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Introduction

Economics of Undocumented Migration is a collection of thirteen important articles, most of them written by Slobodan Djajić and his co-authors. Five of the articles were written in collaboration with Alexandra Vinogradova Brausmann of the University of Vienna, one with Michael S. Michael of the University of Cyprus, one with Alice Mesnard of the City University London, and two of the contributions were published by Alexandra Vinogradova Brausmann. The articles share a common theme of analyzing the effectiveness of immigration policies and enforcement measures of host countries in relation to the problem of undocumented migration. Together, they offer a broad and in-depth theoretical analysis of how various policy measures interact with optimizing behavior of migrants to determine outcomes which are of particular interest to the host countries.

The articles collected in this volume provide a framework for the study of some key decisions that potential migrants are confronted with when considering a move to work abroad. This includes decisions concerning the timing of departure from the home country, the method of financing the move, the choice between documented and undocumented modes of entry, the optimal duration of stay abroad, how much to save while abroad, etc. The various chapters illustrate how the decisions of migrants' are shaped not only by a wide range of immigration policies and enforcement measures of the host country, but also by their own personal characteristics and the economic environment they face at home and abroad. The volume also devotes considerable space to the analysis of undocumented migration in economies that rely on official temporary migration programs to meet shortages in the labor market. In this context it addresses the question of how programs can be designed to avoid a tendency for foreign workers to overstay and hence transit into undocumented status.

The book consists of four sections, each with a focus on a specific facet of undocumented migration. As the questions addressed differ across sections, so do the techniques of analysis.

I Migrants in Debt

The first section contains four chapters dealing with microeconomic aspects. The focus is on the problems facing a potential migrant as he or she tries to overcome barriers to the international mobility of low-skilled workers. Most of the advanced countries have been progressively tightening immigration controls over the last three decades. As a result, undocumented entry is becoming increasingly dependent on the services of human smugglers. At the same time these services are becoming increasingly more costly due to the criminilization of human smuggling activity, but also due to tougher and more sophisticated border-control measures implemented by advanced countries. For a potential low-skilled migrant from a developing country, a key question now is how to finance migration costs. Depending on the magnitude of these costs in relation to one's earnings in the source country and expected earnings in the host country, it may be optimal to accumulate the required funds over time by simply saving. In other cases it may be more advantageous to enter into a debt-for-labor contract (i.e., debt bondage) and pay off the loan by working for the creditor in the destination country over a period of 2-3 years. This type of arrangement has often been observed in the case of debt-bonded migrants from China, as well as from many of the low-income countries, to the United States or Europe over the last couple of decades. The practice has its origins in Colonial America in the 17th and 18th centuries, where it was established to bring workers across the Atlantic. Migrants who could not afford to pay for their passage to the colonies from Britain or continental Europe would indenture themselves, agreeing to repay the loan after arrival with a number of years of labor.

The first chapter of this section, entitled "Undocumented Migrants in Debt," written by Slobodan Djajić and Alexandra Vinogradova Brausmann, examines the optimizing behavior of a debt-bonded worker. The objective of the study is to determine the conditions under which a potential migrant would find it rational to migrate under such conditions. It is found that whether or not it pays to do so depends on the conditions in the labor markets at home and abroad, as well as immigration policies and the intensity of a range of enforcement measures of the host country. These include its deportation policy, internal controls and enforcement measures directed at undocumented aliens, the extent to which it sanctions employers of undocumented workers, and border-control measures that largely determine the cost of undocumented migration. The framework of analysis that we develop enables us to examine the trade-offs among various policy instruments in terms of their effectiveness in deterring debt-bonded migration. We find that tougher deportation policies are an effective substitute for border controls and employer sanctions when the expected duration of an undocumented stay in the host country is relatively short. Tighter border controls are found to be more effective as a deterrent in the presence of tough labor-law enforcement and employer sanctions that keep the bonded wage low relative to the free-market wage. Finally, tighter border controls and labor-law enforcement measures are found to have similar degrees of effectiveness relative to each other for any given deportation policy.

