) bargaining process between firms and job-seekers. In addition to pursuing labor opportunities, agents can choose to undertake criminal activities, which also present expected costs and potential earnings. In particular, the marginal agent will be indifferent between committing a crime and participating in the labor market only if the net expected benefits of job-seeking are equal to those of criminal activities. By following standard migration models, rational agents will migrate only if the net expected benefits of moving abroad (and either engaging in criminal activities or participating in the host country's labor market as job-seekers) are higher than those of remaining in the native country.

Our main result is that immigration is beneficial for countries characterized by a sufficiently flexible labor market, as in these economies immigration is likely to reduce the domestic crime rate. The intuition behind this result is that immigration increases the population density in the host country, reducing the average distance between firms and job-seekers (Diamond, 1982a). If search costs decrease as a result, firms will create new vacancies and the labor market will tighten, which has two main economic consequences: It increases the expected benefits (for both immigrants and the native population) of participating in the domestic labor market by reducing the duration of unemployment, and since better economic conditions offer new crime opportunities, a tight labor market increases the net benefit of engaging in criminal activities. If the degree of tightness varies sufficiently, then the positive effects of the labor market overcome those of crime, and immigrants will opt for participating in the labor market over engaging in criminal activity.

We find empirical support for the main theoretical implication of the model using European Social Survey data from thirteen European countries and the *OECD* Employment Protection Index to assess how the relationship between crime victimization and migration penetration in an area of residence is affected by the flexibility of the domestic labor market. We find that, while countries with flexible labor markets are more likely to see a negative relationship between immigration and crime, the relationship is positive in countries with rigid labor markets.

The rest of the paper is organized as follows. The next section relates our contribution to the existing theoretical literature. Section 3 presents the two-country model and states the main theoretical results on the interplay between immigration, crime and the flexibility of the labor market. Section 4 provides supporting evidence in favor of the model's main theoretical prediction. Section 5 discusses extensions of the model that account for heterogeneity across agents. Finally, Section 5 concludes.

2 Literature review

Our theoretical framework is inspired by standard models of search in the labor market (Diamond, 1981, 1982a,b; Mortensen, 1982a,b; Pissarides, 1984a,b).[2] As in traditional search models, because of imperfect information and other sources of friction, the process of matching job-seekers and the vacant positions firms post imposes time and economic costs on both parties and leads to temporary unemployment. We depart from the standard setting, as we consider a two-country model in which the characteristics of the labor markets determine the sign of the relationship between immigration and crime.

Ortega (2000) is probably contribution most closely related to ours. Ortega presents a two-country labor-matching model (with no crime) in which domestic firms offer job vacancies to residents, taking into account the average search costs of the population, and job-seekers look for positions either in their own country or in the other country. Migrating to the other country imposes mobility costs on agents. In each country, the equilibrium wage is the outcome of a Nash bargaining process between firms and job-seekers based on a matching function with constant returns to scale. Based on this framework, Ortega derives two main results. First, depending on the characteristics of the two countries' labor markets, the model admits multiple equilibria that differ in their migration intensity (no-migration, 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 representing the Pareto-superior and Pareto-inferior outcomes, respectively. We present a generalization of Ortega (2000) in which agents face the choice between migration and crime as alternatives to unfavorable labor conditions in their home country. This approach allows us to

[2] Se also Mortensen (1986) and Mortensen and Pissarides (1999) for excellent surveys.

study the sign of the relationship between immigration and crime and whether this interplay depends on the structural characteristics of the two countries' labor markets.

Leaving aside agents' decisions to migrate, Burdett et al. (2003) present a one-country search model to investigate the interaction among crime, inequality and unemployment. Each firm posts a (fixed) wage and hires any job-seeker who is willing to work for that wage, and crime is introduced as an opportunity to steal others' resources. The probability that an agent will engage in criminal activity depends on both her labor conditions (the equilibrium wage and the probability of finding/losing the job) and the (fixed) probability of being arrested. Finally, all the agents face the risk of crime victimization, as the higher the probability that an agent will engage in criminal activities, the higher the risk of crime victimization in the economy. Burdett et al. show in this framework that introducing crime as an alternative economic activity has two main implications: It causes wage dispersion among homogeneous workers, and it introduces multiple equilibria in terms of combinations of crime and unemployment rates.[3] Our setting differs from that of Burdett et al.'s model in several respects. First, in our model, the equilibrium wages are the result of a Nash bargaining process between firms and workers (Pissarides, 2000), and they reflect the bargaining power of and the costs borne by the two contracting parties. Second, unlike Burdett at al. (2003), we model crime as a reversible choice, as an agent can change her status and switch from criminal activity to job-seeking at any time. Finally, we deal with a two-country economy with migration flows. In this perspective, agents can decide to migrate because they observe either better labor conditions or more remunerative criminal activities in the host country.

Engelhardt et al. (2008) present a search model (with crime) in which all the agents, irrespective of their labor-force status, can engage in criminal activity, and the terms and conditions of employment contracts are the result of bilateral bargaining between firms and workers. In this model, an agent's decision to commit crimes depends on both her bargaining power and the probability of finding a job. The authors show that, in equilibrium, the probability that an agent will commit crimes depends on her labor-force status, with unemployed agents being the most likely to engage in criminal activity. On the basis of their model, the authors analyze the effects of labor and crime policies on the crime rate. Labor policies (e.g., unemployment insurance, small-wage subsidies, hiring subsidies) reduce the crime rate by altering the labor

[3] Burdett et al. (2004) extend their original model to a setting with on-the-job search.

market conditions. On the other hand, crime policies significantly affect the crime rate and do not imply remarkable labor market distortions. Although similar to Engelhardt et al.'s model in terms of the structure of the labor market, our model focuses on the relationship between immigration and crime to determine how migration and labor market policies affect the probability that immigration increases the crime rate in the host country.

3 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 employed (L_i), unemployed (U_i) or criminals (N_i). It follows that $P_i = L_i + U_i + N_i$.[4] Time is continuous, and agents who are not working choose at any point in time whether to participate in the labor market as job-seekers or commit crime.

Subsection 3.1 describes the structure of the labor market in country i. Then we analyze in Subsection 3.2 the crime decision made by agents of country i. Finally, Subsection 3.3 presents the main equilibrium results of the two-country model.

3.1 The labor market

The labor market of country i is characterized by search frictions, that is, because of some source of imperfect information in the labor market, the matching process between vacancies and job-seekers is costly in terms of time and 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 labor market:

$$M_i = M_i(U_i, V_i), \quad \frac{\partial M_i}{\partial U_i}, \frac{\partial M_i}{\partial V_i} > 0, \tag{1}$$

where V_i is the number of vacancies available at 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,

[4] We do not explicitly model the incarceration flows here, but P_i can be considered the fraction of the total population that is not in jail, assuming that the fractions of captured criminals and released prisoners are always the same.

$$m_i \equiv \frac{M_i}{V_i} = q_i(\phi_i), \tag{2}$$

where $\phi_i \equiv \frac{V_i}{U_i}$ measures the tightness of the labor market. Since $M_i \leq V_i$ and $M_i \leq U_i$, $q_i(\phi_i)$ represents the probability that a vacancy will be filled, and it is decreasing in ϕ_i. Therefore, the corresponding instantaneous probability of filling a vacancy is $q_i(\phi_i)dt$. Assuming a Poisson distribution, the average time of a match for a vacancy is $\int_0^\infty e^{-q_i(\phi_i)t}dt = \frac{1}{q_i(\phi_i)}$.

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 ϕ_i. The average time for finding a job is therefore $\frac{1}{F_i(\phi_i)}$. The dynamic equation that describes the evolution of employment is given by $\frac{dL_i}{dt} = F_i(\phi_i)U_i - s_i L_i$, where s_i is the exogenous job-destruction rate. 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:

$$u_i(n_i) = \frac{s_i(1 - n_i)}{s_i + F_i(\phi_i)}, \tag{3}$$

where $u_i = \frac{U_i}{P_i}$ is the unemployment rate and $n_i = \frac{N_i}{P_i}$ is the crime rate.[5]

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

Consider the problem faced by a generic value-maximizer firm entering the search process. Let $J_{0,i}$ and $J_{1,i}$ be the values of an unfilled and filled vacancy, respectively.[6] The two no arbitrage conditions (i.e., hiring a job-seeker and firing a worker) faced by the firm are

$$\begin{cases} r_i J_{0,i} = q_i(\phi_i)(J_{1,i} - J_{0,i}) - c_i(P_i) \\ r_i J_{1,i} = H_i - w_i - s_i(J_{1,i} - J_{0,i}) - k_i n_i, \end{cases}, \tag{4}$$

where r_i is the interest rate and H_i is the productivity of labor 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, $k_i n_i$ represents the victimization cost that a firm bears after the match and $c_i(P_i) > 0$ is the cost of

[5] The crime rate is usually defined as the ratio of crimes in a geographic area to the population size in that area. However, since in our model criminals are homogeneous and each commits the same amount of crime, there is a one-to-one relationship between this definition and the ratio, $\frac{N_i}{P_i}$.

[6] For the sake of simplicity, we abstract from the presence of physical capital. Our main results are not qualitatively affected by this assumption.

searching for a new employee, with $H_i > c_i(P_i)$. By following Burdett et al. (2003), we assume that the victimization cost increases linearly with the crime rate.[7] Moreover, given that an unfilled vacancy does not generate revenues, the victimization cost associated with it is null.

Search costs decrease with the (average) distance between firms and job-seekers. More specifically, as in Diamond (1982a), the search process is characterized by the presence of *agglomeration externalities to density* such that denser markets should be characterized by a lower degree of information imperfection. In a context in which workers are homogenous, this assumption is simply a statistical artifact that is due to the immigration of potential workers. Therefore, following Wheeler (2001), we assume that the per-worker recruitment costs firms bear decrease with population density: $\frac{dc_i(P_i)}{dP_i} < 0$. Of course, in addition to agglomeration externalities, congestion effects may occur (Petrongolo and Pissarides, 2001). However, to keep the analysis as simple as possible, and in line with empirical observations (Di Addario, 2011), we assume that the effects of agglomeration externalities on search costs always exceed those exerted by congestion.[8]

Given the free entry condition in the market, the value of an unfilled 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:

$$\frac{c_i(P_i)}{q_i(\phi_i)} = \frac{H_i - w_i - k_i n_i}{r_i + s_i} \tag{5}$$

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

$$w_i^d = H_i - k_i n_i - \frac{(r_i + s_i)c_i(P_i)}{q_i(\phi_i)}. \tag{6}$$

Moving to the labor force, let $W_{0,i}$ and $W_{1,i}$ be the current values of being unemployed and employed, respectively. Thus, similar to system (4), two no arbitrage conditions for unemployed agents can be specified: the first requires that the current value of being a job-seeker is equal to the expected value of finding a job, and the second requires that the current value of being

[7] Linearity is assumed for the sake of simplicity, but 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 at any point in time, our setting can be modified by introducing a (more general) concave function. Our main results continue to hold under concavity of $k_i(n_i)$.

