WORKING PAPERS

Return Migration and Illegal Immigration Control

Karin Mayr
Alexander Kemnitz

December 2012

Working Paper No: 1208

DEPARTMENT OF ECONOMICS

UNIVERSITY OF VIENNA

All our working papers are available at: http://mailbox.univie.ac.at/papers.econ

Return Migration and Illegal Immigration Control*

Alexander Kemnitz
TU Dresden†

Karin Mayr
University of Vienna

December 2012

Abstract

This paper investigates the effectiveness of immigration control policies when the duration of stay of illegal immigrants is endogenous because they may return home voluntarily. It shows that return intentions matter. First, we find that spending on border enforcement can potentially increase the total amount of illegal labor in the receiving country. This is because, while fewer illegals enter the country, those who do enter stay longer. Second, in-site inspections reduce illegal labor, unless there is an amnesty: then, they can have the opposite effect. Third, fines on apprehended migrants have only limited effect.

JEL classifications: F22,K42,O17

Keywords: Return Migration, Illegal Migration, Immigration Control, Immigration Policy

*We thank seminar participants at TU Dresden and the Universities of Leipzig and Konstanz, participants of the 3rd TEMPO conference in Nuremberg as well as Monika Merz for helpful comments and suggestions. Karin Mayr gratefully acknowledges financial support from the NORFACE research programme on Migration in Europe - Social, Economic, Cultural and Policy Dynamics. The usual disclaimer applies.

†*Correspondence to: TU Dresden, Department of Business and Economics, D-01062 Dresden. Tel: +49-351-46337548. Fax: +49-351-46337130. e-mail: alexander.kemnitz@tu-dresden.de.

1 Introduction

The issue of illegal immigration is of growing importance worldwide. According to ILO estimates, illegal migrants represent 10 to 15 per cent of total global migrant stocks and flows (ILO, 2004). In developed countries, illegal immigrants have been estimated to account for a third to a half of new entrants, with an increase of 20 per cent over ten years (IOM, 2003). However, not all illegals intend to stay in their destination country forever. Empirical evidence shows that a significant fraction intends to immigrate only temporarily and return to their home country eventually (see for example Chiswick (1988), Massey and Liang (1990) and Borjas, Freeman and Lang (1991) for the US). In her study on Western Mexican immigrants, Reyes (1997) in fact finds that undocumented immigrants are much more likely to return than documented ones: about 50 percent of the former leave within two years and retention rates after 5 and 10 years, respectively, are between 30 and 50% lower than those of documented immigrants for both California and the US as a whole. Most recently, Conligio, De Arcangelis and Serlenga (2009) find that more than 70% of illegal immigrants to Italy planned to return home after an intended stay of 6 years on average.

If part of the illegal immigration is voluntarily non-permanent, this should matter for the effectiveness of policies against illegal immigration. In this paper, we develop a simple life-cycle model of migration to allow for both temporary and permanent immigration plans. We then evaluate popular policies against illegal immigration while taking into account explicitly the immigration and emigration decision of illegals. We distinguish between three types of individuals: those who want to emigrate temporarily, those who want to emigrate permanently and those who do not want to emigrate at all. Migration decisions depend on the expected wage gains from moving and on consumption preferences, and we assume that migrants are heterogeneous in both dimensions. Migrants prefer to consume at home but may use migration as a potentially temporary way to supplement their income, if expected wages are higher abroad than at home. Therefore, they face a trade-off between staying and returning: if they stay in the destination country, they forgo the benefit of consumption at home, whereas if they return home, they forgo the pecuniary advantage of earning a higher wage abroad.

In our framework, policies against illegal immigration affect the total amount of illegal labor both via their effect on the initial emigration decision and the subsequent return decision. As a result, policies can have implications that are very different to those emphasized in the existing literature, where the possibility of voluntary return has been neglected so far. Considering two main types of policies against illegal immigration - external control (border enforcement) and internal control (employer inspections) - we find that only the latter decreases the stock of illegals unambiguously in our model. In contrast, the effect of

border control can be positive or negative. This is because, on the one hand, the number of people entering illegally decreases, but on the other hand, a number of temporary migrants change their plans to stay permanently. We also consider the effects of two other policy instruments: amnesties and a penalty on detected migrants. We show that amnesties increase illegal immigration and can, moreover, invert the effect of employer inspections. Finally, increasing deportation fines on apprehended migrants is not necessarily effective either.

Our paper contributes to two strands of the literature, hitherto almost unconnected: illegal immigration and return migration. The economic literature on illegal immigration has been growing since early papers by Ethier (1986), Bond and Chen (1987) and Djajic (1987) who analyze border control and employer sanctions as two effective ways of combating illegal immigration. The subsequent literature has investigated the effects of policies against illegal immigration when taking into account various specific features of illegal immigration unrelated to return migration. For example, Djajic (1999) shows that border control and internal enforcement may increase the overall amount of illegal immigration because it may drive immigrants into sectors where they are harder to detect. Epstein, Hillman and Weiss (1999) consider that migrants may enter the host country legally but move into the illegal sector subsequently to avoid deportation. Chau (2001), Epstein and Weiss (2001) and Mayr, Minter and Krieger (2012) analyze the legalization of immigrants via an amnesty and interactions with other policies against illegal immigration. Friebel and Guriev (2006) consider the effectiveness of policies in the presence of debt-financed illegal immigration. Woodland and Yoshida (2006) analyze the role of risk preferences in the context of policies against illegal immigration.

In turn, a number of studies have identified reasons why the preferred duration of migration may be shorter than the feasible duration, for example because of a preference for consumption at home (Hill (1987), Djajic and Milbourne (1988), Dustmann (1997, 2003), Dustmann and Kirchkamp (2002)), a greater return to host-country human capital at home (Dustmann (1995)), a greater purchasing power of earnings at home (Stark, Helmenstein and Yegorov (1997)), or borrowing constraints at home (Mesnard (2004)). These papers identify important links between migration duration and other variables of interest, but are typically framed in the context of legal migration only.

There are only two papers to our knowledge that are close to ours in considering both illegal immigration and return migration.[1] First, Hill (1987) raises the issue of temporary illegal immigration in his paper on return migration. However, he does not formally ana-

[1] Coniglio, De Arcangelis and Serlenga (2009) find that high-skilled illegals are more likely to return than the low-skilled. Taking earnings opportunities at home as a proxy for skills, our approach is in line with that result. However, Conligio, De Arcangelis and Serlenga (2009) do not address the issue of immigration control.

lyze the policy implications and, moreover, confines the discussion to border enforcement only. Second, Carter (1999) assumes a higher quitting probability of illegal workers (compared to natives) due to return in an efficiency wage model. However, that probability is exogenous to the model and not derived from individual decisions. In contrast, our paper provides an analysis of the effectiveness of illegal immigration policies in a life-cycle model of illegal migration where the duration of stay is endogenous. In showing that some policies against illegal immigration can become ineffective or even counterproductive, we provide an important and novel perspective on the effectiveness of illegal immigration control that should be taken into account in the design of policy.

The paper is organized as follows. Section 2 introduces the model. Section 3 derives the optimal decisions of migrants on (the timing of) migration and consumption. Section 4 analyzes the effects of immigration policies including border enforcement, employer inspections, amnesties and deportation fines. Some concluding remarks are offered in Section 5.

2 The Model

2.1 The Economic Environment

Consider two countries H (home) and F (foreign) and a mass of individuals born in country H living for three periods. At the end of period 0, individuals contemplate whether to stay at home or move illegally to country F. At the beginning of period 2 those residing illegally in F decide whether to stay or return voluntarily to H.[2] A single homogeneous consumption good is produced only from labor input in both countries. Per-period wages are given by h in H and f in F, where $f > h$, and assumed to be unaffected by the number of migrants.[3] However, in F there is a positive probability $1 - \pi$ that an illegal immigrant is detected in both periods, in which case he is deported back to H.

All individuals are endowed with the same initial wealth a_0, but they are heterogenous in two respects. First, they differ in h, their earning opportunities at home and, therefore, the earnings differential that they can gain from emigration. Second, there is variation in the individual attachment to home: people generally prefer living in H over living in F, but to different degrees. In line with the existing literature (e.g. Hill, 1987), we depict this preference by a factor ρ by which marginal utility of consumption at home exceeds marginal utility from consumption abroad. To focus our analysis, we assume that ρ is

[2] In order to focus on return migration, we assume that emigration to F is possible only in period 1. Thus, postponing migration or re-entering is not possible.

