Immigration Policies and the Choice between Documented and Undocumented Migration

Slobodan Djajić* and Alexandra Vinogradova†

April 8, 2017

Abstract

What determines whether a temporary migrant chooses to go abroad as a documented worker or as an illegal alien? We address the question from a theoretical perspective by focusing on how immigration policies, aimed at both documented and undocumented foreign workers, influence the choice between the two modes of migration. Calibrating our model to the specific case of temporary emigration from Thailand, we provide estimates of the relative policy effectiveness. The deportation rate facing undocumented aliens is shown to be the most potent instrument, while some of the measures directed at documented contract workers are found to be more effective in influencing the choice of emigration mode than border controls and employer sanctions aimed at illegal immigrants.

JEL Classification: F22, J61
Key Words: Immigration policies, deportation, guest-workers, illegal immigration.

*The Graduate Institute, 11A Avenue de la Paix, CH-1211 Geneva, Switzerland. Tel: +41-22-908-5934, Fax: +41-22-733-3049, email: slobodan.djajic@graduateinstitute.ch. I wish to thank two anonymous referees for helpful comments on an earlier draft of the paper.

†Center of Economic Research, ETH, Zurich, Switzerland. Tel: +41-44-632-49-49, email: avinogradova@ethz.ch

1 Introduction

One of the key questions of interest to policymakers is what determines whether a potential migrant chooses to go abroad as an undocumented alien or as a documented guest worker. Although the question is relevant to both the countries of emigration and immigration, it is of particular importance to the latter.[1] In this paper we examine the problem facing a worker from a developing country who seeks to take up temporary employment in a more advanced economy and has to decide whether to migrate legally or illegally.

Temporary migration, both authorized and unauthorized, plays an important role in the minds and lives of millions of citizens of the less developed countries. The extensive guest-worker programs of the economies in the Middle East have been attracting hundreds of thousands of contract workers every year from labor-exporting countries in the region, as well as from South and South-East Asia. Rapid growth in South Korea, Taiwan, Singapore, Hong Kong, Brunei, Japan, and Malaysia, has also generated labor shortages and expansion of opportunities for temporary migration of low-skilled workers on fixed-term contracts from the relatively poorer Asian economies. There are vast opportunities, as well, for undocumented migration, which is facilitated by the expanding human-smuggling industry. In the case of Thailand, which is an example of an important labor-exporting country, the flow of temporary emigrants in the late 1990s was split roughly 50-50 between documented contract workers and those who had undocumented status in the more prosperous Asian economies (see Martin, 1996 and Sobieszczyk, 2000). Illegal immigration is in fact a widespread phenomenon in most of the advanced countries, including the U.S.A. and Western European economies that maintain

[1] Illegal immigration is widely regarded to be detrimental from the perspective of a host country. It undermines the authority and the aims of its legal immigration programs, which have been designed to meet certain economic, social, political, and demographic objectives (Borjas, 1999). There are particular concerns about the fiscal implications of illegal immigration, its effects on employment opportunities of the native workers, and the impact on the local communities in which undocumented foreign workers are employed (Djajić, 2001 and Hanson, 2007). In prosperous East Asian economies, such as Japan, South Korea, Taiwan, Singapore and Brunei, the authorities also worry that illegal aliens may alter the ethnic composition of the population in a way that may one day challenge the political and economic status of the natives as well as the country's cultural homogeneity. In the oil-producing economies of the Middle East, illegal immigration is even perceived as a threat to internal security and national cohesiveness.

tight restrictions on documented admission of foreign low-skilled workers.

The vast literature on illegal immigration rarely looks at the choice between documented and undocumented migration from the perspective of a migrating individual.[2] Djajić (2013) studies the conditions under which contract workers are likely to remain in the host country, either temporarily or permanently, beyond the expiration of their work permit, but does not address questions related to the choice between official recruitment and clandestine migration. The same is true with respect to the works of Epstein *et al* (1999) and Djajić and Mesnard (2013), where the possibility of transiting from documented to undocumented status is examined in the context of a general-equilibrium model with a focus on the interaction between the labor markets of the official and the underground economy. Similarly, the literature on illegal immigration, including the studies that address the human-smuggling aspects of the problem (see, Friebel and Guriev 2006, Tamura 2010, 2013, and Djajić and Vinogradova 2013, 2014), focus exclusively on the clandestine mode, ignoring the possibility of obtaining employment in the host country legally as a documented contract worker. Auriol and Mesnard (2016) consider, in addition, the option of purchasing a permanent-residence visa at destination, rather than using human smugglers to reach the foreign country, but they do not consider the possibility of going to work abroad *temporarily* as a contract worker.

The purpose of the present study is to fill some of the existing gaps between the literatures on documented and undocumented temporary migration of low-skilled workers by assessing the role of immigration policies of the host countries in influencing a worker's choice between the two modes. Our study pertains to host countries, such as those in East Asia and the Middle East, where candidates for migration realistically do have this choice. Note that in most of the advanced Western economies, there is very limited scope for low-skilled workers to migrate legally from the developing world. Guest-worker programs in these countries are of very limited size and often restricted to workers from specific source countries on the basis

[2]Theoretical studies on the problem of illegal immigration include Ethier (1986), Bond and Chen (1987) Djajić (1997), Yoshida (2000), Gaytan-Fargos and Lahiri (2000), Kondoh (2000), Woodland and Yoshida (2006), Friebel and Guriev (2006), Tamura (2010, 2013), Camacho, Mariani and Pensieroso (2013), and Facchini and Testa (2015), to name but a few.

of bilateral agreements. Moreover, in contrast with Western countries, East Asian economies impose very strict limitations on the maximum duration of stay of guest workers, impose hefty fees on the admission of guest workers, and resort to strict deportation measures to remove overstaying/undocumented workers from their territories. Our focus on East Asia rather than on Western economies therefore allows us to evaluate the impact of a relatively wider range of policy measures that influence the choice between documented and undocumented migration.

We examine the problem from the perspective of a utility-maximizing agent, who decides whether to migrate on a fixed term contract as a documented worker with the aid of a recruitment agency or as an illegal alien with the aid of human smugglers. These two migration options are associated with different migration costs, different levels of compensation, and different conditions of employment abroad. A documented guest worker operates on the basis of a well-defined contract, while an undocumented worker faces an uncertain environment. An important feature of our model is that foreigners employed without authorization are assumed to face the risk of deportation. We model this risk as in Vinogradova (2014, 2016) within a dynamic stochastic framework of analysis. By taking on the perspective of a migrating individual, we are able to characterize the relative effectiveness of various policy actions in terms of their impact on the composition of migration flows with respect to the legal status of foreign workers. The policies we consider include those directly aimed at reducing illegal immigration, such as border controls, internal enforcement measures and deportations, as well as those that have a direct influence on the welfare of documented guest workers. These include their pay scale, visa and work-permit fees, and the maximum duration of a documented stay in the host country.

Calibrating our model to reflect the economic environment facing low-skilled migrant workers from Thailand in the economies of East Asia, we find that policies which directly concern only documented workers, such as the level at which their wage is set in the host country, can be more effective in influencing migration decisions than internal enforcement measures, such as worksite inspections, that affect the wage received by illegal aliens. Similarly, lengthening

the duration of permits issued to contract workers can be more potent in influencing the choice of migration options than a tightening of border controls that raise the cost of undocumented entry. Policies concerning the treatment of documented workers may therefore serve as effective substitutes for enforcement measures aimed at those who are undocumented.

The rest of the paper is in three parts. Section 2 defines the distinction between documented and undocumented migration for the purpose of our analysis. Section 3 compares the two migration modes in terms of the discounted welfare enjoyed by a migrant. It then examines the implications of changes in immigration policy measures for the optimal choice between the two migration options. The effects of these same measures on the *stock* of undocumented workers in the host country is analyzed in the Appendix. Finally, Section 4 concludes the paper with a summary of the main policy implications of our model.