Chapter 3 on "Liquidity-Constrained Migrants," also written by Slobodan Djajić and Alexandra Vinogradova Brausmann, compares two alternative modes of financing the cost of undocumented migration. One is self-finance, whereby a candidate for migration accumulates savings out of income to cover the cost. The other involves entering into a debt-bondage contract, described in Chapter 2. We find that debt bondage is the preferred option when the international wage differential is sufficiently large in relation to migration costs. We also find that more restrictive border-control measures can help reduce the incidence of debt-bondage. Depending on the wage gap between the host and source countries, however, such measures may merely induce migrants to switch to self-financed migration, rather than reduce the total inflow of undocumented immigrants. Tougher internal enforcement policies that increase the costs and risks facing employers of debt-bonded labor are found to reduce the incidence of debt-bonded migration, increase the incidence of self-financed migration and reduce the overall inflow of undocumented workers. Our analysis suggests that the reduction in the inflow is likely to be from the relatively poorer of the sending countries.

Chapter 4 on "Financial Support from the Family Network and Illegal Immigration," published by Slobodan Djajić, considers the role of financial support from family and friends in covering part of the cost of undocumented migration. The question addressed is whether such support makes self- financed or debt-boded migration a relatively more attractive method of financing the move. Contrary to what one might expect, if a potential migrant is initially indifferent between the two financing options, an increase in the amount of funding that the family network can provide is found to make debt-bondage a relatively more attractive mode of financing the balance of migration costs.

Chapter 5, written by Slobodan Djajić, is on "Asylum Seeking and Irregular Migration." It develops a model of optimizing behavior of asylum seekers whose objective is to reach an advanced country while they find themselves in a transit country. Whether they try to reach their ultimate destination with the aid of human smugglers or by applying for resettlement abroad with the aid of the United Nations High Commissioner for Refugees (UNHCR) is shown to depend on their personal characteristics and the challenges anticipated along the way. In the current policy environment, individuals who are relatively young, skilled, wealthy, and have access to credit from their family network are found to have a strong incentive to choose the undocumented migration option.

II Some Implications of Deportation Measures

Chapter 6 on "Immigration Policies and the Choice between Documented and Undocumented Migration," written by Slobodan Djajić and Alexandra Vinogradova Brausmann, analyzes the role of immigration policies of the host country in determining the legal composition of its foreign work force. The basic question is, what determines whether a temporary migrant chooses to go abroad as a documented worker or as an illegal alien? Assuming that both options exist in the destination country. We analyze this problem from a theoretical perspective by focusing on how a wide range of immigration policies, aimed at both documented and undocumented foreign workers, affect the choice between the two modes of migration. We provide estimates of the relative policy effectiveness by calibrating the model to the case of temporary emigration from Thailand to Japan. The deportation rate facing undocumented aliens is shown to be the most potent policy variable influencing migration decisions. Moreover, some of the measures directed at *documented* contract workers are found to be more effective in influencing a migrant's choice when compared with border controls and employer sanctions aimed at deterring *undocumented* migration.

Chapter 7, written by Alexandra Vinogradova Brausmann is on "Illegal Immigration, Deportation Policy, and the Optimal Timing of Return." It considers the problem of undocumented migration in countries that have strict immigration policies and resort to deportation measures to reduce their stocks of illegal immigrants. There is substantial evidence, however, that many of their undocumented foreign workers are not deported but rather choose to return home voluntarily. This chapter studies the optimizing behavior of undocumented immigrants who continuously face the risk of deportation, modeled by a stochastic process, and must decide how long to remain in the host country. It is found that the presence of uncertainty with respect to the length of stay abroad unambiguously reduces the desired migration duration and may trigger a voluntary return when a permanent stay would otherwise be optimal. Voluntary return is motivated by both economic and psychological factors. Calibration of the model to match the evidence on undocumented Thai migrants in Japan suggests that the psychological impact of being abroad as an illegal alien may be equivalent to as much as a 68% cut in the consumption rate at the point of return.