[3] There is little empirical evidence for wage effects of illegal immigrants on natives (see, for example, Winegarden and Khor (1991) and Hanson, Robertson and Spilimbergo (2002)).

distributed over the interval $[1, \infty)$, and h is distributed over $[0, f]$. So we assume that every individual considers consuming at home at least as good as consuming in F and has non-inferior wage prospects abroad. Let $g(\rho, h)$ and $G(\rho, h)$ denote the joint density and cumulative distribution functions.

Life-time utility of individuals can be described as:

$$U = c_1 \left[1 + (\rho - 1)d_1\right] + c_2 \left[1 + (\rho - 1)d_2\right], \tag{1}$$

where c_t is consumption in period $t \in 1, 2$. The dummy variable d_t captures the effect of location on utility from consumption in period t and is equal to one (zero) for an individual located in H (F). Apart from location, period 1- and period 2-consumption are perfect substitutes, and migrants are assumed to be risk-neutral.[4] For simplicity, we set the discount factor equal to one and abstract from consumption before the migration decision.

2.2 Timing of Events

In our model, individuals face the following decision problems: whether to migrate abroad or not, whether to return or not if they migrate successfully, and how much to save and consume. The timing of events and decisions is as follows.

Period 0: Individuals residing in H decide whether to stay in H or to emigrate to F illegally. Emigration requires a financial investment b.

Period 1: At the beginning of the period, a share $1-\pi > 0$ of immigrants in F is detected and deported to H. There, they earn h, like all other residents in H. The share of undetected migrants $\pi > 0$ works in F and earns f. At the end of the period, all individuals decide how much to consume and save at their current location.

Period 2: At the beginning of the period, immigrants in F decide whether to stay or to return to H voluntarily. Among those deciding to stay, the share $1 - \pi$ is detected and deported. As in period 1, they receive the wage h. The rest manage successfully to stay in F and earn f. At the end of the period, all individuals consume their remaining wealth at their location.

[4] This is the common assumption in the literature (e.g., Ethier (1986), Carter (1999), Friebel and Guriev (2006)). However, risk preferences are not crucial for the mechanism that we focus on in this paper. See Woodland and Yoshida (2006) for an interesting analysis of the role of migrant risk preferences.

3 Migrant Decisions

In this section, we determine the individually optimal location and consumption decisions as described above. Due to the sequential structure, we proceed by backward induction, starting with the return decision in period 2.

3.1 Period 2: The Return Migration Decision

Consider individuals residing illegally in F at the beginning of period 2. Based on a comparison of the respective utility levels, they decide whether to return home or try to remain in F. As this period is the last period of their life, individuals consume their total earnings of that period plus all remaining wealth, which we label a_2. Thus, utility in period 2 in the case of voluntary return amounts to:

$$V_2^T \equiv \rho\,(a_2 + h) \tag{2}$$

and in case of an (intended) stay to:

$$V_2^P \equiv (1-\pi)\rho\,(a_2 + h) + \pi\,(a_2 + f)\,. \tag{3}$$

Deportation reduces the individual income level but increases the utility derived from this income.[5]

Comparing the two utility levels V_2^T and V_2^P, we have:

Proposition 1. *An illegal worker residing in F at the beginning of period 2 returns home voluntarily, if he has a sufficiently strong attachment to home. The share of returnees is smaller, the higher (lower) the foreign (home) wage f (h) and the lower the current individual wealth a_2.*

Proof. We can express the indirect expected utility of migrants in period 2 as:

$$V_2 = \begin{cases} (1-\pi)\rho\,(a_2 + h) + \pi\,(a_2 + f) & : \quad \rho \leq \rho_2^T \\ \rho\,(a_2 + h) & : \quad \rho \geq \rho_2^T \end{cases} \tag{4}$$

which is a function of the threshold level of home attachment where utility in case of return (V_2^T) and stay (V_2^P) is the same:

$$\rho_2^T = \frac{a_2 + f}{a_2 + h}. \tag{5}$$

[5] Assuming that the deported individuals can take all their current wealth back home complies with the general literature and is also corroborated by the fact that fines play a minor role at best in most actual immigration policies. However, we address the effects of fining the deportees in Section 4.4.

As $\frac{\partial V_2^T}{\partial \rho} > \frac{\partial V_2^P}{\partial \rho}$, all people with $\rho > \rho_2^T$ prefer to return to H and all those with $\rho < \rho_2^T$ prefer to stay in F. Thus, the higher ρ_2^T, the fewer illegals return voluntarily. The comparative statics on ρ_2^T are straightforward from (5). ■

The intuition behind this finding is simple. Staying abroad provides a higher income, but at the price of lower marginal utility of consumption. If the attachment to home ρ is sufficiently strong, the latter effect dominates and it is worthwhile to return. An increase in f (or a decrease of h), however, makes returning less lucrative, just as a decrease in wealth a_2, which reduces the relative utility gain from returning home. This is due to the fact that all of period-2 wealth is consumed in that period. Note that the detection probability does not matter for return decisions because utility in the case of voluntary return equals utility in the case of deportation. In sum, we find that people with a low attachment to home, a high wage differential and low wealth intend to stay abroad longer.

3.2 Period 1: The Consumption Decision

Consider now illegals residing in F at the beginning of period 1. A fraction $1-\pi$ of them is detected and sent back home immediately. They work in H for two periods and earn a lifetime income $a_1 + 2h$, where a_1 denotes individual immigrant wealth at the beginning of period 1. Being indifferent between consumption in period 1 or period 2, their lifetime utility amounts to $\rho\,[a_1 + 2h]$.

In contrast, the fraction π manages successfully to stay in F for at least period 1 and earns the wage f.[6] At the end of the period, each migrant decides how much of his current resources $a_1 + f$ to consume now and to save. Obviously, there is a trade-off because higher current consumption decreases period 2-wealth and hence future consumption: $a_2 = a_1 + f - c_1$.

Proposition 2. *For all migrants undetected in period 1, it is optimal to save all current income.*

Proof. Illegal residents in F maximize utility:

$$U = c_1 + \begin{cases} \pi(a_1 + 2f - c_1) + (1-\pi)\rho(a_1 + f + h - c_1) & : \quad \rho \leq \rho_2^T \\ \rho(a_1 + f + h - c_1) & : \quad \rho > \rho_2^T \end{cases},$$

with respect to period 1-consumption. This gives the first-order conditions:

$$\frac{\partial U}{\partial c_1} = \begin{cases} -(1-\pi)(\rho - 1) & : \quad \rho \leq \rho_2^T \\ -(\rho - 1) & : \quad \rho > \rho_2^T \end{cases},$$

[6] There is no voluntary return migration in period 1, as migrants have just borne a cost for entering F. An immediate return would preclude any possible reward for this investment.

which are negative when $\rho > 1$. Therefore, in optimum $c_1 = 0$ or, equivalently, $a_2 = a_1 + f$.

■

This result is due to the home bias in consumption. Temporary migrants have an obvious incentive to defer consumption because they will definitely enjoy a higher marginal utility in period 2. But also those intending to stay permanently gain from postponing consumption, because they will (have to) live in H instead of F with positive probability $1 - \pi$. Consumption in period 1 and period 2 would only be equivalent for a migrant who was certain to live in F for both periods. In this sense, deferring consumption works as a compensation for the expected income loss from deportation.

We can now re-write the threshold for home attachment ρ_2^T, which determines permanent and temporary migration decisions at the beginning of period 2, as a function of wealth at the beginning of period 1, a_1:

$$\rho_1^T = \frac{a_1 + 2f}{a_1 + f + h}. \tag{6}$$

For further reference, we express this threshold level as a function of h, with a higher wage at home promoting voluntary return: $\frac{\partial \rho_1^T}{\partial h} < 0$. Again, people with greater wealth are more likely to return home after period 1, $\frac{\partial \rho_1^T}{\partial a_1} < 0$, because the utility gain from staying becomes smaller relative to the cost. The effect of the wage in F is qualitatively a little more involved. On the one hand, the expectation of a higher f in period 2 makes staying for this period more worthwhile. On the other hand, a higher f in period 1 increases period 2-wealth, so not consuming at home produces a larger utility loss. However, in our simple specification, the first effect dominates and better income opportunities in F prolong the preferred length of stay.