2 Choices Available to a Potential Migrant

This section defines the optimization problem of a low-skilled worker for each of the two migration options: 1) Migrating as a documented guest-worker, with the aid of an official recruitment agency or 2) going abroad with the aid of a human smuggling organization and working in the underground economy without authorization until detected by the authorities and deported back to the country of origin.

2.1 Documented Guest Worker

Consider an individual with a planning horizon extending from time $t = 0$ to T, who intends to migrate as a documented guest worker (G) on a fixed-term contract of the duration τ, where τ is set by the immigration authorities of the host country. To obtain a contract, G must pay the cost of migration, K^g, including the recruitment fee, round-trip transport costs, visa, etc., to the recruitment agent before departure. G's initial asset holdings, A_0, may not be large enough to cover the entire cost. Assuming that he is unable to obtain credit for the purpose of financing migration, G is obliged to continue working at home for ϕ^g units of time until he

saves enough to pay for K^g.[3] Let us assume that he can earn at home, as well as abroad, a real rate of return r on any accumulated savings.

As G lives, works and saves in the home country to pay for the cost of migration, he earns the constant wage, w, measured in terms of the single consumption good (which serves as the numeraire) and consumes at the rate c_t^g. While working abroad, he earns the constant guest-worker wage w^g and consumes at the rate c_t^{g*}. After return back to the source country, he again earns w, consumes at the rate $\tilde{c}_t^g$, and gradually decumulates his repatriated savings. We assume for simplicity that a migrant leaves no bequest at the end of the planning horizon.

G's optimization problem consists of maximizing his discounted lifetime utility, V^g, with respect to c_t^g, c_t^{g*}, $\tilde{c}_t^g$, and the length of the pre-migration asset accumulation period, ϕ^g:

$$\max_{c_t^g, c_t^{g*}, \tilde{c}_t^g, \phi^g} \quad V^G = \int_0^{\phi^g} u(c_t^g) e^{-\delta t} dt + \int_{\phi^g}^{\phi^g+\tau} u(c_t^{g*}) e^{-\delta t} dt + \int_{\phi^g+\tau}^{T} u(\tilde{c}_t^g) e^{-\delta t} dt, \tag{1}$$

subject to the following two constraints. First, G's savings during the period $[0, \phi^g]$ plus his initial asset holdings, along with earned interest, must be equal to the cost of migration K^g:

$$\int_0^{\phi^g} (w - c_t^g) e^{r(\phi^g - t)} dt + A_0 e^{r\phi^g} = K^g. \tag{2}$$

Second, the present discounted value (PDV) of G's earnings abroad (from time ϕ^g to $\phi^g + \tau$), and of his earnings after return (from time $\phi^g + \tau$ to T), must be equal to the PDV of his consumption from time ϕ^g to T:

$$\int_{\phi^g}^{\phi^g+\tau} (w^g - c_t^{g*}) e^{-r(t-\phi^g)} dt + \int_{\phi^g+\tau}^{T} (w - \tilde{c}_t^g) e^{-r(t-\phi^g)} dt = 0. \tag{3}$$

Let us assume for simplicity that the utility function is of the iso-elastic form: $u(c) = \frac{c^{1-\theta}}{1-\theta}$, and that a migrant's rate of time preference equals the rate of interest, i.e. $\delta = r$.

[3] It is usually the case that the stock of liquid assets held by a potential migrant is lower than the cost of going abroad as a contract worker. That cost can amount to one or two years of source-country wages, as in the case of low-skilled workers from Thailand on contracts in the rapidly growing East Asian economies (see Jones and Pardthaisong (1999)). For those who do not have a house or land to commit as collateral, borrowing from a financial institution for the purpose of covering the cost of migration is not common. As noted by Hatton and Williamson (2011, p.24), lenders are reluctant to enter into a contract with an individual going abroad, due to enforcement issues. Informal loans from members of the family or one's social network are a more common form of financial support for the purpose of international migration. We shall see what this type of credit arrangement implies for the choice between documented and undocumented migration later in the paper.

Using standard optimization techniques, we find that the consumption rate during the first, pre-migration phase is constant: $c_t^g = c^g$, $\forall t \in [0, \phi_-^g]$. The consumption rates in phase II (i.e., while abroad) and phase III (i.e., after return) are also constant and identical to each other: $c_t^{g*} = \tilde{c}_t^g \equiv c^{g*}$, $\forall t \in [\phi_+^g, T]$. The system of equations (4)-(6) below provides an implicit solution for the key endogenous variables c^g, c^{g*}, and ϕ^g (see the Appendix A.1 for the derivation in the context of a more general model that allows price levels to differ across countries):

$$c^g = w - \frac{r[K^g e^{-r\phi^g} - A_0]}{1 - e^{-r\phi^g}}, \tag{4}$$

$$c^{g*} = \frac{w^g(1 - e^{-r\tau}) + w(e^{-r\tau} - e^{-r(T-\phi^g)})}{1 - e^{-r(T-\phi^g)}}, \tag{5}$$

$$0 = u(c^{g*}) - u(c^g) - (c^{g*})^{-\theta}\left[(w^g - w)e^{-r\tau} - w^g + c^{g*}\right] - (c^g)^{-\theta}(w - c^g + rK^g), \tag{6}$$

The discounted lifetime utility of G is obtained by substituting the solutions for c_t^g and c^{g*} from the system above into eq. (1). Later we shall compare this utility with that of an undocumented migrant (U) in our analysis of how various policies influence the choice between documented and undocumented migration. Before taking that step, it is useful to illustrate with a numerical example the optimal consumption path of G over the entire planning horizon. For this purpose, we normalize the monthly source-country wage to unity and specify the terms of a guest-worker's contract to match those pertaining to documented Thai migrants employed in Taiwan in the late 1990s. According to Jones and Pardthaisong (1999, p.41), they were required to pay recruitment fees that amounted to roughly two-years of their earnings at home to obtain a two-year contract in Taiwan that pays a wage 4 times higher than that in Thailand. Similar figures are reported by Sobieszczyk (2000) on the basis of a survey of Thai returnees from East Asian labor-importing countries. We therefore set the duration τ of a guest worker's contract at 24 months, assume that $w^g = 4$ per month, and $K^g = 2$ years worth of home-country earnings. Initial asset holdings, A_0, are set to zero, the rate of time preference is equal to the rate of interest, which is assumed to be 3% per year ($\delta = r = 0.03/12$), the migrant's

time horizon $T = 40$ years, and the degree of concavity of the utility function $\theta = 0.85$.[4] We shall note later in the paper the manner in which our main findings are affected by changes in the assumed values of θ and r.

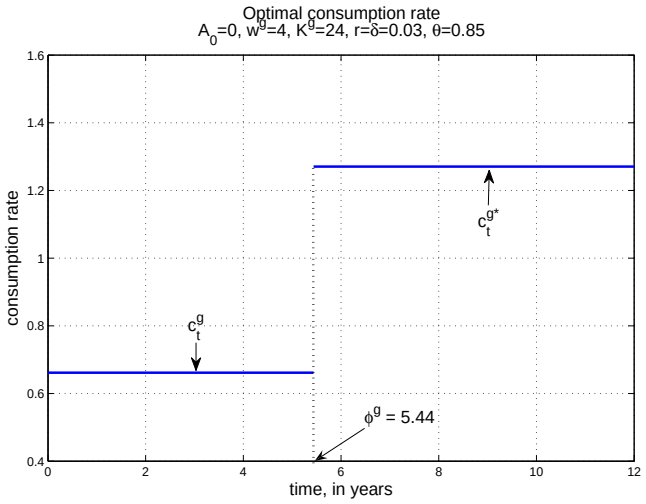

Figure 1: G's optimal consumption rate.