[8] When congestion effects are large enough to determine a positive relationship between search costs and population density, labor market flexibilities may lead to a positive relationship between immigration and crime.

employed is equal to the expected value of losing the job and moving back to the status of job-seeker:

$$\begin{cases} r_i W_{0,i} = F_i(\phi_i)(W_{1,i} - W_{0,i}) - z_i - k_i n_i \\ r_i W_{1,i} = w_i - s_i(W_{1,i} - W_{0,i}) - k_i n_i \end{cases}, \tag{7}$$

where z_i is the search cost faced by an unemployed agent. Henceforth, we assume $z_i = 0$. In (7) we assume that firms and individuals bear the same victimization cost, which excludes the possibility that results are driven by differences in the victimization cost.

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

$$w_i = \arg\max (W_{1,i} - W_{0,i})^{\gamma_i} (J_{1,i} - J_{0,i})^{1-\gamma_i}, \quad \gamma_i \in (0,1), \tag{8}$$

where γ_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 $W_{1,i} - W_{0,i} = \gamma_i \Omega_i$. By using this result and considering systems (4) and (7), we obtain the current value of a job-seeker:

$$\omega_i(P_i, n_i) \equiv r_i W_{0,i} = \frac{\gamma_i}{1-\gamma_i} \phi_i c_i(P_i) - k_i n_i. \tag{9}$$

As shown by equation (9), the value of a job-seeker increases with both the tightness of the labor market and the bargaining power of workers. From equation (9) and the result of the maximization problem (8), we can express the labor supply curve in terms of ϕ_i as:

$$w_i^s = \gamma_i H_i + \gamma_i \phi_i c_i(P_i) - \gamma_i k_i n_i. \tag{10}$$

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 ϕ_i as a function of $c_i(P_i)$ and n_i, $\phi_i(P_i, n_i)$. The following lemma characterizes 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 Lemma 1 is that a higher population density induces firms to post more vacancies by reducing the firm's search costs. This effect implies that both the tightness of the labor market and the probability of finding a job increase. On the other hand, as long as firms have positive bargaining power, a higher crime induces firms to post fewer vacancies by increasing the victimization cost.

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

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

3.2 Crime decision

As anticipated, an agent engages in criminal activity when the expected profit from engaging in crime exceeds the expected value of being a job-seeker. The expected revenue of a criminal is expressed by the ratio between the total victimization cost, $k_i n_i (P_i + L_i)$, and the number of criminals, N_i.[10] The total victimization cost is obtained by multiplying the individual victimization cost ($k_i n_i$) by the number of individuals (P_i) and the number of firms with a filled vacancy (L_i). We also assume that an agent who decides to commit a crime bears the expected cost of being incarcerated, where the risk of incarceration increases linearly with the revenues from crime. Therefore, the expected profit from committing a crime net of the victimization cost and the incarceration cost can be written as

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

where $d_i k_i$, with $d_i > 0$, is the marginal expected cost of incarceration. This parameter also captures the level of law enforcement in country i. For the sake of simplicity, we assume that the marginal cost is the same for both the native population and immigrants, but this assumption can be relaxed by introducing idiosyncratic costs. For instance, one can assume that immigrants are targeted by police or that individuals have diverse abilities to commit

[9] All proofs are presented in the appendix.

[10] We assume that $k_i \leq \min\left(H_i - w_i, \frac{\gamma_i}{1-\gamma_i} \phi_i(P_i, n_i) c_i(P_i)\right)$, such that revenues from crime cannot exceed the gross wealth of their victims.

crimes. In this case, the model also explains why immigrants have higher incarceration rates relative to the native population (see, e.g., Moheling and Piehl, 2009, and Mastrobuoni and Pinotti, 2011). According to (13), criminals (like any other category of agents) also bear the victimization cost, as engaging in criminal activity does not protect an agent from being the victim of crime.

Given the Beveridge curve in (3) and that the probability of finding a job increases with the labor market tightness, it follows that $\pi_i(P_i, n_i)$ is increasing in $\phi_i(P_i, n_i)$. In other words, a tighter labor market leads to more economic activity and, therefore, higher expected profit from crime. Lemma 1 implies the result stated in Lemma 2.

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

Therefore, there is a negative relationship between the crime rate and the expected profit from crime because the victimization cost associated with a higher crime rate reduces the fraction of productive firms and the number of potential victims. On the other hand, an increase in the size of the population facilitates economic and criminal activities by lowering the search costs.

3.3 Equilibrium

Now we move to the equilibrium analysis of the two-country model. Suppose that the world population, P, is fixed, so 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, which has two implications. First, in ensures that the size of a country's population is not fixed but increases with immigration and decreases if residents emigrate. Second, in addition to participating in the domestic labor market and engaging in crime in their own country, agents can also decide to carry out these activities abroad.

We separate our analysis into two steps, studying how a domestic equilibrium reacts to migration flows before and then deriving the conditions under which the domestic equilibria of the two countries are associated with an international equilibrium in which no agent has an incentive to emigrate. In order to conduct our analysis, we develop two theoretical tools: the domestic and the international loci (denoted hereafter, with superscripts D and I, respectively).

3.3.1 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), in 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. Appendix A provides a proof for the existence, stability and uniqueness of a domestic equilibrium for a given population size.

The domestic locus implicitly 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 differentiating equation (14), we obtain the sign of the relationship between $n_i^D(P_i)$ and P_i:

$$\frac{dn_A^D(P_A)}{dP_A} = \frac{\frac{\partial \omega_A(P_A,n_A)}{\partial P_A} - \frac{\partial \pi_A(P_A,n_A)}{\partial P_A}}{\frac{\partial \pi_A(P_A,n_A)}{\partial n_A} - \frac{\partial \omega_A(P_A,n_A)}{\partial n_A}}. \tag{15}$$

The denominator of (15) is always negative and the domestic locus is a continuous function of P_A.[11] Therefore, since $\frac{\partial \pi_A(P_A,n_A)}{\partial P_A}$ is positive (Lemma 2), the sign of $\frac{dn_A^D(P_A)}{dP_A}$ depends on the sign of $\frac{\partial \omega_A(P_A,n_A)}{\partial P_A}$. In other words, the sign of the relationship between n_A and P_A depends on the characteristics of the domestic labor market.

Proposition 1. *The relationship between $n_A^D(P_A)$ and P_A is negative only if the tightness of the labor market is sufficiently reactive to the population density.*

Suppose that the population of country A increases. By lowering the firms' search costs, $c_A(P_A)$, the change in the population size increases the tightness of the labor market and 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, the crime rate decreases. The presence of agglomeration externalities, independent of their size, represents an activator of the transmission channel described above. In fact, the slope of the domestic locus is exclusively determined by the elasticity of the labor market's tightness with respect to the population density. Corollary 1 follows from Proposition 1.

[11] See proposition A2 in Appendix A.

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 $c_A(P_A)$: for any level of P_A, search costs are strictly positive; agglomeration externalities always exceed congestion effects; and as the population density increases, the effects of agglomeration externalities on the search costs tend to vanish. Thus, 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, so immigration does not modify the relative profitability of an agent's choosing to participate in the labor market with respect to crime.

Other results qualify the expression of the domestic locus. For instance, it is possible to show that there is a negative relationship between the crime rate and labor productivity for any given population size.[12]

3.3.2 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:

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

$$\pi_A(P_A, n_A) = \pi_B(P_B, n_B). \tag{17}$$

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.[13] 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

[12] See proposition A4 in Appendix A.

[13] Given the population constraint, one equation of the system that includes condition (14) for the two countries, (16) and (17), is always redundant.

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:

$$\omega_A(P_A, n_A^I) = \omega_B(P - P_A, n_B^D(P - P_A)). \tag{18}$$

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

$$\frac{dn_A^I(P_A)}{dP_A} = \frac{-\frac{\partial \omega_B(P-P_A, n_B^D(P-P_A))}{\partial(P-P_A)} - \frac{\partial \omega_A(P_A, n_A)}{\partial P_A}}{\frac{\partial \omega_A(P_A, n_A)}{\partial n_A}} \tag{19}$$

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

3.3.3 The international equilibrium

Definition 1. *Given the size of the (world) population, P, an international equilibrium is a list $\{P_i^*, n_i^*, \phi_i(P_i^*, n_i^*), w_i(P_i^*, n_i^*), u(P_i^*, n_i^*)\}$, 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 $P_B^* = P$.*

An international equilibrium is associated with a combination of P_A^*, P_B^*, n_A^* and n_B^* such that (14) for both countries and (16) and (17) are simultaneously satisfied. In other words, an international equilibrium is a situation in which there is no immigration and no agent in either country has an incentive to switch from the labor market to crime or 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, that is, $n_A^* = n_A^D(P_A^*) = n_A^I(P_A^*)$. Moreover, as is the case for given population size, the domestic equilibrium in one country is always unique and stable,[14] 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

[14]See proposition A3 in Appendix A.

B. Finally, (ii) and (iii) in definition 1 characterize 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, by Definition 1, the pair $\{P, n_A^*\}$ is associated 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 result refers to the existence of an international equilibrium.

Proposition 2. *An international equilibrium always exists.*

One observation on the international equilibria of our model is that, 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, such that $P_A^* = P$, $P_B^* = 0$ and $n_A^* > 0$, the two-country model collapses into the autarkic setting presented in Appendix A. A second important remark is that, given the structure of the search costs, the model can generate multiple equilibria. Under multiplicity, the stability properties of the equilibria must be studied in order to gain insights into which solution is more likely to emerge. In this respect, Proposition 3 states the condition for the stability of an interior international equilibrium. In line with traditional matching models, the implicit assumption behind Proposition 3 is that, during the adjustment process towards the international equilibrium, condition (14) is always satisfied for each country. In other words, domestic markets adjust faster than international markets do.