Collecting information, we can express the expected utility of illegal immigrants to F from the perspective of the beginning of period 1 as:

$$V_1 \equiv \begin{cases} (1-\pi)\rho\left[a_1 + 2h\right] + \pi\left[(1-\pi)\rho\left[a_1 + f + h\right] + \pi\left[a_1 + 2f\right]\right] & : \quad \rho < \rho_1^T \\ (1-\pi)\rho\left[a_1 + 2h\right] + \pi\rho\left[a_1 + f + h\right] & : \quad \rho \geq \rho_1^T \end{cases}. \tag{7}$$

A migrant planning to stay in F for both periods is detected in period 1 with probability $1 - \pi$ and is detected only in period 2 with probability $(1 - \pi)\pi$. In each case, he consumes in H. With the remaining probability π^2, he stays in F, in which case his marginal utility of consumption is lower. A migrant planning to return voluntarily lives in F in period 1 with probability π and definitely consumes at home in period 2. For further reference, we denote the expressions in (7) by V_1^P (*permanent*, top line) and V_1^T (*temporary*, bottom line).

3.3 Period 0: The Emigration Decision

In period 0, all individuals decide whether to move illegally to F or to remain in H for the rest of their lives. Each person opting for the latter gains lifetime utility:

$$V_0^H = \rho\left[a_0 + 2 \cdot h\right], \tag{8}$$

which is independent of the distribution of consumption between the two periods.

Similar to Friebel and Guriev (2006), we assume that crossing the border requires a financial investment b. This could, for example, represent a migration fee paid for the services of a professional smuggling organization. To simplify matters, we assume that the fee does not exceed initial income a_0.[7] Hence, expected lifetime utility from illegal migration in period 0 is given by (7) with period 1-wealth: $a_1 = a_0 - b$. The decision on whether to emigrate or not depends on how (expected) lifetime utilities compare in case of emigration and no emigration, as described in the following.

3.4 The Pattern of Illegal Immigration

In this subsection, we characterize the amount and the composition of illegal immigration in country F for given policy parameters. Heterogeneity in both earnings opportunities at home and attachment to home lead to different lifetime-utility maximizing migration decisions, depending on the wage in F, the detection probability and the migration fee. In consequence, we can distinguish three different groups of individuals in country H: those who remain in H for both periods (stayers), those who emigrate to F in the first period and plan to stay for both periods (permanent migrants) and those who emigrate to F in the first period and plan to return voluntarily in period 2 (temporary migrants).

Proposition 3. *Individuals with a sufficiently low home wage [$h < h^T$] are either temporary or permanent migrants. They are permanent migrants, if their home attachment is sufficiently weak [$\rho \leq \rho^P(h)$]. Individuals with a sufficiently high home wage [$h > h^T$] are either stayers or permanent emigrants. They are permanent migrants, if their home attachment is sufficiently weak [$\rho \leq \rho^P(h)$].*

Proof. results from comparing utility from the respective options. In period 0, expected utility from temporary migration is:

$$V_0^T = \rho\left[(1-\pi)(a_0 - b + 2h) + \pi(a_0 - b + f + h)\right]. \tag{9}$$

As the utility of staying in H is given by (8), we have:

$$V_0^T \gtrless V_0^H \iff h \lesseqgtr f - \frac{b}{\pi} \equiv h^T. \tag{10}$$

[7] See Friebel and Guriev (2006) for a comprehensive analysis based on debt-financed illegal migration.

Thus, no migration is never the preferred choice when $h < h^T$. Likewise, temporary migration is never optimal when $h \geq h^T$. As a consequence, the decision problem boils down to a decision between temporary versus permanent emigration for a low home wage and a decision between permanent versus no migration for a high home wage. For $h < h^T$, we know from (6) that:

$$V_0^T \gtrless V_0^P \iff \rho \gtrless \rho^T(h) = \frac{a_0 - b + 2f}{a_0 - b + f + h}. \tag{11}$$

For $h \geq h^T$, we compare V_0^H to:

$$V_0^P = \rho(1-\pi)\left[a_0 - b + 2h\right] + (1-\pi)\pi\rho\left[a_0 - b + f + h\right] + \pi^2\left[a_0 - b + 2f\right] \tag{12}$$

to get:

$$V_0^P \gtrless V_0^H \iff \rho \lesseqgtr \frac{\pi^2(a_0 - b + 2f)}{\pi^2 a_0 + (1-\pi^2)b - \pi(1-\pi)f + \pi(1+\pi)h} \equiv \rho^P(h).$$

Figure 1 illustrates the three groups of permanent migrants, temporary migrants and non-migrants depending on their home attachment ρ and wage at home h. Temporary migrants are located above ρ^T to the left of h^T (area C), permanent migrants are below the minimum of $\rho^T(h)$ and $\rho^P(h)$ (areas A and B), and individuals above $\rho^P(h)$ to the right of h^T decide not to migrate at all. ■

The intuition behind this migration pattern is as follows. The decision between temporary and no migration is determined by the wage differential. Going abroad is worthwhile only if the home wage is sufficiently low, such that the expected benefit from one-period migration $\pi(f-h)$ exceeds the migration cost b. The home bias for consumption plays no role here, because consumption takes place in H under either alternative. In contrast, the decision between permanent and no migration is determined by the trade-off between the benefits of higher earnings abroad and those of greater utility from consuming at home. The higher the home bias, the more attractive is no migration compared to temporary or permanent migration, and the lower the home wage must be for migration to be attractive. As a consequence, both thresholds ρ^T and ρ^P decrease in h. Because of $\rho^P(h^P) = 1$ with:

$$h^P \equiv f - \frac{b}{\pi(1+\pi)}, \tag{13}$$

individuals with a very low wage differential ($h \geq h^P$) prefer to stay at home anyway. For them, the expected benefit of permanent migration $\pi(1+\pi)(f-h)$ falls short of the required investment b. These individuals would emigrate only if they had a preference for consuming abroad ($\rho < 1$).

As a consequence, ignoring return incentives leads to a distorted assessment of the size of illegal migration flows. This distortion arises in the group of individuals with a low home

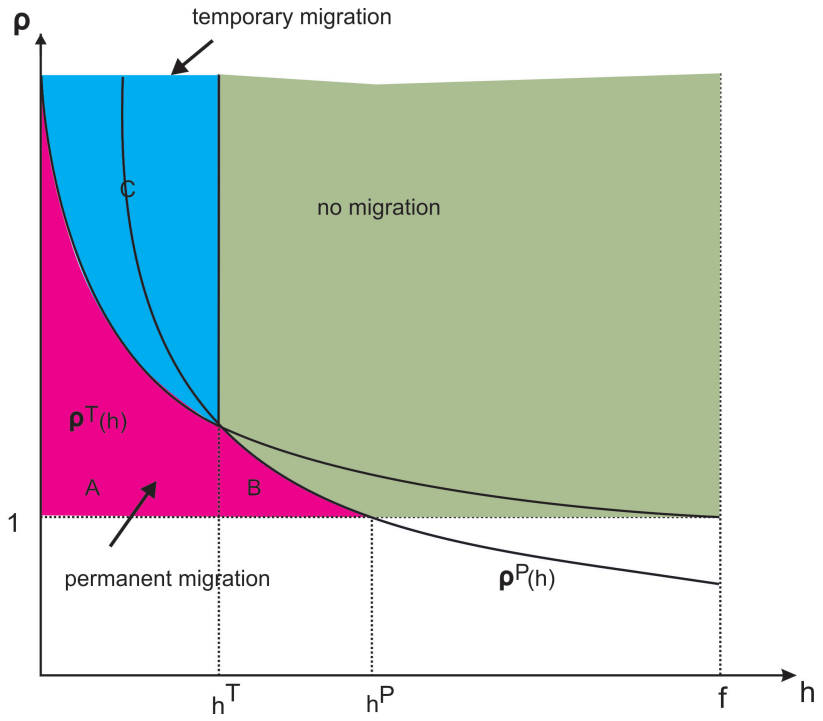

Figure 1: The pattern of migration

wage and a strong home bias, for whom it is optimal to migrate only temporarily. Looking exclusively at permanent migration is tantamount to considering the $\rho^P(h)$-curve only. This would predict that within area C , workers with $\rho > \rho^P(h)$ would not emigrate at all and those with $\rho \in [\rho^P(h), \rho^T(h)]$ would stay for both periods instead of one. Hence, the amount of illegal immigration would be understated in terms of the number of migrants. In terms of hours worked, however, both an under- and overstatement is possible, depending on the share of temporary and permanent migrants and, therefore, on the shape of the distribution function over home biases and wages. If the mass of individuals in area C above $\rho^P(h)$ exceeds the mass between $\rho^P(h)$ and $\rho^T(h)$, then the true amount of illegal labor is higher than projected when considering permanent immigration only.