The solid lines in Figure 1 show G's constant consumption rate being low in the initial phase of asset accumulation at home, as he saves to pay for the cost of migration. This is followed by a higher constant rate of consumption from the time of arrival in the foreign country, $\phi^g = 5.44$ years, until time T. The higher consumption rate corresponds to G's permanent income from $t = \phi^g$ until $t = T$. The jump in consumption on arrival abroad reflects the assumption that the migrant is unable to borrow the funds needed to pay for the cost of migration. If credit were available *for that purpose* at the rate $r = \delta$, he would migrate instead at $t = 0$ and perfectly smooth his consumption intertemporally by choosing the rate that corresponds to his permanent income over the entire planning horizon.

[4]Estimates of θ vary significantly, depending on the data used and the empirical strategy. Chetty (2006) examines some of the factors that explain this wide range of estimates. He reports that the mean estimate in the literature is $\theta = 0.71$, while noting that studies which combine the benefits of exogenous variation with the structural lifecycle approach, such as Blundell, Duncan, and Meghir (1998), with its estimate of $\theta = 0.93$, provide perhaps the most credible microeconomic estimates.

In the analysis of G's problem, we have taken for granted that he voluntarily returns to the home country when his contract comes to an end. In practice, such behavior is sometimes encouraged by the partial withholding of salary, which is released by the foreign employer only at the point when G exits the host country.[5] Our definition of the problem facing G implicitly assumes that an effective withholding scheme is in place.[6] Cases of temporary foreign workers overstaying are rare in host countries with well-structured programs. In Japan, for example, illegal immigrants are not foreign workers who overstayed beyond the expiration of their work permit. They are individuals who arrived in Japan with a short term tourist, student, transit, or other type of visa that does not authorize employment and then violated the terms of admission by working in the underground economy. As noted by Satoshi (2008), only about 2% of the foreign trainees were reported *missing* by their Japanese employers.

2.2 Illegal Immigrant Facing the Risk of Deportation

Consider now the problem of an individual who intends to migrate as an undocumented alien (U) with the aid of a smuggling organization. Let us suppose that safe arrival at the destination is guaranteed by the smuggler in exchange for K^u units of the numeraire. This is usually the case in the East Asian markets for human smuggling. To initiate the transaction, the client is typically required to make a fractional downpayment. If a smuggling attempt is unsuccessful, the contract calls on the smuggling organization to try again to bring the client to the destination. Full payment for smuggling services is made only after the client arrives

[5]Foreign workers in East Asia are often required by their employers to participate in such forced-savings programs. In Taiwan, for example, forced savings of up to 30 percent of a worker's salary is legally permitted to provide the employer with what is sometimes referred to as "guarantee money" or "runaway insurance" (Verite, 2011). Similarly, Japanese employers typically oblige recruiting agents to have foreign trainees sign a contract agreeing to have a part of their salary withheld as a "security deposit" until their departure from Japan (CLB, 2011, p.36). The practice is current in other Asian labor-importing economies, including countries where it is not authorized. An example is Malaysia, where NGOs have reported that the police often fail or refuse to investigate complaints relating to the withholding of wages (United States Department of State, 2011).

[6]Explicitly introducing such a scheme in the context of the present model would not affect the migrant's consumption pattern if the rate of interest r is paid on the withheld wages, assuming that the withholding rate is lower than $1-(c^{g*}/w^g)$. This is typically the case in the East-Asia context.

safely at the destination. In the present context, it is appropriate to assume that the cost of undocumented migration, $K^u > K^g$. For the case of temporary migrants from Thailand, Jones and Pardthaisong (1999, p.45) report that unauthorized entry into Japan required a payment to human smugglers that was 3 to 4 times higher than their annual earnings in Thailand. This is in contrast to the fees paid to recruitment agencies by documented contract workers that amounted to roughly two-years worth of earnings in Thailand. The Sobieszczyk (2000) study of documented and undocumented migration from Thailand also shows that the fees paid for undocumented migration from Thailand (with the most popular destination being Japan), were on average 79 percent higher than those paid by documented workers going on two-year contracts in the construction or manufacturing sectors of Taiwan (see Sobieszczyk, 2000, p.400). In the late 1990s over 96% of registered Thai workers in Taiwan were employed in just these two sectors (see Tsay 2002, Table 6).

With initial asset holdings assumed to be $A_0 = 0$, U must accumulate K^u before departure in order to pay for the services of a human smuggling organization. The advantage of going abroad illegally is that U is not tied to a fixed-term contract with a single employer at the wage w^g, but can choose and switch employers in the host country and earn the underground-economy wage w^u. In many East Asian economies, such as Japan, Singapore, Taiwan and South Korea, the wage earned by an illegal immigrant, w^u, is significantly greater than w^g. Sobieszczyk (2000) notes, for example, that a Thai migrant working in Japan as a documented industrial worker in 1997 reported earning \$1,171 per month plus room, while unauthorized Thai migrants in the same country and the same occupation earned in 1996 between \$2,076 and \$4,193 per month plus room. Earnings of undocumented migrants interviewed for her study are on average 103 percent higher than those of documented contract workers (Sobieszczyk, 2000, p.401).[7] In what follows, we shall therefore assume that $w^u > w^g$. This is, of course, quite different from the situation in Western Europe or North America, where employers of

[7]In the case of South Korea, Mason (2001, p.343) notes that in 1996, low-skilled documented foreign workers (trainees) were being paid \$300-\$350 per month, while illegal workers were earning \$400-\$700 per month. See also Ihlwan (2005) and Migration News (1995, 1996) on the relationship between earnings of documented and undocumented workers in South Korea.

documented temporary foreign workers are normally required to provide the same wages and benefits as those enjoyed by native workers. In that setting, *undocumented* foreign workers get relatively lower compensation due to lack of employment authorization.[8] By contrast, in East Asian economies, such as Taiwan, South Korea or Japan, guest-worker programs are designed not only to relieve a shortage of labor, but also to enable employers to earn rents by hiring guest workers. Thus documented low-skilled guest workers or trainees are contractually paid wages which are a fraction of the wages earned by native workers, leaving a huge gap between their wages and those of the natives. Employment of *undocumented* workers, however, allows potential employers greater flexibility in meeting temporary shortages of labor without having to go through the paperwork associated with hiring a documented guest worker. In addition, employers can get undocumented workers on short notice from intermediaries without entering into a contractual relationship with the worker. In such an environment, employers are willing to pay for undocumented labor higher wages than those paid to documented guest workers. At the same time those undocumented wages are significantly lower than wages of natives in similar occupations, reflecting the fact that the status of the workers is unauthorized and that the intermediary is bound to take advantage of the fact that they are not eligible to work.

Since U's employment is unauthorized, he may be deported back to the home country at any time. Deportations of undocumented foreign workers are a common practice in the Middle East and East Asia. In the specific case of undocumented Thai nationals in Japan, the Japanese Ministry of Justice (2005, 2011) provides data on both the number of deportations as well as on the stocks of Thai citizens residing illegally in Japan in recent years.[9] The ratio of annual deportations of undocumented Thai nationals to the stock of illegal aliens from Thailand residing in Japan is on average 0.1446 for the seven years from 1999 to 2005.[10] Deportation

[8]See, e.g., Rivera-Batiz (1999) and Kossoudji and Cobb-Clark (2002).