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

Suppose that, in equilibrium, $\frac{dn_A^D(P_A^*)}{dP_A} < 0$. Let the population of country A decrease by ε (with ε small enough). 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 it is in country B and agents migrate from country B to country A. Thus, 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.

Corollary 2. *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 3. *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 Corollary 3, 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 slopes upward).

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, Proposition 4 highlights the relevance of the characteristics of the two countries' labor markets to determine the effects of migration flows on the domestic crime rates.

Proposition 4. *Migration flows from a country with a rigid labor market to a country with a flexible labor market are mutually benefic in terms of crime reduction, whereas opposite migration flows increase both countries' crime rates.*

In order to explain the intuition behind Proposition 4 and in line with Corollary 4, consider a situation in which country A is characterized by a (sufficiently) flexible labor market, while country B has a rigid labor market. Figure 1 provides a graphic representation of this situation. 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 the population in country A is P_A and the population in country B is $P - P_A$. In this case, given Proposition 3, the crime rate implied by the domestic locus of country A, $n_A^D(P_A)$, is lower than that associated with the international locus, $n_A^I(P_A)$. Therefore, the expected benefits of participating in the labor 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, increasing the tightness of country A' labor market (Lemma 1) and the value of a job-seeker. Given the assumption that domestic markets adjust faster than international markets do, the economy moves towards the international equilibrium, E_1, along the domestic locus of country A. During this adjustment process, the crime rate in country A decreases. Moreover, since the labor market in country B is rigid, the emigration from B implies an increase in the value of a job-seeker and a corresponding reduction in the domestic crime rate of country B. In other words, migration flows from countries with strong work rigidities to countries characterized by (sufficiently) flexible labor markets are mutually beneficial in terms of reducing the corresponding crime rates.

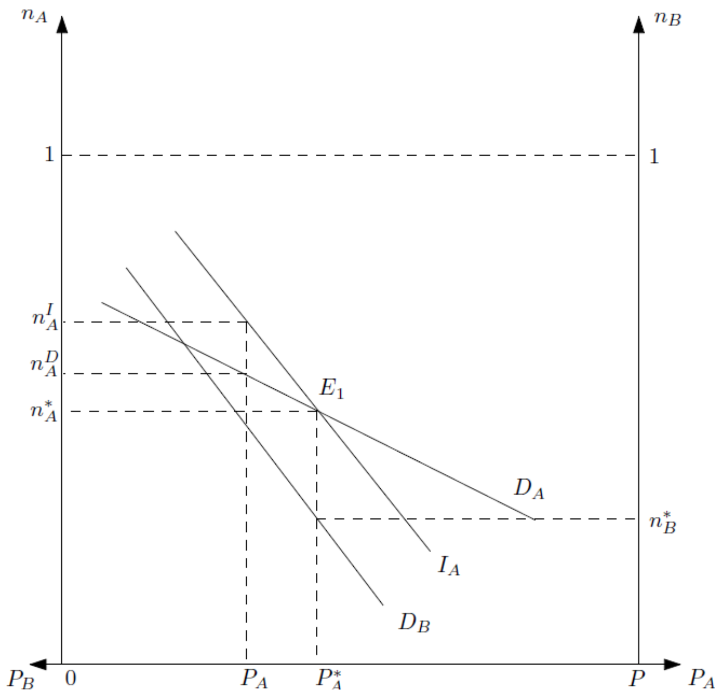

Figure 1. A stable international equilibrium.

4 Empirical evidence

4.1 Data and empirical strategy

In this section, we provide an empirical test of the main result stated in Proposition 1, that countries with a flexible (rigid) labor market are likely to be associated with a negative (positive) relationship between immigration and crime.

The econometric analysis focuses on the probability of being victim of a crime as a function of migration penetration in the area of residence plus a set of regional- and individual-level controls. The analysis is based on Nunziata (2011), where the impact on crime of the recent immigration waves in the 2000s in Europe is analyzed. We depart from the original study by introducing a degree of heterogeneity into the impact of immigration on crime in order to determine how the characteristics of the labor market of the host country influence this relationship.

Our sample is constituted of European Social Survey data collected every two years from 2002 to 2008 in fourteen European Union countries that are traditional migration destinations. We measure crime victimization by whether the respondent or a family member was recently a victim of burglary or assault.[15] The two types of crime the *ESS* accounts for, assault and burglary, constitute a significant proportion of all reported crimes and are generally correlated with the extent of other kind of thefts (Eurostat, 2012).

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Measures of labor market flexibility are reasonable proxies for the elasticity of labor market tightness. We distinguish between rigid and flexible labor markets by focusing on employment-protection legislation (Bassanini et al., 2009), one of the most important institutional dimensions considered by the literature on labor market regulations. Labor market regulation is traditionally measured by the time-varying *OECD* Employment Protection Index (*EPL*). The *EPL*, which increases with labor market rigidity and provides a synthetic measure of the employment-protection legislation (regulations on regular and temporary contracts and collective dismissals) for each country, varies along time according to the labor market reforms adopted in each country (Venn, 2009). The cross-sectional ranking provided by the index is shown in figure B1 (Appendix B) for all the European Union countries included in our dataset in 2008. According to the descriptive statistics, the United Kingdom and Ireland have the lowest *EPL* values and, therefore, the most flexible labor markets, while Spain and Portugal have the highest *EPL* values and the most rigid labor markets.

All of 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.[16] Controls include educational attainment, gender, age, age squared and a dummy that takes the value of 1 if the main source of respondent's income is financial and zero otherwise.[17] In what follows, we report Probit marginal effect estimates from models of the type:

[15] The respondent was asked whether her household has been victim to burglary or assault in the last five years. The timing to which the respondent refers (a five-year interval) and the measurement of migration penetration (a two-year interval) do not perfectly overlap. However, as the literature on the survey methodology notes (e.g., Strube, 1987, and Kessler and Wethington, 1991), individuals have difficulty reporting events that occurred too far in the past. In addition, survey respondents have been shown to report severely negative events with reliability over a twelve-month recall period, so ESS crime victimization data is likely to report crime events that occurred in the recent past rather than several years before. This is confirmed by the analysis in Nunziata (2011), where similar results are obtained using alternative time windows for migration penetration and victimization.

[16] The regional classification is NUTSII for AT, DK, FI, IE, NO, PT, SE and NUTSI for BE, DE, ES, FR, NL, GR, GB.

[17] Data description and summary statistics are presented in the appendix.

$$\Pr(crime_{irct} = 1 | m_{rct}, \mathbf{X}_{it}) = \Phi\left(\beta m_{rct} + \boldsymbol{\lambda}'\mathbf{X}_{it} + \mu_r + \mu_{ct}\right), \tag{20}$$

where $crime_{icrt}$ is a dummy variable that indicates whether the individual's household i, living in region r of country c at time t has been victim of a crime; $\mathbf{X}_{it}$ is a matrix of individual characteristics; μ_r are regional fixed effects and μ_{ct} are country-specific time dummies. The variable of interest is migration penetration in logs, m_{rct}, which is constructed by using Labor Force Survey data at the regional level. Migrants are defined as individuals born abroad.

Our theoretical analysis suggests that the marginal effect of immigration penetration on the probability of crime victimization should vary with the flexibility of the labor markets. Therefore, in order to identify the existence of multiple regimes, we rely on a mechanic sample split to estimate the coefficient of m_{rct} for different classifications of flexible and rigid countries. Sample-splitting techniques allow important nonlinearities in equation (20) to be revealed, avoiding over-parametrization. The usual critique of this approach is that it comes at the cost of an inadequate small sample size, but the number of observations in our subgroups is always larger than 3,000.

4.2 Results for low-density areas

We estimate the marginal effect of immigration on the probability of crime in sparsely populated areas (towns, small cities, country villages or farms, or homes in the countryside). The strength of the relationship between immigration and crime is expected to vanish as the population density increases (Corollary 1).[18]

Table 1 and Figure 2 show how the coefficient of the migration penetration changes when, starting from the most flexible labor markets, we replicate the regression by including countries with increasing EPL values.

[18] The results for the areas with high population density are available upon request. As expected, independent of the value of EPL, the relationship between immigration and crime is always weak and non significant.

Table 1. Probit marginal effects for sparsely populated areas (increasing rigidities)

	(1)	(2)	(3)	(4)	(5)
	$EPL \leq 1.5$	$EPL \leq 2$	$EPL \leq 2.5$	$EPL \leq 3$	$EPL \leq 3.5$
VARIABLES	crimevictim	crimevictim	crimevictim	crimevictim	crimevictim
log(IMM/POP)	-0.247***	-0.235***	0.034	0.008	0.025
	(0.039)	(0.043)	(0.067)	(0.038)	(0.035)
Male	0.021***	0.021***	0.015***	0.016***	0.015***
	(0.008)	(0.008)	(0.004)	(0.004)	(0.003)
financial wealth	0.064	0.063	0.058	0.054	0.057*
	(0.074)	(0.074)	(0.042)	(0.036)	(0.034)
Observations	7,027	8,006	34,231	45,500	54,063
Pseudo-R^2	0.0515	0.0482	0.0636	0.0591	0.0581
Regional FE	YES	YES	YES	YES	YES
Country-Year FE	YES	YES	YES	YES	YES
Clustered SE	YES	YES	YES	YES	YES

Robust standard errors in parentheses; $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

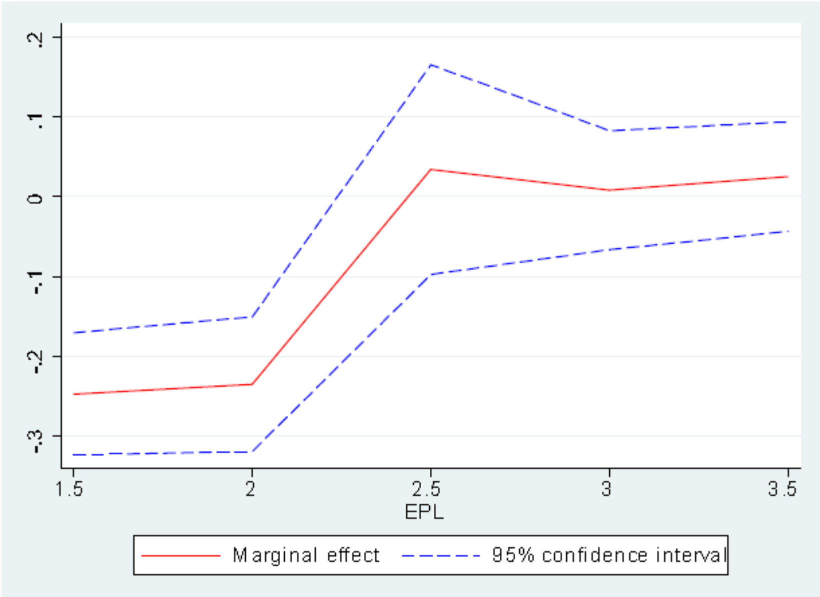

Figure 2. Probit marginal effect estimates for increasing EPL.