In sum, the total amount of illegal immigration over both periods amounts to:

$$\begin{aligned} I &= \pi(1+\pi)\left[\int_0^{h^T}\int_1^{\rho^T(h)} g(\rho,h)d\rho\, dh + \int_{h^T}^{h^P}\int_1^{\rho^P(h)} g(\rho,h)d\rho\, dh\right] \\ &\quad +\pi\int_0^{h^T}\int_{\rho^T(h)}^{\infty} g(\rho,h)d\rho\, dh. \end{aligned} \tag{14}$$

The first term measures the number of permanent migrants (the fraction π of individuals located in the areas A and B of Figure 1) and the second one the number of temporary migrants (the fraction π of area C). As the fraction $1-\pi$ of undocumented workers is apprehended each period, the fraction π of return migrants works in F in period 1. The

probability that a migrant intending to stay permanently is undetected for both periods amounts to: $\pi(1+\pi)$, which equals his average length of stay. The total stock of illegal immigration I is subject to government policy as follows.

4 Immigration Control

We are interested in the effectiveness of immigration control policies when distinguishing between temporary and permanent illegal immigrants. In the following, we consider the impact of border enforcement, employer inspections, amnesties, and fines on apprehended migrants on the total amount of illegal immigration, taking into account both direct and indirect effects via the emigration and return migration decisions of migrants.

Our premise is that country F wants to reduce I and we scrutinize to what extent the various existing policies are conducive to this. So we discuss the effectiveness of these instruments rather than whether immigration control is desirable at all.[8] Identifying the optimal policy would require a detailed knowledge of the distribution function $g(\rho, h)$ and the costs pertaining to the different measures.[9] Without this information, we restrict ourselves to an evaluation of policy effectiveness against illegal immigration. Here, we are able to produce some interesting and novel insights.

From Figure 1 and the expression for the total immigrant stock (14), it is obvious that the amount of illegal labor is crucially affected by the thresholds $\rho^T(h)$, $\rho^P(h)$ (and, correspondingly, h^T and h^P)[10] as well as π, which determine the sizes of areas A-C and the fraction of migrants who remain undetected. A decrease of either threshold reduces I, given that h^T does not increase: a lower $\rho^T(h)$ and a lower $\rho^P(h)$ both reduce the sum of areas A and B.

This is important, since popular immigration policies typically affect these parameters simultaneously. We can conclude that a policy is unequivocally effective only when it decreases at least one of the parameters π, $\rho^T(h)$ or $\rho^P(h)$ without increasing h^T. If that property does not hold, then the policy exerts countervailing effects on I and the total impact is indeterminate and can only be assessed knowing $G(\rho, h)$, which determines the relative strength of effects. Therefore, our subsequent analysis will focus on the policy effects on π, $\rho^T(h)$ and $\rho^P(h)$.

[8] This question has been extensively dealt with in the existing literature, see for example Yoshida (2000), Hillman and Weiss (1999) and Entorf (2002) for theoretical arguments and Bean, Telles and Lowell (1987) for a survey of empirical studies on the impact of illegal immigration on the US labor market.

[9] Moreover, the comparison is impaired by the fact that instruments differ in durability in our model: border interdiction requires spending in period 1, whereas inspections create costs in periods 1 and 2.

[10] h^T and h^P are implicitly defined by $\rho^T(h) = \rho^P(h)$ and $\rho^P(h) = 1$, respectively.

4.1 Border Enforcement

A common policy instrument for tackling illegal immigration is a greater enforcement of border controls. In our model, stricter enforcement equals an increase in b, reflecting the idea that intermediaries charge a higher fee for their services when it becomes harder to cross the border (Friebel and Guriev, 2006). This mechanism is confirmed by US evidence.[11]

Proposition 4. *Border enforcement has an ambiguous effect on the total amount of illegal immigration. It reduces the number of temporary migrants, but can increase the number of permanent migrants.*

Proof. follows from the fact that:

$$\begin{aligned}
\frac{\partial \pi}{\partial b} &= 0, \quad \frac{\partial h^T}{\partial b} = -\frac{1}{\pi} < 0, \\
\frac{\partial \rho^P}{\partial b} &= -\frac{\pi^2[a_0 + \pi(2 - \pi(1+\pi)f + \pi(1+\pi)h]}{[\pi^2 a_0 + (1-\pi^2)b - \pi(1-\pi)f + \pi(1+\pi)h]^2} < 0, \\
\frac{\partial \rho^T}{\partial b} &= \frac{f-h}{[a_0 - b + f + h]^2} > 0.
\end{aligned}$$

■

There are two countervailing effects behind this result. First, stricter border controls improve the attractiveness of staying at home compared to either form of emigration. This is reflected in the decrease of $\rho^P(h)$ and h^T, which reduces the number of illegal immigrants (areas C and A+B shrink). But second, the profitability of permanent over temporary migration increases: higher spending on border crossing b diminishes immigrants' wealth $a_1 = a_0 - b$ and, hence, the utility gain from return migration. The concomitant rise of $\rho^T(h)$ changes the composition of immigrants such that some abandon their plans to return and choose to stay in F permanently instead. Thus, area A grows at the expense of area C, which increases the total amount of illegal immigration. As a consequence, the overall effect on illegal immigration is ambiguous, depending on how the distribution function $G(\rho, h)$ is shaped in the respective areas.

The possible ineffectiveness of border controls results from a change from temporary to permanent migration for some individuals, which is induced by the lower wealth immigrants possess after their arrival in F. As a result, some migrants with low home attachment prolong their duration of stay. This argument is germane to return incentives and is overlooked

[11] As border control in the US increased, the (inflation-adjusted) average price for smuggler services at the US-Mexico border increased from $1250 in the late 1990s to $2750 in 2008 (Hanson, 2009). Gathmann (2008) also finds that migration fees increase with border control intensity.

when only permanent migration is considered. Moreover, the result stands in contrast to the bulk of the literature. With the exceptions of Hill (1987) and Djajic (1999), theoretical approaches usually take the effectiveness of border enforcement policies for granted.[12] If at all, observed deficiencies of this instrument are rooted in possible inefficiencies in terms of raising net national income (Ethier, 1986; Bond and Chen, 1987), if the cost of border patrol exceeds adverse factor price effects of immigration.[13]

4.2 Employer Inspections

Another common instrument is to track illegal workers via in-site inspections, deport them and impose a fine on their employer. Thus, this policy tackles illegal immigration more from the demand side, in contrast to the rather supply-oriented border controls. In our model, employer inspections correspond to an increase in the probability of internal apprehension, that is a decrease in π, combined with a fine q to be paid by the firm.[14]

Even though fines are formally levied on the employer, they affect the labor market return of migrants. As firms are only willing to employ an illegal worker when the expected cost of hiring does not exceed the cost of hiring a regular worker, the economic incidence of the fine is borne by the migrant. Thus, the migrant wage goes below the regular wage, $\hat{f}$, by the expected fine (Ethier, 1986; Djajic, 1999; Woodland and Yoshida, 2006):

$$f = \hat{f} - (1-\pi) \cdot q. \tag{15}$$

An increase in π therefore exerts a downward pressure on migrant wages. We call this the wage effect of employer inspections.

Proposition 5. *Employer inspections decrease the total amount of illegal immigration.*

Proof. follows from:

$$\begin{aligned}
\frac{\partial \pi}{\partial \pi} &= 1, \quad \frac{\partial h^T}{\partial \pi} = \left[q + \frac{b}{\pi^2} \right] > 0, \quad \frac{\partial \rho^T}{\partial \pi} = q \cdot \frac{a_0 - b + 2h}{\left[a_0 - b + f + h) \right]^2} > 0, \\
\frac{\partial \rho^P}{\partial \pi} &= \frac{\pi(a_0 - b + 2f)(2b - \pi f + \pi h)}{\left[\pi^2 a_0 + (1-\pi^2)b - \pi(1-\pi)f + \pi(1+\pi)h \right]^2} > 0,
\end{aligned}$$

[12] Djajic (1999) argues that migrants' offsetting reactions can be strong enough to increase the overall level of immigration. Hill (1987) mentions the possible wealth effects of migration costs in the context of illegal immigration.

