IZA Institute of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 14215

Immigration and Crime: The Role of Self-Selection and Institutions

Fabio Mariani
Marion Mercier

MARCH 2021

I Z A Institute of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 14215

Immigration and Crime: The Role of Self-Selection and Institutions

Fabio Mariani
UCLouvain and IZA

Marion Mercier
CNRS, Université Paris-Dauphine PSL, LEDa–DIAL and IZA

MARCH 2021

ISSN: 2365-9793

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Immigration and Crime: The Role of Self-Selection and Institutions*

Contrary to popular perception, empirical evidence suggests that immigrants do not necessarily commit more crimes than natives, in spite of having lower legitimate earning opportunities. To make sense of this, we propose a novel theoretical framework based on a predator/prey model of crime, where endogenous migration decisions and career choices (between licit and illicit activities) are jointly determined. In this setting, we show that the involvement of migrants in crime crucially depends on self-selection into migration, as well as on productivity and institutional quality in the host economy. In particular, immigrants may display a lower crime rate than natives even if they are less productive on the honest labor market – and this result can still hold if career choices are revised after migration. We also find that stricter immigration policies could induce an adverse selection of migrants, and eventually attract more foreign-born criminals. Finally, a dynamic extension of our model can account for the higher crime rates of second-generation immigrants, and highlights the critical role of immigration and assimilation for the long-run evolution of crime and institutions in host countries.

JEL Classification: F22, K42, O17
Keywords: migration, crime

Corresponding author:
Fabio Mariani
IRES/LIDAM, UCLouvain
Place Montesquieu, 3
B-1348 Louvain-la-Neuve
Belgique
E-mail: fabio.mariani@uclouvain.be

* We are thankful to Giuseppe De Arcangelis, Frédéric Docquier, Hillel Rapoport, Thierry Verdier, as well as seminar participants at Clemson University, LUISS and UCLouvain for useful comments and discussion. We also acknowledge the financial support of the Belgian French-Speaking Community (ARC Project 15/19-063). All errors are under our own responsibility.

1 Introduction

The concern about the propensity of immigrants to be involved in criminal activities is widespread and long-standing. Abbott (1931) and Van Vechten (1941) document that, already in the 19$^{\text{th}}$ and early 20$^{\text{th}}$-century United States, immigration was regarded as a massive inflow of potential criminals. More recent research based on survey data also highlights how frequent is the belief, in today's destination countries, that immigrants commit more crimes than natives and thus trigger an overall increase in crime (Bauer, Lofstrom, and Zimmermann, 2000; Mayda, 2006). This idea is indeed consistent with the implications of the traditional economic theory of crime (Becker, 1968; Ehrlich, 1973), which suggests that immigrants are more likely than natives to engage in illicit activities because they typically expect lower relative net returns from legitimate activities, as a consequence of their socio-demographic characteristics and possible discrimination on legal labor markets. Assessing whether these popular perceptions and theoretical predictions correspond to reality has been the objective of a large and still growing body of empirical literature, which however lends little support to the idea that immigration fuels crime in destination countries.

In this paper, we propose a novel theoretical framework to understand why immigrants may even commit less crime than natives, in spite of economic conditions that are more conducive to criminal behavior. Different from the existing literature, we analyze endogenous migration decisions and career choices (i.e. the decision to engage in honest *vs* illicit activities) within a single theoretical framework. Putting the spotlight on the decision to migrate – so far neglected by the theoretical literature – allows us to explore the consequences of self-selection (of honest *vs* criminal workers) into migration on the composition of emigration flows, and better understand the determinants of migrants' involvement in crime. In particular, if the career choice precedes the migration decision, better institutional conditions in the destination countries are key to explain why honest rather than criminal individuals are more likely to self-select into emigration. As a consequence, the crime rate among immigrants may be lower than among natives, even if the latter have better legitimate earning opportunities. We show that these results can also be preserved if, in the presence of reversible career choices, formerly honest migrants are attracted into crime after arriving in the destination country. Furthermore, our theory implies that stricter immigration policies may induce adverse selection and eventually attract more immigrant criminals. Last, by taking into account the dynamic interplay between crime and institutions, we highlight the crucial role of immigration, assimilation and redistributive policies for crime reduction.

1.1 Related literature

The empirical literature concerned with the migration – crime nexus follows two main directions of research. A first set of papers tries to detect possible differences in criminal behavior between migrants and natives, by looking at individual data. The second one uses aggregate data to identify a (possibly causal) relationship between immigration and crime incidence at the local level.

As far as the first research avenue is concerned, the analysis of administrative or survey data at the individual level either fails to find a significant difference in criminal behavior between native and foreign-born individuals, or documents a lower participation of migrants into criminal activities – especially once socio-demographic characteristics are accounted for (Borowski and Derrick, 1994; Albrecht, 1997; Butcher and Piehl, 1998; Hagan and Palloni, 1999; Light, He, and Robey, 2020).[1] For instance, by taking advantage of a nationally representative survey of the UK, Papadopoulos (2014) shows how, after controlling for the underreporting of criminal behaviors and for basic demographic characteristics, immigrants are significantly less involved in property crime than natives.

The second strand of literature, more concerned with possible aggregate effects, produces mixed results. In fact, while Alonso-Borrego, Garoupa, and Vázquez (2012) find a crime-enhancing impact of immigration to Spain (relying on GMM estimates), several other studies challenge the crime-enhancing view of immigration, by emphasizing a negative or null relationship between immigration and crime prevalence across US localities. In particular, Reid et al. (2005) observe a negative correlation between immigration and homicide rate in 150 US localities in 2000, and no significant relationship with robbery, burglary and larceny. Lyons, Vélez, and Santoro (2013) and MacDonald, Hipp, and Gill (2013) find a negative association between immigration intensity in 2000 and the subsequent change in crime, the former analyzing homicide and robbery in 87 large US cities and the latter focusing on both violent and total crime in the neighborhoods of Los Angeles. Other papers based on panel data also detect a negative link between within-locality changes in immigration and in crime incidence (Ferraro, 2016; Ousey and Kubrin, 2009; Stowell et al., 2009; Martinez, Stowell, and Lee, 2010; Wadsworth, 2010). In a meta-analysis of 51 papers published between 1994 and 2014, Ousey and Kubrin (2018) show that the immigration – crime correlation in the US is overall small in size, but significantly negative.

Within the literature on aggregate effects, some recent papers resort to various identification strategies to try to establish a causal effect of immigration on crime. Again, their results are mixed. Exploiting, respectively, weather- and demography-related factors in Mexico as exogenous sources of variation in the intensity of Mexican migration to the US, Chalfin (2014) observes no impact on criminality, while Chalfin (2015) sees a negative effect on rape, larceny and motor vehicle theft, but a positive impact on aggravated assault. Nunziata (2015) also relies on push factors in origin countries and finds that immigration does not affect criminality in Europe. Using information on emigration trends from the same countries of origin toward alternative destinations, Bianchi, Buonanno, and Pinotti (2012) find no effect of immigration on total crime in Italian provinces, with the exception of a small positive effect on robberies. Spenkuch (2014) relies on an instrument *à la* Card (2001) based on the location choices of previous migrants to emphasize a positive effect of immigration on crime in the US, for immigrants with poor labor market outcomes. Other papers, based on similar empirical strategies, report instead a null impact of immigration on crime in

[1] Other studies emphasize the relatively low levels of incarceration of immigrants as compared to natives. See for instance Rumbaut et al. (2006), for a description of the US case.

Germany (Maghularia and Übelmesser, 2019) and in the UK (Bell and Machin, 2013; Bell, Fasani, and Machin, 2013; Jaitman and Machin, 2013).[2] Last, combining a Card-type instrument with the demographic conditions at origin, Ozden, Testaverde, and Wagner (2017) observe a negative impact of immigration to Malaysia on violent crime, and no effect on property crime.

To sum up, individual data suggest that immigrants do not commit more crime than natives, and could even be less involved in criminal activities, while aggregate evidence is mixed with respect to the causal impact of migration intensity on crime.

The idea that self-selection (of honest *vs* criminal workers) is key to understand the involvement of migrants into illicit activities is present in several papers mentioned above. For instance, Butcher and Piehl (2007) argue that the migration process itself selects individuals who are less prone to crime, and that changes in the legal and socio-economic environment at destination have increased the positive selection of migration flows to the US during the 1980s and 1990s. Ozden, Testaverde, and Wagner (2017) claim that migrants to Malaysia, despite having lower human capital, commit less crime than natives, because they "self-select into migrating for work". This is substantiated by immigrants' crime rates in Malaysia being lower than those observed in their origin countries. MacDonald, Hipp, and Gill (2013), Stowell et al. (2009), and Sampson (2008) also highlight the possibility that migrants self-select along the criminal-*vs*-honest dimension.

As far as the literature on self-selection of migrants is concerned, we are not aware of any paper addressing specifically the issue of selection along the criminal-*vs*-honest dimension.[3] In fact, self-selection on criminal status is hard to assess, as it would require information on the past experience in the honest *vs* criminal sector of newly arrived immigrants. There is evidence, however, that migrants are selected along traits (other than human capital) that are positively correlated with honest activity. For instance, Hendricks and Schoellman (2018) show that migrants from poorer countries (to the US) are self-selected on "being employed for wages" in their origin country, thus pointing to a positive selection on honest work (as opposed to crime).

Immigrants are also, in general, positively self-selected with respect to education, as shown for instance by Grogger and Hanson (2011), Belot and Hatton (2012) and Hendricks and Schoellman (2018). This is compatible with selection on being honest, as human capital is negatively correlated with crime, but is also consistent with Beckerian models. Mexican immigration to the US may be an exception, as some papers – from Borjas (1987) to Fernandez-Huertas Moraga (2011) and Ambrosini and Peri (2012) – find evidence of negative selection on human capital. According to Kaestner and Malamud (2014), Mexican migrants are also negatively selected on earnings. Yet, as shown by the literature on the crime-migration link and contrary to the standard Beckerian

[2] Bell, Fasani, and Machin (2013) show that the economic migration inflow triggered by the EU enlargement in 2004 had no causal impact on crime in the UK. However, using the exogenous geographical allocation of asylum-seekers who arrived in the late 1990s/early 2000s, they find that the effect of this category of immigrants was null on violent crime, but slightly positive on property crime.

[3] The most important papers in this literature are Borjas (1987), Chiswick (1999), Orrenius and Zavodny (2005), McKenzie and Rapoport (2010), Fernandez-Huertas Moraga (2011), Grogger and Hanson (2011), Belot and Hatton (2012), Kaestner and Malamud (2014), Gould and Moav (2016), Parey et al. (2017), Borjas, Kauppinen, and Poutvaara (2019) and Patt et al. (2021).

prediction (according to which migrants who are less educated or face worse earning opportunities should commit more crime), Mexican immigrants to the US do not seem to be associated with higher crime rates. For instance, there is recent evidence from Light, He, and Robey (2020) that immigrants in Texas (about half of whom originate from Mexico) do not commit more crime than US natives. The comparison of their data with international crime rates further reveals that migrants have much lower crime rates at destination than their compatriots have at origin.[4] This echoes the findings of Ozden, Testaverde, and Wagner (2017) in the case of Malaysia, and may reflect a positive self-selection of migrants on honest work.

On the theoretical side, the most widely used framework to look at the immigration – crime nexus and interpret the available evidence is the standard economic theory of crime inspired by Becker (1968) and Ehrlich (1973). In this setting, agents decide whether to engage in crime by looking at the relative returns to illegal (as opposed to legal) activities. As hinted at above, since migrants are on average younger and less educated than natives, and more likely to suffer from skill depreciation and labor-market discrimination, they usually expect lower legal earning opportunities, which should make them more prone to engage in illegal activities.

This line of reasoning is insufficient to make sense of the mixed empirical evidence discussed above. In particular, it cannot explain why immigrants may commit less crime than natives, unless one additionally assumes that foreign-born individuals have a higher expected cost of crime, as they face a higher risk of being arrested (Sharp and Budd, 2005), punished and eventually deported (Smith, 1997; Butcher and Piehl, 2007). This could significantly reduce, from the migrants' viewpoint, the expected relative returns to crime and explain why they can even shy away from criminal activities. In this perspective, Dai, Liu, and Xie (2013) obtain that immigration can have a crime-reducing effect in the short run if immigrants face higher costs of participation into criminal activities. To the best of our knowledge, this is the only existing model that attempts to rationalize the seemingly inconsistent findings of the empirical literature. It still overlooks, however, the importance of endogenous migration decisions.

1.2 Our theory

We propose an alternative model to explain why migrants may, under certain circumstances, turn out to be less criminal than natives. Rather than just evaluating the differential costs and returns to legal *vs* criminal activities for immigrants and natives, we explore the role of self-selection in determining the crime rate of migrants. To do so, we depart from the existing literature by analyzing both the migration and the career decisions, within a single theoretical framework. We

[4]Specifically, Light, He, and Robey (2020) report homicide rates of, respectively, 4.8, 5, and 1.9 (per 100,000 persons) for US-born citizens, legal migrants, and undocumented migrants in Texas, between 2012 and 2018. Using the composition of the immigrant population (from the American Community Surveys of 2012-18, available on iPums) and homicide rates in origin countries (as reported by the UNODC, `https://data.unodc.org`), we can compute the weighted homicide rate at origin. The latter is equal to 18.6 or 15.3 per 100,000 persons (depending on whether we match immigrants with the current rate in their origin country or with the rate at the time of migration), which is much higher than the homicide rates of migrants at destination.

assume that the career choice precedes, rather than follows, the migration choice: if career choices are not easily reversible, accounting for self-selection into migration becomes central to understand migrants' involvement in crime.

The imperfect reversibility of career choices is a very plausible assumption in our context, as success in criminal activities has been shown to crucially depend on the accumulation of criminal human and social capital, i.e. on factors such as experience, specialization, mentoring, connections, etc. (see McCarthy and Hagan (1995, 2001), Uggen and Thompson (2003), Morselli, Tremblay, and McCarthy (2006), Bayer, Hjalmarsson, and Pozen (2009), Loughran et al. (2013) and Nguyen and Bouchard (2013), among others).[5] Given the importance of career-specific assets and skills, it is unlikely that individuals can change occupation – from honest to illicit activities, or *vice versa* – without incurring a substantial cost.

In a two-country setting, we combine migration decisions and a predator/prey model of crime, in which agents make a career choice between legal and criminal activities. Criminal rents derive from the predation of honestly-produced income, and the equilibrium crime rate results from equating the expected revenues of workers and criminals. Migration might then be attractive for both criminals, who can find "better" preys in a richer country, and workers, who expect to find higher wages and more effective protection from crime at destination. In this framework, along with individual characteristics driving self-selection into migration, aggregate factors such as institutional differences between countries (notably in terms of productivity or crime protection) concur to shape the criminal behavior of migrants. In particular, we are able to identify conditions under which the share of criminals among immigrants is higher or lower than among natives in the destination country, and we find that immigrants may be less inclined than natives to engage in criminal activities even if they face less favorable conditions on the honest labor. This result can still hold if we consider that immigrants and natives can both revise their career choice after migration, and honest migrants have an incentive to take up criminal jobs.

We then develop two extensions to our model. First, we explore the consequences of immigration policies for criminal behavior in the host economy, and show that stricter border enforcement may induce an adverse selection of immigrants and eventually attract more immigrant criminals. This is consistent with the empirical evidence pointing to a positive correlation between the restrictiveness of immigration policy and the involvement of migrants in illegal activities (Lynch and Simon, 1999; Melossi, 2012), which cannot be explained by simply adding migration to Beckerian models of crime, i.e. without considering the process of self-selection into migration. Second, we analyze the behavior of second-generation migrants and the joint long-run dynamics of crime and institutions. Consistent with the empirical findings of Albrecht (1997) for Germany and Morenoff and Astor (2006), Hagan, Levi, and Dinovitzer (2008) and Bucerius (2011) for the US, we show that second-generation migrants are more likely to become criminals than their parents. We also highlight that, if the current prevalence of crime affects future institutional quality, a migration-

[5] Several scholars also suggest that crime-specific capital contributes to productivity in illegal activities more than education and physical capital (Grogger, 1998; Tremblay and Morselli, 2000).

induced "crime trap" may emerge over time. These last results underline the critical importance of assimilation and redistribution policies to reduce crime and build up better institutions, in a dynamic perspective.