In line with our theoretical model, in countries with low levels of employment protection ($EPL \leq 1.5$ and $EPL \leq 2.0$), the coefficient of m_{rct} is negative and highly significant (at the 1% level), with a 10 percent increase in immigration reducing the likelihood of being a crime victim by 2.4 percent. As we include EU members with more rigid labor markets, the magnitude of the β coefficient drops and the relationship between immigration and crime vanishes. As Figure 2 shows, there is a threshold value of EPL above which the effect of immigration on the probability of crime is non significant.

Table 2 and Figure 3 show how estimates of the β coefficient change when we start from the most rigid labor markets and progressively include countries with lower EPL.

Table 2. Probit marginal effects for sparsely populated areas (decreasing rigidities)

	(1)	(2)	(3)	(4)	(5)
	$EPL \geq 3$	$EPL \geq 2.5$	$EPL \geq 2$	$EPL \geq 1.5$	$EPL \geq 1$
VARIABLES	crimevictim	crimevictim	crimevictim	crimevictim	crimevictim
log(IMM/POP)	0.103**	0.022	0.026	0.025	0.025
	(0.043)	(0.037)	(0.035)	(0.035)	(0.035)
Male	0.012	0.015***	0.014***	0.014***	0.015***
	(0.009)	(0.005)	(0.004)	(0.004)	(0.003)
financialwealth	0.079	0.04	0.055	0.055	0.057*
	(0.111)	(0.052)	(0.038)	(0.038)	(0.034)
Observations	8,563	24,930	46,057	47,036	54,063
Pseudo-R^2	0.051	0.0525	0.0602	0.0595	0.0581
RegionalFE	YES	YES	YES	YES	YES
Country-YearFE	YES	YES	YES	YES	YES
ClusteredSE	YES	YES	YES	YES	YES

Robust standard errors in parentheses; $^{***}p < 0.01$,$^{**}p < 0.05$,$^{*}p < 0.1$.

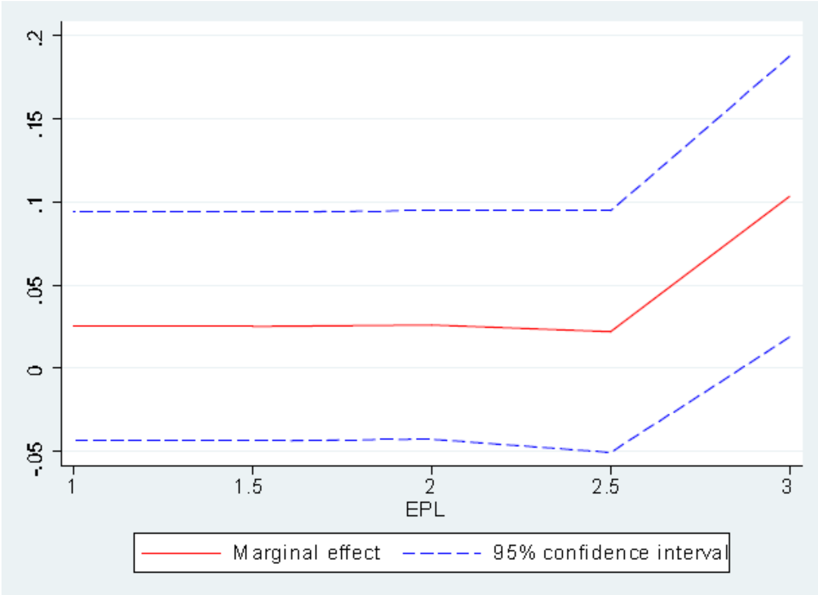

Figure 3. Probit marginal effect estimates for decreasing EPL.

In this case, the relationship between immigration and crime is positive and statistically significant at the 5 percent level only for countries with very rigid labor markets ($EPL > 3.0$).

The previous results are robust to different specifications of the parametric model. In particular, by estimating a linear probability model with robust standard errors, we confirm both the signs and the significance levels of the coefficient of m_{rct} under the same EPL thresholds used in Table 2 and Table 3.[19]

As a final step, we implemented a regression tree analysis (Durlauf and Johnson, 1995) to verify the presence of multiple regimes in the relationship among EPL, immigration and crime.[20] This methodology presents two primary advantages with respect to the other classification methods. First, it identifies the splitting values of EPL endogenously, without making an arbitrary choice of the thresholds to be used in the analysis. Second, since it is a non-parametric technique, it does not require an assumption on the distribution of the splitting variables. According to the regression tree analysis and in line with the splitting values used in

[19] Results of linear probability models are available upon request.

[20] The method consists of two basic steps. First, the algorithm searches for the variable that best splits the data into two subgroups. This division maximizes the between-groups sum-of-squares. Then the splitting technique is applied separately to each subgroup. This process recursively continues until either the subgroups reach a minimum size or no fitness improvement can be generated. Once the "maximal" tree has been created, the second step uses a cross-validation criterion to prune the full tree and obtain a division that fits the information in the dataset well.

Figure 2 and Table 1, the relationship between immigration and crime changes when the EPL indicator reaches the threshold of 2.4.

5 Extensions and (additional) policy implications

The two-country model presented in Section 3 is based on the assumption that agents are identical in all respects, irrespective of their location. This section addresses how the analysis changes when we introduce heterogeneity across agents. First, we consider a simple extension of the model with migration costs and differences in productivity between immigrants and native population. Given the new setting, we discuss the effectiveness of different policies in influencing the equilibrium levels of P_A and n_A. Then we look at a situation in which agents, irrespective of their location, differ in terms of labor skills and analyze the effects of (un)skilled immigration on the labor market conditions and crime rate of the host country.

5.1 Differences between immigrants and the native population in the labor market

Suppose that immigrants are less productive than native population, $H_A > H_B$, and that emigrating imposes (strictly positive) mobility costs on agents.[21] Firms decide whether to open a skilled or an unskilled vacancy. Also assume that the cost of opening a new vacancy decreases with the number of individuals who are eligible to fill that vacancy. This assumption leads to two expressions of the value of being a job-seeker in country A, one for natives and one for immigrants:

$$\omega_A^A(P_A^A, P_A^B, n_A) = \frac{\gamma_A}{1-\gamma_A} c_A^A(P_A^A, P_A^B)\phi_A^A(P_A^A, P_A^B, n_A) - kn_A \tag{21}$$

and

$$\omega_A^B(P_A^A, P_A^B, n_A) = \frac{\gamma_A}{1-\gamma_A} c_A^B(P_A^A, P_A^B)\phi_A^B(P_A^A, P_A^B, n_A) - kn_A, \tag{22}$$

where P_A^B and P_A^A represent the number of agents of country B moving to country A and the number of natives of country A, respectively. Therefore, $P_A = P_A^A + P_A^B$ where we

[21] Our theoretical framework is sufficiently flexible to extend to a setting that is characterized by the presence of differing skill levels in the two countries. Obviously, this assumption further complicates the analysis, increasing the number of no-arbitrage conditions.

assume for simplicity that P_A^A is constant. In this case, c_A^A positively depends on the number of immigrants: by increasing the search costs of firms, unskilled immigration hampers the search for skilled workers.

High-skill jobs yield higher rents, so firms will be keener to open unskilled vacancies only if marginal profits are identical in the two markets, that is, if $\phi_A^A(P_A^A, P_A^B, n_A) > \phi_A^B(P_A^A, P_A^B, n_A)$. Given these differences in the labor markets, the victimization costs may differ across agents. To deal with this issue, we could assume a different value of k for skilled and unskilled workers, but our conclusions on the relationship between unskilled immigration and crime would not qualitatively change. Moreover, since $\phi_A^A(P_A^A, P_A^B, n_A) > \phi_A^B(P_A^A, P_A^B, n_A)$ implies that $u_A^A(P_A^A, P_A^B, n_A) < u_A^B(P_A^A, P_A^B, n_A)$, profits from crime are higher in countries with high productivity levels.

For the sake of simplicity, we assume that native populations and immigrants share the same crime opportunities.[22] Therefore, the equilibrium conditions change as follows:

$$\omega_A^A(P_A^A, P_A^B, n_A) \geq \pi_A(P_A^A, P_A^B, n_A), \tag{23}$$

$$\omega_A^B(P_A^A, P_A^B, n_A) = \pi_A(P_A^A, P_A^B, n_A), \tag{24}$$

and

$$\omega_A^B(P_A^A, P_A^B, n_A^I) = \omega_B^B(P_B^B - P_A^B, n_B^D(P_B^B - P_A^B)) + m_B, \tag{25}$$

where m_B represents the costs of migrating from country B to country A. Given Equation (24), the slope of the domestic locus with respect to the migration inflows becomes:

$$\frac{dn_A^D(P_A^A, P_A^B)}{dP_A^B} = \frac{\frac{\partial \omega_A^B(P_A^A, P_A^B, n_A)}{\partial P_A^B} - \frac{\partial \pi_A(P_A^A, P_A^B, n_A)}{\partial P_A^B}}{\frac{\partial \pi_A(P_A^A, P_A^B, n_A)}{\partial n_A} - \frac{\partial \omega_A^B(P_A^A, P_A^B, n_A)}{\partial n_A}}. \tag{26}$$

In this extended setting, Proposition 1 still holds, wherein the flexibility condition now refers to the labor market of the unskilled agents. When immigrants' productivity increases, the value of being a job-seeker in country A increases and the corresponding crime rate decreases.

