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ABSTRACT

Smuggling Humans: A Theory of Debt-Financed Migration*

We introduce financial constraints in a theoretical analysis of illegal immigration. Intermediaries finance the migration costs of wealth-constrained migrants, who enter temporary servitude contracts to pay back the debt. These debt/labor contracts are more easily enforceable in the illegal than in the legal sector of the host country. Hence, when moving from the illegal to the legal sector becomes more costly, for instance, because of stricter deportation policies, fewer immigrants default on debt. This reduces the risks for intermediaries, who are then more willing to finance illegal migration. Stricter deportation policies may thus increase rather than decrease the ex ante flow of illegal migrants. We also show that stricter deportation policies worsen the skill composition of immigrants. While stricter border controls decrease overall immigration, they may also result in an increase of debt-financed migration.

JEL Classification: O15, O17, J61, N21

Keywords: illegal migration, wealth constraints, indentured servitude, financial contracting

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1 Introduction

Illegal migration is a problem of growing scale and importance. According to the most conservative estimates (Skeldon, 2000), the worldwide stock of irregular migrants exceeds 10 million. The International Organization for Migration estimates that half of all new entrants into developed economies are illegal (IOM, 2003). According to the United Kingdom Home Department, 75% of illegal migrants use the expensive services of smugglers (see IOM, 2003, page 63). Migrants and their families often cannot self-finance these costs, that commonly reach several tens of thousands of US dollars. Hence, migrants endebt themselves. Smugglers and other intermediaries finance the costs of undocumented entry, and the debt repayment is taken out of migrants' wages in sweatshops and restaurants that are related to these intermediaries (Chin, 1999, IOM, 2000).

Owing to its multi-billion USD size (Kyle and Koslowski, 2001) and its inhumane nature, human smuggling causes much concern in public opinion. Given increasing international wage differentials, unstable political circumstances and the importance of financial constraints in most source countries of migration, the demand for human smuggling services may rise further. It is therefore important to consider the interactions between wealth-constrained migrants and intermediaries in an economic theory of illegal migration. To the best of our knowledge, our paper is the first attempt to do this.

In our theory, the government can use two policy variables to fight illegal migration: external enforcement (e.g., stricter border controls) and internal enforcement (e.g., stricter deportation policies). In Ethier's (1986) model on illegal migration and other papers building on his work, these policies have similar, negative effects on illegal immigration. The effect of border controls is in our framework is similar to the literature, but the effect of stricter deportation policies differs substantially. In our model, stricter deportation policies may increase rather than decrease the flow of illegal migrants. We also show that they worsen the skill composition of immigrants.

We derive these results in a model of financial contracting between wealth-constrained migrants and intermediaries. There is a source country from which workers may wish to migrate to earn higher wages in the host country. In the host country there are an illegal and a legal sector. Migration costs must be paid upfront, but many potential migrants do not have enough cash. Wealthy intermediaries/smugglers can provide migrants with funds. If the migrant has no collateral, there is only one way to make the debt contract between intermediary and migrant enforceable: The migrant commits his workforce to the exclusive use of the intermediary in the source country, until the debt is paid back. We will refer to

these contracts as "debt/labor contracts".

Debt/labor contracts collide with labor law. In the illegal sector, the debtholders can enforce the contract through coercion. This is more difficult in the legal sector where the migrant receives some protection from the country's legal system. Thus, migrants who move successfully to the legal system can default on their debt payment. But, there are costs of moving to the legal sector. In the legal sector, migrants become visible to law enforcement agencies, which exposes them to higher risks of being deported to the source country. When deportation policies become stricter, migrants are hence less likely to default on debt repayments by moving to the legal sector. In this framework, more intensive border controls and stricter deportation policies do *not* have the same effects on the flow of illegal migrants.

Stricter border controls decrease the net present value of migration, and, hence, reduce the flow of illegal migrants. The effect of stricter deportation policies is more subtle as they affect the contractual relationship between migrants and intermediaries. As pointed out before, higher risks of deportation reduce the chances that illegal migrants default on their debt repayments. This implies that financing migrants becomes more rewarding for intermediaries and, hence, that the flow of migrants financed by debt/labor contracts increases. At the same time, the net present value of migration for wealthier self-financed migrants decreases, which reduces their inflow. The net effect on total migration flows is ambigious, but migrant skill composition deteriorates unambigiously, given the strong positive correlations between wealth and skills in developing countries (Piketty, 2000).

Our results hold under the following crucial assumptions. First, we presume that migrants' wealth constraints are binding. Our theory therefore applies mainly to long-haul migration, for instance from China or South Asia to the US or EU, where migration costs are too high to be paid upfront. It may be less appropriate for short-haul migration, for instance, between Mexico and the US, or Albania and Italy, although even here, prices for illegal immigration appear to increase, making it more likely that migrants need external sources of finance. Second, we assume that the attempt to obtain legal status in the host country increases an illegal immigrant's risks of being deported. Third, it is harder to enforce the debt/labor contract when migrants have successfully moved to the legal sector of the host country; intermediaries cannot inflict infinitely costly penalties on defaulting migrants in the legal sector.

Finally, our model assumes rational behavior of migrants and intermediaries, and that nobody is forced or tricked to enter a debt/labor contract. We do not look at involuntary

slavery, which is an important problem, but is mostly unrelated to international migration (Bales, 2000). We also distinguish voluntary debt/labor contracts under more or less perfect information from human trafficking, which involves manipulation of information and ex ante kidnapping/coercion.

There is a growing theoretical literature that investigates the effects of host country policies on illegal immigration. Ethier (1986) introduced a theoretical framework in which governments optimally use a mix of external and internal enforcement mechanisms, in particular, employer sanctions to combat illegal immigration. Recent papers have studied the dynamic issues of illegal immigration control. Epstein et al. (1999) look at the problem of migrants who enter legally and subsequently move into the illegal sector in order to avoid deportation. Chau (2001) argues that amnesties for illegal immigrants can help deal with issues of time inconsistency of employer sanctions. Epstein and Weiss (2001) investigate the strategic interaction of immigrants and host countries and the optimal design of amnesties. Djajic (1999) argues that stricter immigration control may be counterproductive as migrants may move into new sectors and new areas, where new migration networks may form.

Our paper is building on the model of Ethier (1986). We, however, do not consider employer sanctions, as these happen to be rarely enforced (see Chau, 2001, for a discussion of credibility of employer sanctions and stylized facts). Rather, we focus on border controls and deportation policies. We do not stress the dynamic aspect of immigration control to the same extent as the recent literature has done. Our main contribution is to take into account the fact that migrants are wealth-constrained and that they deal with intermediaries. When one considers the contractual interaction between intermediaries and migrants (in contrast to the literature), stricter border controls and stricter deportation policies have quite different effects on the flow and composition of illegal migrants.