The rest of the paper is organized as follows. Section 2 presents and solves the benchmark model, compares the crime rates of immigrants and natives, and analyzes the individual and institutional determinants of migrants' criminality. Section 3 studies how the main results of the benchmark model are modified if career choices are reversible. Immigration policies and their consequences on crime are analyzed in Section 4. Section 5 explores the behavior of second-generation immigrants and presents the dynamic extension of the model. Section 6 concludes.

2 The basic model

We consider two countries, denoted by D (destination) and S (sending, or source). In each country, agents make a career choice: they can either engage in a honest activity or become criminals, whose income derives from "predation" of honest workers. The two resulting types of agents – workers and criminals – are denoted by w and c, respectively. Within countries, individuals are assumed to be identical *ex ante*, i.e. before the career choice is made. This assumption is chiefly made for simplicity, although heterogeneous earning abilities and different personal attitudes (toward risk, for instance) certainly play an important role in determining career choices. In Appendix A, we develop an alternative version of the model where agents have heterogeneous productivity in legal activities. Although the analysis becomes substantially more complex, we show through numerical simulations that the main results of the benchmark model remain qualitatively unchanged.

2.1 Endogenous career choices

Consider country $j = D, S$ in autarky, so that migration, for the moment, is not allowed. When deciding about their future career, agents evaluate their expected income from alternative occupations.

The prospective revenue of honest workers is given by

$$\Pi_j^w = (1 - q_j)\lambda_j h_j, \tag{1}$$

where h_j is a parameter accounting for individual productivity (which can be interpreted as human capital), λ_j represents an economy-wide externality, while q_j denotes the fraction of income that is stolen away from honest workers by criminals. Both h and λ, as well as q, are assumed to be country-specific and exogenous. The parameter q can be related to institutions, as it depends – in each country – on factors such as the effectiveness of law enforcement and the culture of legality.[6]

[6] In Appendix B.1 we allow agents to invest in protection, so that q becomes endogenous.

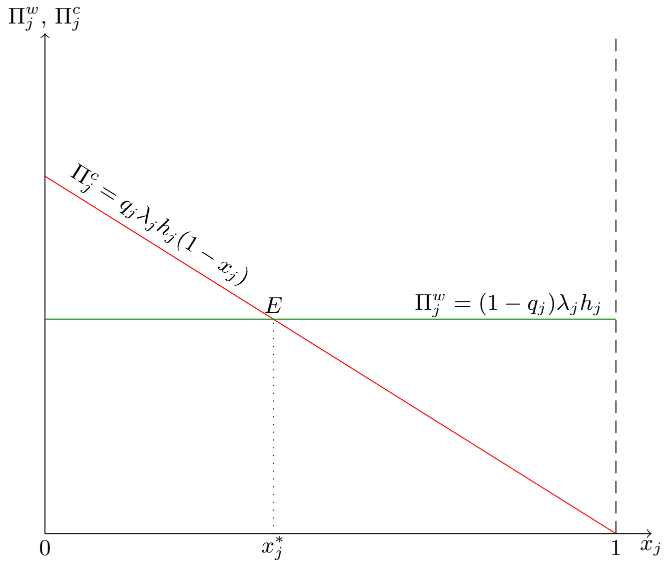

Figure 1: Endogenous career choice

Prospective rents from crime are

$$\Pi_j^c = q_j \lambda_j h_j (1 - x_j), \tag{2}$$

where x_j is the proportion of agents involved in crime in the total population, which we normalize to 1. Π_j^c is a negative function of x_j, thus implying that criminal activities are subject to a crowding-in effect: at the limit, if $x_j = 1$ criminal rents are reduced to zero, as there are no honest workers left and therefore no production to be stolen.

Our description of the interaction between workers and criminals is a simplified, reduced-form version of models of "parasitic" activity *à la* Acemoglu (1995).[7] The stable equilibrium distribution of agents between criminal and honest activities $(x_j^*, 1 - x_j^*)$ can be determined by equating prospective revenues from alternative occupation, i.e. solving $\Pi_j^w = \Pi_j^c(x_j)$, as depicted in Figure 1.[8] In particular, we obtain

$$x_j^* = 2 - \frac{1}{q_j}. \tag{3}$$

Note that for x_j^* to be strictly positive but smaller than 1, so as to exclude the existence of completely crime-free economies while ensuring that there is a positive amount of production, we

[7] As far as criminal rents are concerned, choosing a linearly decreasing function of x is the simplest way to introduce a crowding-in effect. Alternatively, one could have written $\Pi_j^c = q_j \lambda_j h_j (1 - x_j)/x_j$, thereby modeling the predator/prey interaction as a matching process, as in Mariani (2007). Here, we use a reduced-form representation of the interaction between criminals and honest workers, in order to keep the benchmark model as simple as possible, while preserving the fundamental feature that earning opportunities in illicit activities are subject to crowding-in. The matching specification is worked out in Appendix B.3, where we show that the main implications of the model remain valid, although the analysis becomes much more complicated.

[8] In principle, Π_j^w could also be a decreasing function of x_j, so that a larger share of criminals translates into a smaller prospective revenue for honest workers. In such a setting, having $\Pi_j^w(x_j)$ flatter than $\Pi_j^c(x_j)$ would be enough to ensure the existence of a stable equilibrium.

need to have $q_j \in (1/2, 1)$.[9]

2.2 Introducing migration

We assume that (i) migration takes place after the career choice is made, and (ii) career choices are not reversible so that, for instance, honest workers cannot become criminals after arriving in the destination country, even if they have the economic incentive to do so. The assumption of irreversible career choices will be relaxed in Section 3.

In this framework, migration is driven by cross-country differences in income, which are in turn affected by the fundamental parameters of the model. We assume that $\lambda_D = \lambda > 1 = \lambda_S$, so that honest workers are *ceteris paribus* more productive in the destination country. As their gross productivity is λ times higher in country D, honest workers have an incentive to migrate from S to D, even in the absence of crime. We also consider that $h_D = h$ and $h_S = \eta h$ (with $\eta, h > 0$), so as to allow for a human capital differential across countries. As far as institutions are concerned, we have that $q_S = q$ and $q_D = \rho q$, with $q > 0$ and $\rho \in (0, 1)$, thus implying that country D is better at enforcing the rule of law and protecting licit activities from predation.

In our setting, only an exogenously fixed fraction $m \in (0, 1)$ of the population of country S is allowed to migrate to country D. Furthermore, workers and criminals are assumed to have different migration costs, with $c^w < c^c$: this reflects the idea that honest workers are more welcome in destination countries, which try to make the access of criminals more costly. In particular, we define $c^c = c$ and $c^w = c - \gamma$, with $\gamma \in (0, c)$.

Honest workers and criminals may have differential incentives to emigrate from country S, and we want to determine the composition of the emigration flow from S to D. We then denote by $\hat{x}_M$ the equilibrium share of criminals among migrants, i.e. the crime rate that equalizes the incentive to migrate of honest workers and criminals born in S.[10]

2.2.1 Workers

For honest individuals residing in country S, the incentive to migrate Ω^w can be computed as the difference between the income they could obtain abroad, net of the migration cost, and the one they would earn if they stay in their home country:

$$\Omega^w = ((1 - \rho q)\lambda - (1 - q))\eta h - (c - \gamma). \tag{4}$$

[9] Although not uncommon in the literature (see Mariani (2007), for instance), this assumption may look unrealistic. It can be eliminated or mitigated by adding further structure to the model. One could assume, for instance, that each criminal steals from $z_j > 1$ honest workers at the same time. This would modify the condition on the extortion rate into $q_j > 1/(1+z_j)$, which is less restrictive. Alternative ways to proceed are analyzed in Appendices A and B. Here, however, we prefer to preserve as much as possible the analytical parsimony of our framework.

[10] For what concerns notation, we use $\hat{x}_M$ instead of x^*_M to underline the difference between the equilibrium *migration* choice and the equilibrium *career* choice of agents. Given our assumptions, the career choice is made before migration, by agents who do not internalize the possibility of future migration.

Note that, given the specific structure of our model, Ω^w does not depend on the behavior of other agents, be they honest or criminals, natives or immigrants.

2.2.2 Criminals

When computing the prospective income of criminals, we must take into account how they contribute – as migrants – to the crowding-in of the criminal market in the destination country. After migration, the total population of the D economy becomes $1+m$, but the number of criminals grows up to $x_D^* + mx_M$. In addition, the expected rents from crime in country D are modified by the arrival of immigrants engaging in licit activities, who are also subject to predation but are characterized by a different productivity. The prospective income of criminals who migrate from S to D can thus be written as

$$\rho q \frac{((1+m) - (x_D^* + mx_M))}{(1+m)} \frac{((1-x_D^*)\lambda h + m(1-x_M)\lambda\eta h)}{((1-x_D^*) + m(1-x_M))}, \tag{5}$$

where the first fraction accounts for the crowding-in effect, while the second one is the after-migration average productivity of honest workers. Equation (5) can be simplified into

$$\frac{(1 - x_D^* + m\eta(1-x_M))\rho q\lambda h}{1+m}. \tag{6}$$

The expected income of criminals who migrate is thus decreasing in x_M and, for sufficiently low values of η, depends negatively on m. In fact, all other things being equal, more immigration will dilute average productivity and strengthen the crowding-in effect.

If a criminal based in country S decides not to migrate, she will instead earn

$$\frac{(1 - x_S^* - m(1-x_M))q\eta h}{1-m}. \tag{7}$$

The above expression is always increasing in x_M, and also increasing in m if $x_M > x_S^*$: emigration leaves unaffected the income that is available for predation, but the crowding-in effect is weaker if relatively more criminals leave the country, thus raising criminal rents in S.

Given Equations (6) and (7), and after replacing x_S^* and x_D^* with the expressions implied by Equation (3), the incentive to migrate for criminals writes as

$$\Omega^c(x_M) = \frac{(1 - \rho q(1 - \eta m(1-x_M)))\lambda h}{1+m} - \frac{(1 - q(1 + m(1-x_M)))\eta h}{1-m} - c, \tag{8}$$

which is decreasing in x_M, thus reflecting the crowding-in effect of criminal migrants.

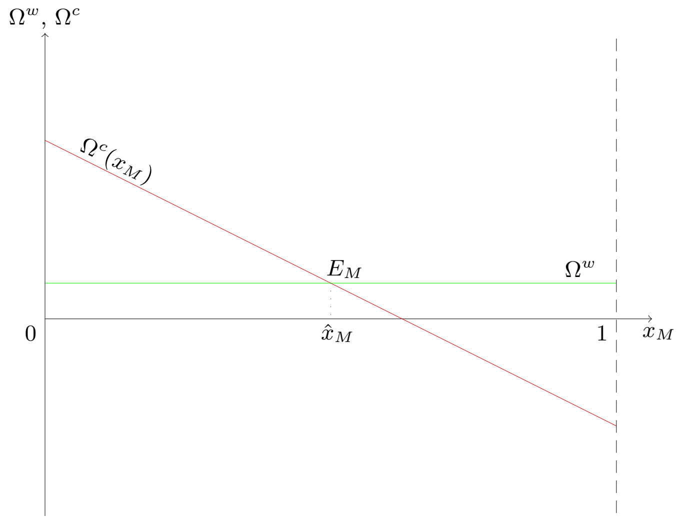

Figure 2: Composition of the migration outflow

2.3 Composition of the migration outflow

Equating Ω^w and $\Omega^c(x_M)$ and solving for x_M, we obtain

$$\hat{x}_M = \frac{((1-\eta)(1-\rho q)\lambda - (\eta+\lambda-2q\eta-(1+\eta)\lambda\rho q)m - (1-\lambda-2q(1-\lambda\rho))\eta m^2)h - \gamma(1-m^2)}{(1+m+(1-m)\lambda\rho)q\eta h m}, \tag{9}$$

which describes the equilibrium composition of the migration flow from country S to country D, as represented in Figure 2.

We can now assess the role of (relative) human capital for the self-selection of migrants.

Proposition 1. *The proportion of criminals among migrants is decreasing in η and h. Moreover, the crime rate of immigrants may be lower than that of natives, even if the human capital of migrants is lower, i.e. $\eta < 1$ does not necessarily imply that $\hat{x}_M > x_D^*$.*

Proof. The first part of the proposition follows directly from the inspection of the partial derivatives of $\hat{x}_M$ with respect to η and h. As far as the second one is concerned, we need to find the value of η, which we denote $\overline{\eta}$, such that $\hat{x}_M = x_D^*$. We obtain

$$\overline{\eta} = \frac{(1-m)\rho((1+m)\gamma - (1-\rho q)\lambda h)}{(m(1+m) - (m(1+m)+(1-m)\lambda)\rho + (1-m)\lambda\rho^2 q)h}, \tag{10}$$

which can be lower than 1. In particular, $\overline{\eta} < 1$ if $\rho < (h\lambda - (1+m)\gamma)/(qh\lambda)$. □

The first part of the above Proposition states that both a generalized increase in human capital (higher h) and convergence between countries in terms of human capital (higher η) may contribute to reducing the participation of migrants into illegal activities. In particular, it reproduces a standard implication of Beckerian models of crime, namely that *ceteris paribus* higher relative returns to human capital in productive activities are associated to a lower involvement in crime.

In addition, the second part of Proposition 1 establishes that – unlike what is conjectured by traditional models – immigrants do not necessarily commit more crime than natives, even if they have lower productivity in honest jobs. This prediction does not hinge on migrants having an intrinsically different structure of incentives (as shaped, for instance, by the cost of crime), but rather on the process of self-selection into emigration. If, for instance, the destination country has sufficiently better institutions ($\rho < 1$) or higher productivity ($\lambda > 1$) than the sending economy, this can make migration more attractive for honest workers, and compensate for their lower human capital ($\eta < 1$). As a consequence, the incidence of crime among immigrants may be lower than the before-migration crime rate in the destination country, even if migrants have lower human capital than natives.

This implication of our analysis is of particular relevance with respect to some of the stylized facts discussed in the Introduction. In particular, it helps us understand why immigration waves composed of individuals with lower skills than natives did not go hand in hand with an increase in crime rate – or even had a crime-mitigating impact. According to Proposition 1, even immigrants who face poor labor-market conditions in the host country can still be characterized by a lower crime rate than natives, provided that the quality of institutions and/or the level of global productivity at destination are sufficiently high.[11]

In order to derive additional results, we now introduce a simplifying assumption on the parameters of our model.

Assumption 1. *We assume that* $\eta = 1 = h$.

The above assumption allows us to deal away with the role of human capital, which has already been highlighted by Proposition 1, and concentrate on the other parameters. Otherwise said, by setting $\eta = 1$, we want to understand how the various characteristics of the source and destination economies affect the crime rate of migrants, once we control for human capital. Further assuming $h = 1$ allows us to save on notation.

Under Assumption 1, the equilibrium crime rate of migrants can be rewritten as

$$\hat{x}_M = 2 - \frac{(1 + m + (1 - m)\lambda - \gamma m)m + \gamma}{(1 + m + (1 - m)\lambda\rho)qm}. \tag{11}$$

We can then summarize the comparative statics of the model.

Proposition 2. *The crime rate among migrants decreases with* γ*, and increases with* ρ*,* q *and* m*. If* ρ *is sufficiently small,* $\hat{x}_M$ *is also decreasing in* λ*.*

Proof. The results of the above Proposition follow from the inspection of the partial derivatives of $\hat{x}_M$. In particular, it can be checked that $\partial \hat{x}_M/\gamma < 0$, $\partial \hat{x}_M/\rho > 0$, $\partial \hat{x}_M/q > 0$ and $\partial \hat{x}_M/m > 0$. Moreover, $\partial \hat{x}_M/\lambda < 0$ if $\rho < m/(m + \gamma(1 - m))$. □

[11] This could be the case, for instance, of the large immigration waves entering the US from the 1980s and mostly composed of Mexican unskilled migrants. In link with the (lack of) association between these migration waves and crime in the US, see for instance Rumbaut et al. (2006), Martinez, Stowell, and Lee (2010), MacDonald, Hipp, and Gill (2013), Chalfin (2014).