Chapter 8 on "Legal and Illegal Immigrants: An Analysis of Optimal Saving Behavior," is also published by Alexandra Vinogradova Brausmann. This chapter compares the saving behavior of two types of migrants: documented guest workers and undocumented immigrants. It is assumed that the former are authorized to work abroad for a specific period of time, while the latter can stay until apprehended and deported by the immigration authorities. Due to the risk of deportation, the saving rate of an undocumented migrant worker is found to be initially above that of a documented migrant. This precautionary saving phenomenon is, however, short-lived: an undocumented migrant's saving rate falls over time as her expected lifetime earnings are adjusted upwards every day that she avoids apprehension and deportation. A key finding of this chapter is that the total repatriated assets of an undocumented migrant are always lower than those of a documented worker, provided that their duration of stay abroad turns out to be identical.

III Undocumented Migrants in Economies with Official Guest-Worker Programs

This section consists of four articles on the problem of undocumented migration in economies with established temporary migration programs. A well-designed guest-worker program can provide advanced and newly-industrialized economies with an economically and politically attractive way of addressing shortages of low-skilled labor. Attractive, because it avoids making long-term commitments to foreign workers. The most important in this respect are commitments in relation to permanent settlement, political rights, and access to social programs. By avoiding such long-term commitments, a temporary migration program offers a host country greater labor-market flexibility at a lower cost when compared with a permanent migration regime.

For a program to maintain its temporary character, however, guest workers must be willing to return home when their work permit expires. Chapter 9 on "Some Essentials of a Workable Guest-Worker Program" published by Slobodan Djajić, examines how immigration policies, enforcement measures, and opportunities available to a worker in various markets at home and abroad affect his or her behavior. Wellbeing of a migrant who obeys the rules of the program is compared with that of workers who choose other options in order to define the conditions under which temporary migration is welfare improving for potential migrants and at the same time consistent with voluntary return. It is found that if the international wage differential is very large and the duration of a guest-worker permit relatively short, migrants have a strong incentive to remain in the host country illegally. The host country can offset this tendency, not only by relying on stricter internal enforcement measures, but also by choosing migrants from source countries with a relatively low cost of living and/or a high expected rate of return on repatriated savings. Recruiting migrants with a certain minimum initial stock of wealth also works in that same direction, provided the rate of return on investments is higher at home than it is abroad. While this analysis pertains mainly to western host countries with a relatively permissive attitude towards undocumented stays, the model is extended further to address the question of policy effectiveness also in the context of more restrictive East Asian policy regimes of countries such as Japan and South Korea. In this particular setting the focus is on the role of deportation policy, the salary-withholding rate, standard duration of a documented stay, wages paid to guest workers, magnitude of the wage premium in the underground economy and the size of the contract-completion deposit. The model also considers the role of international wage, price, and return-on-investment differentials in influencing behavior of foreign workers.

Chapter 10 on "Overstaying Guest Workers and the Incentives for Return", written by Slobodan Djajić and Alexandra Vinogradova Brausmann, extends the model of the previous chapter to examine not only whether a guest-worker program provides adequate incentives for voluntary return of its participants, but also to study the factors that determine how long is it optimal for a foreign worker to remain in the host country if he or she finds it appropriate to overstay. It is assumed that, as in many host countries, an employer can withhold a certain portion of a guest worker's salary to guarantee that the worker complies with the rules of the program. We find, as expected, that a higher salary withholding rate and a fine for overstaying does serve to discourage overstays. Depending on the conditions the workers face back home, some participants in the program may nonetheless choose to stay beyond the expiration of the work permit. In such cases, an increase in the salary withholding rate actually induce overstayers to remain in the host country for a relatively longer period of time. This implies that increases in the salary withholding rate or in other forms of pecuniary penalties that fall short of being sufficient to guarantee strict compliance with the rules of program can be counterproductive with respect to the goal of reducing the stock of undocumented aliens in the economy. They may have a weak effect on the flow of guest workers transiting to undocumented status, while increasing the amount of time these workers remain in the host country without proper documentation. Thus there is the possibility that these policies may generate a larger equilibrium *stock* of undocumented workers.