The empirical literature on effects of policies on illegal immigration is rather scarce. This is not surprising as illegal immigration is by definition a clandestine activity and reliable data are hard to obtain. Also, policy changes do not occur in controlled environments. They are endogenous to the inflow of migrants, which, with the given data, makes it quite hard to properly correlate changes in policies with changes in immigrant flows. Moreover, illegal migration is a relatively new phenomenon by historical standards. Past migration waves were driven by income differentials in similar ways as current migration. It has always been expensive to migrate, and migrants have always been subject to financial constraints.[1] What

[1]See Chiswick annd Hatton (2002) and O'Rourke and Williamson (1999) for an overview on current and past migration.

distinguishes the present wave of migration from the previous ones is that nowadays host country governments undertake efforts to restrain and deter migrants.

In principle, there are three types of policies against illegal immigration: (i) border controls, (ii) deportation and legalization policies, and (iii) worksite inspections/raids and sanctions against employers of illegal immigrants. We are not aware of any evidence about the effect of sanctions against employers of illegal immigrants, because they are very rarely applied.[2] Given that employer sanctions appear to be irrelevant, we will focus on border controls, deportation and legalization policies. Rather little is known about the effects of these policies. Hanson et al. (2002b) show that border controls deter immigration to a limited extent and that they are very costly. Donato et al. (1992) find that stricter deportation rules and stricter border controls in the framework of the Immigration Reform and Control Act (IRCA) had no significant effect on the flow of migrants. There are a number of studies that look at the effect of legalization on migrants' earnings (for instance, Kossoudji and Cobb-Clark, 2002, Rivera-Batiz, 1999), but there are no studies that look at how changes in deportation and legalization policies affect migrant flows. It thus seems to make much sense to continue theoretic work on the effects of different policies, taking into account the so far black-boxed relationship between intermediaries and migrants.

The paper proceeeds as follows. The next section summarizes briefly what is known about the relationship between intermediaries and immigrants and motivates the assumptions of our theory. Section 3 sets up the model. Section 4 establishes the main results. Section 5 relaxes some assumptions and investigates the comparative statics of stricter border controls and stricter deportation policies. It also establishes the additional result that stricter border controls may result in an increase of debt-financed migration. In Section 6 we argue that our results are robust and do not depend much on the specific setting. We also discuss normative considerations, to what extent the theory applies to human trafficking, and what can be learnt from the history of migration through indentured servitude to the British colonies in the 17th and 18th century. Section 7 concludes.

[2]According to Hanson et al. (2002a) in 1990 less than eight percent of INS enforcement manpower was devoted to worksite inspections, and less then one percent of the 1.5 million apprehensions were made at worksites. IOM (2003) reports that the number of UK employers who were fined under the Asylum and Immigration Act of 1996 were zero in 1997, one in 1998, nine in 1999, and 23 in 2000.

2 Relationship between intermediaries and migrants

Most of the available sociological and criminological research on debt-financed migration concerns illegal migration from China, which appears to be the most important source country for long-haul illegal migration under wealth constraints. Similar but less well researched arrangements are also reported for other source countries, for instance, the Balkans (Business Week, 2000) and India (INS, 1998a). We here present evidence about a) information available to potential migrants, b) debt/labor contracts between intermediaries and migrants, c) the organization of intermediaries, and d) repayment of debt. The facts presented below motivate the setting of the model.

Information: There are important and often blurred distinctions between human trafficking and smuggling (see Laczko, 2002, Salt, 2001). The availability of information is crucial. Young women and children are sometimes tricked or forced into prostitution, but it appears that most migrants know quite well what to expect (Skeldon, 2000). This concerns not only the costs and non-monetary risks involved with illegal migration, but also the initially poor living conditions in host countries. Chin (2001) shows that most Chinese migrants come from the same few provinces. They benefit from the information of relatives and friends who have migrated before. Some pieces of information may be lacking, but this can only be a transitory phenomenon. O'Rourke and Williamson (1999) document that even 19th century migrants were well informed about their prospects, at a time when information travelled by boat. There is little reason to believe that in the presence of information and telecommunication technologies, informational frictions would persist for long.

Debt/labor contract: Costs of migration are high, and only few wealthy individuals or families can afford to self-finance migration. For instance, China-US smuggling fees reached USD 35,000 in mid 1990s and continued to rise to USD 40-50 thousand since then (Chin, 1999, Kwong, 1997, 2001, INS, 1998b, New York Times, 2000b). The fees for passage from China to Europe, or from India to the US are lower but still above USD 20,000 (Business Week, 2000, New York Times, 2000a, INS, 1998a). It is interesting that within the same route (e.g. Fujian – New York) fees do not seem to vary substantially across individuals.

A survey of 300 illegal Chinese immigrants from Fujian province shows that 90% had to borrow for paying the fee, even though the province is among the richest ones in China (Chin, 1999). However, many potential migrants have access to intermediaries who arrange air, sea or ground transport, provide forged documents and assist in entering the country of destination. Long-haul migration is organized (Schloenhardt, 1999) in rather similar ways whether migrants come from China, Russia (Finckenauer, 2001), or Asia (Business Week,

2000). The migrant may or may not pay a downpayment of up to 20 percent of the total fee. Smuggler networks arrange the transfer to the host country, by sea, land or air transport. They also help to enter the host country. Upon arrival, the migrant is usually kept in a "safe house" or sweatshop until the debt has been paid back to the smuggler or related businesses. The migrant thus provides his labor as collateral to the smuggler or its business partners until the debt is paid back.

Organization of intermediaries: There is agreement that the supply side of the market for illegal migration consists of an oligopoly of well-organized and profitable networks of intermediaries (Schloenhardt, 1999, INS, 1998b). Smugglers oftentimes re-invest the returns into the smuggling business (Chin and Zhang, 2002), which indicates that they have long-term horizons. Reputational concerns appear to keep smugglers and their partners from treating migrants too badly or from extending their temporary servitude unduly. In particular, workers are usually set free after the debt has been paid back (Chin, 1999). Otherwise, new migrants would barely enter contractual relationships with smugglers.

Repayment of debt: Sometimes, relatives of the migrant pay the debt, but usually the migrant works in businesses associated with the intermediary he used, and the debt is paid back from his wage. In the case of Fujian Chinese, repayment takes between half a year and four years with an average of 26 months (Chin, 1999, p. 119). Much of the illegal migration business appears to follow the spirit of the debt/labor contract quite closely.

3 The model

There are two players, M and I. A potential migrant M ('he', occasionally also called "the worker") lives in the source country and wishes to migrate to the host country, which does not permit legal entry. Thus, M needs the services of a smuggler or intermediary I ('it'). The migrant is wealth-constrained, while the intermediary has unlimited access to credit at zero cost. Government policies are modelled in terms of comparative statics.

Below we formulate two assumptions that are crucial for our theory. Their role is further discussed in Section 6.1.