[22] One can remove this assumption and introduce differences in crime opportunities between the two categories of agents. For instance, one can assume that immigrants are more likely to be targeted by police.

When $H_A^B = H_A^A$, the extended setting collapses into the model analyzed in the theoretical section. Therefore, the domestic crime rate is now higher than the crime rate implied by the initial assumption of homogeneity across countries, $H_A^B = H_A^A$. In other words, the domestic locus lies above the one described in the original version of the model and shifts upward as the productivity gap increases. At the same time, a change in the value of being a job-seeker affects the position of the international locus. In fact, for any given level of $\omega_B(P_B^B - P_A^B, n_B^D(P_B^B - P_A^B))$, a higher $\omega_A^B(P_A^A, P_A^B, n_A^I)$ will imply a higher n_A^I. That is, the international locus also shifts upward as the productivity gap increases.[23]

Similar considerations can be made in order to model discrimination against immigrants in the labor market. In fact, a higher search cost for immigrants, z_A^B, has the same effect on the crime rate as an increase in the productivity gap. At the same time, when m_B increases, the international locus will shift downward. Moreover, following Ortega (2000), one can also assume that firms observe individual mobility costs and offer immigrants lower wages in the (Nash) bargaining process. Compared to the initial model, as the bargaining power of immigrants decreases relative to that of the native population, both loci shift upward.

Focusing on the effects of changes in H_A^B, z_A^B and m_B is important because they might represent the result of ad hoc policy intervention. For instance, policy makers can design ad hoc training programs to increase the labor productivity of immigrants or by promoting the activities of employment agencies that specialize in unskilled jobs, policy makers can reduce immigrants' search costs. All these interventions influence the immigration flows and the crime rate. This section presents comparative-static considerations to highlight the potential effects of these policy interventions on migration flows and the equilibrium crime rate of the host country. Figures 4 and 5 compare the effects of policy interventions intended to facilitate immigrants' integration. We can distinguish two categories of policy interventions: labor market policies, which refer to changes in H_A^B and z_A^B and influence the position of the two loci, and migration policies, which mainly include changes in m_B and affect the position of the international locus.

Figure 4 shows the effects of the two categories of policies when country A is experiencing a negative relationship between immigration and crime. There are two main conclusions that can be drawn from the figure. First, when $\frac{dn_A^D(P_A^A, P_A^B)}{dP_A^B} < 0$, both removing differences between

[23] If (23) is satisfied as an equality, an increase in the number of immigrants will cause an increase in $\pi_A(P_A^A, P_A^B, n_A)$ and a reduction in $\omega_A^A(P_A^A, P_A^B, n_A)$. Therefore, even in this case, unskilled migration would increase the crime rate.

immigrants and natives and limiting the mobility costs of immigrants are valid policy interventions to reduce the country's crime rate. Second, given the stability condition stated by Proposition 3, when P_A marginally increases, a labor market policy is more effective than an intervention on migration costs. In addition, when H_A^B increases, the international locus tends to shift upward, reinforcing the effects of the change in the domestic locus.

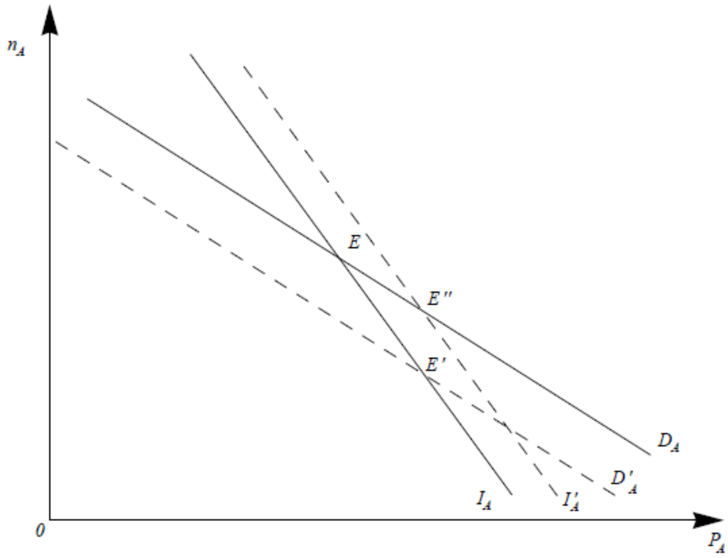

Figure 4. The labor market in country A is flexible.

Figure 5 shows the case in which countries A and B are both characterized by a positive relationship between immigration and crime. To reduce the crime rate, policy makers of country A should reduce the differences in the labor market or increase the mobility costs, m_B. In this situation, the final effect of the two policies depends on the relative slope of the domestic locus with respect to that of the international locus. In particular, when the domestic locus is relatively flat (i.e. P_A is high enough, see Corollary 1), an intervention in the labor market should be preferable to a migration policy, even if the effect of the labor market policy might cause an upward shift in the international locus.[24]

[24]If the domestic locus is (perfectly) flat, that is, if crime is independent from immigration (Corollary 1), only labor market policies are effective in reducing the crime rate of the host country because mobility costs do not affect the position of the domestic locus.

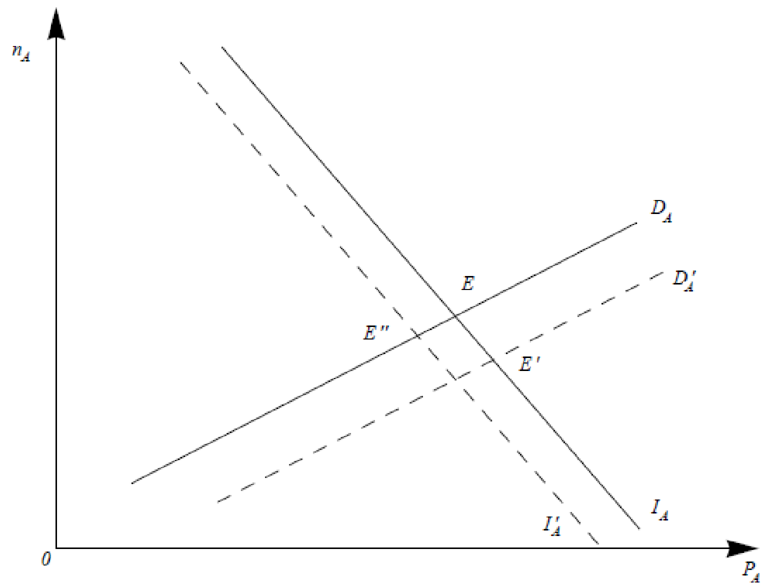

Figure 5. The labor markets in both countries are rigid.

5.2 Heterogeneous agents

Consider a continuous mass of agents that differ in terms of skills but that can be ranked according to their productivity. Following Burdett et al. (2004), we can define the skilled class (P_A^h) as the class whose value of being a job-seeker is greater than or equal to the profit from crime: $\omega_A^h(P_A^h, P_A^l, n_A) \geq \pi_A(P_A^h, P_A^l, n_A)$. Similarly, the unskilled class (P_A^l) consists of agents whose value of being a job-seeker is less than the profit from crime: $\omega_A^l(P_A^h, P_A^l, n_A) < \pi_A(P_A^h, P_A^l, n_A)$. Let j be agents who are indifferent between looking for a job or engaging in criminal activity:

$$\omega_A^{h_j}(P_A^h, P_A^l, n_A^D) = \pi_A(P_A^h, P_A^l, n_A). \tag{27}$$

Let us analyze the effects on the crime rate of country A when the size of the unskilled class increases because of immigration. By differentiating equation (27), we obtain:

$$\frac{dn_A^D(P_A^h, P_A^l)}{dP_A^l} = \frac{\frac{\partial \pi_A(P_A^h, P_A^l, n_A)}{\partial P_A^l} - \frac{\partial \omega_A^{h_j}(P_A^h, P_A^l, n_A)}{\partial P_A^l}}{\frac{\partial \omega_A^{h_j}(P_A^h, P_A^l, n_A)}{\partial n_A} - \frac{\partial \pi_A(P_A^h, P_A^l, n_A)}{\partial n_A}}. \tag{28}$$

Given the stability condition $\frac{\partial \omega_A^{h_j}(P_A^h, P_A^l, n_A)}{\partial n_A} > \frac{\partial \pi_A(P_A^h, P_A^l, n_A)}{\partial n_A}$, the fact that immigrants can also be victimized (i.e., $\frac{\partial \pi_A(P_A^h, P_A^l, n_A)}{\partial P_A^l} > 0$) and the negative (or null) effect of P_A^l on $\omega_A^{h_j}(P_A^h, P_A^l, n_A)$, it follows that $\frac{dn_A^D(P_A^h, P_A^l)}{dP_A^l} > 0$ and that immigration of unskilled agents increases the domestic crime rate of country A.

The intuition behind this result is simple. When unskilled agents move to country A, they will find it convenient to engage in criminal activity, at least initially. The increase in the crime rate will reduce both $\omega_A^{h_j}$ and π_A, with the reduction in π_A being greater than the reduction in $\omega_A^{h_j}$. Given this change, (i) the ex-marginal agent j will participate in the labor market as a job-seeker and (ii) the new marginal agent will be characterized by a labor productivity that is lower than h_j. Therefore, all the immigrants and natives with labor productivity that is included between these two levels will decide to seek a job in the labor market. As final result of immigration of unskilled agents, both the domestic crime rate and the number of job-seekers increase.[25]

6 Conclusion

Does immigration cause crime? In order to determine the interplay between immigration and crime, we presented a two-country search model in which agents can participate in the labor market or engage in criminal activity in their own country or in a country to which they emigrate. Our results highlight the importance of the structural characteristics of a country's labor market in determining the sign of the relationship between immigration and crime. Our main finding is that immigration reduces the domestic crime rate in countries with flexible labor markets.[26] We present empirical evidence in favor of this prediction. Using a database that merges data from the European Social Survey with the *OECD* Employment Protection Legislation index, we find that countries with a low degree of employment protection exhibit a negative correlation between immigration and crime, while countries with high labor rigidities show a positive correlation between immigration and crime.

[25] The same approach can be used to study the effects of other sources of heterogeneity. For instance, the effect of discrimination against some groups of immigrants in the labor market can be captured by assuming different levels of bargaining power for natives and immigrants. Similarly, one can introduce the assumption that agents differ in the marginal cost of committing crime, d_i (Borjas, 1987).