The point is that salary withholding rates and fines for overstaying must be carefully designed in relation to the environment that guest workers face at home and abroad if these policies are to be effective in reducing the number of undocumented workers. Lowering the cost of migration facing guest workers is found to make overstaying less attractive. Should some workers still choose to overstay, we find that they will do so for a relatively shorter period of time. We also find that both a higher rate of return on investments at home and a larger cost-of-living differential between the host and the source country help strengthen the incentives for strict compliance on the part of guest workers. In the event that these incentives for strict compliance prove to be insufficient, they nonetheless shorten the optimal duration of an overstay.

Chapter 11 on "Guest Workers in the Underground Economy," written by Slobodan Djajić and Alice Mesnard, examines the links between a guest-worker program and the supply and demand for clandestine labor in the underground economy of the host country. Our main focus is on the question of how the program rules and enforcement measures of the immigration authorities influence the behavior of illegal immigrants and their employers to determine the equilibrium wage and the stock of undocumented workers. We find that an increase in the flow of guest workers officially admitted into the economy lowers the wage of undocumented workers, while having an ambiguous effect on the stock of illegal aliens. If the degree of intersectoral mobility of native workers is sufficiently low, an increase in the inflow of guest workers generates a larger stock of undocumented labor. By contrast, allowing each of the guest workers to remain longer in the host country decreases the undocumented stock. Since the stock of documented guest workers is simply the product of the allowed inflow and the duration of each worker's authorized stay, our findings indicate that countries requiring an increase in the stock of documented guest workers can achieve this objective with a more favorable outcome in terms of illegal-immigration control by increasing the duration of each guest worker's stay, rather than by increasing the allowed inflow. Repressive policies aimed at illegal aliens, such as increased identity checks outside of the workplace and tougher deportation measures and fines for overstaying, all have the expected effect of lowering the stock of undocumented labor in the economy and raising the equilibrium wage received by illegal aliens.

IV Undocumented Migration and the Transit Countries

This section deals with questions related to undocumented migration through transit countries. For both economic migrants and asylum seekers who lack liquid assets and/or access to credit, an increasingly popular way of reaching the desired destination involves multistage migration through one or more transit countries. Libya, Tunisia, Morocco, and Mauritania are examples of transit countries, used as stepping stones by migrants from Sub-Saharan Africa trying to reach Western Europe. At the same time Turkey has become the key transit country for migrants from Central Asia and the Middle East on their way to the European Union. In the Western Hemisphere, Mexico and the countries in Central America are seeing increasing volumes of transit migration to the United States. The choice of land routes through transit countries is not only the cheapest undocumented means of getting to the final destination, but it also allows a migrant to work and accumulate savings at various points along the way to pay for the next leg of the journey.

Chapter 12 on "Transit Migration,", written by Slobodan Djajić, develops a microeconomic framework for the analysis of the economic problems that migrants encounter from the time they decide they want to migrate until they reach the final-destination country. Behavior of transit migrants is modelled to examine their optimal response to changes in the conditions they face at home, in transit, and at the final destination. The questions that emerge in this context include the following: Under what conditions does it pay to become a transit migrant? What is the role of wages at home, in transit, and at the final destination in influencing a migrant's saving behavior and the optimal duration of stay in each of the three locations? How is the optimal migration strategy shaped by migration costs at various points along the journey and the difficulties anticipated in transit? Answers to these questions set the stage for an analysis of policy effectiveness. The focus is on how the various instruments of immigration control interact with market conditions to shape migration decisions. Of key interest is the question of relative effectiveness of border controls and internal enforcement measures at various stages of the migration process in terms of their capacity to deter unauthorized migration. Increasing the cost of migration by tightening border controls between origin and transit countries is shown to be more effective than doing the same between the transit and final-destination countries. Stricter internal enforcement measures are also found to be relatively more effective when applied in the transit countries than they are when applied at the final destination. Moreover, strengthening of border controls at the final destination is shown to increase the relative effectiveness of internal enforcement measures of the transit countries, while tougher internal enforcement in the transit countries increases the relative effectiveness of border controls at the final destination.