[9]Data on the *stocks* of illegal aliens by country of origin is available from the Japanese Ministry of Justice (2011), going back to 1991. Data on *deportation rates* or the number of *deportation orders* issued in each year can be obtained from the Japanese Ministry of Justice (2005, 2011) going back to 1999. The difference between the number of deportations and the number of deportation orderers issued to undocumented Thai nationals is very small, typically amounting to just 1-2 percent of the number of deportations.

[10]For each of these years, the ratio is reported to be as follows: 3886/30065=0.1292 in 1999, 3359/23503=0.1429

rates obviously affect the gains that a migrant can expect to enjoy as an undocumented worker. In our analysis below, we shall assume that the event of deportation follows the Poisson process with a constant mean arrival rate λ.

Unlike G's optimization problem, that of U may consist of either two or three phases, depending on whether or not he is eventually deported. In phase I, i.e. from $t = 0$ until $t = \phi^u$, U works in the home country, earns the wage w, consumes at the rate c_t^u, and accumulates assets to cover migration costs, K^u. At the beginning of phase II, he is smuggled to the destination country and remains there until deportation occurs at some random date, say ε. While abroad, U earns w^u and consumes at the rate c_t^{u*}. If he is deported back to the country origin, phase III begins. His wage then drops to w and consumption to $\tilde{c}_t^u$. In this setting, U's objective is to maximize the expected discounted lifetime utility

$$V^u = \int_0^{\phi^u} u(c_t^u)e^{-\delta t}dt + E_\varepsilon\{V^{u*}\}, \tag{7}$$

where E_ε is the expectation operator with respect to the distribution[11] of ε and

$$V^{u*} = \int_{\phi^u}^{\varepsilon} u(c_t^{u*})e^{-\delta t}dt + \int_{\varepsilon}^{T} u(\tilde{c}_t^u)e^{-\delta t}dt.$$

Maximization is subject to the following constraints. During phase I, the migrant's initial asset holdings plus the accumulated savings must sum up to K^u:

$$A_0e^{r\phi^u} + \int_0^{\phi^u} (w - c_t^u)e^{r(\phi^u - t)}dt = K^u, \tag{8}$$

While U is abroad, his asset position evolves according to the following differential equation:

$$\dot{a}_t = ra_t + w^u - c_t^{u*}, \quad t \in [\phi^u, \varepsilon_-], \quad a_{\phi^u} = 0. \tag{9}$$

and if he is deported

$$\dot{a}_t = ra_t + w - \tilde{c}_t^u, \quad t \in [\varepsilon_+, T], \quad a_T = 0. \tag{10}$$

in 2000, 2552/19500=0.1308 in 2001, 2391/16925=0.1412 in 2002, 2272/15693=0.1447 in 2003, 2521/14334=0.1758 in 2004, and 1895/12787=0.1481 in 2005 (Japanese Ministry of Justice, 2005, 2011).

[11]Since we assume that the event of deportation follows a Poisson process, the waiting time until the first arrival is an exponentially distributed random variable with the truncated density $f_\varepsilon = \frac{\lambda e^{-\lambda(\varepsilon - \phi^u)}}{1 - e^{-\lambda(T - \phi^u)}}$.

The solution to the stochastic problem is rather straightforward but requires a few preliminary steps. First, the optimal consumption rates are obtained for any given ϕ^u. Then the optimal timing of departure is calculated to maximize (7), given the relationship between ϕ^u and the consumption rates at each point in time over the entire planning horizon.

Since $r = \delta$ by assumption, U's consumption rate in phase I is constant: $c_t^u = c^u$, $\forall t \in [0, \phi^u]$, and equal to

$$c^u = w - \frac{r(K^u - A_0 e^{r\phi^u})}{e^{r\phi^u} - 1}. \tag{11}$$

Moreover, U's consumption rate after deportation is also constant, given a_ε, and equal to

$$\tilde{c}^u = w + \frac{r a_\varepsilon}{1 - e^{-r(T-\varepsilon)}}, \tag{12}$$

where $a_\varepsilon \geqslant 0$ is the amount of savings accumulated up to the time of deportation.

The optimal time path of consumption while abroad satisfies the following system of equations[12]:

$$\frac{\dot{c}_t^{u*}}{c_t^{u*}} = \frac{\lambda}{\theta}\left[\left(\frac{\tilde{c}_t^u}{c_t^{u*}}\right)^{-\theta} - 1\right] > 0, \tag{13}$$

$$\tilde{c}_t^u = w + \frac{r a_t}{1 - e^{-r(T-t)}}, \tag{14}$$

$$\dot{a}_t = r a_t + w^u - c_t^{u*}, \quad t \in [\phi^u, T], \quad a_{\phi^u} = 0, a_T = 0. \tag{15}$$

The optimal time of migration is obtained by maximizing (7) with respect to ϕ^u subject to (11) - (15). This is done numerically since the analytical solution is not feasible. The maximized value of (7) is given by

$$V^u = u(c^u)\frac{1 - e^{-\delta\phi^u}}{\delta} + \int_{\phi^u}^{T}\left\{\int_{\phi^u}^{\varepsilon} u(c_t^{u*})e^{-\delta t}dt + \int_{\varepsilon}^{T} u(\tilde{c}_t^u)e^{-\delta t}dt\right\}\frac{\lambda e^{-\lambda(\varepsilon-\phi^u)}}{1 - e^{-\lambda(T-\phi^u)}}d\varepsilon, \tag{16}$$

where c^u, c_t^{u*}, $\tilde{c}^u$, and ϕ^u are optimally chosen.

The solid lines in Figure 2 trace the optimal time path of consumption of an undocumented migrant and identify the duration of the pre-migration asset-accumulation period. We assume

[12]See Appendix A.2 for the derivation of eq (13). For a more detailed derivation of the solution to the optimal program of an undocumented immigrant subject to deportation see Vinogradova (2016).

that $w^u = 8.12$ per month (so that an undocumented worker's wage is at a 103% premium over the wage of a foreign contract worker, as in the sample of migrants interviewed for the Sobieszczyk (2000) study), $\lambda = 0.1446$ (corresponding to the case of Thai nationals in Japan over the years 1999-2005, so that an undocumented Thai worker can expect to avoid deportation on average for 6.91 years), and $K^u = 3.58$ (or 79% higher than $K^g = 2$, corresponding to the average cost of migration of undocumented relative to documented migrants in the Sobieszczyk (2000) study). The remaining parameters take on the same benchmark values that pertain to G, namely $w = 1$, $r = \delta = 0.03$ per year, $\theta = 0.85$, $A_0 = 0$, and $T = 40$. The figure shows again an initial phase of low consumption as savings are accumulated out of

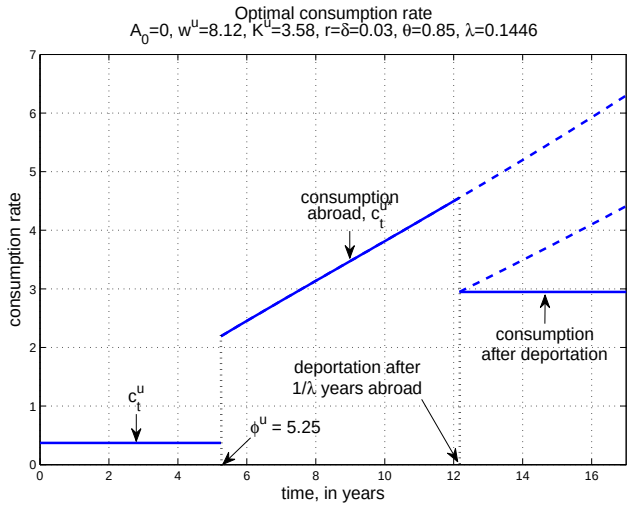

Figure 2: U's optimal consumption rate.

home-country earnings to pay for K^u at $t = \phi^u$. On arrival to the host country, consumption jumps to $c^{*u}_{\phi^u}$ and continues to increase over time as long as U manages to avoid deportation.[13] Assuming that deportation occurs at $t = \phi^u + 6.91$ years, U is sent back to the home country where he earns the wage w over the remainder of the planning horizon and his consumption

[13]The growth rate of consumption abroad is positive due to the presence of uncertainty (see eq. (13)). If there were no uncertainty, U's time profile of consumption would be determined by the difference between r and δ, and therefore would be flat in our case since we assumed $r = \delta$.

drops to a constant rate $\tilde{c}^u$. The latter is determined, as stated in eq. (12), by the amount of savings accumulated until the time of deportation, the source-country wage, and the amount of time remaining until the end of the planning horizon. In the event that U manages to avoid deportation for more than $1/\lambda$ years, the upper and lower dashed lines show, respectively, the consumption rate abroad and the *constant* rate of consumption after deportation that would be optimal if U is apprehended and returned to his country of origin at the corresponding point in time.