[26] Engelhardt (2010) studies the effects of rigidities of the labor market on the incarceration rate and finds that the unemployed are incarcerated twice as often as low-wage workers and four times as often as high-wage workers.

Our model provides additional policy insights. First, as long as search costs decrease with the size of the population, migration from societies with rigid labor markets to societies with more flexible labor markets are mutually beneficial, as they reduce the crime rates in both countries by increasing the number of job-seekers. In particular, if the labor market is sufficiently flexible and there are agglomeration externalities, the arrival of new immigrants will reduce firms' search costs by stimulating the creation of new vacancies. On the other hand, emigrations from rigid economies tend to increase the value of job-seeking by increasing the search cost without excessively loosening the labor market. Second, although highly stylized, our results contribute to the debate on the effects of restrictive policies that impose severe constraints on the admissibility and permanence of immigrants in the host country.[27] Specifically, our model raises doubts about the effectiveness of such repressive laws by indicating that, "*to crack down on crime, closing the nation's doors is not the answer.*"[28] Policy interventions that increase labor flexibility are more likely to prevent crime than are restrictive immigration laws.

Several aspects of our model are worthy of further research. Studying the case of organized crime may help to reveal how migration policies affect the market power of criminal organizations. Moreover, considering a setting in which the job-destruction rates are endogenously determined by the characteristics of heterogeneous firms and job-seekers is a natural follow up of our research.

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Appendix

A The autarkic equilibrium

This appendix provides additional results for a benchmark, autarkic model with a fixed population. These results provide useful insights for building the domestic locus.

Definition A1. *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 $\omega_i(P_i, n_i^*) \geqslant \pi_i(P_i, n_i^*)$.*

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

Proposition A1. *An autarkic equilibrium always exists.*

Proof of Proposition A1. 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, $\lim\limits_{n_i \to 0} \pi_i(P_i, n_i) = (1 - d_i)\left(\frac{s_i + 2F_i(\phi_i(P_i,0))}{s_i + F_i(\phi_i(P_i,0))}\right) k_i$ and $\lim\limits_{n_i \to 0} \omega_i(P_i, n_i) = \frac{\gamma_i}{1-\gamma_i} c_i(P_i)\phi_i(P_i, 0)$, where $\phi_i(P_i, 0)$ denotes the tightness of the labor market when $n_i = 0$. From Lemma 2, $\pi_i(P_i, n_i)$ decreases with 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, that is, $k_i n_i \leq \frac{\gamma_i}{1-\gamma_i} c_i(P_i)\phi_i(P_i, n_i)$ $\forall n_i \in [0, 1)$, 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) $\omega_i(P_i, n_i) > \pi_i(P_i, n_i)$, $\forall n_i \in [0, 1)$.

Under (a), an interior equilibrium exists. Given that $\lim\limits_{n_i \to 1^-} \omega_i(P_i, n_i) = \frac{\gamma_i}{1-\gamma_i} c_i(P_i)\phi_i(P_i, 1) - k_i \geq 0$, $d_i > 0$ and $\pi_i(P_i, 1) < 0$, then $(1-d_i)k_i \geq \frac{\gamma_i}{1-\gamma_i} c_i(P_i)\phi_i(P_i, 0)\left(\frac{s_i + F_i(\phi_i(P_i,0))}{s_i + 2F_i(\phi_i(P_i,0))}\right)$ 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. Therefore, 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 $\left(\frac{s_i+F_i(\phi_i(P_i,0))}{s_i+2F_i(\phi_i(P_i,0))}\right)$ of the value of being a job-seeker. That is, when criminal activities are sufficiently profitable, agents have an incentive to switch from the labor market to crime.

On the other hand, when n_i goes to 1, since profit from crime becomes negative and an unemployed agent cannot lose more than the value of being a job-seeker, individuals always have an incentive to switch from crime to job-seeking.■

Corollary A1 is directly implied by Proposition A1.

Corollary A1. *There are no countries where all individuals are criminals.*

Proof of Corollary A1. Given 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 1.■

Therefore, 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. Proposition A2 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 A2. *An interior equilibrium is stable only if* $\frac{d\omega_i(P_i,n_i^*)}{dn_i} > \frac{\partial \pi_i(P_i,n_i^*)}{\partial n_i}$.

Proof of Proposition A2. 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 $\varepsilon > 0$ and sufficiently small. 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. Therefore, 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:

$$\frac{\partial \omega_i(P_i, n_i^*)}{\partial n_i} > \frac{\partial \pi_i(P_i, n_i^*)}{\partial n_i} \tag{A1}$$

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 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^*. However, 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. $\omega_i(P_i, n_i^* - \varepsilon) > \pi_i(P_i, n_i^* - \varepsilon)$, which contradicts the hypothesis of stability.■

We are now able to characterize the autarkic equilibrium. According to Proposition A3, the autarkic equilibrium is unique and, given the condition in Proposition A2, stable.

Proposition A3. *The autarkic equilibrium is always unique and stable.*

Proof of Proposition A3. First, we show that, in equilibrium, $\frac{\partial \omega_i(P_i,n_i^*)}{\partial n_i} > \frac{\partial \pi_i(P_i,n_i^*)}{\partial n_i}$. Let $\eta_i(\phi_i(P_i, n_i^*)) \equiv -\frac{dq_i(\phi_i(P_i,n_i^*))}{d\phi_i(P_i,n_i^*)} \frac{\phi_i(P_i,n_i^*)}{q_i(\phi_i(P_i,n_i^*))}$ be the elasticity of the matching function with respect to the equilibrium unemployment rate.

By simple algebra, $\frac{\partial \phi_i(P_i,n_i)}{\partial n_i} = -\frac{(1-\gamma_i)k_i}{c_i(P_i)\left[\gamma_i+(r_i+s_i)\frac{1}{F_i(\phi_i(P_i,n_i))}\eta_i(\phi_i(P_i,n_i))\right]}$. Thus, the previous inequality evaluated in equilibrium becomes:

$$-\frac{k_i\gamma_i F_i(\phi_i(P_i,n_i^*))}{(r_i+s_i)\eta_i(\phi_i(P_i,n_i^*))+\gamma_i F_i(\phi_i(P_i,n_i^*))} >$$

$$> (1-d_i)k_i F_i(\phi_i(P_i,n_i^*))\frac{1}{(s_i+F_i(\phi_i(P_i,n_i^*)))^2}\times \tag{A2}$$

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

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

$$\eta_i(\phi_i(P_i,n_i^*)) >$$

$$> \frac{c_i(P_i)\gamma_i(s_i+F_i(\phi_i(P_i,n_i^*)))\left(s_i+(2-d_i)F_i(\phi_i(P_i,n_i^*))\right)}{(d_i-1)\left[c_i(P_i)(r_i+s_i)(s_i+F_i(\phi_i(P_i,n_i^*))\right]-k_i(-1+n_i^*)s_i(\gamma_i-1)q_i(\phi_i(P_i,n_i^*)))}+ \tag{A3}$$

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

The algebraic sum of the numerators of the two fractions on the RHS is always positive, so if the denominator is always negative, the last inequality will always be satisfied. Since $d_i \leq 1$, we must prove that

$$c_i(P_i)(r_i+s_i)(s_i+F_i(\phi_i(P_i,n_i^*))) - k_i(-1+n_i^*)s_i(\gamma_i-1)q_i(\phi_i(P_i,n_i^*)) > 0, \tag{A4}$$

or, by rearranging terms,

$$(1-n_i^*)k_i < \frac{c_i(P_i)(r_i+s_i)}{q_i(\phi_i(P_i,n_i^*))}\frac{s_i+F_i(\phi_i(P_i,n_i^*))}{s_i(1-\gamma_i)}. \tag{A5}$$

From (6), we know that $\frac{c_i(P_i)(r_i+s_i)}{q_i(\phi_i(P_i,n_i))} = H_i - w_i - k_i n_i$. At the same time, we have that $\frac{s_i+F_i(\phi_i(P_i,n_i^*))}{s_i(1-\gamma_i)} > 1$. Therefore, given that $H_i - w_i \geq k_i$, in equilibrium must be that $\frac{\partial\omega_i(P_i,n_i^*)}{\partial n_i} > \frac{\partial\pi_i(P_i,n_i^*)}{\partial n_i}$.

Since $\frac{\partial\omega_i(P_i,n_i^*)}{\partial n_i} > \frac{\partial\pi_i(P_i,n_i^*)}{\partial n_i}$ and $\lim\limits_{n_i\to 1^-}\pi_i(P_i,n_i) < \lim\limits_{n_i\to 1^-}\omega_i(P_i,n_i)$, 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 and 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 focus on the local properties of an interior equilibrium. 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 labor productivity and crime.

Proposition A4. *If in the autarkic equilibrium,* $n_i^* > 0$, *when the labor productivity increases, the equilibrium crime rate decreases.*

Proof of Proposition A4. 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: $\frac{dn_i^*}{dH_i} = \frac{\frac{\partial\omega_i(P_i,n_i^*)}{\partial H_i} - \frac{\partial\pi_i(P_i,n_i^*)}{\partial H_i}}{\frac{\partial\pi_i(P_i,n_i^*)}{\partial n_i} - \frac{\partial\omega_i(P_i,n_i^*)}{\partial n_i}}$. 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 $\frac{\gamma_i}{1-\gamma_i}c_i(P_i) > -(1-d_i)k_i\frac{du_i(\phi_i(P_i,n_i^*))}{dF_i(\phi_i(P_i,n_i^*))}\frac{dF_i(\phi_i(P_i,n_i^*))}{d\phi(P_i,n_i^*)}$. 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 must prove that $\pi_i(P_i,n_i^*) + k_i n_i > -(1-d_i)k_i\phi_i(P_i,n_i^*)\frac{du_i(\phi_i(P_i,n_i^*))}{dF_i(\phi_i(P_i,n_i^*))}\frac{dF_i(\phi_i(P_i,n_i^*))}{d\phi_i(P_i,n_i^*)}$. By using equations (3) and (13) and by recalling that $\frac{dF_i(\phi_i(P_i,n_i^*))}{d\phi_i(P_i,n_i^*)} = q_i(\phi_i(P_i,n_i^*))(1-\eta_i(\phi_i(P_i,n_i^*)))$, 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 labor becomes more productive, the value of being a job-seeker increases more than does the profit from crime, suggesting a reduction in the crime rate and, by the stability of the autarkic equilibrium, an increase in the profit from crime that compensates for the effects of the initial shock on $\omega_i(P_i,n_i)$. This process drives the system to a new equilibrium that is associated with a lower crime rate.