In light of the findings that the effectiveness of border controls and internal enforcement measures is higher at the level of a transit country than it is when implemented by a final-destination country, one would expect that there should be considerable scope for international cooperation on migration issues between the two countries. Chapter 13, entitled "Controlling Illegal Immigration: On the Scope for Cooperation with a Transit Country," written by Slobodan Djajić and Michael S. Michael, explores the possibility of an advanced country providing aid to a transit country as a way of more effectively controlling flows of undocumented aliens across its own border. Our analysis is conducted in the context of a two-country model of transit migration. For undocumented migrants from third countries, an advanced country, D, is assumed to be the final destination while its poorer, southern neighbor, T, is the country of transit. Resources that T has initially available for the purpose of controlling its borders and the interior are assumed to be very limited, resulting in practically unimpeded flows of undocumented migrants through its territory on the way to D. Ability of D to control its own inflows is assumed to depend on the volume of flows getting through T. This raises the question of how much assistance D should offer to T, out of its given border-enforcement budget, in exchange for taking measures to curb transit migration. From the perspective of T, the problem is to choose the optimal allocation of this aid between spending on immigration control, which is primarily of interest to D, and diverting resources to other border-security priorities. We solve for the Nash-equilibrium values of the two policy instruments: the flow of aid provided by D to T and the proportion of that flow that T chooses to allocate strictly for the control of transit migration. We find that technical improvements that raise the effectiveness of spending on immigration control in the transit country call for a greater flow of aid from D to T, even if T finds it optimal to divert a larger fraction of this aid to meet border-security objectives other than immigration control. Similarly, if preferences of T change so that it favors a more restrictive policy with respect to transit migration, it is optimal for D to provide it with greater support for immigration control. A surge in migration flows towards D also calls for an increase in its support of immigration control in T at the expense of a corresponding cut in spending on the protection of D's own borders.

Finally, Chapeter 14 on the "Dynamics of Mass Migration," written by Alexandra Vinogradova Brausmann and Slobodan Djajić examines some of the key dynamic features of massive population movements through a transit country on the way to a safer and more prosperous region. Such movements can be triggered by armed conflicts, natural disasters, degradation of the environment, severe economic crises, and other adverse events. A surge in immigration flows and asylum requests can represent a serious challenge for the authorities of the final-destination countries. An example of this is the mass-migration crisis that the European Union experienced during the recent war in Syria, with Turkey being the main transit country.

This chapter provides a theoretical framework suited for analysing the dynamics of massive population movements. We present a model that addresses questions related to the stability of the system governing the behavior of migrants on the one hand and that of the authorities of the destination country on the other. In this context, it is important to understand what elements help to stabilize a surge in migration flows, and hence preserve the integrity of border-control structures and of the fundamental principles on which immigration policy of the destination country is based. More specifically, what is the role of the speed of adjustment with which the authorities react to an increase in migration pressures? What role does the diaspora play in the dynamics of adjustment? What effect might criminalization of human smuggling activity in the transit country have on the evolution of migration flows and the effectiveness of border-control efforts of the destination country? It is found that the slower the policy response of the final-destination country, the more resources are needed in the long run to bring migration flows back under control. We also provide simulations of the model based on the Syrian migration crisis of 2015 in an attempt to quantify the implications of various policy responses of the destination country for the evolution of border-control spending and the stock of migrants in the transit country along the adjustment path. Finally, we extend the model to consider the influence of the diaspora on the dynamics of migration flows and border-control expenditures.

While each of the chapters addresses a very specific issue related to undocumented migration, together they provide a fairly comprehensive overview of the economic aspects of this problem from the perspective of a range of concerned actors: undocumented migrants, policymakers of host, source, and transit countries, human smugglers, asylum seekers, native workers of the host country, and employers of undocumented workers.

Part I

Liquidity Constraints and Undocumented Migration

2

Undocumented Migrants in Debt[1]

2.1 Introduction

New barriers to international migration of low skilled workers along with an increasing supply of willing migrants are contributing to the expansion of illegal immigration and rapid growth of illicit enterprizes specialized in moving humans across international borders.[2] In spite of the rather competitive nature of smuggling organizations, the cost of migration is now reaching levels of $50,000 to $70,000 on certain long-haul routes. Such amounts are often far beyond the volume of savings that potential migrants can accumulate on their own or with the support of family and friends. When the migrants are unable to pay for the cost of passage, in many cases they choose to become indebted to the smugglers. The purpose of our study is to characterize a debt-bonded migrant's optimizing behavior and examine the effectiveness of immigration policy measures aimed at deterring this mode of international migration.