Assumption 1 *Moving from the illegal to the legal sector of the host country exposes illegal migrants to higher risks of being deported.*

We will assume that the risk of being detected is zero as long as the migrant stays in the illegal sector (which makes sense in the absence of systematic employer checks). But,

when moving out of the illegal sector, a migrant becomes more visible for public enforcement agencies, especially if the migrant wants to obtain a legal job and protection from smugglers. This exposes him to a higher risk of being arrested and deported.

Assumption 2 *It is harder to enforce the debt/labor contract when migrants have obtained legal status.*

This assumption states that being legalized, migrants receive some protection against coercion and that intermediaries cannot inflict infinitely harsh punishments on defaulting migrants. In what follows, we will assume for simplicity that there is perfect enforcement of the debt/labor contract in the illegal sector, while in the legal sector, M is perfectly protected from coercion by I. In subsection 6.1, we argue that the results hold unless the enforcement of debt/labor contracts is equally strong in both sectors.

3.1 Timing and migration contract

The parties maximize their respective payoffs U^M (migrant) and U^I (intermediary), over two periods. Without loss of generality, the time discount is zero. Figure 1 shows the timing.

At the beginning of the *first* period, M makes I a take-it-or-leave-it offer.[3] The contract specifies that I pays the costs of taking M to the illegal sector of the host country and that M is supposed to make a downpayment p_1 that is not exceeding the migrant's initial wealth a, and a payment p_2 in the second period. The migrant owns no collateral other than his labor. Hence, the contract stipulates that until p_2 is paid, I or its business partners[4] own the revenue of M's work. This contract puts M in a situation of temporary, voluntary servitude. The intermediary either accepts or rejects the offer. If I rejects and M stays (index "s") in the source country, the payoffs are:

$$\begin{aligned} U_s^M &= a + \omega, \\ U_s^I &= 0. \end{aligned}$$

[3]This implies that the market for smugglers is competitive, a simplifying assumption that is not important for the results. A model with intermediaries' market power would shift rents from M to I (via charging fees equal to maximum willingness to pay) but would not alter the flows and composition of migration. Anecdotal evidence (Section 2) suggests that there is certain competition between smugglers: fees depend on routes (the longer/difficult routes are more expensive); also, given the route there seems to be no evidence of price discrimination across migrants.

[4]It does not matter for our results whether or not the intermediary is integrated with sweatshops or whether they have contractual relations. The migrant can indeed be "sold" or "rented" to a business partner.

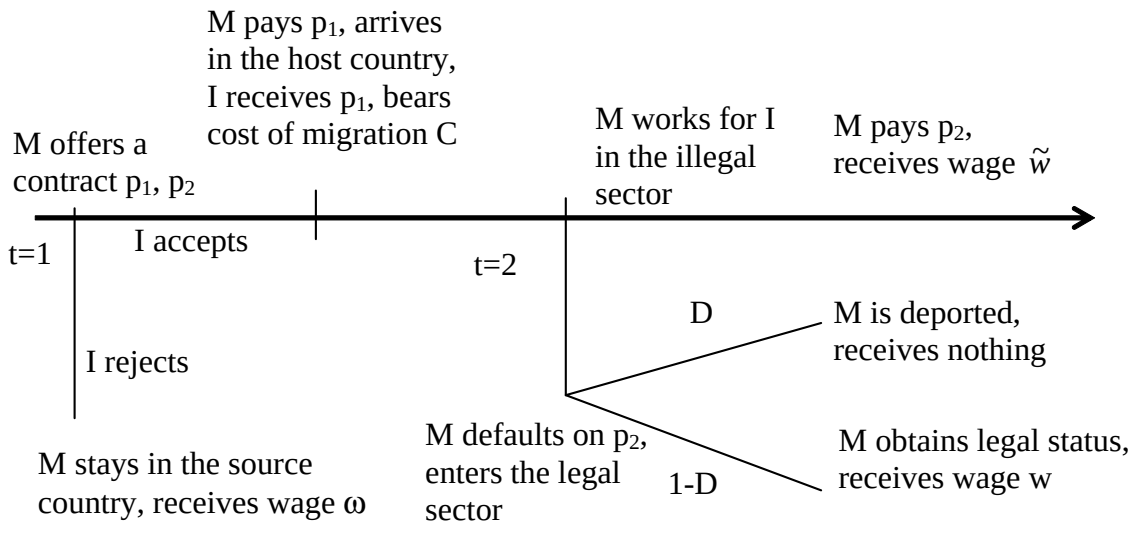

Figure 1: Timing.

Here, ω is M's wage in the source country. If I accepts the offer, M migrates. Migration involves costs of entry into the host country C that are borne by I. These costs C are the first policy variable of the model: stricter border controls increase C. During the *second* period, M either stays in the illegal sector working for I or tries to enter the legal sector. In the illegal sector of the host country, I appropriates the product of $M's$ work up to p_2; M receives the residual. The total payoff of M when staying in the illegal sector (index "i") is thus:

$$U_i^M = a - p_1 + \widetilde{w} - p_2,$$

where $\widetilde{w}$ is the M's wage in the illegal sector. The payoff of I is:

$$U_i^I = p_1 + p_2 - C.$$

If M tries to receive legal status, there are benefits and costs. When the move is successful, M's wage increases from $\widetilde{w}$ to w. As the legal system protects M against coercion by I, M then reneges on the payment of p_2. On the cost side, M increases his risk of deportation. We here normalize the deportation risk in the legal sector to nil, and label D the deportation risk when applying for legal status. Probability D is the second policy variable of the model. Stricter deportation policies increase D.

If M applies for the legal status, his payoff is as follows (indices "l" if M receives legal

status, "d" if he is deported to the source country):

$$\begin{aligned} U^M = U_l^M &\equiv a - p_1 + w, \quad \text{with probability } 1 - D, \\ U^M = U_d^M &\equiv a - p_1, \qquad\quad \text{with probability } D. \end{aligned}$$

If M becomes a legal resident, he defaults on his debt and receives his full legal wage. If deported, M receives $a - p_1$: he cannot pay p_2 and does not receive any labour income. For simplicity's sake we assume that migration and deportation take up all M's time so he forgoes the home country wage ω. One could also consider a model where M would still be able to earn some wage at home upon deportation; the results would not change qualitatively.

The respective payoffs for I are:

$$U_l^I = U_d^I = p_1 - C,$$

because whenever M attempts to move to the legal sector, I does not receive p_2, while, at this stage, the cost of immigration C has already been sunk.