Proposition 2 shows that better institutions in country D (in the absolute, or relative to country S, i.e. lower values of q and ρ, respectively) or a better ability of the destination country to screen honest migrants (higher γ) translate into lower crime rates among immigrants.[12] Moreover, in the presence of a sufficiently low predation rate in the destination country, a higher productivity results into a lower migrants' crime rate, by inducing a more favorable self-selection of migrants. Conversely, if ρ is large enough (i.e. predation at destination is important), a higher λ, from the viewpoint of prospective migrants, raises criminal rents more than honest income at destination (since criminal rents, unlike honest income, depend also on the productivity of natives), and is thus associated with a larger crime rate among migrants. As far as m is concerned, an increase in total immigration worsens the composition of the immigrant group – all other things being equal.

2.4 Decreasing returns

So far, we have considered a situation in which the inflow of immigrants does not affect legal earning opportunities. One may argue, however, that the arrival of migrants influences labor market outcomes in the destination country, thereby altering the incentive to engage in criminal activities for both natives and immigrants.

One possible way to deal with this issue is to modify the benchmark model by allowing for decreasing returns to labor in the legal sector, in both countries. In particular, we assume that the aggregate before-predation output of the honest sector can be written as

$$y_j = \lambda_j (h_j(1 - x_j))^{\alpha}, \tag{12}$$

where $\alpha \in (0, 1]$ is an (inverse) measure of the intensity of decreasing returns. Setting $\alpha = 1$ would bring us back to the basic model, characterized by a linear production technology in the legal sector, i.e. constant returns to honest labor. Note also that we have relaxed Assumption 1 to ensure comparability with the benchmark case.

In the absence of productive factors other than labor, the human capital of honest workers is remunerated at its average product, given by $\lambda_j(h_j(1 - x_j))^{\alpha-1}$ for each unit of human capital.[13]

This implies that in autarky, Equations (1) and (2) respectively become

$$\Pi_j^w = (1 - q_j)\lambda_j h_j^{\alpha}(1 - x_j)^{\alpha-1}, \tag{13}$$

and

$$\Pi_j^c = q_j \lambda_j h_j^{\alpha}(1 - x_j)^{\alpha}. \tag{14}$$

As long as migration is not considered, the introduction of decreasing returns has no bearing

[12]Therefore, it can be claimed that the receiving country has an influence on the composition of the inflow of migrants, as bad institutions tend to attract those who are specialized in illicit activities. Moreover, if native criminal organizations are pretty effective and well organized, they are also susceptible of hiring foreign criminals.

[13]This formulation is equivalent to assuming that labor is combined with a fixed factor (say land, infrastructure or capital) which is free of property rights, and we normalize to 1.

on crime rates in the source and destination countries. In fact, it can be checked that $x_j^* = 2-1/q_j$, just as in Equation (3). This is due to the fact that, without migration, both criminal rents and honest incomes incorporate decreasing returns in the same fashion.

Things can change, however, if we allow for migration from country S to country D, along the lines of Section 2.2. As in the benchmark model, we impose $\lambda_D = \lambda > 1 = \lambda_S$, $h_D = h$, $h_S = \eta h$, $q_S = q$ and $q_D = \rho q$ (with $\eta, h > 0$ and $\rho \in (0,1)$). After simplifying, the incentive to migrate Ω^w for honest individuals in country S is given by

$$\Omega^w(x_M) = (1-\rho q)\eta h\lambda((1-x_D^*)h+m(1-x_M)\eta h)^{\alpha-1}-(1-q)\eta h(((1-x_S^*)-m(1-x_M))\eta h)^{\alpha-1}-(c-\gamma), \tag{15}$$

while the incentive to migrate for criminals writes as

$$\Omega^c(x_M) = \rho q\lambda\frac{((1-x_D^*)h + m(1-x_M)\eta h)^{\alpha-1}}{1+m} - q\frac{(((1-x_S^*)-m(1-x_M))\eta h)^{\alpha-1}}{1-m} - c. \tag{16}$$

These expressions correspond to Equations (4) and (8) for the model with constant returns. With respect to the benchmark case, the main difference is that Ω^w is now an increasing function of x_M. A larger proportion of criminals among immigrants, by implying that less honest workers join the destination country, translates into higher relative returns to honest activities – exactly because of decreasing returns.

As in Section 2.2, we focus only on interior solutions for the crime rates. After solving $\Omega^w = \Omega^c$ for x_M, we can determine $\hat{x}_M$, i.e. the crime rate among migrants. Although we cannot obtain a closed-form solution for $\hat{x}_M$, it is possible to establish a condition on α such that migrants commit less crime than natives, i.e. $\hat{x}_M < x_D^*$.

Proposition 3. *Suppose that Assumption 1 holds and $m < (1-q)\rho/(1-q\rho)$. Then, there exists*

$$\tilde{\alpha} = \frac{\log\dfrac{(1-m)\gamma((1-q)\rho-(1-q\rho)m)}{mq(1-\rho)}}{\log\dfrac{(1-q)\rho-(1-q\rho)m}{q\rho}}, \tag{17}$$

which solves $\hat{x}_M = x_D^*$. This solution is unique, and the crime rate of immigrants is lower (higher) than that of natives if $\alpha > \tilde{\alpha}$ ($\alpha < \tilde{\alpha}$).

Proof. By replacing $x_D^* = 2 - 1/q\rho$ in Ω^w and Ω^c, and solving $\Omega^w = \Omega^c$ for α, we obtain $\tilde{\alpha}$ as reported in Equation (17). To prove the Proposition, we just need to show that $\Omega^w - \Omega^c$ is an increasing function of α. This is the case if $\partial(\Omega^w - \Omega^c)/\partial\alpha = -\gamma\log(-1+m+1/q-1/q\rho) > 0$. The latter inequality is always satisfied provided that the argument of the logarithm is positive, i.e. if $m < (1-q)\rho/(1-q\rho)$. $\square$

The above Proposition states that the closer we are to the case of constant returns, the more likely it is that migrants commit less crime than natives. In other words, if the labor-market impact of honest migrants is not too harmful to legal wages (i.e. $\alpha > \tilde{\alpha}$), relatively few foreign-born criminals are attracted into migration, thus warranting that the crime rate of immigrants does not exceed that of natives ($\hat{x}_M < x^*_D$).

Before moving on, let us stress that in this example, the impact of immigration on the (legal) labor market of the destination country is entirely driven by decreasing returns to labor, with natives and immigrants being perfect substitutes. This means that the arrival of migrants causes legitimate earning opportunities to decrease, for both natives and immigrants. In Appendix C we consider an alternative setting in which returns to labor are constant on the aggregate, but migrants and natives may not be perfect substitutes, as the labor inputs of natives and immigrants are aggregated through a CES production function. In such a setting, immigration may have a differential effect on natives' and immigrants' incomes: in particular, it may cause the unit wage of honest natives to increase, while the earning prospects of foreign-born workers worsen with the size of immigration.[14] We show that, even with this different structure of incentives, the main results of our analysis can still hold.

3 Reversible career choices

Throughout Section 2, we have considered career choices as being completely irreversible: migrants who leave the sending economy as criminals or honest workers stick to their specific sector of activity in the destination country and, symmetrically, natives at destination do not change occupation upon migrants' arrival. This is consistent, as discussed in the Introduction, with empirical evidence showing that criminal and honest careers require job-specific capital that is typically acquired on-the-job, so that career choices cannot be revised without costs.[15] In this Section, however, we relax the assumption of irreversible career choices and consider that all agents can change occupation – from the legal to the illegal sector, or *vice versa* – after migration. Moving from one sector to the other may be costless (Section 3.1) or imply some income loss (Section 3.2) that, however, does not prevent agents from revising their career choices. We can thus check whether our results on crime-rate differentials between migrants and natives are robust to the introduction of the possibility of career shifts. As both immigrants and natives can change occupation, this setting also allows us to explore the possible spillover effects of immigration on the criminal behavior of natives.

3.1 A simple case

Suppose that changing occupation is costless and Assumption 1 holds, so that migrants and natives have the same level of human capital.

[14] This way of modelling the labor-market effect of immigration is reminiscent of Ottaviano and Peri (2012), who show that legal migrants to the US have a small but positive effect on natives' wages, while harming the earnings of (previous) migrants.

[15] On the role of experience, specialization, tutelage, networking and the like for criminal success, see for instance McCarthy and Hagan (1995, 2001), Uggen and Thompson (2003), Morselli, Tremblay, and McCarthy (2006), Bayer, Hjalmarsson, and Pozen (2009), Loughran et al. (2013) and Nguyen and Bouchard (2013).

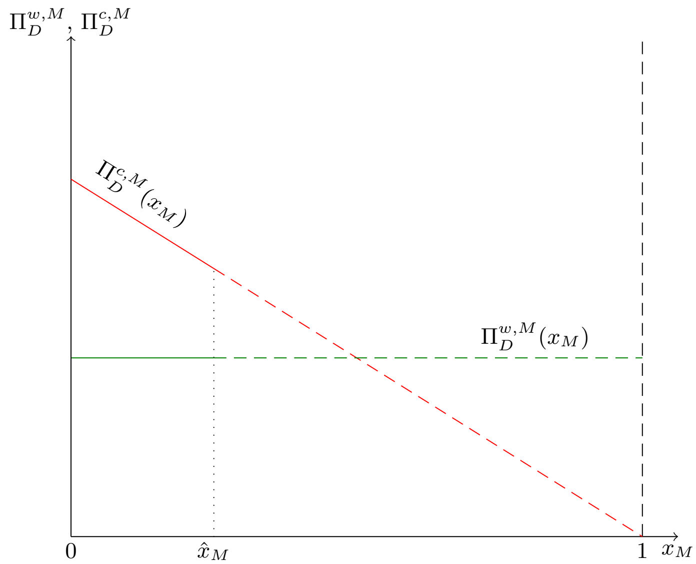

Figure 3: Reversible career choices with $\eta = h = 1$: migrants

We can check under which conditions honest workers, regardless of their birthplace, have an incentive to change occupation after migration takes place. The net incentive I for honest workers to join the criminal sector is obtained by subtracting $(1-\rho q)\lambda$, the revenue from honest activities in country D, from the returns to crime in D after migration, given by Equation (5) with $\eta = 1 = h$; and replacing x_D with x_D^* and x_M with $\hat{x}_M$. It can be written as

$$I = \frac{\lambda((\gamma + (1-\gamma)m)\rho - m)}{1 + m + (1-m)\lambda\rho}. \tag{18}$$

We can then claim the following.

Proposition 4. *Under Assumption 1, if institutions are sufficiently weak in the destination country, i.e.* $\rho > m/(m+(1-m)\gamma)$*, and career choices are reversible, some formerly honest immigrants and/or natives take up criminal jobs.*

Proof. The condition on ρ derives directly from $I > 0$, where I is given by Equation (18). □

The situation, from the viewpoint of immigrants, is illustrated by Figure 3. The equilibrium composition of the immigration flow $\hat{x}_M$ is obtained by equating incentives to migrate for different types of agents born in country S (as in Figure 2), and is given by Equation (11). It does not ensure, however, that honest and criminal revenues are equal in country D, after migration takes place. In particular, if ρ is sufficiently large, prospective rents from crime are higher than actual honest earnings, for migrants (and natives). Hence, some formerly honest workers switch to illicit activities, until $I = 0$. On the contrary, if property rights are sufficiently well-protected and allow for small criminal rents (small ρ) in the destination country, the more severe crowding-in effect in the crime sector deters some migrants and some natives from pursuing illicit activities, and pushes them toward the legal sector ($I < 0$).

If career choices are reversible, and if migrants and natives have equal productivity in honest jobs (as implied by Assumption 1), the after-migration equilibrium in the destination country is characterized by the same crime rate as in autarky. In fact, natives and migrants end up having the same prospective revenues from honest labor and from crime, i.e.

$$\Pi^w_{shift} = (1-\rho q)\lambda \tag{19}$$

and

$$\Pi^c_{shift} = \rho q\lambda(1-x_{shift}), \tag{20}$$

where x_{shift} is the proportion of agents involved in crime in the total population after career choices are revised. Solving $\Pi^w_{shift} = \Pi^c_{shift}$ yields

$$x^*_{shift} = 2 - \frac{1}{\rho q}, \tag{21}$$

which is the economy-wide equilibrium crime rate after migration and career shifts, and reproduces Equation (3) in Section 2.1.[16]

In the absence of further assumptions, however, it is not possible to say whether the overall crime rate given by Equation (21) hides a difference between the crime rate of natives and that of migrants. In principle, any combination of group-specific crime rates leading to x^*_{shift} is compatible with the equilibrium.

One possible way to overcome indeterminacy is to impose that, if $I > 0$, the composition by birthplace of the flow of honest workers switching to illicit activities reproduces exactly the composition by birthplace of the before-shift honest population.[17] This corresponds to granting to natives and migrants the same access to career shifts.

In such a case, the after-shift crime rates among migrants and natives are given by

$$x^*_{M,shift} = \frac{\hat{x}_M(1-\rho q) - (1-\hat{x}_M)(1-2\rho q)m}{1-(1-m(1-\hat{x}_M))\rho q} \tag{22}$$

and

$$x^*_{N,shift} = \frac{\rho q((3+2m) - (2+m\hat{x}_M)\rho q) - (1+m)}{\rho q(1-(1-m(1-\hat{x}_M))\rho q)}, \tag{23}$$

where $\hat{x}_M$ is the before-shift share of criminals among immigrants.[18] We can then claim the following.

Proposition 5. *Suppose that Assumption 1 holds, and that career shifts are possible and equally accessible to natives and migrants. After career choices are revised, migrants commit less crime than natives (i.e. $x^*_{M,shift} < x^*_{N,shift}$) if $\hat{x}_M < x^*_D$.*

[16] Consistent with the notation rule described in Footnote 10, we denote with a star this equilibrium crime rate because it results from *career* (rather than *migration*) decisions.

[17] Otherwise said, we require the share of honest workers who switch from honest to illicit activities to be the same across groups (i.e. natives and immigrants).

[18] See Appendix D.1 for the derivation of Equations (22) and (23).

Proof. Recall that $x_D^* = 2 - 1/(\rho q)$. The Proof then follows directly from the comparison between $x^*_{M,shift}$ and $x^*_{N,shift}$ as expressed in Equations (22) and (23), in which we replace $\hat{x}_M$ as given by Equation (11). $\square$

The above Proposition tells us that if foreign-born and native workers have the same productivity in honest jobs, and immigrants have a lower crime rate than natives when they reach the host country, this remains the case even if career choices are reversible.[19]

3.2 Costly career shifts in the presence of productivity differentials

To generalize the analysis, we now relax the assumption that natives and immigrants have the same level of human capital, thus allowing η to be different from 1 (but we still use $h = 1$ to save on notation). As a consequence, migrants and natives can face differential incentives. To see how this affects the main result of our analysis, namely that immigrants can commit less crime than natives despite having lower productivity, we focus on the "least favorable scenario". This would be a situation in which some formerly honest migrants join the criminal sector, and/or some criminal natives are attracted into a honest career.

In addition, we introduce the possibility that career shifts are costly. We consider that each agent who changes occupation incurs a cost $\Xi > 0$, which is not anticipated before migration. The idea that changing occupation is costly is supported by an extensive empirical literature, as documented in the Introduction and earlier in this Section. It is then interesting to see how the switching cost interplays with human capital differentials in determining the after-shift crime rates of migrants and natives, and see whether the results of Sections 2 and 3.1 are confirmed.[20]

We start by looking at the incentives to update career choices, for both migrants and natives. As far as honest immigrants are concerned, the incentive to turn to criminal activities (net of the switching cost) is given by

$$I_M^{w \to c} = \frac{\lambda((1-\rho q)(1-\eta) + (1-m)\gamma\rho - m\eta(1-\rho))}{(1+m) + (1-m)\lambda\rho} - \Xi. \tag{24}$$

For what concerns natives, the incentive to switch from criminal to honest activities writes as

$$I_N^{c \to w} = I_M^{c \to w} + (1-\eta)\lambda(1-\rho q). \tag{25}$$

We can then claim the following.