[13] The empirical literature typically studies the deterrence effects of border control, which some studies identify to be only weak (e.g. Hanson, Scheve, Slaughter and Spilimbergo, 2002).

[14] Analogous results could be derived with respect to the level of the fine. Like the references quoted in the paragraph below, we take the fine as given - mainly for the sake of brevity.

where the sign of the last expression follows from $2b - \pi f + \pi h \geq b > 0$ due to $h \geq h^T = f - b/\pi$ in the relevant range. Thus, all thresholds decrease with an intensification of inspections, i.e. a decrease in π. Areas A, B and C become smaller, and a smaller fraction of people in these areas stays undetected. ■

Employer inspections have a direct negative effect on the illegal workforce as a greater share of them is detected. Moreover, they decrease the effective wage to be earned in F and, thereby, diminish the incentives both to emigrate at all and to stay abroad for both periods. Interestingly, there are countervailing effects on return incentives. On the one hand, the wage effect in period 1 reduces period 1-wealth, which reduces return incentives. On the other hand, the lower wage in period 2 increases return incentives. In sum, the latter effect dominates, such that employer inspections are a proper tool to control the illegal influx of labor.

This result is mostly uncontested in the theoretical literature (Ethier, 1986; Chau, 2001; Friebel and Guriev, 2006).[15] However, some empirical evidence for the US argues that employer inspections and fines have at best minor deterring effects (Chiswick, 1988).[16] Our interpretation of this evidence is that problems of employer inspections might be a problem of a lack of information and enforcement rather than of the instrument itself. Similar findings have been documented for continental Europe, where spending on labor inspections is much higher (Friebel and Guriev, 2006).

4.3 Amnesties

Legalizing migrants is a recurrent theme in many receiving countries. Among others, Spain and the US have enacted comprehensive amnesties in recent years. Our interest is to see how such amnesties affect illegal immigration and how they interact with other policy instruments. Following Chau (2001), we model amnesties by introducing some probability μ that the migrant gains full legal status and earns the regular wage $\hat{f}$. With probability $1 - \mu$ the migrant remains illegal and earns wage f as defined in (15).

As the prospect of legalization can make illegal immigration more attractive, real world amnesties are usually not granted to all illegals but only to those who can document a minimum duration of residence in the country. This has also been the case in the above mentioned legalization waves. We incorporate this feature by assuming that the probability of becoming legalized is positive only in period 2. In period 1, no amnesties are granted and each migrant faces the risk $1 - \pi$ of detection and deportation as before.

[15] Djajic (1999) finds that employer inspections may be ineffective in the presence of sectoral relocation of migrants.

[16] For that reason, some theoretical work abstracts from this instrument (Carter, 1999).

Before deriving further results, it is necessary to adjust the host country's objective function to the present context. Because amnesties transform illegal labor into regular employment, it is misleading to look at the total amount of illegal labor here. In fact, a comprehensive amnesty ($\mu = 1$) would do away with all illegal employment in period 2, but can hardly be considered a purposive policy to combat illegal immigration. Therefore, we change our focus here to total *immigration* rather than total *illegal immigration* in F over both periods. Encompassing all illegal and legalized foreign workers, this measure is equivalent to (14) with the threshold values $\rho^T(h)$ and $\rho^P(h)$ depending on μ as shown in the following.

The decision on an amnesty is taken in period 2 after the migrant's choice of location. Therefore, the prospect of getting legal status affects the return decision. The expected utility from staying becomes:

$$\begin{aligned} & \mu(a_2 + \hat{f}) + (1-\mu)\left[(1-\pi)\rho\,(a_2 + h) + \pi\,(a_2 + f)\right] \\ = \;& (1-\mu)(1-\pi)\rho(a_2 + h) + (1-(1-\mu)(1-\pi))a_2 + \mu\hat{f} + (1-\mu)\pi f. \end{aligned} \tag{16}$$

Since utility from voluntary return is still given by (2), the amnesty has an impact on the home bias threshold determining return decisions. Now, individuals with a home bias of at least $(a_2 + f_\mu)/(a_2 + h)$ decide to return to H at the beginning of period 2, where

$$f_\mu = \frac{\mu\hat{f} + (1-\mu)\pi f}{\mu + (1-\mu)\pi} \tag{17}$$

denotes the average expected wage in F in period 2. This expression increases in the probability of legalization. As a result, amnesties change the migration pattern towards more permanent and less temporary migration.

As before, migrants defer consumption to period 2: $a_2 = a_1 + f$. This is because the marginal utility of consumption in period 1 still equals unity and is lower than the expected marginal utility of consumption in period 2 regardless of return intentions. In period 2, a temporary migrant enjoys marginal utility ρ from consumption at home, whereas according to (16) a permanent migrant has expected marginal utility $(1-\mu)(1-\pi)\rho + 1 - (1-\mu)(1-\pi) = 1 + (1-\mu)(1-\pi)(\rho - 1) > 1$. Thus, amnesties do not alter saving decisions.

Utilizing this result and $a_2 = a_0 - b + f$, we get the home bias threshold for temporary versus permanent migration from the perspective of period 0:

$$\rho^T_\mu(h) = \frac{a_0 - b + f + f_\mu}{a_0 - b + f + h}. \tag{18}$$

Migrants with a preference for home consumption of at least ρ^T_μ return voluntarily after period 1 and enjoy total expected utility according to (9). The rest prefers to stay in F

and has total expected utility

$$\begin{aligned}&\rho(1-\pi)\left[a_0-b+2h\right]\\&\quad+\quad\pi\left[\mu(a_0-b+f+\hat{f})+(1-\mu)\left[(1-\pi)\rho(a_0-b+f+h)+\pi(a_0-b+2f)\right]\right].\end{aligned}\tag{19}$$

For the decision between no migration and permanent migration, we compare utilities (8) and (19) to derive the threshold:

$$\rho_\mu^P(h)\equiv\frac{\pi(\mu+(1-\mu)\pi)(a_0-b+f+f_\mu)}{a_0\pi(\mu+(1-\mu)\pi)+(1-\pi)(1+(1-\mu)\pi)b-(1-\mu)\pi(1-\pi)f+\pi(1+\pi)(1-\mu)h}.\tag{20}$$

such that everybody in the interval $h\in[h^T,h^P]$ with $\rho<\rho_\mu^P$ aims for permanent emigration (area B) , whereas the others remain in H. The upper limit of that interval results from $\rho^P(h^P)=1$. From (20) together with $\rho^P(h^P)=1$, we get:

$$h_\mu^P=f-\frac{b-(1-\pi)\pi\mu q}{\pi[2-(1-\pi)(1-\mu)]},$$

which is increasing in μ. Since ρ^P is a decreasing function of h^P, it follows that ρ^P is increasing in μ, as well.

Proposition 6a. *Amnesties increase the total amount of immigrant labor.*

Proof. Follows from Proposition 3 together with the fact that ρ_μ^P and ρ_μ^T increase in μ while h^T stays constant. ■

The possibility of an amnesty increases the expected utility from permanent migration. Moreover, it leaves the utility of both alternatives unchanged: because the amnesty is tied to a minimum duration of stay, the expected utilities of both temporary and no emigration are not altered, and nor is h^T. All persons with a sufficiently low home wage $h<h^T$ migrate either for one or for two periods, and choose the former if their home bias for consumption is at least as high as ρ_μ^T from (18) (area C). Individuals with a higher home wage aim for either permanent or no migration.