3.2 Assumptions on wealth and returns to skills

We here make some simplifying assumptions. There are only two types of migrants, high- and low-skilled (in Section 5, we will look at a continuum of skills). We assume the simplest possible returns to skills:

$$\omega = \begin{cases} \omega^H, & \text{if } a \geq C \\ \omega^L, & \text{if } a < C \end{cases}, \ \omega^H > \omega^L;$$

and

$$w = \begin{cases} w^H, & \text{if } a \geq C \\ w^L, & \text{if } a < C \end{cases}, \ w^H > w^L.$$

Wealth and skills are perfectly correlated. If M has $a \geq C$ ($a < C$) cash, he has high (low) skills, that is, high-skilled workers have enough cash to finance their migration, while low-skilled workers do not. Also, workers who are high- (low-) skilled in one country, are high- (low-) skilled in the other country as well. In Section 5, we show that our results hold qualitatively under relaxed assumptions about wealth/skill correlations.

We further assume that in the illegal sector of the host country, the skill premium is nil. That is, $\widetilde{w}$ does not depend on whether $\omega = \omega^H$ or $\omega = \omega^L$. More generally, one can assume that the sensitivity of wage with respect to skills is larger in the legal sector than in the illegal sector. This leads qualitatively to the same results. The assumption reflects the

fact that independently of their skills, illegal workers usually work in low-skilled jobs, for instance, in the garment industry or restaurants (Kwong, 2001). By definition, illegal jobs are in such sectors because large and capital-intensive firms cannot operate illegally.

4 Equilibrium migration and policy effects

As a benchmark, we first look at the case in which there is no intermediary. Here, M must pay the cost of migration upfront, that is, the contract space degenerates to: $p_1 = C$ and $p_2 = 0$. Under our assumptions, a low-skilled M ($a < C$) cannot migrate because the liquidity constraint is binding. Furthermore, if

$$\widetilde{w} - C < \omega^H, \tag{1}$$

high-skilled workers ($a > C$) are not interested in migrating to stay in the illegal sector. In what follows we assume for simplicity that condition (1) holds. To check whether high-skilled workers migrate in order to try attaining legal status, we compare $(1-D)U_l^M + DU_d^M$ with U_s^M. This leads to a simple condition: migration only occurs if

$$(1-D)w^H > \omega^H + C. \tag{2}$$

The left-hand side (LHS) represents the expected wage in the legal sector (with probability D, M is deported home), and the RHS is a skilled worker's payoff when staying in the source country. Summarizing, in this benchmark, only the wealthier individuals migrate, and the policy effects are as expected: When D or C increase, migration becomes less likely. We now look at the equilibrium with intermediary and obtain the first Proposition.

Proposition 1 *Assume that condition (1) holds (i.e. the high-skilled workers are not interested in illegal migration). Then, equilibrium is as follows:*

1. *Low-skilled workers ($a < C$) migrate if and only if:*

$$a \geq C - \left(\widetilde{w} - (1-D)w^L\right). \tag{3}$$

   The migrant does not attempt to move to the legal sector. The contract stipulates $p_1 = a$ and $p_2 = C - a$.

2. *High-skilled workers ($a \geq C$) migrate if and only if (2) holds, and subsequently try to attain legal status. The contract stipulates $p_1 = C$ and $p_2 = 0$.*

3. No other migration occurs.

To understand Proposition 1, consider first the migrant's choice. He decides whether or not to migrate, and whether or not to try moving from the illegal to the legal sector subsequently. We thus look at M's payoffs for the three outcomes: "stay in the source country" ($U_s^M = a + \omega$), "migrate and work in the illegal sector" ($U_i^M = a - p_1 + \widetilde{w} - p_2$), "migrate and apply for legal status" $\Big[(1-D)U_l^M + DU_d^M = a - p_1 + (1-D)w\Big]$. The migrant maximizes his payoff subject to satisfying I's individual rationality constraint (IR), that is, the expected payoff of I at the time the contract is signed must be larger or equal zero. For high-skilled migrants this does not cause problems. They pay C upfront to the intermediary and subsequently try to attain legal status. To use a parallel from corporate finance, they behave like self-financed entrepreneurs, who migrate if the net present value of migration exceeds the one of staying home. The low-skilled workers' case is more complicated. They can only pay a part of the total cost upfront. The intermediary is hence only willing to finance migration if the migrant does not attempt to move from the illegal to the legal sector. Put differently, the debt/labor contract is "incentive-compatible" if and only if $\widetilde{w} - p_2 \geq (1-D)w^L$, i.e.

$$p_2 \leq \widetilde{w} - (1-D)w^L. \tag{4}$$

Using another parallel from corporate finance, the liquidity-constrained (low-skilled) migrant behaves like a debt-financed entrepreneur. There is a risk that he defaults on his debt by trying to attain legal status. The term $\widetilde{w} - (1-D)w^L$ represents the value of the "pledgeable income" in the debt contract between M and I. Pledgeable income (see Tirole, 2001) is the maximum amount that M can credibly commit to pay back; therefore it is also the maximum amount that I is willing to lend M. Hence, the participation constraint of the intermediary $U^I \geq 0$ is satisfied only if $a + \widetilde{w} - (1-D)w^L - C \geq 0$, which is equivalent to (3) stated in the Proposition.

Consider now the effect of changes in policies C and D on immigration of high- and low-skilled workers.

Proposition 2 *Comparative statics.*

1. *An increase in C, i.e., stricter border controls, makes migration of low-skilled and high-skilled migrants less likely.*

2. *An increase in D, i.e., stricter deportation and legalization rules, makes migration of (i) low-skilled workers more likely and of (ii) high-skilled workers less likely.*

Proposition 2 entails the main policy implication. Unlike in the benchmark, stricter border enforcement and stricter deportation policies are not equivalent when wealth constraints and intermediaries are taken into account. When C increases, the effects on low and high-skilled workers are similar – the value of migration as an investment decreases. But, when D increases, the effects are different. For low-skilled migrants, condition (3) becomes *more* likely to hold. Then, the risk of M's default on p_2 decreases. The individual rationality constraint of the intermediary is more likely to be satisfied and as a result, migration of the low-skilled becomes more likely. For high-skilled migrants, condition (2) becomes *less* likely to hold when D increases, that is, high-skilled workers find migration to the host country's legal sector less attractive. While the total effect on the flow of migrants is ambigious, it follows from the above discussion that the skill composition deteriorates when D increases. The effect on skill composition of an increase in C is ambigious, because it reduces the flow of both high- and low-skilled migrants.

5 Generalized model

We now drop the assumption of perfect correlation between skills and wealth. We also consider a continuum of workers. This allows a better comparison of the effects of stricter border controls *vs* stricter deportation policies. The modified model generates an additional result: stricter border controls may induce illegal migrants to move from self-financed migration to debt/labor contracts.