[19] If the possibility to costlessly change occupation is perfectly anticipated by migrants, the after-shift equilibrium is such that $x^*_{M,shift} = x^*_{shift} = x^*_D$. Therefore, in the absence of productivity differentials, immigrants and natives would be characterized by the same crime rate. This case is, however, of limited empirical relevance – as it describes an essentially frictionless economy.

[20] From the technical point of view, adding a switching cost also allows to overcome the indeterminacy problem encountered in Section 3.1.

Lemma 1. *Let us define*

$$\eta_M^{w\to c} = \frac{\lambda(1-\rho(q-(1-m)(\gamma-\Xi))) - (1+m)\Xi}{\lambda((1-\rho q)+m(1-\rho))}, \tag{26}$$

and

$$\eta_N^{c\to w} = \frac{\lambda(m(1-\rho q)+(\lambda-\gamma-\Xi)(1-m)\rho) - (1-m)\lambda^2\rho^2 q - (1+m)\Xi}{\lambda\rho(\lambda(1-(1-m)\rho q) - m(q+\lambda-1))}. \tag{27}$$

Then, honest migrants have an incentive to switch to illicit activities if $\eta < \eta_M^{w\to c}$, while criminal natives have an incentive to move to honest jobs if $\eta < \eta_N^{c\to w}$.

Proof. Follows directly from the inspection of the signs of $I_M^{w\to c}$ and $I_N^{c\to w}$. In particular, $\eta_M^{w\to c}$ solves $I_M^{w\to c} = 0$ and $\eta_N^{c\to w}$ solves $I_N^{c\to w} = 0$. □

Lemma 1 shows that the presence of a sufficiently large skill gap at destination may push some migrants who had a honest job in their origin country to join the criminal sector, after arriving in the host country. In particular, if $\eta < \min(\eta_M^{w\to c}, \eta_N^{c\to w})$, they may end up replacing natives who, on the opposite, are attracted to the formal sector. This result is consistent with the hypothesis of a substitution effect in illegal activities, supported by Ruggiero (1996), among others. Bianchi, Buonanno, and Pinotti (2012) also suggest that such a substitution effect may explain why immigration does not affect the overall crime rate across Italian provinces.

Note that Lemma 1 abstracts from general equilibrium effects, as the incentives reported in Equations (24) and (25) do not take into account the career shifts of other agents in the economy. It may in fact happen that criminal natives who would stick to their original occupation are pushed to reconsider their choice and take up honest jobs if migrants flock to the criminal sector, thereby decreasing criminal rents.

To understand whether – in this setting – the possibility of changing occupation can reverse the main result of Section 2, let us suppose that the composition of the migration flow arriving in the destination country is such that migrants are less criminal than natives before career choices are revised, i.e. $\hat{x}_M < x_D$. We want to establish whether a crime-rate differential in favor of migrants can persist even after agents have had the opportunity to change occupation, so that $x^*_{M,shift} < x^*_{N,shift}$. The following Proposition summarizes our findings.

Proposition 6. *Let us define*

$$\check{\eta} \equiv 1 - \frac{(1+m)\Xi}{(1-\rho q)\lambda}. \tag{28}$$

After career choices are revised, the crime rate among migrants is lower than among natives if

$$\eta > \max(\check{\eta}, \overline{\eta}), \tag{29}$$

where $\overline{\eta}$ is given by Equation (10).

Proof. See Appendix D.2. □

This Proposition tells us that if the relative human capital of immigrants is sufficiently high, the crime rate among immigrants can still be lower than among natives, even if career choices are revised after migration. In particular, if some honest migrants become involved in illicit activities after arriving in the destination country, we need $\eta > \check{\eta}$ for the crime rate to remain lower among immigrants. Note that this does not require immigrants to be more productive than natives, as $\check{\eta}$ can be lower than 1 as long as $\Xi > 0$.[21] If instead no migrant changes occupation, for migrants to commit less crime than natives we need $\eta > \overline{\eta}$, as in the benchmark model with irreversible career choices (see Proposition 1 and its Proof).

Note also that $\eta > \check{\eta}$ can be rewritten as a condition on the switching cost, namely $\Xi > (1-\eta)\lambda(1-\rho q)/(1+m)$. This means that immigrants end up committing less crime than natives, even when they have lower legitimate earning opportunities, if changing occupation is sufficiently costly. In other words, the virtuous effect of self-selection into migration on immigrants' crime may survive the revision of career choices, if mobility between sectors is less than perfect.

The results of Proposition 6 can also be rephrased by looking at Figure 4, in which the shaded area corresponds to all the (Ξ, η) combinations such that, once career choices are revised, migrants commit less crime than natives. Suppose that, upon arrival the composition of the migration inflow is such that $\hat{x}_M < x_D^*$, which happens if $\eta > \overline{\eta}$, but honest migrants know that they could earn more if they engage in criminal activities. If switching costs are large enough, so that we are in the region of the (Ξ, η) space comprised between $\eta_M(\Xi)$ and $\eta_N(\Xi)$ in Figure 4, migrants (as well as natives) decide to remain in their original occupation, and $\eta > \overline{\eta}$ is sufficient to ensure that the crime rate remains lower among migrants.[22] If instead switching costs are not prohibitive, then some honest migrants take up illicit jobs, while natives do not move across sectors: this corresponds to the region comprised between $\eta_M(\Xi)$ and $\tilde{\eta}(\Xi)$ and the vertical axis. Within this region, we can still observe that the crime rate – after career choices are revised – is lower among migrants, provided that $\eta > \check{\eta}(\Xi)$. On the contrary, for values of the switching cost Ξ such that $\bar{\eta} < \eta < \check{\eta}(\Xi)$, foreign-born agents are less criminal than natives when they arrive in the host country ($\hat{x}_M < x_D^*$), but then the situation reverses – with immigrants *becoming* more criminal than natives once they are given the opportunity to change occupation.

In Appendix D.2, we provide more details on the determination of the threshold functions, as well as a full characterization of Figure 4. In particular, we discuss the case in which immigrants do not change occupation but some natives quit the criminal sector in favor of honest jobs, which corresponds to the area delimited by $\eta_N(\Xi)$, $\tilde{\eta}(\Xi)$ and the horizontal axis. We also describe the equilibrium configurations characterized by $\eta < \tilde{\eta}(\Xi)$, in which, due to their low productivity in honest jobs, immigrants end up committing more crime than natives after career shifts.

Equation (29) and Figure 4 also show that, in the absence of switching costs (i.e. if $\Xi = 0$), the

[21]Note also that η must be lower than $\eta_M^{w \to c}$ (as defined in Lemma 1) to ensure that honest migrants have an incentive to take up illicit jobs. In particular, it is possible to show that $\check{\eta} < \eta_M^{w \to c}$ if γ is sufficiently large. Recall that the higher is γ, the stronger is the effect of self-selection into migration on the crime rate of migrants, as highlighted in Proposition 2.

[22]In Figure 4, the segments $\eta_M(\Xi)$ and $\eta_N(\Xi)$ are simply the portions of $\eta_M^{w \to c}$ and $\eta_N^{c \to w}$ above $\tilde{\eta}(\Xi)$.

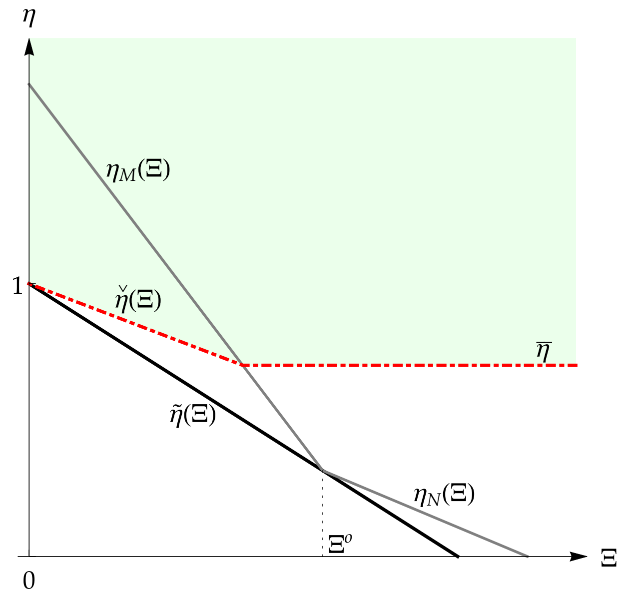

Figure 4: Reversible career choices

crime-rate differential between immigrants and natives depends entirely on relative human capital η, with migrants committing less crime than natives only if $\eta > 1$. Otherwise said, if career choices can be revised without cost, the effect of self-selection into migration on crime is erased, and the after-shift differential involvement in crime of migrants and natives can be traced back to differences in legitimate earning opportunities – a typical Beckerian result. Even a small switching cost, however, is sufficient to elicit an effect of selection into migration on criminal behavior.

4 The role of immigration policy

We now come back to the basic setting of our model – with constant returns to honest labor and irreversible career choices – and focus on the role of immigration policy. Until now, we have considered m as exogenous. In reality, managing immigration implies important policy tradeoffs, which may in particular affect the incentives to pursue a criminal career in the destination country.

4.1 Border *vs* law enforcement

We build a simple extension of our model, in order to discuss a specific policy tradeoff: in the presence of a binding government budget constraint, a stricter border enforcement may weaken the destination country's capacity to contrast criminal activities.

We introduce a parameter $s \in (0, 1)$, accounting for the degree of restrictiveness of immigration policy. Intensifying border controls has a double effect: on the one hand it reduces m, the number of migrants who reach the destination country; on the other hand, it requires to spend more in border patrolling, thus draining resources out of law enforcement, so that ρ increases.

For simplicity, we choose a linear formulation, so that

$$m = (1 - s)M \tag{30}$$

and

$$\rho = \theta s, \tag{31}$$

where M is the potential supply of migrants to country D, while $\theta \in (0, 1)$ accounts for the opportunity cost of a stricter immigration policy in terms of law enforcement.

From the viewpoint of the host country, it is interesting to determine how s affects two different variables: $\hat{x}_M$ (the composition of the migration inflow) and $N_M \equiv \hat{x}_M(1-s)M$ (the total number of foreign-born criminals). Both variables may be relevant for social welfare in country D.

For ease of presentation, we keep working under Assumption 1 and further set $\gamma = 0$.[23] Our main variable of interest thus becomes

$$\hat{x}_M = 2 - \frac{1 + \lambda + (1 - \lambda)(1 - s)M}{(1 + \theta\lambda s + (1 - s)(1 - \theta\lambda s)M)q}, \tag{32}$$

and the consequences of immigration policy for the criminal behavior of immigrants can be summarized as follows.

Proposition 7. *There exist two threshold values θ_1 and θ_2, with $\theta_1 < \theta_2$, such that, for $s \in (0, 1)$:*

- *if $\theta < \theta_1$, $\hat{x}_M$ is decreasing with s,*
- *if $\theta_1 < \theta < \theta_2$, $\hat{x}_M$ is U-shaped in s,*
- *if $\theta > \theta_2$, $\hat{x}_M$ is increasing with s.*

There also exists θ_1' such that if $\theta_1' < \theta < \theta_2$, then N_M is also U-shaped in s. Furthermore, if we denote by $\check{s}$ and $\breve{s}$ the values of s which minimize $\hat{x}_M$ and N_M, respectively, we have that $\check{s} < \breve{s}$, i.e. the minimum of N_M is reached for a higher value of s than the minimum of $\hat{x}_M$.

Proof. See Appendix E. □

The above Proposition establishes that, unsurprisingly, when θ is very small, the opportunity cost of border enforcement is so low that any increase in s will result into a lower crime rate of immigrants, given that – as stated in Proposition 2 – $\hat{x}_M$ is increasing in m. On the opposite, when θ is large, increasing s will entrain a big increase in ρ, thus bringing about a more adverse self-selection of migrants. More interestingly, for intermediate values of θ, both the crime rate of immigrants and the total number of "imported" criminals first decrease with s, but eventually increase if the immigration policy becomes too restrictive.

Therefore, as can be seen in Figure 5, restricting immigration is not always a good option if the policy-maker wants to achieve a reduction in crime rates. In particular, starting from low

[23] We will discuss the link between immigration policy and differential migration costs in Section 4.2.

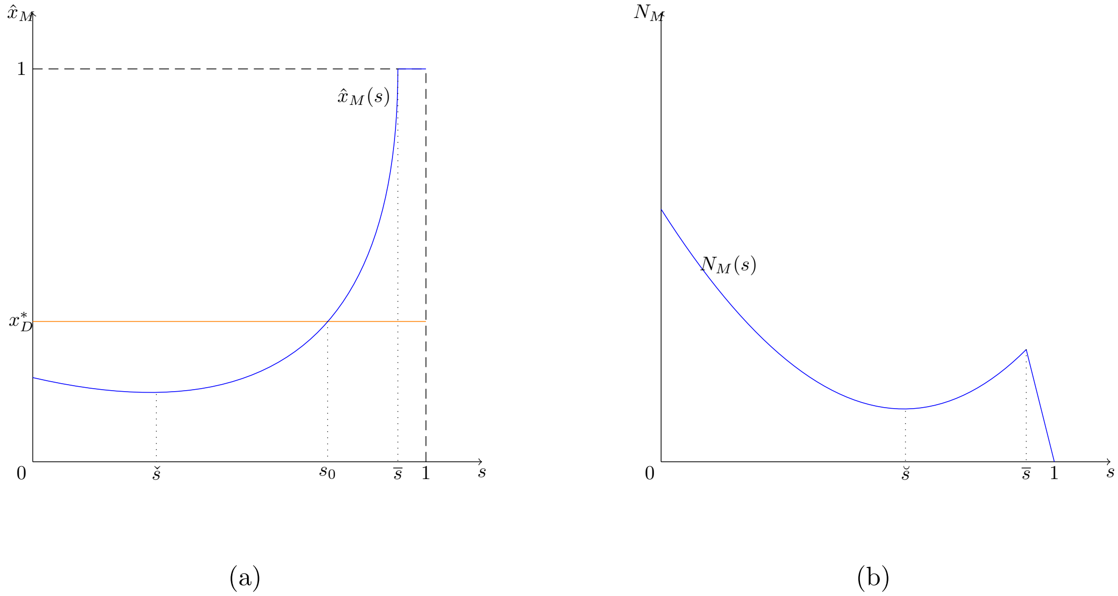

Figure 5: Effect of the immigration policy on $\hat{x}_M$, N_M.

values of s, a tightening of immigration policy is effective in reducing immigrant crime, but a too restrictive policy (i.e. $s > \check{s}$) may induce an adverse selection of immigrants driven by worse institutions, i.e. a higher ρ. However, the policy-maker may choose to accept the increase in $\hat{x}_M$ (i.e. a worse composition of the migration inflow) associated with tougher border enforcement, if the corresponding decrease in m brings about a reduction in the total number of foreign-born criminals – as would happen for $\check{s} < s < \check{s}$. In Figure 5, we also identify two more threshold values of s, denoted by s_0 and $\overline{s}$, respectively. As soon as $s > s_0$ immigrants necessarily have a higher crime rate than natives, because of the increase in ρ brought about by the toughening of immigration policies. If s grows further and eventually reaches $\overline{s}$, all migrants are criminals.

4.2 Border enforcement and migration costs

There may be other consequences of a more restrictive immigration policy. Rather than increasing ρ, a higher s may bring about a reduction in γ, the migration-cost differential between criminals and honest workers. As soon as migration is restricted, some individuals may decide to migrate illegally, and it is quite plausible that the cost of such illegal emigration is relatively lower for those involved in illicit activities than for honest workers.[24] At the limit, when s tends to 1, one would expect migration-cost differential to vanish ($\gamma = 0$), as migration would be completely illegal and

[24]On the link between immigration policies and the choice between illegal and legal emigration, see Djajić (1999) and Djajić and Vinogradova (2019). Camacho, Mariani, and Pensieroso (2017) also study the possible consequences of border enforcement for illegal immigration. As far as crime is concerned, the legal status of migrants may also become a key determinant of their likelihood to engage in illicit activities, once they have reached the destination country. In this respect, papers such as Mastrobuoni and Pinotti (2015), Pinotti (2017) and Fasani (2018) provide convincing causal evidence of a crime-reducing effect of legalization.

honest workers and criminals would be treated equally at the border.