B Proofs of the results in the paper

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

$$G_i \equiv \gamma_i H_i + \gamma_i\phi_i c_i(P_i) - \gamma_i k_i n_i - H_i + k_i n_i + \frac{(r_i+s_i)c_i(P_i)}{q_i(\phi_i)}. \tag{B1}$$

By applying the implicit function theorem, we obtain

$$\frac{\partial\phi_i}{\partial P_i} = -\frac{\partial G_i/\partial P_i}{\partial G_i/\partial\phi_i} = -\frac{\left(\frac{r_i+s_i}{q_i(\phi_i)}+\gamma_i\phi_i\right)\frac{dc_i(P_i)}{dP_i}}{c_i(P_i)\left(\gamma_i-(r_i+s_i)\frac{c_i(P_i)}{q_i(\phi_i)^2}\frac{dq_i(\phi_i)}{d\phi_i}\right)} \tag{B2}$$

and

$$\frac{\partial\phi_i}{\partial n_i} = -\frac{\partial G_i/\partial n_i}{\partial G_i/\partial\phi_i} = -\frac{(1-\gamma_i)k_i}{c_i(P_i)\left(\gamma_i-(r_i+s_i)\frac{1}{q_i(\phi_i)^2}\frac{dq_i(\phi_i)}{d\phi_i}\right)}. \tag{B3}$$

Since $\frac{dq_i(\phi_i)}{d\phi_i}, \frac{dc_i(P_i)}{dP_i} < 0$ 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:

$$\pi_i(P_i,n_i) \equiv (1-d_i)\left(2-n_i-\frac{s_i(1-n_i)}{s_i+F_i(\phi_i(P_i,n_i))}\right)k_i - k_i n_i. \tag{B4}$$

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 it is in the neighborhood of the equilibrium $\frac{\partial\pi_A(P_A,n_A)}{\partial n_A} - \frac{\partial\omega_A(P_A,n_A)}{\partial n_A} < 0$. Therefore, from (15), we have that $\frac{dn_A^D(P_A)}{dP_A} < 0$ only if $\frac{\partial\omega_A(P_A,n_A)}{\partial P_A} > \frac{\partial\pi_A(P_A,n_A)}{\partial P_A}$. This inequality can be written as follows:

$$\frac{\frac{d\Gamma_A(P_A,n_A)}{dP_A}}{\frac{dF_A(\phi_A(P_A,n_A))}{dP_A}} > \frac{1-\gamma_A}{\gamma_A}\frac{(1-d_A)(1-n_A)k_A s_A}{(s_A+F_A(\phi_A(P_A,n_A)))^2}, \tag{B5}$$

where $\Gamma_A(P_A,n_A) \equiv c_A(P_A)\phi_A(P_A,n_A)$ 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 n_A, $F_A(\phi_A(P_A,n_A))$ and d_A take values from 0 to 1, the right hand side of (B5) cannot be greater than $\frac{1-\gamma_A}{\gamma_A}\frac{k_A}{s_A}$.

Therefore, to show that this inequality holds when $\frac{\partial\phi_A(P_A,n_A)}{\partial P_A}$ is sufficiently high, we must work on the left hand side of (B5). In particular, we want to show that this term is increasing in $\frac{\partial\phi_A(P_A,n_A)}{\partial P_A}$ and that it takes values from $-\infty$ to $+\infty$. By noting that $\frac{\partial\phi_A(P_A,n_A)}{\partial P_A} = \frac{d\phi_A(P_A,n_A)}{dc_A(P_A)}\frac{dc_A(P_A)}{dP_A}$, we can re-write (B5) as follows:

$$\frac{\frac{dc_A(P_A)}{dP_A}\phi_A(P_A,n_A)+\frac{\partial\phi_A(P_A,n_A)}{\partial P_A}c_A(P_A)}{\left[\frac{dq_A(\phi_A(P_A,n_A))}{d\phi_A(P_A,n_A)}\phi_A(P_A,n_A)+q_A(\phi_A(P_A,n_A))\right]\frac{\partial\phi_A(P_A,n_A)}{\partial P_A}} > \tag{B6}$$

$$> \frac{1-\gamma_A}{\gamma_A}\frac{(1-d_A)(1-n_A)k_A s_A}{(s_A+F_A(\phi_A(P_A,n_A)))^2}.$$

Since $\frac{dF_A(\phi_A(P_A,n_A))}{dP_A} = \frac{dF_A(\phi_A(P_A,n_A))}{d\phi_A(P_A,n_A)}\frac{\partial\phi_A(P_A,n_A)}{\partial P_A} \geq 0$, it follows that

$$\frac{dF_A(\phi_A(P_A,n_A))}{d\phi_A(P_A,n_A)} = \frac{dq_A(\phi_A(P_A,n_A))}{d\phi_A(P_A,n_A)}\phi_A(P_A,n_A)+q_A(\phi_A(P_A,n_A)) \geq 0, \tag{B7}$$

and the left-hand side of (B5) is increasing in $\frac{\partial\phi_A(P_A,n_A)}{\partial P_A}$. In particular,

$$\lim_{\frac{\partial\phi_A(P_A,n_A)}{\partial P_A(\phi_A(P_A,n_A))}\to 0}\frac{\frac{dc_A}{dP_A}\phi_A(P_A,n_A)+\frac{\partial\phi_A(P_A,n_A)}{\partial P_A}c_A(P_A)}{\left(\frac{dq_A(\phi_A)}{d\phi_A(P_A,n_A)}\phi_A(P_A,n_A)+q_A(\phi_A(P_A,n_A))\right)\frac{\partial\phi_A(P_A,n_A)}{\partial P_A}} = -\infty, \tag{B8}$$

and

$$\lim_{\frac{\partial\phi_A(P_A,n_A)}{\partial P_A}\to\infty}\frac{\frac{dc_A(P_A)}{dP_A}\phi_A(P_A,n_A)+\frac{\partial\phi_A(P_A,n_A)}{\partial P_A}c_A(P_A)}{\left[\frac{dq_A(\phi_A(P_A,n_A))}{d\phi_A(P_A,n_A)}\phi_A(P_A,n_A)+q_A(\phi_A(P_A,n_A))\right]\frac{\partial\phi_A(P_A,n_A)}{\partial P_A}} = \infty. \tag{B9}$$

since $F_A(\phi_A(P_A,n_A)) \leq 1$. Therefore, as $\frac{\partial\phi_A(P_A,n_A)}{\partial P_A}$ goes to infinity, $\frac{dF_A(\phi_A(P_A,n_A))}{d\phi_A(P_A,n_A)}$ goes to zero. We can conclude that there is a threshold value of $\frac{\partial\phi_A(P_A,n_A)}{\partial P_A}$ above which $\frac{dn_A^D(P_A)}{dP_A} < 0$.■

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

$$\frac{dc_A(P_A)}{dP_A}\left(\frac{\partial\omega_A(P_A,n_A)}{\partial c_A(P_A)}-\frac{\partial\pi_A(P_A,n_A)}{\partial c_A(P_A)}\right). \tag{B10}$$

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 Proposition 2. By Definition 2, an equilibrium is associated with 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) $\exists P_A^*\in(0,P): n_A^D(P_A^*)=n_A^I(P_A^*)$. Therefore (P_A^*,n_A^*) will be an interior international equilibrium.

2) $n_A^D(P_A)>n_A^I(P_A)$, $\forall P_A\in(0,P)$. Since $n_A^I(P_A)$ represents the crime rate of country A that satisfies the no migration condition (16) for a given population $P_B=P-P_A$ and crime rate $n_B^D(P-P_A)$ in country B, 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 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

$$-\frac{\partial\omega_B(P-P_A,n_B^D(P-P_A))}{\partial(P-P_A)}=\frac{\partial\omega_A(P_A,n_A^I(P_A))}{\partial P_A}+\frac{\partial\omega_A(P_A,n_A^I(P_A))}{\partial n_A^I(P_A)}\frac{dn_A^I(P_A)}{dP_A}. \tag{B11}$$

At the same time, it follows that:

$$\frac{\partial\omega_A(P_A,n_A^D(P_A))}{\partial P_A}=\frac{\partial\omega_A(P_A,n_A^D(P_A))}{\partial P_A}+\frac{\partial\omega_A(P_A,n_A^D(P_A))}{\partial n_A^D(P_A)}\frac{dn_A^D(P_A)}{dP_A} \tag{B12}$$

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 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 that $\omega_A(P_A, n_A)$ monotonically decreases in the crime rate, the previous condition implies $\frac{dn_A^D(P_A^*)}{dP_A} > \frac{dn_A^I(P_A^*)}{dP_A}$. 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 2. By contradiction, suppose that the unique international equilibrium is unstable. If this equilibrium is an interior solution, we have

$$\frac{dn_A^D(P_A^*)}{dP_A} < \frac{dn_A^I(P_A^*)}{dP_A} \tag{B13}$$

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

Proof of Corollary 3. By contradiction, suppose that the international equilibrium (P_A^*, n_A^*) is stable and $\frac{dn_i^D(P_i^*)}{dP_i^*} < 0$ for $i = A, B$. Therefore, by Lemma 1 and (9), we know that $\frac{\partial \omega_B(P-P_A^*, n_B^D(P-P_A^*))}{\partial (P-P_A)} > 0$. We also know that $\frac{\partial \omega_A(P_A^*, n_A^*)}{\partial n_A} < 0$ and $\frac{\partial \omega_A(P_A^*, n_A^*)}{\partial P_A} > 0$ (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 $\frac{dn_A^I(P_A^*)}{dP_A} > \frac{dn_A^D(P_A^*)}{dP_A}$, which 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 characterized by a negative relationship between P_A and n_A, that is, it must be $\frac{dn_A^D(P_A^*)}{dP_A} < 0$ in a neighborhood of the international equilibrium. From Corollary 3, we know that local stability requires $\frac{dn_B^D(P_B^*)}{dP_B} > 0$. Therefore, migration from country B to country A reduce the crime rates of both countries and migration from A to B increases the crime rates in both countries.■

C Descriptive statistics

C.1 Data description

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

Immigration penetration: log(born abroad/resident population). Years: 2002, 2004, 2006, 2008. Source: authors' calculation using Labor Force Survey data.