The source country is populated with a continuum of workers whose mass is normalized to 1. There are two types of workers: high-skilled with home wage ω^H, and low-skilled with wage ω^L. The share of high-skilled workers is λ. Wealth among high-skilled (low-skilled) workers is distributed according to a c.d.f. $F_H(a)$, $(F_L(a))$. The corresponding density functions are $f_H(a)$ and $f_L(a)$. Thus, for a migrant with skills $j = L, H$, the probability to have wealth in a range $[a, a + da]$ is $f_j(a)da$. For simplicity, we maintain the assumptions that high-skilled workers are not migrating to stay in the illegal sector (condition (1)) and that there is no skill premium in the illegal sector ($\widetilde{w}$ is the same for low and high-skilled). Relaxing these assumptions would not change the results but would generate additional economically uninteresting case distinctions. Wage in the legal sector depends on skills. Low-skilled workers earn w^L in the legal sector, while high-skilled workers earn wage w^H. The low-skilled wage is distributed on $[\underline{w}^L, \overline{w}^L]$ with c.d.f. $G_L(w^L)$; the high-skilled wage is distributed on $[\underline{w}^H, \overline{w}^H]$ with c.d.f. $G_H(w^H)$. The corresponding density functions are g_L

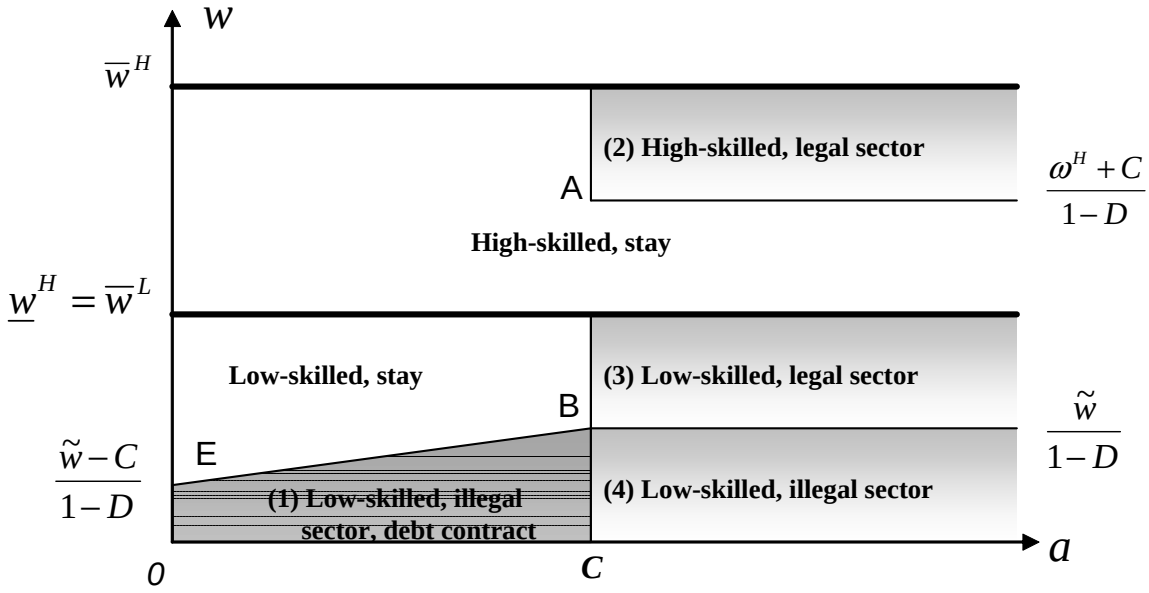

Figure 2: Migration flows in the generalized model.

and g_H. To make things simple, we assume $\underline{w}^L = 0$, and $\underline{w}^H = \overline{w}^L$. Skills are not correlated with wealth.[5]

The analysis is similar to that of Section 4. Lemma 1 (in the Appendix) states the precise expressions for different types of migrant flows. Figure 2 plots how these flows depend on migrant wages w and initial wealth a. Wealthy workers who can self-finance migration are located to the right of $a = C$, while wealth-constrained workers are to the left. Area (1) represents low-skilled workers, who migrate to the illegal sector, stay there and finance migration through a debt-labor contract. The line EB is determined by the migrant's incentive constraint (that is, the pledgeable income being above the amount borrowed $C-a$). The intermediary will only finance wealth constrained workers with low skills (below EB). Indeed, if the migrant expects to get a high wage in the legal sector, the temptation to default on the debt is very strong, and the pledgeable income is not sufficient to cover I's costs.

Area (2) represents high-skilled, self-financed workers who migrate and subsequently try moving to the legal sector. Indeed, by assumption, high-skilled workers do migrate to stay in

[5]If we allowed for arbitrary interdependence between a and w, the analysis would remain qualitatively the same but the formulas in the Appendix would become more involved.

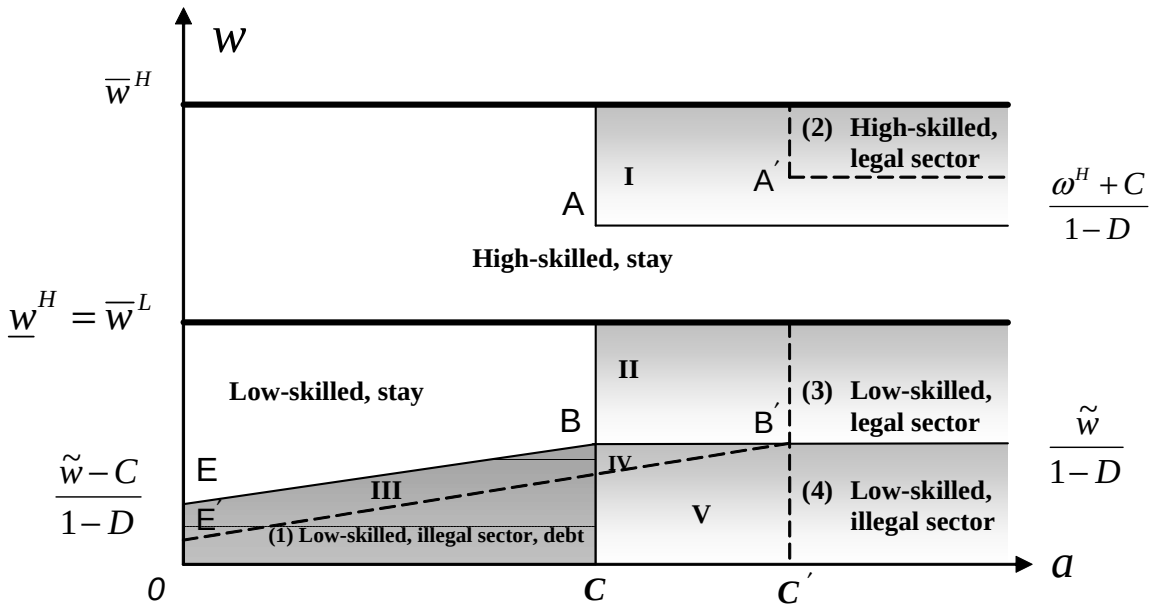

Figure 3: Comparative statics: the effect of stricter border enforcement (an increase from C to C').

the illegal sector (the horizontal line, originating at A, represents the points at which high-skilled workers are indifferent between migrating or staying). On the other hand, migration to the legal sector can only be self-financed, since the intermediaries expect M to move to legal sector and default on the debt.