Once in the host country, a migrant in debt is typically turned over by the smuggling organization to a local employer. During the period of indebtedness, he is dispossessed of identity documents and deprived of basic rights, including the freedom of movement or the possibility of changing jobs. From the point of view of the creditor, there is the risk that the migrant might be deported, become disabled, or even run away without repaying the loan. In order

[1] First published as Djajić, S., and Vinogradiva, A. (2013) "Undocumented Migrants in Debt." *Labour Economics*, vol. 24: 15-24 © 2013 by Elsevier

[2] There is a vast theoretical literature on illegal immigration, starting with the work of Ethier (1986) and including the contributions by Djajić (1987, 1997), Epstein *et al* (1999), Hillman and Weiss (1999), Gaytan-Fregoso and Lahiri (2000), Hazari and Sgro (2003), and Woodland and Yoshida (2006). For an excellent survey of the literature see Hanson (2006) and the paper's extensive references to both theoretical and empirical work on this subject.

to minimize the likelihood of default, the employer literally holds on to the migrant until the loan is paid off. The rates of interest charged on such loans are reported to be excessive, often 30 to 60% per annum, while the bonded wage paid by the employer during the period of indebtedness is lower than the free-market wage in a similar occupation.[3] With these key features, the relationship between the employer and the migrant takes on the appearance of a forced-labor arrangement. Nonetheless, there is evidence that the vast majority of debt-bonded migrants are behaving rationally, well aware of the fees and conditions of employment at destination before entering into verbal agreements or signed contracts with a smuggling organization.[4] The problem of trafficking, which involves deception, coercion, abuse and even violence, is not addressed in this paper.[5]

Debt bondage is viewed today as a particularly cruel and exploitative arrangement, akin to modern-day slavery (see Humantrafficking.org (2011)). It is a stated objective of governments all over the world to deter the use of such contracts, especially when they form the basis for funding clandestine immigration (see Trafficking in Persons Report (2010)). While there are numerous descriptive studies of indebted migrant workers and the nature of their relationship with the smuggling organizations (see, e.g., Gao (2004), and Gao and Poisson (2005), Human Rights Watch (2000), Kwong (1997), Salt (2000), Skeldon (2000), Sobieszczyk (2000), Stein (2003), Surtees (2003), and Vayrynan (2003)), very little theoretical work has been done on this subject.[6]

[3] See Kwong (1997), Gao (2004), and Gao and Poisson (2005). Human Rights Watch (2000) provides extensive evidence on the experience of debt-bonded Thai sex workers in Japan. The wage they earn from their employers is noted to be higher once they pay off the debt.

[4] All of the persons identified by Sobieszczyk (2000) to have migrated in debt-bondage were aware in advance of the location and nature of their work. See also Friebel and Guriev (2006, p.1089).

[5] It is important to emphasize the distinction between human smuggling and human trafficking, which is often blurred in the media. Human trafficking involves transporting individuals from one place to another either against their will or under a false pretence. It is a violation of basic human rights, can occur across and/or within borders, and starts when one party deprives another of the freedom of choice by using threats, force, coercion, deception or fraud for the purpose of exploitation (see FAITC (2011)). Human smuggling, on the other hand, generally takes place with the consent of the person being smuggled. The vast majority of illegal immigrants are smuggled, rather than trafficked to their destinations. The number of immigrants smuggled from Mexico into the U.S.A. is upwards of 350,000 per year, while the State Department estimates that 14,500 to 17,500 people, primarily women and children, are trafficked annually into the U.S.A. (see humantrafficking.org (2011)).