EPL: employment protection legislation indicator, increasing with the strictness of regulations. Weighted sum of sub-indicators for regular contracts (weight 5/12), temporary contracts (weight 5/12) and collective dismissals (weight 2/12). Years: 2002, 2004, 2006, 2008. Source: *OECD*.

Financial wealth: whether the main source of income in the respondent's household is financial. Years: 2002, 2004, 2006, 2008. Source: *ESS*.

Educational attainment, years of education, age, gender. Years: 2002, 2004, 2006, 2008. Source: *ESS*.

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

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

Table C.1. (cont'd). Summary statistics, by country (mean, standard deviation)

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

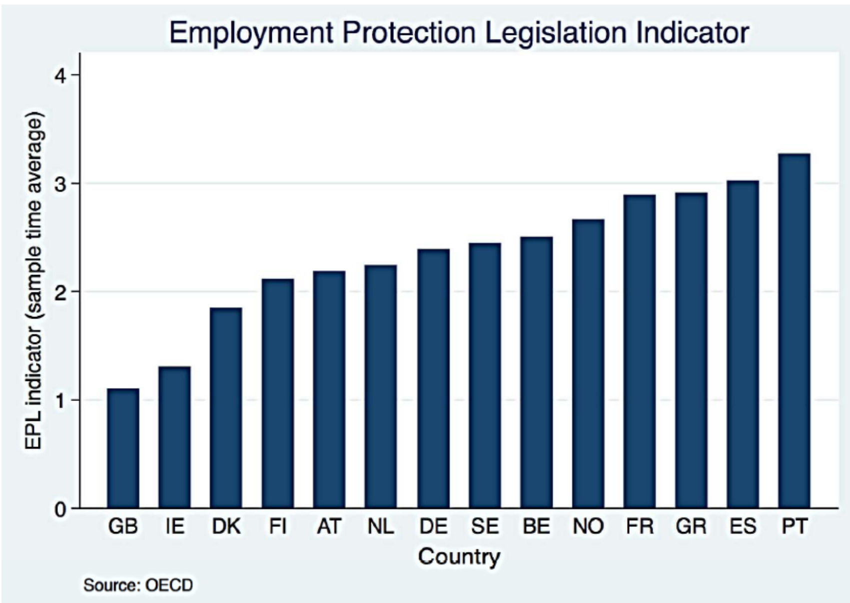

Figure C1. EPL ranking for EU countries

D Additional results (not intended for publication)

This appendix contains additional results that will be provided by authors upon request of the reader. In particular, the first part of the appendix contains Probit marginal effect estimates for highly populated areas and the second part reports estimates of a linear probability model.

D.1 Probit estimates for highly populated areas

In order to control for the role of population density, in this appendix we repeat the empirical analysis for areas with a high-density (big cities and suburbs or outskirts of big cities).

Table C.2. Probit marginal effects for highly populated areas (increasing rigidities)

	(1)	(2)	(3)	(4)	(5)
	$EPL \leq 1.5$	$EPL \leq 2$	$EPL \leq 2.5$	$EPL \leq 3$	$EPL \leq 3.5$
VARIABLES	crimevictim	crimevictim	crimevictim	crimevictim	crimevictim
log(IMM/POP)	0.587	0.434	0.057	0.043	0.051
	(0.535)	(0.482)	(0.055)	(0.061)	(0.051)
Male	0.029*	0.017	0.008	0.007	0.006
	(0.015)	(0.013)	(0.010)	(0.009)	(0.008)
financial wealth	-0.011	-0.013	0.165***	0.110**	0.114**
	(0.141)	(0.138)	(0.060)	(0.048)	(0.047)
Observations	3,058	3,577	13,781	20,248	24,202
Pseudo-R^2	0.0407	0.0368	0.0524	0.0423	0.0428
Regional FE	YES	YES	YES	YES	YES
Country-Year FE	YES	YES	YES	YES	YES
Clustered SE	YES	YES	YES	YES	YES

Robust standard errors in parentheses. $^{***}p < 0.01$,$^{**}p < 0.05$,$^{*}p < 0.1$.

Table C.3. Probit marginal effects for highly populated areas (decreasing rigidities)

	(1)	(2)	(3)	(4)	(5)
	$EPL \geq 3$	$EPL \geq 2.5$	$EPL \geq 2$	$EPL \geq 1.5$	$EPL \geq 1$
VARIABLES	crimevictim	crimevictim	crimevictim	crimevictim	crimevictim
log(IMM/POP)	0.080	0.041	0.051	0.051	0.051
	(0.088)	(0.076)	(0.051)	(0.051)	(0.051)
Male	0.001	0.004	0.004	0.003	0.006
	(0.019)	(0.011)	(0.009)	(0.009)	(0.008)
financial wealth.	0.233	0.099	0.134***	0.134***	0.114**
	(0.165)	(0.069)	(0.049)	(0.050)	(0.047)
Observations	3,954	11,786	20,625	21,144	24,202
Pseudo-R^2	0.0487	0.0375	0.0443	0.0436	0.0428
Regional FE	YES	YES	YES	YES	YES
Country-Year FE	YES	YES	YES	YES	YES
Clustered SE	YES	YES	YES	YES	YES

Robust standard errors in parentheses. $^{***}p < 0.01$,$^{**}p < 0.05$,$^{*}p < 0.1$.

D.2 Results from linear probability models

Results in Tables 1 and 2 are robust to different specifications of the parametric model. In particular, by estimating a linear probability model with robust standard errors, we confirm both the signs and the significance levels of m_{rct} under the same EPL thresholds used in Tables 1 and 2.

Table C.4. LPM for sparsely populated areas (increasing rigidities)

	(1)	(2)	(3)	(4)	(5)
	$EPL \leq 1.5$	$EPL \leq 2$	$EPL \leq 2.5$	$EPL \leq 3$	$EPL \leq 3.5$
VARIABLES	crimevictim	crimevictim	crimevictim	crimevictim	crimevictim
log(IMM/POP)	-0.140**	-0.130**	0.036	0.007	0.024
	(0.059)	(0.060)	(0.072)	(0.040)	(0.036)
Male	0.021**	0.021**	0.014***	0.015***	0.014***
	(0.008)	(0.008)	(0.004)	(0.004)	(0.003)
financial wealth	0.057	0.057	0.053	0.049	0.052
	(0.068)	(0.068)	(0.040)	(0.034)	(0.032)
Observations	7,027	8,006	34,235	45,504	54,067
R^2	0.048	0.045	0.061	0.057	0.055
Regional FE	YES	YES	YES	YES	YES
Country-Year FE	YES	YES	YES	YES	YES
Clustered SE	YES	YES	YES	YES	YES

Robust standard errors in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table C.5. LPM for sparsely populated areas (decreasing rigidities)

	(1)	(2)	(3)	(4)	(5)
	$EPL \geq 3$	$EPL \geq 2.5$	$EPL \geq 2$	$EPL \geq 1.5$	$EPL \geq 1$
VARIABLES	crimevictim	crimevictim	crimevictim	crimevictim	crimevictim
log(IMM/POP)	0.101*	0.020	0.024	0.024	0.024
	(0.049)	(0.038)	(0.036)	(0.036)	(0.036)
Male	0.012	0.014**	0.013***	0.013***	0.014***
	(0.010)	(0.006)	(0.004)	(0.004)	(0.003)
financial wealth	0.075	0.036	0.050	0.050	0.052
	(0.107)	(0.050)	(0.037)	(0.037)	(0.032)
Observations	8,563	24,930	46,061	47,040	54,067
R^2	0.045	0.051	0.057	0.056	0.055
Regional FE	YES	YES	YES	YES	YES
Country-Year FE	YES	YES	YES	YES	YES
Clustered SE	YES	YES	YES	YES	YES

Robust standard errors in parentheses. $^{***}p < 0.01$,$^{**}p < 0.05$,$^{*}p < 0.1$.

Table C.6. LPM for highly populated areas (increasing rigidities)

	(1)	(2)	(3)	(4)	(5)
	$EPL \leq 1.5$	$EPL \leq 2$	$EPL \leq 2.5$	$EPL \leq 3$	$EPL \leq 3.5$
VARIABLES	crimevictim	crimevictim	crimevictim	crimevictim	crimevictim
log(IMM/POP)	0.600	0.391	0.057	0.043	0.049
	(0.510)	(0.480)	(0.053)	(0.060)	(0.049)
Male	0.029*	0.018	0.008	0.007	0.006
	(0.015)	(0.013)	(0.010)	(0.008)	(0.008)
financial wealth	-0.017	-0.019	0.155***	0.105**	0.109**
	(0.141)	(0.139)	(0.055)	(0.045)	(0.044)
Observations	3,058	3,577	13,796	20,263	24,217
R^2	0.045	0.041	0.059	0.048	0.048
Regional FE	YES	YES	YES	YES	YES
Country-Year FE	YES	YES	YES	YES	YES
Clustered SE	YES	YES	YES	YES	YES

Robust standard errors in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table C.7. LPM for highly populated areas (decreasing rigidities)

	(1)	(2)	(3)	(4)	(5)
	$EPL \geq 3$	$EPL \geq 2.5$	$EPL \geq 2$	$EPL \geq 1.5$	$EPL \geq 1$
VARIABLES	crimevictim	crimevictim	crimevictim	crimevictim	crimevictim
log(IMM/POP)	0.066	0.037	0.049	0.049	0.049
	(0.084)	(0.069)	(0.049)	(0.049)	(0.049)
Male	0.001	0.004	0.004	0.003	0.006
	(0.019)	(0.011)	(0.009)	(0.008)	(0.008)
financial wealth	0.209	0.093	0.129***	0.129***	0.109**
	(0.151)	(0.064)	(0.046)	(0.046)	(0.044)
Observations	3,954	11,786	20,640	21,159	24,217
R^2	0.053	0.043	0.050	0.049	0.048
Regional FE	YES	YES	YES	YES	YES
Country-Year FE	YES	YES	YES	YES	YES
Clustered SE	YES	YES	YES	YES	YES

Robust standard errors in parentheses. $^{***}p < 0.01$,$^{**}p < 0.05$,$^{*}p < 0.1$.