Although we do not develop a formal analysis of this case, its implications are qualitatively the same as those presented in Proposition 7 and illustrated by Figure 5.[25] In particular, beyond a certain threshold value of s, a stricter immigration policy may induce a negative self-selection of immigrants by raising the relative returns to migration for criminals. The existence of an upward-sloping part in the relation linking immigration policy tightness and migrants' involvement in crime is also consistent with the empirical evidence provided by Lynch and Simon (1999), who find a positive correlation between the restrictiveness of immigration policies and "imported" crime.[26]

5 Dynamics

Until now, we have seen how our model economy may behave after the arrival of a wave of migrants. We have restricted our attention, however, to one single generation (of migrants and natives). In this Section, we extend the benchmark version of the model to further generations.

5.1 Second-generation migrants

We start by the analysis of the criminal behavior of second-generation immigrants. This is potentially important, since some existing research on crime and immigration (e.g. Albrecht (1997) and Rumbaut et al. (2006), among others) has found a strikingly high involvement in criminal activities of the children of foreign-born people.

Our benchmark model can be slightly modified to address this issue. In particular, we focus on one migration wave only, and suppose that there are i second-generation immigrants (children of foreign-born parents) and $(1 - i)$ agents born from native parents, with $i \in (0, 1)$. Assuming no population growth among both natives and migrants, we would have that: $i = m/(1 + m)$.

Second-generation immigrants have to choose whether to become criminals or honest workers. The key assumption is that their ability to set up productive capital is lower than that of the children of natives. Although not modeled explicitly, this may be due to the relatively low skill level of their parents (through the inter-generational transmission of human capital) or related to some discrimination on the credit and/or the labor market. We set the productivity of second-generation immigrants equal to σh, with $\sigma \in (0, 1)$, whereas that of the children of natives is h. The parameter σ lends itself to a straightforward interpretation: it could be seen, in fact, as a measure of the degree of assimilation of immigrants, which might in turn depend on several variables not modeled here, ranging from cultural factors to any policy aimed at reducing discrimination and inequality (through redistribution, public schooling, etc.). For simplicity, here we also drop

[25] Results are available upon request.

[26] Lynch and Simon (1999) contrast the so-called "immigrant nations", characterized by large inflows and low barriers to entry and naturalization, to "non-immigrant nations" where the volume of immigration and possibilities of entry, settlement and naturalization are restricted. They observe that immigrant nations have, on average, lower ratios of immigrant-to-native crime than nations with less liberal policies. The welfare effects of policies dealing with undocumented immigrants (namely, amnesties and deportations) are also studied by Machado (2017), which is however is not specifically concerned with the issue of crime.

country indexes and parameters ρ and λ, since our analysis is now focused exclusively on the destination country.

To sum up, the expected income of workers, native or of foreign origin, is given by

$$\Pi^w = (1-q)h \tag{33}$$

and

$$\Pi_I^w = (1-q)\sigma h, \tag{34}$$

respectively.

The prospective income of a criminal, native or of foreign origin, is given by

$$\Pi^c = \Pi_I^c = q((1-x)(1-i)h + (1-x_I)i\sigma h), \tag{35}$$

and depends on the average productivity of honest workers.

It follows that the prospective income of criminals does not depend on their own origin, while working honestly pays better for natives.

The endogenous career choice is made in the usual fashion, by comparing prospective incomes from alternative occupations. For instance, solving $\Pi_I^w = \Pi_I^c$ for x_I yields the equilibrium share of criminals among second-generation immigrants (x_I^*), while $\Pi^w = \Pi^c$ can be used to find the equilibrium value of x. Note, however, that Π^c and Π_I^c depend on both x and x_I, so that x_I^* and x^* must be determined simultaneously, as a solution of the following system:

$$\begin{cases} \Pi^w = \Pi^c(x, x_I) \\ \Pi_I^w = \Pi_I^c(x, x_I) \end{cases}. \tag{36}$$

Since $\Pi^w > \Pi_I^w$, it is not possible to have, at the same time, $0 < x^* < 1$ and $0 < x_I^* < 1$. In fact, the equilibrium shares of criminals in the two groups are given by

$$x^* = \max\left(0, \frac{(1-i)q - (1-q)}{(1-i)q}\right) \tag{37}$$

and

$$x_I^* = \min\left(\max\left(0, 1 - \frac{\sigma(1-q) - (1-i)q}{\sigma i q}\right), 1\right), \tag{38}$$

respectively.

Depending on the configuration of the parameters, four different situations may arise: (i) $x^* = 0$ and $x_I^* = 0$, (ii) $x^* = 0$ and $0 < x_I^* < 1$, (iii) $x^* = 0$ and $x_I^* = 1$, or (iv) $0 < x^* < 1$ and $x_I^* = 1$. The role of q is illustrated by Figure 6, where $q' = \sigma/((1-i)+\sigma(1+i))$, $q'' = \sigma/(1-i+\sigma)$ and $q''' = 1/(2-i)$.[27]

[27] In particular, q', q'' and q''' respectively solve $\left(1 - \frac{\sigma(1-q)-(1-i)q}{\sigma i q}\right) = 0$, $\left(1 - \frac{\sigma(1-q)-(1-i)q}{\sigma i q}\right) = 1$ and $\left(\frac{(1-i)q-(1-q)}{(1-i)q}\right) = 0$.

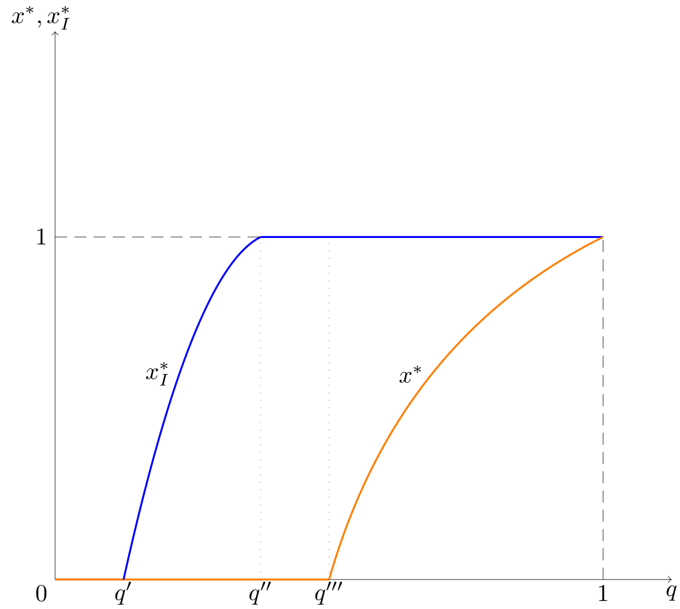

Figure 6: Second-generation immigrants and natives: differential involvement in crime

In any case, however, the crime rate among second-generation immigrants cannot be lower than among natives, consistent with the empirical evidence cited above.

5.2 Long-run dynamics

Let us now go beyond the second generation. We assume that the dynamic evolution of our economy – over a discrete-time, infinite horizon – is driven by an intergenerational externality, linking the current prevalence of crime in the total population, as determined by x_t^* and $x_{I,t}^*$, to the future quality of institutions, i.e. the extortion rate q_{t+1}. In particular, we consider the following dynamic equation:

$$q_{t+1} = \min(a + \zeta((1-i)x_t^*(q_t) + ix_{I,t}^*(q_t)), 1), \tag{39}$$

with $a, \zeta \in (0,1)$, while x_t^* and $x_{I,t}^*$ are given by the time-indexed version of Equations (37) and (38), respectively. Here, we are also implicitly assuming that (i) different generations do not overlap with each other on legal and illegal labor markets, (ii) reproduction occurs asexually, and (iii) each agent's fertility is constant and equal to 1.

The transition function in Equation (39), which we can summarize as $q_{t+1} = f(q_t)$, is piecewise due to the shape of x_t^* and $x_{I,t}^*$, represented in Figure 6. As further depicted in Figure 7, the transition function $f(q_t)$ may give rise to multiple equilibria.

Multiple equilibria are in turn associated with the existence of a crime trap, based on the

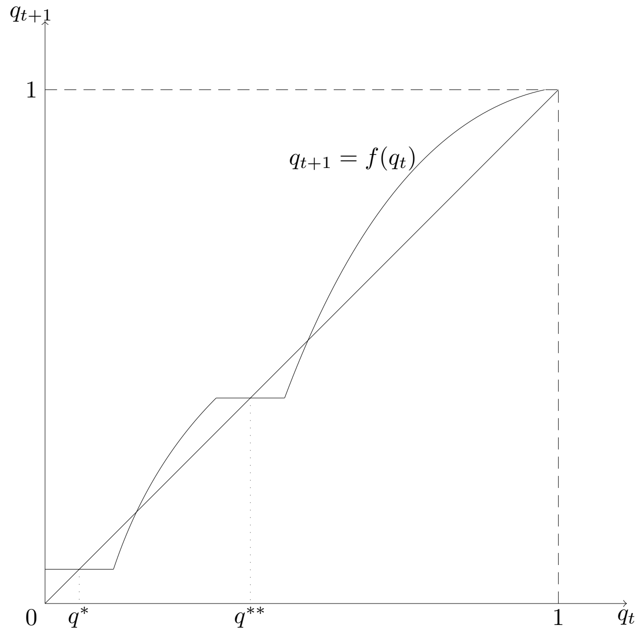

Figure 7: Dynamics of q

two-way relationship between the quality of institutions and the criminal behavior of immigrants. In particular, if first- or second-generation migrants have higher crime rates than natives (because of self-selection or discrimination, respectively), immigration can potentially drive the destination economy towards an inferior equilibrium, namely q^{**} in Figure 7, characterized by a high crime rate and bad institutions.

This is, however, only a possibility, and the trap can be circumvented or eliminated, through a number of different policies. For instance, institutional reforms aimed at lowering q_0 may, by changing initial conditions, allow the economy to reach the equilibrium characterized by q^* instead of q^{**}, in the long-run (without affecting the shape of the transition function in Figure 7). Alternatively, if initial conditions cannot be altered, the trap may be eliminated altogether by restricting immigration (lower m) or reducing discrimination and fostering assimilation (higher σ), as can be seen from the example in Figure 8. There, the transition function has been redrawn for a higher value of σ than in Figure 7. As a consequence, there is a unique, stable steady state displaying good institutions ($q = q^*$) and a moderate crime rate.

6 Conclusion

In this paper, we propose a two-country model of immigration and crime. In the benchmark version of our theory, migration occurs after agents have decided whether to become criminals or to work honestly. In this setting, we discuss how individual and institutional factors, in both the

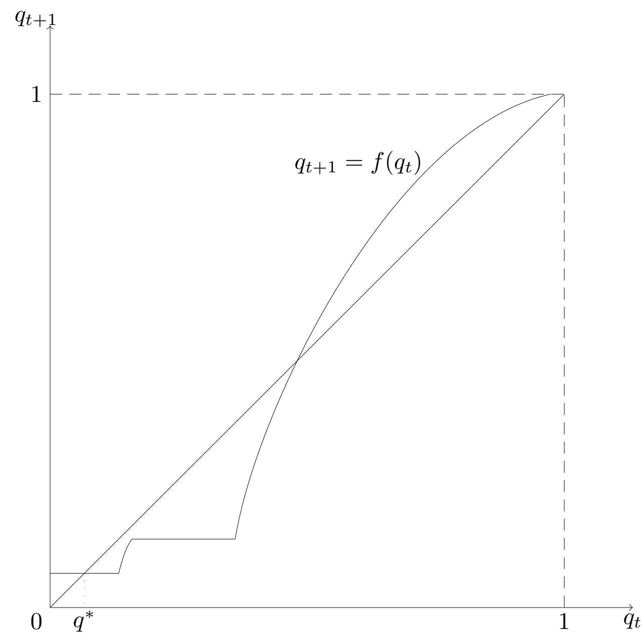

Figure 8: Dynamics: the role of policy

sending and the destination economies, affect the composition of the migration flow, i.e. the crime rate among migrants. Consistent with the findings of the empirical literature on immigration and crime, we show that the involvement in illicit activities is not necessarily higher among foreign-born individuals than among natives, even if the former are less educated. This result, which is driven by self-selection into migration and shaped by the quality of institutions and productivity at destination, can still emerge if we allow for a negative impact of immigration on host-country wages, and if migrants and natives can revise their career choice after migration takes place.

We then develop two extensions of the benchmark model. First, we study the role of migration policies and derive conditions under which a more restrictive immigration quota can drive an increase in the proportion of immigrant criminals. Second, we construct a dynamic extension of our model, which can explain the higher crime rates of second-generation immigrants, and lends itself to the analysis of the long-run consequences of immigration for the prevalence of crime in the destination country, when crime and institutions interplay with each other. From the normative point of view, our dynamic analysis puts the spotlight on the long-run effects of immigration policies and other forms of public intervention that can affect the assimilation of migrants and the enforcement of the rule of law in destination countries.

Our theory must be regarded as a first attempt to go beyond the traditional Beckerian framework, by highlighting the role of self-selection into migration to better understand the interaction between immigration and crime. The model, which we have kept as simple as possible, could be further extended to gain additional insight on the immigration – crime nexus. For instance, it would be instructive to see what happens if individuals fully internalize migration prospects when making their original career choice. This could generate a number of additional findings, especially from the point of view of the sending economy, which may use its emigration policy as an instrument to reduce crime. The mechanism would be similar to those of the brain-gain literature (Beine, Docquier, and Rapoport, 2001; Docquier and Rapoport, 2012), according to which higher chances of emigration may induce a better skill composition of the workforce in the sending country, and the conflict literature (Mariani, Mercier, and Verdier, 2018), which explores the possible peace-building effects of emigration.

References

Abbott, E. 1931. *National Commission on Law Observance and Enforcement-Report No 10-Report on crime and the foreign born.* US Government Printing Office, Washington DC.

Acemoglu, D. 1995. "Reward structures and the allocation of talent." *European Economic Review* 39 (1):17–33.

Albrecht, H.-J. 1997. "Ethnic minorities, crime, and criminal justice in Germany." *Crime and Justice* 21:31–99.

Alonso-Borrego, C., N. Garoupa, and P. Vázquez. 2012. "Does immigration cause crime? Evidence from Spain." *American Law and Economics Review* 14 (1):165–191.

Ambrosini, J William and Giovanni Peri. 2012. "The determinants and the selection of Mexico–US migrants." *The World Economy* 35 (2):111–151.

Bauer, Th., M. Lofstrom, and K. F. Zimmermann. 2000. "Immigration policy, assimilation of immigrants, and natives' sentiments towards immigrants: evidence from 12 OECD countries." *Swedish Economic Policy Review* 7:11–53.

Bayer, P., R. Hjalmarsson, and D. Pozen. 2009. "Building criminal capital behind bars: Peer effects in juvenile corrections." *The Quarterly Journal of Economics* 124 (1):105–147.

Becker, G. S. 1968. "Crime and punishment: An economic approach." *The Journal of Political Economy* 76 (2):169–217.

Beine, M., F. Docquier, and H. Rapoport. 2001. "Brain drain and economic growth: theory and evidence." *Journal of Development Economics* 64 (1):275–289.

Bell, B., F. Fasani, and S. Machin. 2013. "Crime and immigration: Evidence from large immigrant waves." *Review of Economics and Statistics* 21 (3):1278–1290.

Bell, B. and S. Machin. 2013. "Immigrant enclaves and crime." *Journal of Regional Science* 53 (1):118–141.

Belot, Michèle VK and Timothy J Hatton. 2012. "Immigrant Selection in the OECD." *The Scandinavian Journal of Economics* 114 (4):1105–1128.

Bianchi, M., P. Buonanno, and P. Pinotti. 2012. "Do immigrants cause crime?" *Journal of the European Economic Association* 10 (6):1318–1347.

Borjas, George J, Ilpo Kauppinen, and Panu Poutvaara. 2019. "Self-selection of emigrants: Theory and evidence on stochastic dominance in observable and unobservable characteristics." *The Economic Journal* 129 (617):143–171.

Borjas, G.J. 1987. "Self-selection and the Earnings of Immigrants." *American Economic Review* 77:531–553.