As expected and in line with former analyses (Chau (2001), Epstein and Weiss (2001)), the prospect of legalization fosters immigration incentives. However, in contrast to the existing literature (Chau (2001), Friebel and Guriev (2006), we find that it weakens the effectiveness of employer inspections:

Proposition 6b. *In the presence of amnesties, employer inspections can become an ineffective tool for immigration policy: they can now increase the total amount of immigrant labor.*

Proof. For a possible ineffectiveness of employer inspections, at least one of the thresholds ρ^P and ρ^T must increase in π. From (18), the effect of tighter controls (a reduction of π) on ρ_μ^T is as follows:

$$-\frac{d\rho_\mu^T}{d\pi} = -\frac{\partial \rho_\mu^T}{\partial f}\frac{df}{d\pi} - \frac{\partial \rho_\mu^T}{\partial f_\mu}\frac{df_\mu}{d\pi},$$

depicting the effects both on the period 1-wage and on the expected average earnings in F in period 2. The wage effect in the first period is unambiguously positive:

$$-\frac{\partial \rho_\mu^T}{\partial f}\frac{df}{d\pi} = -\frac{(h-f_\mu)q}{(a_0-b+f+h)^2} > 0,$$

whereas the reaction of expected average earnings in period 2 is ambiguous:

$$-\frac{\partial \rho_\mu^T}{\partial f_\mu}\frac{df_\mu}{d\pi} = -\frac{1}{[a_0-b+f+h]} \cdot \frac{(1-\mu)q\left(\pi^2-\mu(1-\pi)^2\right)}{[\mu+(1-\mu)\pi]^2}. \tag{21}$$

For $\mu < 1$, (21) is negative (positive) iff μ is less (greater) than $\frac{\pi^2}{(1-\pi)^2}$. Moreover, (21) is definitely zero for $\mu = 1$. Therefore, we must have $\frac{d\rho^T}{d\pi} > 0$ for at least sufficiently high μ. Consequently, employer inspections can be counterproductive for immigration control. ■

There are two mechanisms behind this possible adverse effect of amnesties on the efficacy of employer inspections. First, suppose for the moment that sanctions decrease f_μ, the earnings expected from staying. Then, amnesties reduce the bite of inspections: the higher the probability of authentication, the less the risk of being detected matters. In the polar case of a comprehensive amnesty ($\mu = 1$), no migrant would care about inspections in period 2 and only the effect on the period 1-wage matters. As employer sanctions reduce that wage, migrants become poorer and are inclined to remain in F for another period. Consequently, stronger inspections can cause an increase in the total amount of foreign labor via a shift from temporary to permanent migration. It should be stressed that this effect occurs (1) despite the fact that the total number of foreign workers goes down (h^T, h^P and ρ^P decrease in π for all μ) and (2) not because of the higher incentive to stay due to the amnesty prospect per se but because of the countervailing effects of employer sanctions over time. In a sense, this result stresses that immigration policies should be consistent, as the effectiveness of employer sanctions can be weakened by subsequent amnesties.

But, second, the premise that sanctions reduce the earnings prospects in F is not necessarily fulfilled. In the presence of amnesties, in-site inspections have a dual impact on average expected earnings abroad, because they affect both the level of the wage of immigrants when illegal (see (17)) and their likelihood of receiving the (higher) official wage in the course of an amnesty. The two effects run in opposite directions: when inspections increase, illegal workers' earnings are reduced by the wage effect on the one hand but, on the other hand, fewer illegals remain in F such that a greater share of migrants receives the high official wage $\hat{f}$. The first effect dominates the latter when the probability of attaining legal

status is low and vice versa, when μ is sufficiently high.[17] Therefore, it is possible that the period 2-effect of employer sanctions reinforces instead of mitigates the mechanisms present in period 1, reducing return incentives.

It is interesting to compare this finding to the literature. In Chau (2001), amnesties serve to sustain government incentives for employer inspections and, thus, complement inspections. In Friebel and Guriev (2006), a greater amnesty probability reduces the effectiveness of employer fines. In turn, our results suggest that amnesties can even revert this effectiveness such that employer inspections increase the total amount of illegal immigration.

4.4 Immigrant Deportation Fines

The literature on illegal immigration policy typically abstracts from fines on the tracked migrants themselves. However, such fines have been implemented time and again in some countries in order to deter illegal immigration.[18] Motivated by this observation, we also analyze the effectiveness of this instrument in our context. To the best of our knowledge, we are the first to address this issue analytically.[19]

Due to the poverty of those apprehended, deportation fines become confiscatory even at very low levels and are frequently criticized for being too harsh from a humanitarian perspective (Human Rights Watch, 2009). Without embarking on that debate, we show in the following that fines that exceed a certain threshold are not conducive to immigration control for economic reasons. The reason is that fines affect migrants' wealth at the point of detention via their consumption and saving decisions and, therefore, their incentive to return.

To fix ideas, we assume that penalties exist only in period 2 such that they affect only the utility from permanent migration. This implies that h^T, the threshold between high and low home wages, is unaltered.

One distinctive feature of fines is that the migrant can lose at most the wealth he owns at the beginning of period 2, $a_2 = a_1 + f$. F-authorities cannot collect fines exceeding that amount because they cannot enforce any payments after deportation. Therefore, we limit our attention to fines no greater than the maximum wealth a migrant can hold at the

[17] Without amnesties, there is no composition effect and the only impact of increasing inspections is to reduce f. Then, the expected average wage declines in π.

[18] See the recent discussion in Italy (Human Rights Watch, 2009). In the early 1990s, Germany charged arrested illegal migrants with bills for their jail terms at levels beyond the true cost. It is still common practice to demand the cost of deportation. From the perspective of the migrant, this is equivalent to a fine.

[19] Chiswick (1988) provides an informal discussion of the usefulness of deportation fines.

beginning of period 2, $p \leq a_1 + f$.

First, we consider migrants with a low home wage, $h < h^T$, deciding whether to return to H in period 2 or not. With wealth a_2, the expected utility from a (planned) stay in F in period 2 is:

$$(1-\pi)\rho\,(a_2 + h - p) + \pi\,(a_2 + f)\,. \tag{22}$$

This expression is obviously decreasing in p, suggesting that higher fines reduce the utility from staying. However, a_2 depends on period 1-consumption, the incentives of which are affected by the level of the fine. In particular, the effective loss from a fine in period 2 is lower, the more has been consumed in period 1. This creates an incentive for migrants planning to stay to bring forward their consumption in order to curtail the expropriation by the fine.

To make this point more precise, consider utility from the perspective of period 1:

$$\begin{aligned} U_1 \;=\; & c_1 + \\ & \begin{cases} (1-\pi)\rho(a_1 + f + h - p - c_1) + \pi(a_1 + 2f - c_1) & : \quad 0 \leq c_1 < a_1 + f - p \\ (1-\pi)\rho \cdot h + \pi(a_1 + 2f - c_1) & : \quad a_1 + f - p \leq c_1 \leq a_1 + f \end{cases}, \end{aligned} \tag{23}$$

where we have taken account of the fact that illegal migrants cannot borrow ($c_1 \leq a_1 + f$). According to (23), the level of the deportation fine has a crucial impact on the marginal utility of consumption in period 1: it is negative, if the fine is sufficiently low to leave the deported migrant with some wealth, and positive otherwise:

$$\frac{\partial U_1}{\partial c_1} = \begin{cases} (1-\pi)\cdot(1-\rho) < 0 & : \quad 0 \leq c_1 < a_1 + f - p \\ (1-\pi) > 0 & : \quad a_1 + f - p \leq c_1 \leq a_1 + f \end{cases}. \tag{24}$$

Consequently, there are two local optima for the consumption decision at the corner solutions $c_1 = 0$ and $c_1 = a_1 + f$: migrants consume either nothing or their total wealth in period 1. Which option is chosen depends on how the benefit from consumption at home tomorrow in case of deportation is traded off with the benefit from consumption when spending all resources today. Comparing the respective utility levels $(1-\pi)\rho(a_1 + f + h - p) + \pi(a_1 + 2f)$ and $a_1 + f + (1-\pi)\rho \cdot h + \pi f$, we find that early consumption is preferred if the home bias does not exceed the threshold:

$$\tilde{\rho} = \frac{a_1 + f}{a_1 + f - p}. \tag{25}$$

The higher the home bias, the higher the utility from consuming the remaining wealth at home after deportation, and thus the lower the incentives to consume in period 1. As the fine diminishes consumption possibilities in case of deportation, $\tilde{\rho}$ increases in p.

Depending on whether consumption is early or not, we get two different expressions for

indirect period-0 utility of those intending to stay:

$$V_0^P \equiv \rho(1-\pi)(a_0-b+2h)+\pi \begin{cases} (1-\pi)\rho(a_0-b+f+h-p)+\pi(a_0-b+2f) & : \quad \rho > \tilde{\rho} \\ a_0-b+f+(1-\pi)\rho\cdot h+\pi f & : \quad \rho \leq \tilde{\rho} \end{cases}. \tag{26}$$

A higher fine reduces the utility of an individual intending to stay only if his preference for home consumption is sufficiently strong that he is willing to postpone consumption despite the expected fine.