While cases (1) and (2) are similar to Proposition 1, (3) and (4) emerge because we drop the correlation between skills and wealth. Wealthy low-skilled workers can migrate without entering a debt/labor contract. Depending on their wages, they either try moving to the legal sector or stay in the illegal sector.

Comparative statics results can be found in Lemma 2 in the Appendix. Figure 3 illustrates the effects of stricter border enforcement policies (an increase of C to C'). The direct effect of this change is that fewer workers can self-finance their migration. Second, the net present value of migration for high-skilled workers decreases (shift from A to A'). Finally, the line BE shifts to $\mathsf{B}'\mathsf{E}'$. All effects have the same direction: They reduce migration flows (areas I to IV) as expected and predicted by other models. However, there is also a new effect. Area V depicts workers who are induced to move from self-financed migration to debt/labor contracts when C increases. While their wealth does not suffice anymore to pay the cost of

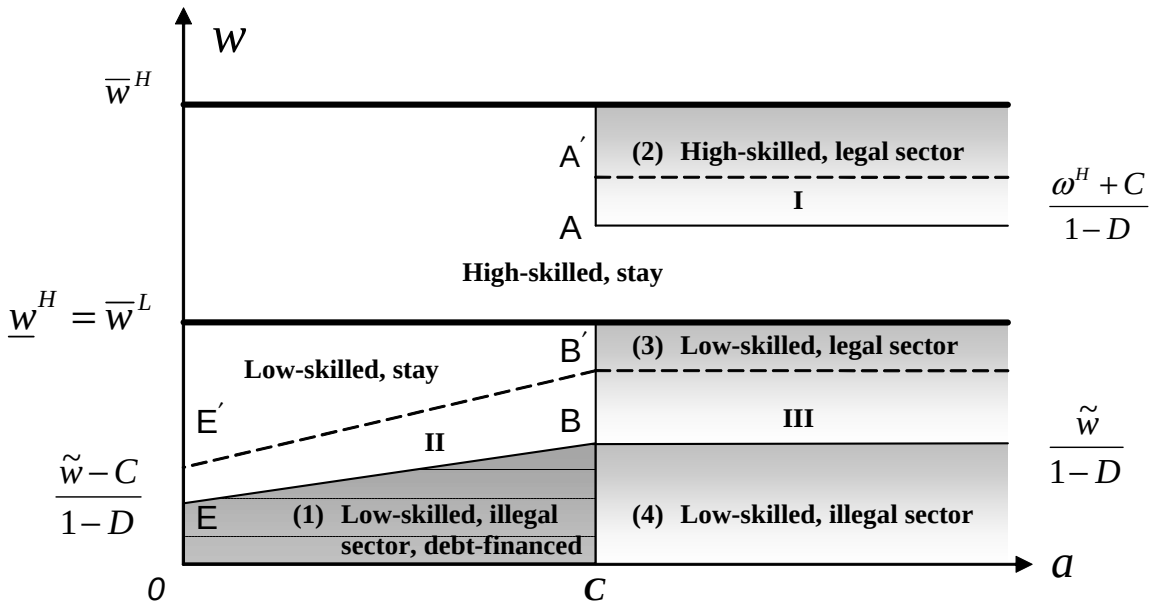

Figure 4: Comparative statics: the effect of stricter deportation policy (increase in D).

migration themselves, the pledgeable income is large enough for the intermediary to break even. This effect emerges in the general model because we allow for imperfect correlation between wealth and skills (so there are self-financed low-skilled illegal immigrants) . Notice also that while an increase in C reduces the flow of all types of migrants, the effect on skill composition is ambigous.

Figure 4 illustrates the effect of stricter deportation policies (an increase of D to D'). The net present value of migration for high-skilled workers decreases, which reduces their influx (area I). However, when moving to the legal sector becomes less attractive, it is easier for the intermediary to recover its investment (the pledgeable income of wealth-constrained workers increases). Hence, a greater number of low-skilled workers migrate (area II). Area III represents wealthy low-skilled workers who stay in the illegal sector rather then move to the legal sector.[6] As more low-skilled and less high-skilled migrate, migrant skill composition deteriorates.

The comparative statics in the general model suggests that the interaction of policies is more nuanced than the simple model (Section 4) would suggest. Indeed, if one wants to eliminate debt/labor migration without raising total inflow of workers, the simple model

[6]This effect is discussed in Epstein et al. (1999).

offers a quick solution: decrease D, and if total immigration increases (due to large high-skilled immigration), then raise C to reduce overall migration to the original level. In the general model, the success of this policy package falls apart: An increase in C will create new debt/labor immigrants.

The last proposition summarizes the above discussion.

Proposition 3 *Effects of policy variables in the generalized model.*

1. *An increase in C reduces migrant flows and has ambiguous effects on the skill composition of migrants.*

2. *An increase in D has ambigious effects on migrant flows and reduces the average skills of migrants.*

6 Discussion and implications

6.1 Robustness

Our theory is based on two crucial assumptions. Assumption 1 requires that for an illegal immigrant, an attempt to acquire legal status involves a higher risk of deportation. Normalization of deportation risk to zero in the illegal sector is not necessary for our results. What is needed only is that when deportation policies become stricter, the risk of deportation increases more in the legal than in the illegal sector. Otherwise, stricter deportation policies would not decrease migrant incentives to default on debt repayments. The effect of stricter border controls and stricter deportation policies would then be equivalent.

Assumption 1 makes sense for a number of reasons. Moving from the illegal to the legal sector makes migrants more visible and vulnerable. They have to register with government agencies, which increases the risks of deportation. Furthermore, in the absence of raids on employers, there is hardly a chance to detect illegal immigrants unless they get in contact with the legal sector. This implies that there is a strong complementarity between the two policies: Stricter deportation policies can only have deterrent effects on illegal migrants if raids on employers of illegal migrants are intensified. Otherwise, as our model shows, stricter deportation policies make things worse, as they deter migrants from moving to the legal sector. By the same logic, if worksite inspections were intensifying and the probability of deportation in the illegal sector increased, the deterring effect of moving to the legal sector

and overall returns to migration would decrease. In order to keep the analysis simple, we do not model the worksite inspections formally.