A comparison of the optimal consumption paths under the two options reveals that U's consumption rate in the initial phase is lower than that of G. This reflects the higher future earnings that U expects to realize abroad, inducing him to save at a higher rate in order to reach the lucrative foreign market for undocumented labor relatively sooner. U saves at a 63% rate out of his pre-migration earnings for 5.25 years to accumulate K^u equal to 3.58-years worth of source-country wages. By contrast, in Figure 1, G saves 34% of his income at origin over 5.44 years to cover his relatively lower migration costs, $K^g = 2$. It is the difference in the expected income on arrival in the host country that accounts for the discrepancy in the saving rates between U and G, and not the magnitude of migration costs.[14]

3 The Choice of Migration Mode

We begin by examining the role of a worker's initial asset holdings, A_0, in influencing the choice between U and G and subsequently consider the role of policy measures of the host country.

3.1 Initial Asset Holdings

Initial assets are a very important variable in the present context as both documented or undocumented migration is contingent on one's ability to cover the pecuniary cost of reaching the

[14]See Djajić and Vinogradova (2013) for a detailed analysis of the role of expected future earnings in influencing the optimal saving rate of a liquidity-constrained migrant in a deterministic setting.

foreign country, which is a multiple of annual earnings at home. A focus on initial asset holdings enables us to highlight the role of liquidity constraints in influencing migration decisions. In contrast with previous studies, such as Djajić, Kirdar and Vinogradova (2015), our interest here is not in the role of liquidity constraints in determining whether or not to migrate, but rather *how* to migrate: as a documented or an undocumented worker. The optimal choice of the mode of migration is determined by comparing the present values of the welfare associated with each of the two alternatives.

Figure 3 plots the maximized discounted utilities stemming from both migration options as functions of A_0. The benchmark values of the model's parameters are specified at the top of the figure, with the discounted utility of U evaluated on the assumption that he gets deported after 6.91 years of work abroad, which is the average expected duration of stay until deportation for undocumented Thai migrants in Japan in the years 1999-2005.

While higher initial asset holdings obviously imply higher welfare for both G and U, the marginal utility of wealth is higher for U at the point of intersection in Figure 3, where a worker is indifferent between the two choices. This reflects the fact that the U option is relatively more costly, yet more rewarding, calling for greater sacrifice of consumption prior to migration. This makes the marginal utility of consumption (and hence of an additional unit of wealth) relatively higher for U in the pre-migration, asset-accumulation phase.[15]

For the benchmark case, the value of $A_0 = 0.6633$ years of source-country wages is the critical initial level of wealth, A_0^*, that makes a potential migrant indifferent between the two modes of migration. If we were to assume a lower elasticity of intertemporal consumption

[15]This has interesting implications regarding the way that availability of credit can influence the choice between documented and undocumented migration. It can be shown that an informal loan of a given amount from the family network to a financially-constrained potential migrant makes U relatively more attractive in comparison with G if the individual is initially indifferent between the two options. The logic behind this result, as shown by Djajić (2015), is that the marginal utility of consumption at the beginning the planning horizon is higher for a financially constrained undocumented migrant than it is for a documented one, while on arrival in the foreign country the opposite is true. This implies that a family loan that relaxes the budget constraint of a potential migrant at the beginning of the planning horizon, with the burden of repayment coming once he starts working abroad, increases the lifetime utility of an undocumented migrant by more than it does that of a documented one. In terms of Figure 3, a given amount of credit provided to a migrant through a family-loan agreement shifts both schedules up, but more so the one pertaining to the undocumented migration option.

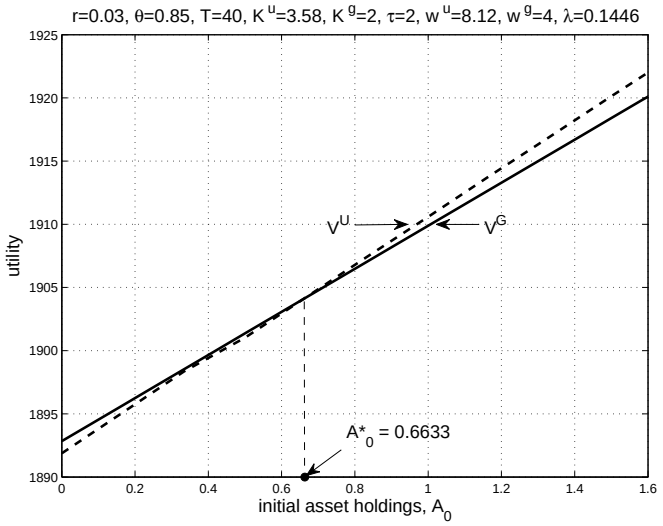

Figure 3: Welfare of U and G as a function of initial asset holdings.

substitution (a higher value of θ), the two schedules would intersect at a higher value of A_0. An increase in θ can be shown to make U less attractive in relation to G, holding other parameters of the model constant. On the other hand, an increase in r has the opposite effect. It makes U more attractive relative to G by 1) facilitating asset accumulation in the pre-migration phase and thus allowing for an earlier departure to a high-wage destination and 2) offering a higher return on the stock of repatriated assets, which is on average larger for U.

Workers that possess more than A_0^* at the beginning of the planning horizon will have a greater incentive to go abroad as undocumented migrants and those who are below the threshold are better off by aiming for documented migration. Thus the distribution of wealth in a population of potential migrants can have an influence on the composition of migration flows in terms of the legal status of migrant workers. Evidence gathered by Sobieszczyk (2000), pertaining to the case of emigration from Thailand, does in fact suggest that relatively poorer migrants opt for documented migration arranged through recruitment agencies, while somewhat wealthier, self-financed migrants are more likely to choose the undocumented route.[16] Of

[16]We are grateful to Theresa Sobieszczyk for sharing with us her data.

those in her sample who chose undocumented migration, 28.2% were reported to own a car prior to having emigrated, 87.18% owned a motorbike and 28.2% had a phone. The corresponding figures for documented contract workers are 9.8%, 76.47% and 15.68%, respectively.[17]

Remaining permanently at home is clearly another option. A worker who does not migrate faces the problem of choosing the time path of consumption, c_t^n, that maximizes $V^N = \int_0^T u(c_t^n)e^{-\delta t}dt$, subject to the budget constraint $\int_0^T (w - c_t^n)e^{-rt}dt + A_0 = 0$. With the rate of time preference equal to the rate of interest, as assumed earlier, the optimal consumption rate is $c^n = w + \frac{rA_0}{1-e^{-rT}}$ and the level of welfare enjoyed by a non-migrant is simply $V^N = \int_0^T \frac{(w+\frac{rA_0}{1-e^{-rT}})^{1-\theta}}{1-\theta}e^{-\delta t}dt = \frac{(w+\frac{rA_0}{1-e^{-rT}})^{1-\theta}}{1-\theta}\frac{(1-e^{-\delta T})}{\delta}$. If we compute the value of V^N, using the same parameters of the model as in Figure 3, we find that with initial asset holdings of $A_0 = 0.6633$, as at the point of intersection between the V^G and V^U schedules, the level of welfare of a non-migrant is 1864.1. This is considerably lower than the 1904.05 units enjoyed by similarly endowed documented and undocumented migrants. To explain why only a small proportion of the Thai labor force migrates in spite of the seemingly large gains from migration, one would need to take into consideration the strong preference that people have for staying at home and the non-pecuniary costs of migration, both of which vary across individuals. Our focus, however, is not on the choice between migrating and staying at home, but rather the choice between U and G for those who are inclined to migrate.