We can now determine the threshold for return migration by comparing V_0^P and V_0^T using (26) and (9). Those with a home bias greater than or equal to:

$$\rho_p^T(h) \equiv \begin{cases} \dfrac{\pi(a_0-b+2f)}{\pi(a_0-b+f+h)+(1-\pi)p} & : \quad p < \bar{p}^T(h) \\ \dfrac{a_0-b+(1+\pi)f}{a_0-b+f+\pi h} & : \quad p \geq \bar{p}^T(h) \end{cases} \tag{27}$$

return voluntarily after period 1, and all others intend to stay. This threshold bias depends on the consumption timing of the latter, which is in turn determined by the amount of the deportation fine. If the fine is greater than or equal to:

$$\bar{p}^T(h) = \frac{\pi(f-h)(a_0-b+f)}{a_0-b+(1+\pi)f}, \tag{28}$$

the level where $\rho_p^T(h) = \tilde{\rho}$, all those with a given home wage h who intend to stay prefer to consume their entire wealth in period 1. If the fine is lower ($p < \bar{p}^T(h)$), some ($\rho \in [1, \tilde{\rho})$]) consume in period 1 and others ($\rho \in [\tilde{\rho}, \rho_p^T(h)]$) in period 2. From (28), $\frac{\partial \bar{p}^T}{\partial h} < 0$ holds: among those intending to stay, individuals with lower home wages have stronger preferences for home consumption, so it requires a more severe fine for them to advance consumption.

We can also express this threshold in terms of the home wage, by solving (28) for h, such that all migrants planning to stay who have a home wage greater than or equal to:

$$\bar{h}^T(p) \equiv f - \frac{p}{\pi}\frac{a_0-b+(1+\pi)f}{a_0-b+f} \tag{29}$$

prefer to consume in period 1 for a given deportation fine p. Those with a smaller home wage ($h < \bar{h}^T(p)$) consume in period 2. Increasing the fine turns migrants with poorer earnings opportunities at home from period-1 savers into period-1 consumers.

For migrants with a high home wage ($h \geq h^T$), deciding between permanent and no emigration only, the change in consumption timing matters as well. By analogous calculations - comparing V_0^P and V_0^H using (26) and (8) - we get the home bias thresholds:

$$\rho_p^P(h) \equiv \begin{cases} \dfrac{\pi^2(a_0-b+2f)}{\pi^2 a_0+(1-\pi^2)b-\pi(1-\pi)(f-p)+\pi(1+\pi)h} & : \quad p < \bar{p}^P(h) \\ \dfrac{\pi(a_0-b+(1+\pi)f)}{\pi a_0+(1-\pi)b+\pi(1+\pi)h} & : \quad p \geq \bar{p}^P(h) \end{cases} \tag{30}$$

with the respective deportation fine threshold:

$$\bar{p}^P(h) = \frac{a_0 - b + f}{\pi(a_0 - b + (1+\pi)f)} \cdot [\pi(1+\pi)(f-h)) - b] \tag{31}$$

and the corresponding home wage threshold $\bar{h}^P(p)$ (not shown). Again, individuals with $\rho > \rho_p^P(h)$ prefer not to emigrate at all whereas all others plan to emigrate permanently. If the fine is greater than or equal to $\bar{p}^P(h)$, everyone with the home wage h who plans to stay consumes in the first period.

Proposition 7. *Higher period 2-deportation fines diminish the total amount of illegal immigrant labor only up to the level:*

$$\hat{p} = \pi f \cdot \frac{a_0 - b + f}{a_0 - b + (1+\pi)f}. \tag{32}$$

Increasing fines above this level has no additional deterring effect.

Proof. Consider first the low wage group $h \leq h^T$. Increasing the fine fosters return incentives among migrants with a given home wage h iff $p < \bar{p}^T(h)$. This condition is unambiguously fulfilled for $p = 0$ and unambiguously violated when p is greater than or equal to $p = \bar{p}^T(0) = \hat{p}$, the maximum of (28). For the high wage group $h > h^T$, an analogous argument applies: here, increasing the fine deters initial emigration iff $p < \bar{p}^P(h)$. This condition is unambiguously fulfilled for $p = 0$ and unambiguously violated when p is greater than or equal to $\bar{p}^P(h^T)$. Simple but tedious algebra shows that $\bar{p}^T(0) > \bar{p}^P(h^T)$; thus, the maximum effective fine is given by (32). ■

Figure 2 illustrates the working of the fine for the exemplary case where $p \geq \bar{p}^P(h^T)$. In this case, the deportation fine is so high that all migrants with a high home wage $h \geq h^T$ consume in period 1 anyway, and increases of the fine affect the low home wage group only. We therefore need to look only at the expressions of the two branches of (27), and $\bar{h}^T(p)$. Increasing p reduces ρ_p^T for all migrants for whom $p < \bar{p}^T(h)$ ($h < \bar{h}^T(p)$). This means that the higher deportation fine changes the decision of some migrants who save their wealth to period 2 from staying to voluntary return. However, it also decreases $\bar{h}^T(p)$, so more migrants decide not to save but to spend their wealth in period 1 to avoid the possible payment of the fine. For a sufficiently high deportation fine (32), even migrants planning to stay who have a home wage of zero will advance consumption ($\bar{h}^T(\bar{p}^T) = 0$), and further increases in the fine will be ineffective.

We would like to highlight two properties of the maximum effective fine $\hat{p}$. First, this fine is not confiscatory in the sense that tracked migrants lose all of their accumulated lifetime earnings. Rather, it becomes confiscatory with respect to period-2 wealth because of migrants' consumption choices. In fact, it amounts to less than 50 percent of period

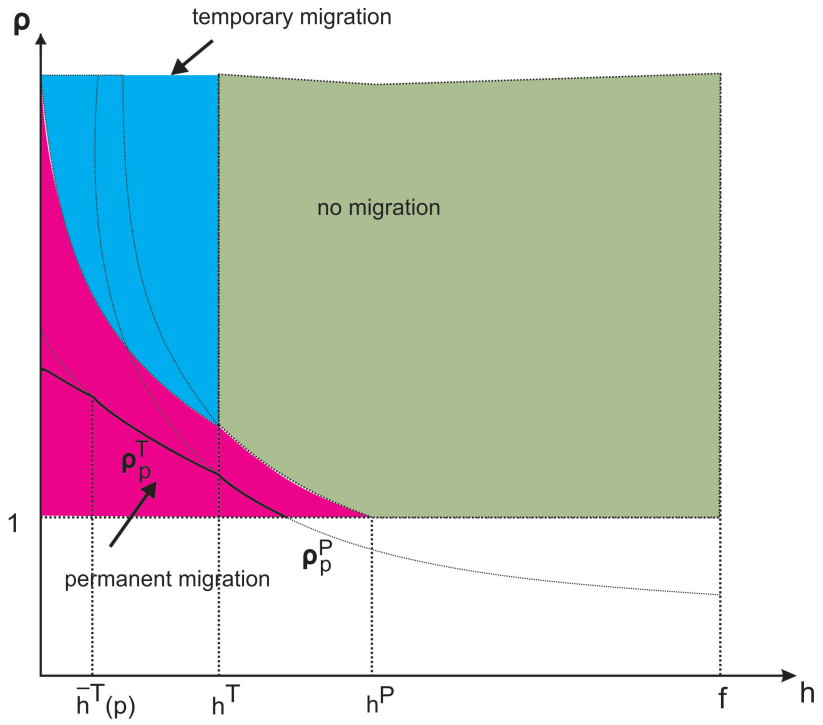

Figure 2: The pattern of migration with deportation fines

1-resources of migrants, as can be shown by rearranging (32).[20] Second, the maximum effective fine is a function of the other instruments of immigration control: the fine that induces early consumption is lower, the stricter border controls are, because then migrants are poorer. Tighter employment inspections have a similar effect, because they increase the risk of detection.

Of course, these arguments are valid only if migrants have no means to conceal their wealth from authorities in F or to remit their total wealth to the home country, which would render fines ineffective.[21] However, we think that this is unlikely and the risk of expropriation by deportation fines is relevant for illegal migrants.