Borowski, A. and T. Derrick. 1994. "Immigration and Crime." In *Immigration and Refugee Policy: Australia and Canada Compared*, edited by H. Adelman, A. Borowski, M. Burstein, and Foster L. University of Toronto Press, 631–652.

Bucerius, S. M. 2011. "Immigrants and crime." In *The Oxford Handbook of Crime and Criminal Justice*. Oxford University Press Oxford, UK, 385–419.

Butcher, K. F. and A. M. Piehl. 1998. "Cross-city evidence on the relationship between immigration and crime." *Journal of Policy Analysis and Management* 17 (3):457–493.

———. 2007. "Why are immigrants' incarceration rates so low? Evidence on selective immigration, deterrence, and deportation." *NBER working paper* 13229.

Camacho, C., F. Mariani, and L. Pensieroso. 2017. "Illegal immigration and the shadow economy." *International Tax and Public Finance* 24 (6):1050–1080.

Card, D. 2001. "Immigrant inflows, native outflows, and the local labor market impacts of higher immigration." *Journal of Labor Economics* 19 (1):22–64.

Chalfin, A. 2014. "What is the contribution of Mexican immigration to US crime rates? Evidence from rainfall shocks in Mexico." *American Law and Economics Review* 16 (1):220–268.

———. 2015. "The long-run effect of Mexican immigration on crime in US cities: Evidence from variation in Mexican fertility rates." *American Economic Review* 105 (5):220–25.

Chiswick, Barry. 1999. "Are immigrants favorably self-selected?" *American Economic Review* 89 (2):181–185.

Dai, T., X. Liu, and B. Xie. 2013. "The impact of immigrants on host country crime." *Economics Letters* 119 (2):157–161.

Djajić, S. 1999. "Dynamics of immigration control." *Journal of Population Economics* 12 (1):45–61.

Djajić, S. and A. Vinogradova. 2019. "Immigration policies and the choice between documented and undocumented migration." *Economica* 86 (341):201–228.

Docquier, F. and H. Rapoport. 2012. "Globalization, brain drain, and development." *Journal of Economic Literature* 50 (3):681–730.

Ehrlich, I. 1973. "Participation in illegitimate activities: A theoretical and empirical investigation." *The Journal of Political Economy* 81 (3):521–565.

Fasani, F. 2018. "Immigrant crime and legal status: Evidence from repeated amnesty programs." *Journal of Economic Geography* 18 (4):887–914.

Fernandez-Huertas Moraga, Jesus. 2011. "New evidence on emigrant selection." *The Review of Economics and Statistics* 93 (1):72–96.

Ferraro, V. 2016. "Immigration and crime in the new destinations, 2000–2007: A test of the disorganizing effect of migration." *Journal of Quantitative Criminology* 32 (1):23–45.

Gould, Eric D and Omer Moav. 2016. "Does high inequality attract high skilled immigrants?" *The Economic Journal* 126 (593):1055–1091.

Grogger, J. 1998. "Market wages and youth crime." *Journal of Labor Economics* 16 (4):756–791.

Grogger, Jeffrey and Gordon H Hanson. 2011. "Income maximization and the selection and sorting of international migrants." *Journal of Development Economics* 95 (1):42–57.

Hagan, J., R. Levi, and R. Dinovitzer. 2008. "The symbolic violence of the crime-immigration nexus: Migrant mythologies in the Americas." *Criminology & Public Policy* 7 (1):95–112.

Hagan, J. and A. Palloni. 1999. "Sociological criminology and the mythology of Hispanic immigration and crime." *Social Problems* 46 (4):617–632.

Hendricks, Lutz and Todd Schoellman. 2018. "Human capital and development accounting: New evidence from wage gains at migration." *The Quarterly Journal of Economics* 133 (2):665–700.

Jaitman, L. and S. Machin. 2013. "Crime and immigration: new evidence from England and Wales." *IZA Journal of Migration* 2 (1):19.

Kaestner, Robert and Ofer Malamud. 2014. "Self-selection and international migration: New evidence from Mexico." *The Review of Economics and Statistics* 96 (1):78–91.

Light, Michael T, Jingying He, and Jason P Robey. 2020. "Comparing crime rates between undocumented immigrants, legal immigrants, and native-born US citizens in Texas." *Proceedings of the National Academy of Sciences* 117 (51):32340–32347.

Loughran, Th. A., H. Nguyen, A. R. Piquero, and J. Fagan. 2013. "The returns to criminal capital." *American Sociological Review* 78 (6):925–948.

Lynch, J. P. and R. J. Simon. 1999. "A comparative assessment of criminal involvement among immigrants and natives across seven nations." *International Criminal Justice Review* 9 (1):1–17.

Lyons, Ch. J., M. B. Vélez, and W. A. Santoro. 2013. "Neighborhood immigration, violence, and city-level immigrant political opportunities." *American Sociological Review* 78 (4):604–632.

MacDonald, J. M., J. R. Hipp, and Ch. Gill. 2013. "The effects of immigrant concentration on changes in neighborhood crime rates." *Journal of Quantitative Criminology* 29 (2):191–215.

Machado, J. 2017. "Dealing with undocumented immigrants: the welfare effects of amnesties and deportations." *Journal of Demographic Economics* 83 (4):445–492.

Maghularia, R. and S. Übelmesser. 2019. "Do immigrants affect crime? Evidence from panel data for Germany." *CESifo working paper* 7696.

Mariani, F. 2007. "Migration as an antidote to rent-seeking?" *Journal of Development Economics* 84 (2):609–630.

Mariani, F., M. Mercier, and Th. Verdier. 2018. "Diasporas and conflict." *Journal of Economic Geography* 18 (4):761–793.

Martinez, R., J. I. Stowell, and M. T. Lee. 2010. "Immigration and crime in an era of transformation: A longitudinal analysis of homicides in San Diego neighborhoods, 1980–2000." *Criminology* 48 (3):797–829.

Mastrobuoni, G. and P. Pinotti. 2015. "Legal status and the criminal activity of immigrants." *American Economic Journal: Applied Economics* 7 (2):175–206.

Mayda, A. M. 2006. "Who is against immigration? A cross-country investigation of individual attitudes toward immigrants." *The Review of Economics and Statistics* 88 (3):510–530.

McCarthy, B. and J. Hagan. 1995. "Getting into street crime: The structure and process of criminal embeddedness." *Social Science Research* 24 (1):63–95.

———. 2001. "When crime pays: Capital, competence, and criminal success." *Social Forces* 79 (3):1035–1060.

McKenzie, David and Hillel Rapoport. 2010. "Self-selection patterns in Mexico-US migration: the role of migration networks." *The Review of Economics and Statistics* 92 (4):811–821.

Melossi, D. 2012. "The processes of criminalization of migrants and the borders of "Fortress Europe"." In *Borders and crime*. Springer, 17–34.

Morenoff, J. D. and A. Astor. 2006. "Immigrant assimilation and crime." *Immigration and Crime: Race, Ethnicity, and Violence* :36–63.

Morselli, C., P. Tremblay, and B. McCarthy. 2006. "Mentors and criminal achievement." *Criminology* 44 (1):17–43.

Nguyen, H. and M. Bouchard. 2013. "Need, connections, or competence? Criminal achievement among adolescent offenders." *Justice Quarterly* 30 (1):44–83.

Nunziata, L. 2015. "Immigration and crime: evidence from victimization data." *Journal of Population Economics* 28 (3):697–736.

Orrenius, P. M. and M. Zavodny. 2005. "Self-selection among undocumented immigrants from Mexico." *Journal of Development Economics* 78 (1):215–240.

Ottaviano, Gianmarco IP and Giovanni Peri. 2012. "Rethinking the effect of immigration on wages." *Journal of the European Economic Association* 10 (1):152–197.

Ousey, G. C. and Ch. E. Kubrin. 2009. "Exploring the connection between immigration and violent crime rates in US cities, 1980–2000." *Social Problems* 56 (3):447–473.

———. 2018. "Immigration and crime: Assessing a contentious issue." *Annual Review of Criminology* 1:63–84.

Ozden, C., M. Testaverde, and M. Wagner. 2017. "How and why does immigration affect crime? Evidence from Malaysia." *The World Bank Economic Review* 32 (1):183–202.

Papadopoulos, G. 2014. "Immigration status and property crime: an application of estimators for underreported outcomes." *IZA Journal of Migration* 3 (1):12.

Parey, Matthias, Jens Ruhose, Fabian Waldinger, and Nicolai Netz. 2017. "The selection of high-skilled emigrants." *Review of Economics and Statistics* 99 (5):776–792.

Patt, Alexander, Jens Ruhose, Simon Wiederhold, and Miguel Flores. 2021. "International emigrant selection on occupational skills." *Journal of the European Economic Association* forthcoming.

Pinotti, P. 2017. "Clicking on Heaven's door: The effect of immigrant legalization on crime." *American Economic Review* 107 (1):138–68.

Reid, L. W., H. E. Weiss, R. M. Adelman, and Ch. Jaret. 2005. "The immigration–crime relationship: Evidence across US metropolitan areas." *Social Science Research* 34 (4):757–780.

Ruggiero, V. 1996. *Organized and corporate crime in Europe: offers that can't be refused*. Dartmouth.

Rumbaut, R. G., R. G. Gonzales, G. Komaie, and C. V. Morgan. 2006. "Debunking the myth of immigrant criminality: Imprisonment among first-and second-generation young men." *Migration Information Source* .

Sampson, Robert J. 2008. "Rethinking crime and immigration." *Contexts* 7 (1):28–33.

Sharp, C. and T. Budd. 2005. *Minority ethnic groups and crime: findings from the offending, crime and justice survey 2003*. Home Office Online Report 33/05. London: Home Office.

Smith, D. J. 1997. "Ethnic origins, crime, and criminal justice in England and Wales." *Crime and Justice* 21:101–182.

Spenkuch, J. L. 2014. "Understanding the impact of immigration on crime." *American Law and Economics Review* 16 (1):177–219.

Stowell, J. I., S. F. Messner, K. F. McGeever, and L. E. Raffalovich. 2009. "Immigration and the recent violent crime drop in the United States: A pooled, cross-sectional time-series analysis of metropolitan areas." *Criminology* 47 (3):889–928.

Tremblay, P. and C. Morselli. 2000. "Patterns in criminal achievement: Wilson and Abrahamse revisited." *Criminology* 38 (2):633–657.

Uggen, Ch. and M. Thompson. 2003. "The socioeconomic determinants of ill-gotten gains: Within-person changes in drug use and illegal earnings." *American Journal of Sociology* 109 (1):146–185.

Van Vechten, C. C. 1941. "The criminality of the foreign born." *Journal of Criminal Law and Criminology (1931-1951)* 32 (2):139–147.

Wadsworth, T. 2010. "Is immigration responsible for the crime drop? An assessment of the influence of immigration on changes in violent crime between 1990 and 2000." *Social Science Quarterly* 91 (2):531–553.

A Heterogeneity

We now consider that agents are all alike in terms of criminal productivity, but differ regarding their productivity in honest work. In particular, we assume that each agent i in country j is characterized by an individual level of human capital, $h_{i,j}$, and that human capital is distributed uniformly over each country's population. To account for the possibility that countries S and D differ in terms of human capital, we assume that $h_{i,j}$ is uniformly distributed between 0 and H_j, with $H_D = H$ and $H_S = \eta H$. The parameter $\eta > 0$, as in the benchmark model, is a measure of the relative human capital of country S with respect to country D.

In autarky, the prospective revenue of honest worker i in country j is given by

$$\Pi^w_{i,j} = (1 - q_j)\lambda_j h_{i,j}, \tag{40}$$

while expected rents from crime are

$$\Pi^c_j = q_j \lambda \frac{H_j - \tilde{h}_j}{2}(1 - x_j). \tag{41}$$

Note that $q_S = q$ and $q_D = \rho q$ as in Section 2, while $\tilde{h}_j$ is the threshold level of human capital below which agents in country j choose a criminal career. Therefore, a consequence of this setting is that agents in the two sectors are self-selected depending on their ability in honest work – which seems to be a fairly realistic implication.

Equating prospective revenues from alternative occupations in each country yields the following equilibrium values for $\tilde{h}$:

$$\tilde{h}^*_D = \frac{H(1 - \sqrt{1 - (\rho q)^2})}{\rho q}, \tag{42}$$

and

$$\tilde{h}^*_S = \frac{\eta H(1 - \sqrt{1 - q^2})}{q}. \tag{43}$$

We can then compute the share of criminals among natives of countries D and S that, in autarky, are given by

$$x^*_D = \frac{1 - \sqrt{1 - (\rho q)^2}}{\rho q}, \tag{44}$$

and

$$x^*_S = \frac{1 - \sqrt{1 - q^2}}{q}, \tag{45}$$

respectively.

Note that this alternative version of the model with heterogenous productivity does not require any condition on q_j other than $q_j \in (0, 1)$, for the share of criminals in country j to be strictly positive and smaller than one.

In this framework, we introduce the possibility that m agents from country S migrate to D. Honest workers and criminals have differential incentives to emigrate, which affect the composition of the emigration flow. We denote by $\hat{h}_S$ the threshold value of $h_{i,S}$ such that the incentives to migrate of honest workers and criminals born in S are equalized. In this case, all honest workers with $h_{i,S} > \hat{h}_S$ migrate to country D, along with some criminals until the emigration quota m is fullfilled. The remaining criminals, and less productive honest workers (i.e. those characterized by $h_{i,S} < \hat{h}_S$) stay in country S.

For the i-th honest worker i, the incentive to emigrate $\Omega^{w,i}$ is

$$\Omega^{w,i} = (1 - \rho q)\lambda h_{i,S} - (1 - q)h_{i,S} - (c - \gamma). \tag{46}$$

As far as criminals are concerned, they expect the following rent if they migrate to country D:

$$\rho q \frac{(1 + m) - (x_D^* + m x_M)}{(1 + m)} \frac{(1 - x_D^*)\lambda \left(\frac{H - \tilde{h}_D}{2}\right) + m(1 - x_M)\lambda \left(\frac{\eta H - \hat{h}_S}{2}\right)}{(1 - x_D^*) + m(1 - x_M)}. \tag{47}$$

For those who stay in country S, the prospective rents from crime are given by

$$q \frac{(1 - x_S^*) - m(1 - x_M)}{(1 - m)} \frac{\hat{h}_S - \tilde{h}_S}{2}. \tag{48}$$

The incentive to migrate for criminals, Ω^c, can then be computed as the difference between (47) and (48), to which we need to further subtract the migration cost c. By solving $\Omega^c = \Omega^{w,i}$ for $h_{i,S}$, we obtain $\hat{h}_S$. The analytical expression for $\hat{h}_S$ is too complex to be reported here. However, knowing that

$$\hat{x}_M = \frac{m - (\eta H - \hat{h}_S)}{m}, \tag{49}$$

we can resort to numerical simulations to illustrate how the share of criminals among immigrants compares to the share of criminals among natives of country D.

Figure 9 displays how $\hat{h}_S$ (Panel (a)) and $\hat{x}_M$ and x_D^* (Panel (b)) vary with η. The first graph shows that a higher human capital in country S relative to D (larger η) translates into a larger $\hat{h}_S$, i.e. a larger threshold level of h above which honest workers from S decide to migrate to D. Said differently, a higher level of human capital (or productivity) in the home country is associated with higher human capital among immigrants. The second graph illustrates how the shares of criminals evolve when relative human capital increases. As shown in Equation (44), criminality among natives of D (x_D^*) only depends on the quality of institutions, and is thus flat in Panel (b). On the other hand, a higher relative human capital is associated with a lower crime rate among migrants ($\hat{x}_M$). Thus, as in the benchmark case without heterogeneity, the share of criminals can be lower among migrants than among natives of the destination country, and this can even be the case when human capital is lower in country S than in country D ($\eta < 1$), provided that the institutional characteristics and/or productivity in country D ensure a favorable selection of honest workers into migration.