In addition to initial asset holdings and access to credit, one can think of many other sources of heterogeneity that have bearing on the question of selection. Those with a higher degree of relative risk aversion are more likely to opt for documented rather than undocumented mode of migration. Those with friends or relatives in the host country (who can provide information and various forms of support that lower the risks facing illegal immigrants) may find it

[17]This is not to suggest that wealthiest workers will choose to migrate without documentation. Wealthy individuals are likely to have more education and skills when compared with low-skilled workers who are considering the choice between the two options we model in the paper. Their skills, possibly entrepreneurial ability, and social capital in the community at origin are factors that make U and G options inferior in relation to other choices they may have available: skilled migration to a foreign country, starting a business abroad, or remaining at home. Thus in focusing on the migration options available to low-skilled migrants we exclude consideration of skilled and wealthy individuals who would not find these migration options attractive.

more attractive, instead, to choose the undocumented mode, etc. Unfortunately, evidence on the level of asset holdings of candidates for migration, their aversion to risk, or presence of friends and relatives abroad, is extremely scarce in the East-Asia context. This is clearly a major obstacle to testing the implications of our model. Our investigation in the next section will therefore consist of examining the sensitivity of the choice between documented and undocumented modes of migration to changes in the immigration-policy environment of the destination countries.

3.2 Immigration Policies

It is clear that tighter border control measures and more restrictive conditions for issuing tourist and other non-work visas (that effectively raise the cost, K^u, of getting into the host country and reaching its labor market in a clandestine manner) tend to lower the attractiveness of illegal immigration. Similarly, more rigorous labor-law enforcement and tougher employer sanctions are likely to lower w^u, thereby deterring undocumented immigration and clandestine employment. Stricter deportation measures operate in the same direction by reducing U's expected payoff. Less obvious is the quantitative impact of these measures, including those that pertain only to documented guest workers. Our model, designed to analyze the choice between G and U, with parameters set to reflect the conditions facing a worker from Thailand, enables us to shed light on the question of potency of any one measure relative to another in affecting the legal composition of migration flows. We define potency of a measure in terms of its impact on a migrant's discounted lifetime utility.

For the countries hosting both documented and undocumented foreign workers, each measure has its associated costs. They are economic, social and political, but they also have human-rights dimensions. An increase in w^g comes at the expense of the employers who end up enjoying lower rents from employing foreign contract workers. On the other hand, expenditures on stricter border controls, internal enforcement and deportation measures are shouldered primarily by the taxpayers of the host country and the undocumented foreign work-

ers at whom these measures are directed. A change in the duration of a guest-worker permit is at the expense of what is presumably a balance between the interest of the employer to retain a worker for a longer period of time, having provided him with firm-specific training, and the aim of the authorities to avoid hosting foreign low-skilled workers on a long-term basis. All these considerations render the analysis of the *optimal* structure of immigration policies in the present context extremely complicated. Just to define the goals of the immigration authorities and the weights they attach to the objectives of various stakeholders in a model of documented and undocumented migration with a wide range of policy instruments is an extremely challenging task. Moreover, there is very little information on the marginal cost of implementing enforcement activities and their impact on λ, K^u, and w^u. Our investigation is therefore limited to a comparison of the effectiveness of the key policy-dependent parameters ($\lambda, K^u, w^u, \tau, K^g$, and w^g) in influencing the choice of migration options from the perspective of a representative worker. An analysis of their effectiveness in influencing the *stock* of undocumented migrants in the host country and how it relates to their effectiveness in influencing the legal composition of emigration flows is provided in Appendix A.3.

Let us start from the point of intersection in Figure 3, which shows $V^G = V^U$ for a potential migrant with $A_0 = 0.6633$ years worth of source-country earnings and other parameters as in the benchmark case. The fact that the most attractive documented migration option is in one country and the most attractive undocumented option is in another requires that we calibrate the model to policies of two different countries. The benchmark values therefore correspond to the policy setting facing Thai workers who are choosing between documented migration to Taiwan and undocumented migration to Japan. Starting from that point of indifference, our computations show that a one- percent increase in w^g from 4 to 4.04, would require w^u to increase by 1.197% in order to keep a potential migrant indifferent between the G and U options. That is to say, in influencing the choice between G and U, the impact of a 1% increase in the contract wage for documented foreign workers in Taiwan is equivalent to that of a tightening of labor-law enforcement in the underground economy of Japan to the point

where it reduces the wage paid to undocumented immigrants by roughly 1.2%. Similarly, in influencing the attractiveness of G relative to U, a 1% increase in w^g is equivalent to a 0.486% increase in λ or a tightening of border controls that results in a 2.105% increase in K^u.

Extending the duration of a guest-worker permit by 1% from $\tau = 2$ to $\tau = 2.02$ years would require a 0.869% increase in w^u, a 0.354% reduction in λ or a 1.481% reduction in K^u to keep a potential migrant indifferent between the G and U options. Moreover, a 1% increase in τ affects the attractiveness of documented relative to undocumented migration as much as a 0.727% increase in w^g or a 1.634% reduction in K^g. Lowering the cost of migration of documented guest workers by reducing visa, work permit, and recruitment fees, works in the same direction. A 1% reduction in K^g requires a 0.536% increase in w^u, a 0.215% reduction in λ, or a 0.937% reduction in K^u to keep the representative migrant indifferent between the two migration options.

Our quantitative results are summarized in Table 1, where for a 1% increase in the variable i (displayed in the column on the extreme left), the table shows the change in variable j (displayed in the top row), that is required in order to maintain equality between the discounted utilities of the U and G options, holding all other parameters at their benchmark values: $A_0 = 0.6633, \tau = 2, w = 1, w^g = 4, w^u = 8.12, K^g = 2, K^u = 3.58, \lambda = 0.1446, r = \delta = 0.03$ per year, $\theta = 0.85$ and $T = 40$. Thus each entry in Table 1 is defined as $X_{i,j} = -\frac{\partial(V^u - V^g)/(\partial i/i)}{\partial(V^u - V^g)/(\partial j/j)}$, evaluated at the initial point of indifference, where $V^u = V^g$.

i \ j	w^g	τ	K^g	w^u	λ	K^u
w^g	-1	-1.375	2.247	1.197	-0.486	-2.105
τ	-0.727	-1	1.634	0.869	-0.3546	-1.481
K^g	0.445	0.612	-1	-0.536	0.215	0.937
w^u	0.835	1.150	-1.865	-1	0.414	1.773
λ	-2.057	-2.825	4.650	2.416	-1	-4.366
K^u	-0.475	-0.650	1.067	0.564	-0.229	-1

Table 1: Values of $X_{i,j}$, for the benchmark case.