Our analysis has focused on deportation fines in period 2 only. Of course, such fines could also be imposed in period 1. In the present setup, this would render the benefits from migration arbitrarily low, and the illegal inflow to F would cease for a sufficiently high fine. However, this is due to the simplifying assumption that migrants do not consume in the preceding period 0. If we allowed for consumption in period 0 as well, then the effects

[20]The maximum effective fine is a fraction $\pi \cdot f/(a_1 + (1+\pi)f)$ of period 1-resources $a_1 + f$. Suppose that migrants enter without any wealth: $a_0 = b$. Then, $\hat{p} = \pi \cdot f/(1+\pi) \leq f/2$.

[21]For temporary migrants, remittances may be a possible albeit not necessarily practical option. Permanent migrants, however, could use remittances only if they could tap their deposits in H for period-2 consumption in F.

of period-1 fines would be analogous to those derived for period 2.

5 Conclusion

This paper shows that return incentives of illegal immigrants can be crucial for the effects of illegal immigration policies. We develop a simple life-cycle model of migration to allow for both temporary and permanent migration plans. In this framework, immigration policy can affect not only the total number of illegal migrants in a given period but also their optimal migration duration. In consequence, we find that employer inspections are the only policy that can be expected to be generally effective in reducing the long-term stock of illegal immigrants. Other measures such as border enforcement and amnesties can have unintended detrimental effects on illegal immigration. Deportation fines on immigrants are effective only up to a certain point. We argue that these findings should be taken into account when designing illegal immigration policy.

Our framework can be used for addressing a variety of further issues. For example, one could analyze the effectiveness of additional policy instruments that may be considered by policymakers. Or one could analyze the issue of overstaying on (legal) temporary work permits, which is a frequent source of illegal residence in many countries. It may also be interesting to introduce financial constraints of migrants in the spirit of Friebel and Guriev (2006) to our setup.

We show that common policy instruments can have counter-intuitive and in the literature so far unconsidered effects on illegal immigration in a very parsimonious model based on standard assumptions about labor mobility. These effects carry through to natural extensions of the model such as non-linear utility and risk aversion in a straightforward way. Risk aversion will reduce the total amount of illegal immigration in our model, but not affect the qualitative effects of policies on migrants' wealth and, hence, our results.

Furthermore, we have assumed certainty of success when entering the host country (managed by professional intermediaries). When crossing the border is risky, and this risk depends positively on the intensity of border controls and negatively on migration fees and/or efforts, the overall effect of increasing the former depends on the degree of complementarity with respect to the latter. In particular, our findings would remain valid whenever migration fees increased in response to stricter controls:[22] then, even though the number of successful migrants would decline, those who would make it across the border would be poorer and hence inclined to stay longer.

Finally, we have assumed that migrants prefer to consume at home rather than abroad, all

[22]Such a positive price effect is found, for example, in Gathmann (2008) and Hanson (2009).

other things equal. This ceteris paribus condition abstracts from non-economic factors in source countries such as poor humanitarian conditions, civil wars and political oppression, which make consumption at home unattractive. However, available empirical evidence cited in this paper shows that return incentives exist for a substantial fraction of illegal migrants. We therefore believe that our analysis picks up an aspect of illegal immigration that is both important for policy and insufficiently investigated in the literature so far.

References

Bean, F.D., E.E. Telles and B.L. Lowell (1987), Undocumented migration to the United States: Perceptions and evidence, Population and Development Review, 13, 671-690.

Bond, E. and T. Chen (1987), The welfare effects of illegal immigration, Journal of International Economics, 23/3-4, 315-328.

Borjas, G.J., R. Freeman and K. Lang (1991), Undocumented Mexican-born workers in the United States: How many, how permanent?, 77-100, in: M. Abowd and R.B. Freeman (eds.), Immigration, trade, and the labor market, Chicago, IL: University of Chicago Press.

Carter, T. (1999), Illegal immigration in an efficiency wage model, Journal of International Economics, 49, 385-401.

Chau, N. (2001), Strategic amnesty and credible immigration reform, Journal of Labor Economics, 19/3, 604-634.

Chiswick, B. (1988), Illegal immigration and immigration control, Journal of Economic Perspectives, 2/3, 101-15.

Conligio, N., G. De Arcangelis and L. Serlenga (2009), Intentions to return of clandestine migrants: The perverse effect of illegality on skills, Review of Development Economics, 13, 641-657.

Djajic, S. (1987), Illegal aliens, unemployment and immigration policy, Journal of Development Economics, 25, 235-249.

Djajic, S. (1999), Dynamics of immigration control, Journal of Population Economics, 12, 45-61.

Djajic, S. and R. Milbourne (1988), A general equilibrium model of guest-worker migration: A source-country perspective, Journal of International Economics, 25, 335-351.

Dustmann, C. (1995), Savings behavior of migrant workers: A life-cycle analysis, Zeitschrift fuer Wirtschafts- und Sozialwissenschaften, 115, 511-533.

Dustmann, C. (1997), Return migration, savings and uncertainty, Journal of Development Economics, 52, 295-316.

Dustmann, C. (2003), Return migration, wage differentials, and the optimal migration duration, European Economic Review, 47/2, 353-369.

Dustmann, D. and O. Kirchkamp (2002), The optimal migration duration and activity choice after re-migration, Journal of Development Economics, 67, 351-372.

Entorf, H. (2002), Rational migration policy should tolerate non-zero illegal migration flows: Lessons from modelling the market for illegal migration, International Migration 40, 27-43.

Epstein, G., A. Hillman and A. Weiss (1999), Creating illegal immigrants, Journal of Population Economics, 12/1, 3-21.

Epstein, G. and A. Weiss (2001), A theory of immigration amnesties, CEPR Discussion Paper 2830.

Ethier, W. (1986), Illegal immigration: The host-country problem, American Economic Review, 76, 51-71.

Friebel, G. and S. Guriev (2006), Smuggling humans: A theory of debt-financed migration, Journal of the European Economic Association, 4, 1085-1111.

Gathmann, C. (2008), Effects of enforcement on illegal markets: Evidence from migrant smuggling along the Southwestern border, Journal of Public Economics, 92, 1926-1941.

Hanson, G., R. Robertson and A. Spilimbergo (2002), Does Border Enforcement Protect U.S. Workers From Illegal Immigration?, The Review of Economics and Statistics, 84, 73-92.

Hanson, G., K. Scheve, M. Slaughter and A. Spilimbergo (2002), Illegal immigration, 207-231, in: Boeri, T., G. Hanson and B. McCormick, eds., Immigration policy and the welfare system. Oxford University Press.

Hanson, G. (2009), The economics and policy of illegal immigration in the United States, Washington, DC: Migration Policy Institute.

Hill, J. (1987), Immigrant decisions concerning duration of stay and migration frequency, Journal of Development Economics, 25, 221-234.

Human Rights Watch (2009), Italy: Reject anti-migrant bill, available at: http://www.unhcr.org/refworld/docid/4a3f8d3ec.html.

International Labour Organisation (2004), Towards a fair deal for migrant workers in the global economy, Report VI, International Labour Conference, 92nd Session, International Labour Office, Geneva.

IOM (2003), World migration report: Managing migration, challenges and responses for people on the move, International Organization for Migration, Geneva.

Massey, D. and Z. Liang (1990), Effects of the Immigration Reform and Control Act of 1986: Preliminary data from Mexico, 183-210 in: F.D. Bean, B. Edmonston and J.S. Passel, eds., Illegal immigration to the United States: The experience of the 1980s. Washington, D.C.: Urban Institute Press.

Mayr, K., S. Minter and T. Krieger (2012), Policies on illegal immigration in a federation, Regional Science and Urban Economics, 42/1-2, 153-165.

Mesnard, A. (2004), Temporary migration and capital market imperfections, Oxford Eco-

nomic Papers, 56, 242-262.

Reyes, B. I. (1997), Dynamics of immigration: Return migration to Western Mexico, Public Policy Institute of California, San Francisco.

Stark, O., C. Helmenstein and Y. Yegorov (1997), Migrants saving, purchasing power parity, and the optimal duration of migration, International Tax and Public Finance, 4, 307-324.

Winegarden, C.R. and L.B. Khor (1991), Undocumented Immigration and Unemployment of U.S. Youth and Minority Workers: Econometric Evidence, The Review of Economics and Statistics 73, 105-112.

Woodland, A.D. and C. Yoshida (2006), Risk preference, immigration policy and illegal immigration, Journal of Development Economics 81, 500-513.

Yoshida, C. (2000), Illegal immigration and economic welfare, Physica-Verlag, Heidelberg.