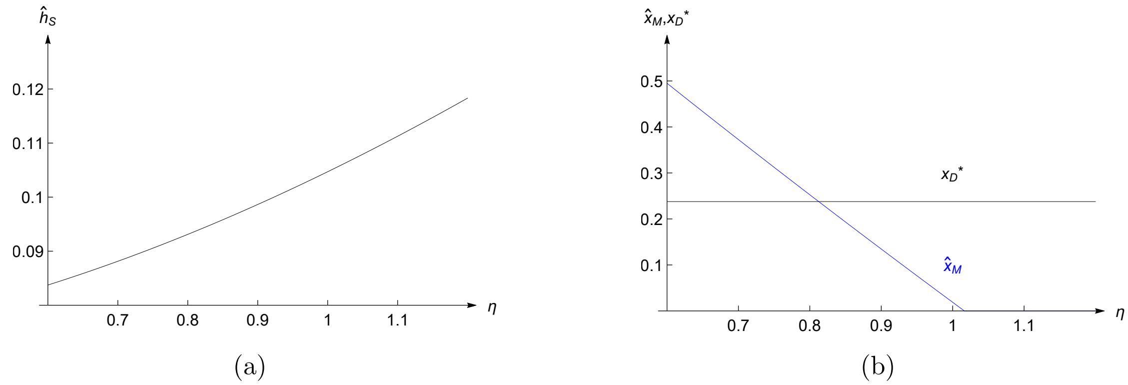

Figure 9: Effect of η and H on $\hat{h}_S$, $\hat{x}_M$ and x_D^*.

Note: the chosen parameter values are $q = 0.5, \rho = 0.9, \gamma = 0.01, c = 1, \lambda = 4, m = 0.25, H = 0.35$.

B Further refinements of the analysis

In Section 2 we describe the interaction between honest workers and criminals in a very stylized fashion, in order to obtain as many closed-form solutions as possible and use them in the remainder of the paper. This allows us to keep our model fairly tractable in Sections 3, 4 and 5.

Simplicity, however, comes at the cost of realism. In this Appendix, we refine the benchmark model presented in Section 2 to show that its core results remain valid if we (i) consider that workers can protect themselves against predation, or (ii) allow the extortion rate to take more "realistic" values at equilibrium, or (iii) go beyond the reduced-form modelization of criminal behavior. We find that the main results of Section 2 are preserved, although they present themselves in a more complicated form, which would have rendered the extensions in Sections 3, 4 and 5 particularly cumbersome.

B.1 Endogenous protection

In Section 2 we assume the extortion rate q to be exogenous. In reality, one may think that workers can devote some resources to protect themselves against criminals, thus facing a trade-off between production and protection.

Given that, in our model, income derives from human capital, the above trade-off may be related to time, which honest individuals can allocate between working and carrying out defensive activities improving the protection of their property rights (such activities may range from guarding property to political lobbying finalized to build better institutions).

A parsimonious way to introduce endogenous protection in our theory is to assume that, in country $j = S, D$, honest workers have one unit of time, a fraction l_j of which is used to work, while a fraction $1 - l_j$ is devoted to protection. Protection translates into a lower extortion rate q_j, through the function

$$q_j = 1 - \nu_j l_j^{\phi}, \tag{50}$$

where $\phi \in (0,1)$ accounts for decreasing returns to defensive activities, while $\nu_j \in (0,1)$ measures the effectiveness of protection.

Accordingly, the income of honest workers becomes

$$\Pi_j^w = (1-q_j)\lambda_j(1-l_j)h_j, \tag{51}$$

while criminal revenues are given by

$$\Pi_j^c = q_j\lambda_j(1-l_j)h_j(1-x_j). \tag{52}$$

Before determining the equilibrium crime rate, we need to compute the optimal time allocation of honest workers, who maximize their after-predation income. After replacing q_j, as defined by Equation (50), in the expression for Π_j^w, the optimization process of honest agents leads to

$$l_j^* = \frac{\phi}{1+\phi}. \tag{53}$$

By consequence, the extortion rate becomes

$$q_j^* = 1 - \nu_j\left(\frac{\phi}{1+\phi}\right)^{\phi}, \tag{54}$$

which is a combination of parameters.

By solving $\Pi_j^w = \Pi_j^c$ for x_j, we obtain the autarkic crime rate in the two countries, i.e.

$$x_j^* = 2 - \frac{1}{1-\nu_j\left(\frac{\phi}{1+\phi}\right)^{\phi}}. \tag{55}$$

Let us now turn to the analysis of migration, which follows the same lines as Section 2. To account for institutional differences across countries, we set $\nu_S = \nu$ and introduce a parameter $\kappa > 0$ such that $\nu_D = \kappa\nu_S$. By equating the incentives to migrate for criminal and honest workers, we obtain $\hat{x}_M$.

With respect to the case with exogenous protection, the only difference is that q_S and q_D are replaced by a combination of parameters that are not present in the benchmark model. It then follows that the results of Proposition 1 are maintained. In particular, the decisive role of selection into migration is confirmed, as immigrants may be less prone to crime than natives even if their human capital is lower.

If we operate under Assumption 1, we can obtain a simpler expression for the crime rate among migrants, i.e.

$$\hat{x}_M = \frac{(1+\phi)^{\phi}\left(m(1+m+\lambda(1-m)) - (1-m^2)\gamma(1+\phi)\right) - \phi^{\phi}\nu\left(2m(1+m)+2m\lambda\kappa(1-m)\right)}{m\left((1+\phi)^{\phi}(1+m+\lambda(1-m)) - \phi^{\phi}\nu(1+m+(1-m)\lambda\kappa)\right)}. \tag{56}$$

Based on the above expression, we can also look into the role of the additional institutional factors, ν and κ, and claim the following.

Proposition 8. *The crime rate among migrants decreases with the effectiveness of protection. All other things being equal, the easier is property protection in the destination country, the lower is immigrants' involvement in crime.*

Proof. Follows directly from the inspection of the partial derivatives $\partial \hat{x}_M/\partial \nu$ and $\partial \hat{x}_M/\partial \kappa$ that, under Assumption 1, are both negative. $\square$

B.2 Taxation

Let us now go back to exogenous protection, and consider country $j = D, S$ in autarky. As in Section 2, Equation (2), the expected revenues from crime are given by $\Pi_j^c = q_j \lambda_j h_j (1 - x_j)$.

As far as the income of honest workers is concerned, we depart from the benchmark model by assuming that – different from criminal rents – earnings from legal activities are subject to taxation, at the rate t_j.[28] In particular, for analytical convenience, we consider that taxes are levied on income net of predation.[29] Hence

$$\Pi_j^w = (1 - t_j)(1 - q_j)\lambda_j h_j. \tag{57}$$

We can then compute the equilibrium crime rates in the two countries, and obtain

$$x_j^* = 2 - t_j - \frac{1 - t_j}{q_j}. \tag{58}$$

It can be checked that with a positive tax rate, the condition $q_j > 1/2$ is no longer required in order to have a positive crime rate.

As far as migration is concerned, we proceed as in Section 2: the equilibrium crime rate among migrants is determined by equating the incentives to migrate for criminal and honest workers, respectively. We can further set $t_S = t$ and allow taxation to differ across countries, by introducing a parameter $\tau > 0$ such that $t_D = \tau t_S$.

The resulting expression for $\hat{x}_M$ is a more complicated version of Equation (9), but leads to the same results as in Proposition 1.[30] In addition, we can gain some interesting insight on the role of taxation after introducing the simplification implied by Assumption 1. In particular, we can prove the following.

Proposition 9. *The crime rate among migrants increases with the level of taxation, be it in the sending or in the destination economy.*

[28] The idea that illegal production, almost by definition, is more likely to elude taxation than legal production is quite standard in the literature. See for instance Camacho, Mariani, and Pensieroso (2017) and the papers cited therein.

[29] This boils down to assuming that criminals steal from legal workers before the latter pay taxes. In reality, however, both pre-tax production and after-tax income can suffer from predation and illegal activities of all kinds.

[30] All the analytical expressions and results that are related to this Appendix, but are not shown in the text, are available upon request.

Proof. It follows directly from the inspection of partial derivatives. Under Assumption 1, we have

$$\frac{\partial \hat{x}_M}{\partial t} = \frac{(1+m)(1-q) + (1-m)\lambda(1-\rho q)\tau}{q((1+m) + (1-m)\lambda\rho)} > 0$$

and

$$\frac{\partial \hat{x}_M}{\partial \tau} = \frac{(1-m)\lambda(1-\rho q)t}{q((1+m) + (1-m)\lambda\rho)} > 0.$$

□

This Proposition highlights a potentially interesting result, namely that higher taxation can induce a worse selection of immigrants, by attracting relatively more criminals than honest workers from the source country.

Finally, note that we have remained agnostic concerning the use of tax revenues. The results of our analysis, however, are consistent with the idea that taxes are used to finance a public good that has the same impact on the welfare of all agents, be they native or immigrants, honest or criminals. Alternatively, tax revenues could be used (at least partially) to finance the protection of honest workers against predation. For instance, the government could use the money raised through taxation to finance the police, with the objective of reducing the economy-wide extortion rate q. This type of extension can be regarded as a reinterpretation of the model presented in Appendix B.1, where l would become the tax rate chosen by a policy-maker whose objective is to maximize the income of honest workers.

B.3 Revisiting the interaction between criminals and honest workers

In Section 2, we present an analytically convenient, reduced-form representation of the interaction between criminals and honest workers. Here, we propose an alternative description of predation, based on a matching process involving workers and criminals.

In particular, we assume that in country $j = D, S$, each criminal can handle up to $z_j > 1$ producers at the same time and steal them a fraction q_j of their product, while no producer can be robbed twice.

In autarky, if $z_j x_j < (1-x_j)$, some honest workers may escape predation, so that the extortion rate is given by $(z_j x_j/(1-x_j))\, q_j$ in expected terms, with $z_j x_j/(1-x_j)$ being the probability to "meet" a criminal, which is increasing in x_j and z_j. Otherwise, all honest workers are subject to predation and lose a share q_j of their income with certainty. To sum up, the expected revenue of workers is given by

$$\Pi_j^w = \begin{cases} \left(1 - \dfrac{z_j x_j}{1-x_j} q_j\right) \lambda_j h_j & \text{if } x_j \leq \dfrac{1}{1+z_j} \\ (1-q_j)\lambda_j h_j & \text{if } x_j > \dfrac{1}{1+z_j} \end{cases}. \tag{59}$$

As far as criminals are concerned, their income is subject to crowding-in as soon as $z_j x_j > (1-x_j)$. Otherwise, they can be sure to steal a fraction q_j of their income to z_j different workers.

This means that

$$\Pi_j^c = \begin{cases} z_j q_j \lambda_j h_j & \text{if } x_j \leq \dfrac{1}{1+z_j} \\ \dfrac{(1-x_j)}{x_j} q_j \lambda_j h_j & \text{if } x_j > \dfrac{1}{1+z_j} \end{cases}. \tag{60}$$

A stable, autarkic equilibrium exists only if Π_j^c crosses Π_j^w from above, that is if $x_j > 1/(1+z_j)$. It is given by

$$x_j^* = q_j, \tag{61}$$

and $q_j > 0$ automatically ensures that $x_j^* > 0$. Note also that the equilibrium results, as in the benchmark model, from the intersection between a flat Π_j^w and a decreasing Π_j^c; the only difference being that $\Pi_j^c(x_j)$, describing how criminal rents vary with the proportion of criminals, is now a convex (rather than linear) function.

Let us now consider migration. We introduce migration costs and the same notations as in Section 2, i.e. $\lambda_D = \lambda > 1 = \lambda_S$, $h_D = h$, $h_S = \eta h$, $q_S = q$ and $q_D = \rho q$, with $\rho \in (0,1)$ and $\eta = h = 1$. The incentive to migrate for honest workers (Ω^w) is given by the same expression as in Equation (4). As far as criminals are concerned, after replacing x_D^* and x_S^* with the expressions implied by Equation (61), we obtain

$$\Omega^c(x_M) = qh\left(\frac{\lambda\rho(1-\rho q+\eta(1-x_M)m)}{\rho q + x_M m} - \frac{\eta(1-q-(1-x_M)m)}{q - x_M m}\right) - c. \tag{62}$$

By solving $\Omega^w = \Omega^c(x_M)$ for x_M, we can determine $\hat{x}_M$, i.e. the equilibrium crime rate among migrants. The resulting expression is overly complicated and, unlike Section 2, does not allow us to characterize analytically the comparative statics of the model.[31]

It is possible, however, to show that one of main results of our benchmark model – i.e. that migrants may commit less crime than natives even if their human capital is lower (as stated in Proposition 1) – is preserved. In fact, there exists only one value of η for which $\hat{x}_M = x_D$, and it is given by

$$\breve{\eta} = \frac{(1-m\rho)(\lambda h(1-\rho q)-(1+m)\gamma)}{h(\lambda(1-\rho(q+m(1-\rho q)))-m(1+m)(1-\rho))}. \tag{63}$$

For $\eta > \breve{\eta}$, migrants are less involved in crime than natives, i.e. $\hat{x}_M < x_D^*$. It can be checked that $\breve{\eta} < 1$ for appropriate values of the parameters, i.e. $\rho < (hm-\gamma)/(m(h-\gamma))$, a condition that is similar to that contained in the Proof of Proposition 1.

Finally, let us stress that the analysis carried out in Section 2 can be rendered consistent with the matching formulation presented here. Suppose in fact that, along with the crowding-in effect, illicit activities are also characterized by positive externalities related to the prevalence of crime. For instance, criminals may incur a risk of detection, which is decreasing in the proportion of agents involved in illicit activities. Alternatively, criminal rents could be re-invested after predation and serve as an input that, combined with illegal labor, produces further revenues. In such cases,

[31] Through numerical simulations, we can see that most of the comparative statics are qualitatively the same as those of the benchmark model.

criminal income would become

$$\Pi^c_j = \frac{1-x_j}{x_j} q_j \lambda_j h_j x_j^{\iota}, \tag{64}$$

if we restrict our attention to stable equilibria. Note that $\iota \in (0,1]$ measures the intensity of positive externalities: the higher ι, the less convex becomes the rent function. At the limit, if $\iota = 1$, the crowding-in effect is completely offset by positive externalities in crime, and Equation (64) boils down to Equation (2) in Section 2.

C Labor-market effects of immigration: CES production function

In this Appendix, we follow an alternative approach to describe the labor-market impact of immigrants. Different from Section 2.4, we consider honest natives and immigrants as separate productive factors that combine with each other in the legal sector according to the following CES production function:

$$Y_j = \lambda_j \left(a(h_S L_{S,j})^{\frac{\psi-1}{\psi}} + (1-a)(h_D L_{D,j})^{\frac{\psi-1}{\psi}} \right). \tag{65}$$

In the above function, h_S and $L_{S,j}$ are the human capital and the number of workers born in country S and working in country j. The parameter $a \in (0,1)$ denotes the relative importance of workers born in S, while $\psi \geq 0$ is the elasticity of substitution. In particular, (i) $\psi = +\infty$ corresponds to the case of a linear production function (perfect substitutability), (ii) $\psi = 1$ generates a Cobb-Douglas production function, and (iii) $\psi = 0$ determines a Leontieff production function (with no substitution).

In autarky, one would have $L_{S,D} = 0$ and $L_{D,S} = 0$ with the production function becoming linear in "local" labor. It can also be checked that $x^*_j = 2 - 1/q_j$, as in Section 2.

If instead a fraction m of the population of country S migrates to country D, with x^*_D being the pre-migration crime rate at destination and $\hat{x}_M$ the share of criminals among migrants, Equation (65) for country D becomes:

$$Y_D = \lambda_D \left(a(h_S m(1-\hat{x}_M))^{\frac{\psi-1}{\psi}} + (1-a)(h_D(1-x^*_D))^{\frac{\psi-1}{\psi}} \right). \tag{66}$$

Based on Equation (66) we can determine the wages of honest workers before predation. In particular, migrants earn

$$h_S a \lambda \left(a + (1-a) \left(\frac{(1-x^*_D)h_D}{m(1-\hat{x}_M)h_S} \right)^{\frac{\psi-1}{\psi}} \right)^{\frac{1}{\psi-1}}, \tag{67}$$

while natives obtain

$$h_D(1-a)\lambda \left((1-a) + a \left(\frac{m(1-\hat{x}_M)h_S}{(1-x^*_D)h_D} \right)^{\frac{\psi-1}{\psi}} \right)^{\frac{1}{\psi-1}}. \tag{68}$$

The gross wages of workers born in country S who do not migrate are instead given by $h_S a^{\psi/(\psi-1)}$.