[6] Tamura (2010) provides a pioneering theoretical analysis of migrant exploitation by smugglers. In contrast with our model, however, he assumes that migrants are not indebted. They pay

A recent paper by Friebel and Guriev (2006) is the first to explicitly consider modern-day, debt-financed migration from a theoretical perspective. It examines the interaction between wealth-constrained migrants and human smugglers, with a focus on the conditions under which the latter are willing to offer credit to their clients. This provides a basis for evaluating the impact of various policy measures on the equilibrium volume of debt-bonded and self-financed migration. One of their principal findings is that tougher border controls and stricter deportation measures have very different implications for the flow of illegal immigrants and its composition. Taking the interaction between wealth-constrained migrants and smugglers into account, they show that tougher border controls tend to reduce the overall inflow of illegal aliens, but not necessarily the number of those who are debt bonded, while stricter deportation measures *promote* debt-bonded migration.[7]

One of the distinctions between our model and that of Friebel and Guriev (2006) is that we introduce time explicitly into the analysis. Thus the payoff is not realized by a migrant immediately on arrival in the host country, but over a finite horizon which consists of two or more phases with endogenously-determined durations. This allows us to examine the impact of changes in the conditions facing a migrant on the duration of the debt-repayment phase, the debt-free phase in the host country, and a possible third phase back in the source country in case of deportation. Changes in immigration policies affect the length of each phase, the path of consumption within it, and therefore a migrant's discounted lifetime utility. Assuming that there is a choice between migrating and remaining permanently at home, this framework enables us to examine the trade-offs among the various policy measures in terms of their effectiveness in deterring debt-bonded migration.

With respect to the behavior of migrants, we find that stricter employer sanctions, to the extent that they lower the bonded wage, decrease the migrant's consumption while in debt, leave it unaffected after debt repayment, and have an ambiguous effect on the optimal duration of the repayment period. By contrast, an increase in the free-market wage *lowers* consumption

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the smuggling fee in full out of initial asset holdings at the time of arrival. A recent empirical study by Mahmoud and Trebesch (2010) examines the factors that influence the incidence of trafficking within a migrant population, although their data does not distinguish between direct pay and debt-bonded migrants.

[7] Friebel and Guriev (2006) assume that an indebted migrant has a higher chance of successfully defaulting on the loan by transiting to the legal sector, while we assume that full repayment of the loan is the only feasible option. Thus the channel through which stricter deportation measures contribute to an increase in the inflow of debt-bonded immigrants in the Friebel-Guriev model is not operational in the context of our framework of analysis.

while in debt, raises it after the loan is repaid, and shortens the duration of the repayment period. An increase in the interest rate charged by the creditor lowers consumption while in debt, leaves it unchanged after debt repayment and may either reduce or extend the repayment period, depending mainly on the size of the debt, the relationship between the bonded and free-market wage and the level of the interest rate.

We also consider the implications of deportation measures in the context of our model. If the duration of the period over which an undocumented migrant can remain in the host country is reduced due to a tougher deportation policy, loan repayment is accelerated. To the extent that the smuggling organization is able to shield a migrant from deportation while he is repaying the debt, this tends to lengthen the repayment period. In our evaluation of the trade-off among immigration policy instruments aimed at deterring debt-bonded migration, we find that tougher deportation policies are very effective in substituting for border controls and employer sanctions when the duration of an undocumented stay in the host country is already short. Tightening of border controls is found to be more effective as a deterrent in the presence of tough labor-law enforcement and employer sanctions that keep the bonded wage low relative to the free-market wage. Finally, tighter border controls and labor-law enforcement measures are found to have similar degrees of effectiveness relative to each other for any given deportation policy.

A brief introduction describing the structure of the market for human smuggling that we consider in this paper is provided in Section 2. Section 3 defines the basic problem confronting a migrant in debt. Section 4 examines a migrant's optimal response to changes in the conditions while in bondage and after debt repayment. Section 5 introduces the possibility of deportation into the model, while Section 6 looks at the relationship among the key policy variables that must be in place to render debt-bonded migration unattractive for a potential migrant. Finally, Section 7 concludes the paper.

2.2 The Market for Human Smuggling

Various types of human smuggling operations exist across the globe. Even within a given country, the structure of the market and the type of organization involved in the provision of smuggling services may differ, depending on the profile of the client, the occupation sought abroad, the country of destination, and the mode of transport. Some operations resemble (and are often combined with) legitimate activities of a travel agent, servicing both documented passengers and those who lack documentation. In many devel-