Several interesting findings emerge from these calculations. First, the deportation rate is by far the most potent policy instrument influencing the choice between the documented and undocumented migration options. A 1% increase in the deportation rate affects this choice as much as a 4.366% increase in the pecuniary cost of undocumented migration or tougher internal enforcement measures that depress the earnings of undocumented migrants by 2.416%. By comparing the magnitudes of required changes in one variable for any given change in another variable such that $V^G = V^U$, we can establish on the basis of Table 1 the following ranking of the six policy-dependent variables in terms of their capacity to influence migration decisions of workers from Thailand: 1) the deportation rate, 2) the wage paid to documented workers, 3) the wage enjoyed by illegal aliens in the underground economy, 4) a contract worker's allowed duration of stay in the host country, 5) the cost of undocumented entry and finally 6) the pecuniary cost of documented migration.

In appendix A.3 we extend our model to endogenize the stock, S, of undocumented migrants in the host country and the wage, w^u, they enjoy in the underground economy. This extension allows us to draw conclusions with respect to the relationship between the relative effectiveness of policy instruments in influencing S and their relative effectiveness in influencing a worker's choice between U and G. Our findings in Appendix A.3 may be summarized as follows: 1) Deportations are not only the most potent policy variable in influencing the legal composition of Thai emigrants in East Asia, but it is even *more* effective in relation to all other policy instruments if the objective of the authorities is to control the stock of undocumented workers in the host country. This is because all other policy measures influence S only by deterring inflows, while deportations operate through two channels: they have a powerful deterrent effect on the inflow and they also reduce the stock of undocumented immigrants directly. 2) Policies aimed at influencing the utility of an undocumented migrant, as opposed to those that have a direct effect on the utility of a documented guest worker, are more potent in terms of their impact on the stock of undocumented workers than they are in terms of their impact on the legal composition of migration flows.

4 Conclusions

This paper examines the choice between documented and undocumented international migration from the perspective of a low-skilled worker. While this choice may not be available to citizens of all developing countries, it is certainly relevant to workers in South and South-East Asia, where employers from rapidly growing economies in the region and the oil-producing countries in the Middle East are recruiting most of their contract workers. The structure of our model enables us to examine how immigration policies, both with respect to documented guest workers and those aimed at undocumented migrants, influence the choice of legal status abroad for potential migrants from developing countries. We argue that offering more favorable conditions to documented contract workers makes undocumented migration relatively less rewarding and can serve as a deterrent to clandestine immigration. Setting the parameters of our model to reflect migration opportunities facing low-skilled workers from Thailand, we calculate the relative effectiveness of host-country policies aimed at documented and undocumented foreign workers in terms of their capacity to influence the legal composition of migration flows. Under these specific parametric assumptions, the deportation rate is found to be the most potent instrument in the sense that the elasticity of a migrant's discounted lifetime utility with respect to a change in the deportation rate is larger than that with respect to any other instrument under consideration. Moreover, the deportation rate is found to be even more effective in relation to all other instruments in terms of its impact on the *stock* of undocumented migrants in the host country.

A particularly interesting conclusion that emerges from our investigation is that some of the policies that directly concern documented workers, such as their wage in the host country, can be more effective in influencing migration decisions than internal enforcement measures that affect the wage received by illegal aliens. Similarly, lengthening the duration of a contract worker's permit can be more effective in influencing the choice of migration options than a tightening of border controls that raises the cost of illegal immigration. In consequence, measures that affect the treatment of documented workers can be effective substitutes for

enforcement measures aimed at illegal aliens. Considering the problem of fighting illegal immigration from a regional or even global perspective, our analysis implies that policies which affect the welfare of documented contract workers in one host country can have an impact on undocumented flows into another country. This suggests that the international migration regime is inefficient in that it fails to internalize such externalities. An analysis of the interaction among the host countries in setting their immigration policies in a more efficient manner is therefore an important item on the agenda for future research.

A Appendix

A.1 Documented migrant

The Lagrangian of the problem is

$$L = \int_0^{\phi^g} u(c_t^g)e^{-\delta t}dt + \int_{\phi^g}^{\phi^g+\tau} u(c_t^{g*})e^{-\delta t}dt + \int_{\phi^g+\tau}^{T} u(\tilde{c}_t^g)e^{-\delta t}dt +$$
$$+\mu^g\left[\int_0^{\phi^g}(w - pc_t^g)e^{-rt}dt + A_0 - K^g e^{-r\phi^g}\right] +$$
$$+\mu^{g*}\left[\int_{\phi^g}^{\phi^g+\tau}(w^g - p^*c_t^{g*})e^{-rt}dt + \int_{\phi^g+\tau}^{T}(w - p\tilde{c}_t^g)e^{-rt}dt\right],$$

where p and p^* are the domestic and the foreign price levels, respectively, assumed to be constant and μ^g and μ^{g*} are the Lagrange multipliers associated with the pre- and post-migration budget constraints, eqs. (2) and (3) of the main text, respectively. The first order conditions with respect to the choice variables are

$$\begin{aligned}
c^g: &\quad u'(c_t^g)e^{-\delta t} - \mu^g p e^{-rt} = 0\\
c^{g*}: &\quad u'(c_t^{g*})e^{-\delta t} - \mu^{g*}p^* e^{-rt} = 0\\
\tilde{c}^g: &\quad u'(\tilde{c}_t^g)e^{-\delta t} - \mu^{g*} p e^{-rt} = 0\\
\phi^g: &\quad u(c_{\phi^g}^g)e^{-\delta\phi^g} + \left[u(c_{\phi^g+\tau}^{g*})e^{-\delta(\phi^g+\tau)} - u(c_{\phi^g}^{g*})e^{-\delta\phi^g}\right] - u(\tilde{c}_{\phi^g+\tau}^g)e^{-\delta(\phi^g+\tau)} +\\
&\quad +\mu^g\left[(w - pc_{\phi^g}^g)e^{-r\phi^g} + rK^g e^{-r\phi^g}\right] +\\
&\quad +\mu^{g*}\left[(w^g - p^*c_{\phi^g+\tau}^{g*})e^{-r(\phi^g+\tau)} - (w^g - p^*c_{\phi^g}^{g*})e^{-r\phi^g} - (w - p\tilde{c}_{\phi^g+\tau}^g)e^{-r(\phi^g+\tau)}\right] = 0.
\end{aligned}$$

Assuming that $r = \delta$, the consumption rate during the first phase is constant at $c_t^g = c^g = (p\mu^g)^{-1/\theta}$. Similarly, consumption rates in the second phase (abroad) and in the third phase (after return) are also constant, as can be seen from the second and third conditions:

$$c_t^{g*} = c^{g*} = (p^*\mu^{g*})^{-1/\theta}, \quad \tilde{c}_t^g = \tilde{c}^g = (p\mu^{g*})^{-1/\theta}$$

and

$$c^{g*} = \tilde{c}^g\pi, \quad \pi \equiv (p/p^*)^{1/\theta}.$$

The optimality condition with respect to ϕ^g can be simplified by multiplying throughout by $e^{\delta\phi^g}$ and using the fact that $c^{g*} = \tilde{c}^g\pi$ to obtain

$$u(c^{g*}) - u(c^g) + e^{-r\tau}[u(\tilde{c}^g) - u(c^{g*})] - \frac{(\tilde{c}^g)^{-\theta}}{p}\left[(w^g - w)e^{-r\tau} - w^g + p^*c^{g*} - \tilde{c}^g p e^{-r\tau}(\pi^{1-\theta} - 1)\right]$$
$$-\frac{(c^g)^{-\theta}}{p}(w - c^g p + rK^g) = 0, \tag{17}$$

where we also used the CRRA specification for the utility function. Next, substitute the constant consumption rates in the respective budget constraints and integrate to obtain:

$$c^g = \frac{1}{p}\left[w - \frac{r(K^g e^{-r\phi^g} - A_0)}{1 - e^{-r\phi^g}}\right], \tag{18}$$

$$\tilde{c}^g = \frac{1}{p}\left[\frac{w^g(1 - e^{-r\tau}) + w(e^{-r\tau} - e^{-r(T-\phi^g)})}{\pi^{1-\theta}(1 - e^{-r\tau}) + e^{-r\tau} - e^{-r(T-\phi^g)}}\right]. \tag{19}$$

In the main text of the paper we consider a special case in which the price levels are identical across countries. The solution of the model simplifies to the following system:

$$c^g = w - \frac{r[K^g e^{-r\phi^g} - A_0]}{1 - e^{-r\phi^g}},$$
$$c^{g*} = \frac{w^g(1 - e^{-r\tau}) + w(e^{-r\tau} - e^{-r(T-\phi^g)})}{1 - e^{-r(T-\phi^g)}},$$
$$\tilde{c}^g = c^{g*},$$
$$u(c^{g*}) - u(c^g) - (c^{g*})^{-\theta}\left[(w^g - w)e^{-r\tau} - w^g + c^{g*}\right] - (c^g)^{-\theta}(w - c^g + rK^g) = 0.$$

Note that consumption levels abroad and after return are in that case identical. By contrast, this is not the case if price levels differ across countries.