It is interesting to notice that, because of imperfect substitution, the wages of native workers increase with the number of honest immigrants. On the contrary, the wages of honest immigrants depend negatively on their number. These effects of immigration are in line with the findings of Ottaviano and Peri (2012), who show that legal migrants to the US have a small but positive effect on natives' earnings, while harming substantially the wages of (previous) migrants.

Proceeding as in Section 2, we can compute the incentives to migrate for criminals and honest workers, i.e. $\Omega^c(x_M)$ and $\Omega^w(x_M)$, respectively. By solving $\Omega^c(x_M) = \Omega^w(x_M)$, we can determine the equilibrium value of x_M (i.e. $\hat{x}_M$), and compare it with x_D^*.

After introducing the usual simplifications ($\lambda_D = \lambda > 1 = \lambda_S$, $h_D = h$, $h_S = \eta h$, $q_S = q$ and $q_D = \rho q$, with $\rho \in (0,1)$ and $\eta = h = 1$), it is possible to show that $\hat{x}_M < x_D^*$, for some convenient parametrization. In particular, there exists $\bar{\lambda}$ such that immigrants commit less crime than natives if $\lambda > \bar{\lambda}$. The threshold value of λ is given by

$$\bar{\lambda} = \frac{m(1+m)a^{\frac{\psi}{\psi-1}}(1-\rho) - (1-m^2)\gamma\rho}{(1-m)\left(a\left(a+(1-a)m^{\frac{1-\psi}{\psi}}\right)^{\frac{1}{\psi-1}} - (1-a)\left(1-a\left(1-m^{\frac{\psi-1}{\psi}}\right)\right)^{\frac{1}{\psi-1}}\right)\rho(1-\rho q)}. \tag{69}$$

It thus appears that immigrants can be less criminal than natives, if productivity at destination is high enough to induce a sufficiently favorable self-selection of natives of country S into emigration. Said differently, criminality among immigrants may be lower than among natives of country D if the productivity at destination makes honest workers from country S more willing to move to country D than criminals.[32]

D Reversible career choices: additional results

Here we present some additional analytical results related to the analysis carried out in Section 3.

D.1 Derivation of Equations (22) and (23)

Before agents can change occupation, there are $2 - 1/(\rho q)$ native criminals and $m\hat{x}_M$ foreign-born criminals, in the destination country. After career choices are revised, the total number of people engaged in illicit activities is given by $(1+m)(2-1/(\rho q))$, as can be inferred from Equation (21). The total number of honest workers switching to criminal activities must then be equal to

$$m\left(2 - \frac{1}{\rho q} - \hat{x}_M\right). \tag{70}$$

Given that, in country D, the "after-migration, before-shift" honest workforce is composed of

[32] Equation (69) can be rewritten as a condition on ρ, implying that immigrants commit less crime than natives if the protection of property rights at destination is good enough to attract relatively more honest agents from country S into emigration.

$m(1-\hat{x}_M)$ immigrants and $1-(2-1/(\rho q))$ natives, the share of immigrants among honest workers before shifts can be written as

$$\frac{m(1-\hat{x}_M)\rho q}{1-(1-m(1-\hat{x}_M))\rho q}, \tag{71}$$

and the share of natives among honest workers as

$$\left(1-\frac{m(1-\hat{x}_M)\rho q}{1-(1-m(1-\hat{x}_M))\rho q}\right). \tag{72}$$

By combining Equations (70) and (71) (respectively, (72)), we obtain the total number of immigrants (respectively, natives) who move from honest to criminal activities. In turn, this allows us to compute the share of criminals among immigrants and natives, i.e. Equations (22) and (23).

D.2 Proof of Proposition 6

We consider that some formerly honest migrants and/or some native criminals wish to change occupation. The proportion of the immigrant population switching from honest to illicit occupation is denoted by y_M, while the share of natives moving from the illegal to the legal sector is y_N. Note that y_M must be comprised between 0 and $1-\hat{x}_M$, the latter being the proportion of honest workers among the m migrants arriving in country D. As far as natives are concerned y_N must be comprised between 0 and x^*_D, which represents the before-shift share of criminals among natives.

Natives' and immigrants' choices are interdependent. By equating criminal rents and honest wages, net of switching costs for those who change occupation, we determine the reaction functions $y_M(y_N)$ and $y_N(y_M)$. Solving the system composed by the two reaction functions allows us to compute the equilibrium shares of switchers among migrants and natives, i.e. y^*_M and y^*_N, respectively. The after-shift crime rates for the two groups of agents will be computed as $x^*_{M,shift} = \hat{x}_M + y^*_M$ and $x^*_{N,shift} = x^*_D - y^*_N$.

Recall that $h = 1$. For honest migrants who may consider to become criminals, the net criminal rent and honest income can be written as

$$\Pi^c_{M,shift} = \frac{(1-(x^*_D - y_N) + m(1-(\hat{x}_M + y_M))\eta)}{1+m}\lambda\rho q - \Xi \tag{73}$$

and

$$\Pi^w_{M,shift} = (1-\rho q)\lambda\eta, \tag{74}$$

respectively, where the switching cost applies only to the prospective rents from crime.

In the case of criminal natives who may want to take up honest jobs, the switching cost must be subtracted from their expected income from legal activities. We then have

$$\Pi^c_{N,shift} = \frac{(1-(x^*_D - y_N) + m(1-(\hat{x}_M + y_M))\eta)}{1+m}\lambda\rho q, \tag{75}$$

and

$$\Pi^w_{N,shift} = (1-\rho q)\lambda - \Xi. \tag{76}$$

The reaction function $y_M(y_N)$ is obtained as a solution of $\Pi^c_{M,shift} = \Pi^w_{M,shift}$ and can be written as

$$y_M(y_N) = \max\left(\min\left(\frac{\lambda\rho q(1-(x^*_D - y_N)+\eta(1+m(2-\hat{x}_M))) - (1+m)(\eta\lambda+\Xi)}{m\eta\lambda\rho q}, 1-\hat{x}_M\right), 0\right). \tag{77}$$

Symmetrically, $y_M(y_N)$ emerges as a solution of $\Pi^c_{N,shift} = \Pi^w_{N,shift}$ and is given by

$$y_N(y_M) = \max\left(\min\left(\frac{\lambda\rho q(2-(x^*_D - y_N)+m(1+\eta(1-\hat{x}_M))) - (1+m)(\lambda-\Xi)}{m\eta\lambda\rho q}, x^*_D\right), 0\right). \tag{78}$$

After replacing $\hat{x}_M$ and x^*_D with their respective expressions from Equations (9) and (3), the two reaction functions form a system of two equations in two unknowns, whose solution is the pair (y^*_M, y^*_N).

Let us now define

$$\tilde{\eta} \equiv 1 - \frac{2\Xi}{\lambda(1-\rho q)}, \tag{79}$$

and

$$m' \equiv \frac{\gamma\rho}{1-(1-\gamma)\rho}. \tag{80}$$

Depending on the values of the parameters, different cases may arise.

Case 1: $\eta < \tilde{\eta}$.

In this case, depending on the values of the parameters, the equilibrium can be such that (i) $y^*_M = 1-\hat{x}_M$ and $y^*_N = x^*_D$, or (ii) $y^*_M = 1-\hat{x}_M$ and $y^*_N \in (0, x^*_D)$, or (iii) $y^*_M \in (0, 1-\hat{x}_M)$ and $y^*_N = x^*_D$. An equilibrium of type (i) is a limit situation: all potential switchers change occupation, so that in the end all natives are honest, whereas all migrants are criminal. In an equilibrium of type (ii), all migrants become criminals, while not all natives are honest. Finally, an equilibrium configuration of type (iii) implies that after career choices are revised, all natives are honest while only some immigrants are not involved in crime. Therefore, we can conclude that – regardless of the specific type of equilibrium – migrants commit more crime than natives after career choices are revised if $\eta < \tilde{\eta}(\Xi)$.

In Figure 4, this situation corresponds to the region of the (Ξ, η) space below the $\tilde{\eta}(\Xi)$ line. Within this region, it is interesting to see general equilibrium effects at play. For instance, if $\eta^{c\to w}_N(\Xi) < \eta < \tilde{\eta}(\Xi)$, criminal natives would stick to their occupation but they reconsider their choice and take up honest jobs because illicit rents shrink, due to migrants crowding in the criminal sector.[33]

Case 2a: $\eta > \tilde{\eta}$ and $m < m'$.

[33] Remind that, in Figure 4, $\eta_N(\Xi)$ is the portion of $\eta^{c\to w}_N(\Xi)$ above $\tilde{\eta}(\Xi)$.

This case is also depicted in Figure 4.

Let us define $\eta_M(\Xi)$ and $\eta_N(\Xi)$ as the values of η that solve $y_M = 0$ and $y_N = 0$, respectively. Consistent with the analysis carried out in Section 3.2, it can be checked that $\eta_M(\Xi) = \eta_M^{w\to c}$ and $\eta_N(\Xi) = \eta_N^{c\to w}$, where $\eta_M^{w\to c}$ and $\eta_N^{c\to w}$ are given by Equations (26) and (27), respectively.

The three functions $\eta_M(\Xi)$, $\eta_N(\Xi)$ and $\tilde{\eta}(\Xi)$ are all decreasing in Ξ. In addition, they intersect each other in one single point, for which

$$\Xi = \Xi^\circ \equiv \frac{\lambda(1-\rho q)(m(1-\rho)-(1-m)\gamma\rho)}{1+m-((q+\lambda(1-\rho q))(1-m)+2m)\rho}. \tag{81}$$

If $m < m'$, it can be checked that $\eta_M(0) > \tilde{\eta}(0) > \eta_N(0)$. It then follows that three equilibrium configurations are possible, i.e.

(i) $y_M^* > 0$ and $y_N^* = 0$, if $\tilde{\eta}(\Xi) < \eta < \eta_M(\Xi)$;

(ii) $y_M^* = y_N^* = 0$, if $\eta > \max(\eta_M(\Xi), \eta_N(\Xi))$;

(iii) $y_M^* = 0$ and $y_N^* > 0$, if $\tilde{\eta}(\Xi) < \eta < \eta_N(\Xi)$.

These three different situations correspond to the three subregions above $\tilde{\eta}(\Xi)$ in Figure 4.

If $\tilde{\eta}(\Xi) < \eta < \eta_M(\Xi)$, the equilibrium is such that $y_N^* = 0$ and

$$y_M^* = \frac{\lambda\rho q(1-x_D^*+\eta(1+m(2-\hat{x}_M)))-(1+m)(\eta\lambda+\Xi)}{m\eta\lambda\rho q}.$$

As mentioned above, all natives stick to their original career choice, but some honest migrants decide to move to the criminal sector. We can compute the after-shift crime rates for the two groups, i.e. $x_{M,shift}^* = \hat{x}_M + y_M^*$ and $x_{N,shift}^* = x_D^* - y_N^*$. It turns out that $x_{M,shift}^* < x_{N,shift}^*$ if

$$\eta > \check{\eta} \equiv 1 - \frac{(1+m)\Xi}{\lambda(1-\rho q)}, \tag{82}$$

which defines the shaded area within this subregion, in Figure 4. Note also that $\check{\eta} > 1-2\Xi/(\lambda(1-\rho q))$ for any $m \in (0,1)$.

If instead $\eta > \max(\eta_M(\Xi), \eta_N(\Xi))$, nobody – among immigrants and natives – changes occupation. The equilibrium reproduces that of the benchmark model, so that $x_{M,shift}^* = \hat{x}_M$ and $x_{N,shift}^* = x_D^*$. The threshold value of η beyond which the crime rate of immigrants is lower than that of natives is then the same as in Equation (10), i.e. $\overline{\eta}$ – above which lies the shaded area for this subregion.

Finally, if $\tilde{\eta}(\Xi) < \eta < \eta_N(\Xi)$, the equilibrium is such that $y_M^* = 0$ and

$$y_N^* = \frac{(1+m)(\lambda-\Xi)}{\lambda\rho q} - (2-x_D^*+m(1+\eta(1-\hat{x}_M))).$$

Otherwise said, all migrants stick to their original career choice, but some criminal natives decide to take up honest jobs. Given that $\tilde{\eta}(\Xi)$ and $\eta_N(\Xi)$ are both decreasing, and their intersection lies below $\overline{\eta}$, it follows that $x^*_{M,shift} > x^*_{N,shift}$. The interpretation is the following: if career choices are reversible, some natives decide to switch to the legal sector only if η is very low, namely lower than $\eta_N(\Xi^\circ)$, where Ξ° is as in Equation (81). However, the values of η compatible with this situation are lower than $\overline{\eta}$, meaning that before career choices are revised, one would observe $\hat{x}_M > x^*_D$. If some criminal natives become honest, the gap between the crime rate of immigrants and natives increases further, so that we necessarily have $x^*_{M,shift} > x^*_{N,shift}$.

Case 2b: $\eta > \tilde{\eta}$ and $m > m'$.

If $m > m'$, we have that $\overline{\eta} > \eta_N(\Xi)$ and $\overline{\eta} > \eta_M(\Xi)$, for any $\Xi > 0$. This can be shown by recalling that both $\eta_N(\Xi)$ and $\eta_M(\Xi)$ decrease with Ξ, and checking that $\eta_M(0) < \eta_N(0) < \overline{\eta}$.

It then follows that the two subregions where some agents change occupation (with honest migrants becoming criminals or native criminals becoming honest) lie entirely below $\overline{\eta}$. The only situation in which the crime rate of immigrants can be lower than that of natives is such that nobody changes occupation and $\eta > \overline{\eta}$.

Considering cases 1, 2a and 2b together allows us to prove the claim of Proposition 6. □

To sum up, when migrants' relative human capital is too low (case 1), the revision of career choices ultimately causes the migrants' crime rate to exceed that of natives. On the contrary, if migrants are productive enough in honest jobs (cases 2a and 2b), they can end up having a lower crime rate than natives after career choices are updated, even if some of them leave the honest sector to become criminals. Note that, while migrants and natives can change careers simultaneously in the first case – with migrants replacing natives in criminal occupations (the so-called substitution effect) – only one of the two groups is concerned by career shifts in cases 2a and 2b.

E Proof of Proposition 7

Consider $\hat{x}_M$ as given by Equation (32). By solving $\partial \hat{x}_M / \partial s = 0$, we find two roots, one of which is always negative. The other root is

$$\check{s} = 1 - \frac{\lambda + 1}{(\lambda - 1)M} + \frac{\sqrt{2\theta((\lambda+1)\theta + (\lambda-1)(1-\theta)M)}}{(\lambda-1)\theta M}.$$

It follows that $\hat{x}_M$ reaches a minimum when $s = \check{s}$, if $\lim_{s \to 1} \partial \hat{x}_M / \partial s > 0$ and $\lim_{s \to 0} \partial \hat{x}_M / \partial s < 0$. The first inequality is verified if

$$\theta > \theta_1 \equiv \frac{2M}{1 + \lambda + 2M},$$

while the second one holds if

$$\theta < \theta_2 \equiv \frac{2M}{1 + (\lambda - 1)M^2 + \lambda(1 - 2M)}.$$

Therefore, if $\theta_1 < \theta < \theta_2$, $\hat{x}_M$ is U-shaped in s, and $\check{s} \in (0,1)$. If $\theta < \theta_1$, $\hat{x}_M$ is decreasing with s when $s \in (0,1)$. If instead $\theta > \theta_2$, $\hat{x}_M$ is increasing with s when $s \in (0,1)$.

Let us now restrict our attention to $\theta \in (\theta_1, \theta_2)$. Given that $N_M = m\hat{x}_M$ and $m = (1-s)M$, it automatically follows that the minimum of N_M will be reached for a higher value of s, denoted by $\breve{s}$, which falls in the $(0,1)$ interval if $\lim_{s\to 1} \partial N_M/\partial s > 0$. Such inequality is satisfied if

$$\theta > \theta_1' \equiv \frac{1-2q+\lambda}{2q\lambda}.$$

□