According to Assumption 2, the debt/labor contracts cannot be enforced in the legal sector. Put differently, the only cost the migrant bears when defaulting is a higher risk of deportation. This is a simplifying assumption. One can readily introduce other costs of defaulting with the straightforward effect that migrant incentives to default decreases. Migrants who try to default on their debt installments are indeed subject to penalties. Chin and Zhang (2002, page 753) quote a debt enforcer: *"If some clients (*migrants owing debt, GF and SG) *fail to show up, I will wait for them near where they live. When they leave their apartments, I will threaten them or beat them up. I usually go with three other people. It is not hard to do. They are illegal immigrants and dare not tell the police."* What this quote makes clear is that there are ways to make migrants pay back their debt, but that the effectiveness of sanctions depends on whether or not migrants are protected by the legal system.[7]

One may also argue that migrants are not protected by limited liability even in the legal sector, because the smuggler/intermediary could penalize the migrant's family. However, inflicting harm on the migrant's family is costly, and it is not clear that it is *ex post* rational. Even if the intermediary is carrying out penalties occasionally (because he has reputational concerns, for instance), this may not be sufficient to deter default. To understand why, one must consider the lethal risks migrants expose themselves to when trying to enter a country illegally. These are particularly high when sea travel is involved, as a series of tragic accidents has shown. This indicates that migrants may not consider the potential loss of their own life an infinite loss of utility. Otherwise, they would *ex ante* not be willing to try clandestine migration, in particular, if it involves travel by sea. But, the net present value of migration seems positive, even taking into account a positive probability of dying. There is little reason to believe that migrants would *ex post* shirk from taking similar risks, provided the payoffs are large enough. According to surveys among migrants by Jasso et al. (2000), migrants who move from illegal to legal jobs double or even triple their income. This is tantamount to lifetime gains of several hundreds of thousands USD. Such gains may be large enough for taking the risk of drastic penalties. The fact that the statistical value of life is much higher in richer than in poorer countries (Viscusi and Aldy, 2003) may further

[7]Similarly, Kwong (1997, page 209) argues that the illegal status prevents the sweatshop employess from renegotiating their wages and working conditions (which would be equivalent to a partial default on the debt): *"Illegals seldom ... complain about their wages or working conditions because they fear deportation and the return to poverty in their homeland."*

rationalize why migrants may be willing to take high risks both *ex ante* and *ex post*, whether the risk concerns the migrant's own life or the life of a family member (New York Times, 2000a, documents the fact that migrants are well aware of the lethal risks and are ready to take them).

In closely knit ethnic networks, migrants who default on debt payments may be excluded from future trading opportunities with other network members. This is a powerful deterrent, but nonetheless not an infinite penalty. Otherwise, there would be no need for the use of violence in contract enforcement and for keeping migrants in safe houses. Moreover, there are network externalities: The more migrants default, the less effective the penalty is. According to Kwong (1997, ch. 4 "Limits to Kinship Networks"), as the increasing debt burden provides higher returns to default, the kinship networks *alone* no longer provide sufficient incentives for honoring the debt; Kwong reports increasing use of violence in enforcing the debt/labor contracts including violence with regard to family members. Also, the larger the size of the smuggling business, the lower the strength of network incentives: the connections between smugglers, sweatshop owners and new immigrants are becoming weaker.

In order to test whether strict deportation/legalization policies are an important factor for enforcing the debt contracts, one would need to stage an experiment where indebted immigrants are unexpectedly given a legal status. Would the reputation/hostages/networks or other mechanisms be sufficient to make he immigrants pay back their debt to smugglers? Or would immigrants seek legal protection from the smugglers? While a controlled experiment has never been carried out, the Golden Venture accident provides some insights. In June 1993, after a 4-month voyage, the Golden Venture freighter carrying 286 illegal immigrants (each had made a 10-20% downpayment out of the $30,000 total fee) ran aground near New York. About 10 people died, most others were imprisoned for up to 3.5 years. For our purpose, it is important to learn more about those who were granted legal status. Everyone who received legal status was afraid of being contacted by the smugglers; apparently, they believed that the contract still required the repayment debt even though the migrants were not safely delivered to destinations. However, nobody was certain he would be contacted, and nobody was willing to contact the smugglers to pay the debt as the reputational concerns would dictate (New York Times, 1997). As reported in New York Times (1994), a 25-year old student was granted legal status right after the crash, and while still owing $24,000 to the smuggling ring, moved to a city far from New York, got a legal job and started to learn English. After three months, he had still not heard from the smugglers ; *"... his demeanor has changed from withdrawn and depressed to optimistic"*. Certainly, this anecdote provides

only indirect evidence: receiving the legal status exogenously may be different from defaulting to apply for the legal status that we model. Yet, it shows that illegal immigrants are rational, and may prefer to default ex post whenever the costs and risks associated with default are reasonably low.

Assumption 2 also implies that M cannot default without leaving the illegal sector. This is an extreme case; immigrants may default and seek illegal employment in a different city. In the latter case our results would be weaker but still hold as long as default is easier in the legal sector. If the legal residents are protected by police, enforcement of the debt/labor contract is more costly for the intermediary.

Another simplifiying feature of our model is ruling out possibility of legal entry. Even high-skilled immigrants can only get legal jobs through first entering the illegal sector. Adding a fully legal migration channel would not change our results. We could also consider the possibility for visa overstaying and the move from the legal to the illegal sector, which has been discussed in Epstein et al. (1999).

6.2 Implications

An implication in line with Ethier (1986) and more recent work, for instance, Chau (2001) is that policy instruments should be combined to be effective. Our model shows that in the absence of employer sanctions, stricter deportation policies and possibly also stricter border enforcement policies increase debt-financed migration. While we do not model employer sanctions explicitly, it is clear that if there is a higher risk of deportation and lower wages for immigrants staying in the illegal sector, then both self-financed and debt-financed migration decrease.

While *immigration amnesties* are very different from lenient deportation policies, our model can still provide certain insights about the effect of amnesties on the ex ante decisions to migrate. The existing literature on amnesties (e.g. Chau, 2001, and Epstein and Weiss, 2001) neglects financial constraints. Therefore, since each amnesty raises expectations for future amnesties, it results in higher incentives to migrate. This is true in our model as long as self-financed migration is considered. Indeed, if *ex ante* both migrants and intermediaries anticipate a sufficiently high chance of amnesty (lower D, in terms of our model), then high-skilled migration should increase (Part 2 of Proposition 2). However, once we analyze the impact of expected amnesty on the debt/labor contract, we find a countervailing effect that arises only in the presence of wealth constraints. If the intermediary expects that the immigrant will be able to obtain legal status through amnesty, the intermediary will refuse

to lend, and wealth-constrained migrants will have to stay in the source country. The low-skilled migration will therefore decrease. Thus, an expected amnesty may either increase or decrease total immigration, and will definitely improve the skill composition of incoming migrants.

Our model takes a positive perspective. It is difficult to formulate a normative position. In our model, debt-labor contract is in the interest of wealth-constrained immigrants who would not be able migrate in the absence of intermediaries willing to finance them.[8] Lenient deportation policies can actually reduce the joint welfare of immigrants and the host country. However, our model does not take into account a number of external effects: (i) the negative impact of high-skilled emigration on the source country ('brain drain'); (ii) the impact of immigration on the low-skilled domestic workers whose retraining is costly and take time; these workers are interested in decreasing low-skilled immigration but may benefit from high-skilled immigration (Zimmermann, 1994); (iii) the host country's disutility of having sweatshops and illegal immigration that raises ethical concerns and corrupts the law enforcement system; (iv) the impact of lenient deportation policies on the stock of illegal immigrants who have already entered the country. The welfare analysis is even more involved in the case of immigration amnesties which are hard to study in a static framework.

We have throughout the paper made a distinction between human smuggling, which assumes rational contracting between intermediary and migrants, and *human trafficking* that involves manipulation and coercion. While one should be careful to expand the model's reach to trafficking, it appears to us that the potential desirability of more lenient deportation policies is enforced by the fact that they may help trafficking victims and may undermine the profitability of trafficking networks. While the *ex ante* analysis of our model does not hold for migrants who are forced or manipulated, the profitability of the trafficking industry depends to a similar extent on the strictness of deportation rules as the one of the smuggling industry, with similar implications.

We would finally want to point out that the contracts between today's migrants and intermediaries have striking parallels to *indentured servitude*. Between one half and two thirds of all white immigrants coming to the Northern American British Colonies between 1630 and the Revolution came as indentured servants. They committed their workforce for a certain period of time against a free passage to the colonies (Galenson, 1984). Debtholders

[8] In our model, the servitude is voluntary. Stricter deportation policies that facilitate debt-labor migration therefore benefit immigrants. As argued in Genicot (2002), it is quite hard to come up with an economic argument where voluntary bonded labor is against the worker's interest without introducing externalities in credit markets.

respected the terms of contracts and set workers free after they had paid their debt (which usually took three to seven years). Many indentured servants tried to run away, but as the contracts between migrants and debtholders were fully legal, captured servants were penalized and sent back to the debtholders. This made sense since the government was interested in an inflow of cheap labor. In terms of our theory, the host country could not further decrease the cost of migration C (it was dictated by high relative transportation costs rather then by policy-driven barriers), so the only way to increase immigration was to enforce debt/labor contracts and sustain indentured servitude as a labor market institution. The difference between indentured servitude and modern sweatshop employment is that nowadays host countries do want to combat illegal migration. Our model shows, however, that by applying stricter immigration policies, they may contribute to the spread of debt/labor contracts. First, by adopting stricter border and visa policies they increase cost of entry and make financial constraints binding for a greater number of potential immigrants. Second, stricter deportation policies help enforce debt/labor contracts in a way similar to that of the British colonies in the 17th and 18th centuries.

7 Concluding remarks

Poor data do not yet allow to carry out a comprehensive empirical evaluation of immigration policies. There is thus scope for theoretical analysis to better understand the effects of different policies, and the costs that may be associated with them. The main contribution of the paper is to model explicitly that migrants are wealth-constrained and that they deal with intermediaries.

In this realistic framework stricter border controls and stricter deportation policies do not affect the flow and composition of illegal immigration in similar ways. While stricter border controls reduce migrant flows and have ambigious effects on skill composition, stricter deportation policies have ambigious effects on flows, but unambigiously worsen skill composition. We have also shown that stricter border controls may induce migrants to move from self-financed migration to temporary servitude. These effects arise in a straightforward way once the financial constraints and the role of intermediaries are considered.

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Appendix: Comparative Statics in the Generalized Model

Straightforward calculations yield the following Lemma.

Lemma 1 *Equilibrium migration flows under Assumptions 1 and 2, and the assumptions of Section 5:*

1. Inflow of low-skilled migrants, financed through a debt/labor contract, staying in the illegal sector:

$$n^L_{debt,i} = (1-\lambda) \int_0^{\widetilde{w}/(1-D)} \left[F_L(C) - F_L\left(C - \left(\widetilde{w} - (1-D)w^L\right)\right)\right] g_L\left(w^L\right) dw^L.$$

2. Inflow of high-skilled migrants, self-financed, trying to move to the legal sector:

$$n^H_{self,l} = \lambda \left[1 - F_H(C)\right] \left(1 - G_H\left(\frac{\omega^H + C}{1-D}\right)\right).$$

3. Inflow of low-skilled migrants, self-financed, trying to move to the legal sector:

$$n^L_{self,l} = (1-\lambda) \left[1 - F_L(C)\right] \left(1 - G_L\left(\frac{\widetilde{w}}{1-D}\right)\right).$$

4. Inflow of low-skilled migrants, self-financed, staying in the illegal sector:

$$n^L_{self,i} = (1-\lambda) \left[1 - F_L(C)\right] G_L\left(\frac{\widetilde{w}}{1-D}\right).$$

Note that except for case (1) of the proposition, nobody enters a debt/labor contract. Indices "debt" and "self" represent sources of financing; indices "l" and "i" stand for legal and illegal sector.

Lemma 2 *Comparative statics.*

1. An increase in C decreases both high- and low-skilled migration.

$$\frac{\partial n^H}{\partial C} = \frac{\partial n^H_{self,l}}{\partial C} < 0,$$
$$\frac{\partial n^L}{\partial C} = \frac{\partial \left(n^L_{debt,i} + n^L_{self,l} + n^L_{self,i}\right)}{\partial C} < 0.$$

2. An increase in D decreases high-skilled, but increases low-skilled migration.

$$\frac{\partial n^H}{\partial D} = -\lambda \frac{1 - F_H(C)}{(1-D)^2} g_H\left(\frac{\omega^H + C}{1-D}\right) < 0,$$

$$\frac{\partial n^L}{\partial D} = \frac{\partial\left(n^L_{debt,i} + n^L_{self,l} + n^L_{self,i}\right)}{\partial D} =$$

$$\frac{\partial n^L_{debt,i}}{\partial D} = (1-\lambda)\int_0^{\widetilde{w}/(1-D)} w^L f_L\left(C - \left(\widetilde{w} - (1-D)w^L\right)\right) g_L\left(w^L\right) dw^L > 0.$$

Part 1 and the first expression of part 2 are straightforward. The effect on low-skilled migrant flow ($\frac{\partial n^L}{\partial D}$) consists of three components, but one can readily show that $0 > \frac{\partial n^L_{self,l}}{\partial D} = -\frac{\partial n^L_{self,i}}{\partial D}$, that, is the decrease in legal migration of self-financed low-skilled workers cancels with the increase in illegal migration. (The preferences of low-skilled workers with enough cash to migrate simply shift from legal to illegal migration.) As $\frac{\partial n^L_{debt,i}}{\partial D} > 0$, the total effect on low-skilled migrant flows is positive. The effect on total immigration can be positive or negative, depending on the sign of $\frac{\partial n^L}{\partial D} - \left|\frac{\partial n^H}{\partial D}\right|$.