In order to make a rigorous comparison of consumption profiles between the cases with identical and different price levels across countries, we differentiate equations (17) and (19) with respect to $\tilde{c}^g$, ϕ^g and p^* to obtain:

$$d\tilde{c}^g - \frac{\partial\tilde{c}^g}{\partial\phi^g}d\phi^g = \frac{\partial\tilde{c}^g}{\partial p^*}dp^* \tag{20}$$

$$\Delta_c d\tilde{c}^g = \Delta_p dp^*, \tag{21}$$

where

$$\Delta_c = (\tilde{c}^g)^{-\theta}\theta\left\{e^{-r\tau}(1 - \pi^{1-\theta}) - \frac{(\tilde{c}^g)^{-1}}{p}\left[(w^g - w)e^{-r\tau} - w^g + p^*c^{g*}\right]\right\},$$

$$\Delta_p = u(\tilde{c}^g)(\theta - 1)\frac{\pi}{p}(1 - e^{-r\tau}) \gtrless 0 \Leftrightarrow \theta \gtrless 1.$$

By Cramer's rule we have

$$\frac{d\tilde{c}^g}{dp^*} = -\frac{\Delta_p}{\Delta_c}, \tag{22}$$

$$\frac{d\phi^g}{dp^*} = -\frac{\Delta_p + \Delta_c \frac{\partial \tilde{c}^g}{\partial p^*}}{\Delta_c \frac{\partial \tilde{c}^g}{\partial \phi^g}}, \tag{23}$$

$$\frac{dc^g}{dp^*} = \frac{\partial c^g}{\partial \phi^g}\frac{d\phi^g}{dp^*}, \tag{24}$$

where

$$\frac{\partial \tilde{c}^g}{\partial p^*} = \frac{\tilde{c}^g(1 - e^{-r\tau})(1 - \theta)\pi^{1-\theta}}{\theta p^*[\pi^{1-\theta}(1 - e^{-r\tau}) + e^{-r\tau} - e^{-r(T-\phi^g)}]} \gtrless 0 \Leftrightarrow \theta \lesseqgtr 1,$$

$$\frac{\partial \tilde{c}^g}{\partial \phi^g} = re^{-r(T-\phi^g)}p^*\left(\frac{w^*}{p^*} - \frac{w}{p}\pi\right) > 0.$$

$$\frac{\partial c^g}{\partial \phi^g} = \frac{(K^g - A_0)r^2e^{-r\tau}}{p(1 - e^{-r\tau})^2} > 0.$$

When the utility function is logarithmic (i.e., $\theta = 1$), a migrant's consumption path after return is unaffected by variations in the foreign price level. With logarithmic utility, his nominal expenditure rate on consumption abroad is identical to his nominal expenditure rate on consumption after return. An increase in p^* results in a proportional decline in the rate of physical consumption abroad, leaving p^*c^{g*} unchanged and equal to $p\tilde{c}^g$. This can be seen by substituting $\theta = 1$ into (22). If $\theta < 1$, however, the utility function is relatively flatter, allowing for a higher degree of intertemporal consumption substitution in response to an increase in p^*. In consequence, nominal expenditure abroad declines (i.e., the decline in consumption is proportionately greater than the increase in p^*), while expenditure on consumption after return to the source country (and hence c^g) increases. The opposite is true if $\theta > 1$ (see Djajić, 1989).

Also note on the basis of (23), that the duration of the first, pre-migration phase is longer and its consumption path higher, the higher the foreign price level. Thus in comparing the optimal consumption paths in the case of identical price levels across countries with the case in which $p^* > p$, we may summarize our findings as follows. For the relevant range of $\theta <$

1, a higher price level abroad entails a delay in the optimal timing of emigration, a higher consumption rate over the pre-migration phase of the planing horizon, a lower consumption rate abroad, and a higher rate after return.

A.2 Undocumented migrant

The Hamilton-Jacobi-Bellman equation for U's problem while abroad is given by

$$\max_{c^{u*},a} \quad \left\{ u(c_t^{u*}) + \frac{\partial V_t}{\partial a_t}(ra_t + w^u - p^* c_t^{u*}) \right\} + \lambda(V_t^d - V_t) + \frac{\partial V_t}{\partial t} - \delta V_t = 0, \tag{25}$$

where V_t is U's value function and V^d is the value function after deportation. The first order conditions with respect to c_t^{u*} and a_t yield

$$u'(c_t^{u*}) - p^* \frac{\partial V_t}{\partial a_t} = 0, \tag{26}$$

$$\frac{\partial^2 V_t}{\partial a_t^2}\dot{a}_t + r\frac{\partial V_t}{\partial a_t} + \lambda\left(\frac{\partial V_t^d}{\partial a_t} - \frac{\partial V_t}{\partial a_t}\right) - \delta\frac{\partial V_t}{\partial a_t} = 0. \tag{27}$$

Differentiating (26) with respect to time and using the result in (27) yields

$$\frac{u''(c_t^{u*})}{u'(c_t^{u*})}\dot{c}_t^{u*} + r + \lambda\left[\frac{u'(\tilde{c}_t^u)p^*}{u'(c_t^{u*})p} - 1\right] - \delta = 0.$$

The optimal consumption rates in the pre-migration phase and after return are obtained following similar steps as described in the previous subsection:

$$c^u = \frac{1}{p}\left[w - \frac{r(K^u - A_0 e^{r\phi^u})}{e^{r\phi^u} - 1}\right],$$

$$\tilde{c}^u = \frac{1}{p}\left[w + \frac{ra_\varepsilon}{1 - e^{-r(T-\varepsilon)}}\right].$$

In the special case with $\delta = r$ and $p^* = p$, we obtain the solution presented in the main text. The more general case, with unequal prices levels across countries, is different from the special case as follows: If $p* > p$,

(i) Real consumption in the pre-migration phase is higher.

(ii) Real consumption rate abroad is lower and can even be below the consumption rate after deportation if p^*/p is sufficiently large.

(iii) The growth rate of consumption abroad is lower.

(iv) Real consumption rate after deportation is higher, unless $\theta > 1$ and p^*/p is sufficiently large.

(v) The optimal timing of emigration is delayed.

A.3 Immigration Policies and the Stock of Undocumented Migrants

The main body of our paper deals with the implications of host-country policies for a potential migrant's choice between documented and undocumented migration. The purpose of the analysis in this appendix is to see what the calculations presented in Section 3 can tell us about the relative effectiveness of immigration policies in influencing the *stock* of undocumented migrants in the host country.

For a given set of conditions prevailing in Thailand, let us suppose that the flow, F, of undocumented emigrants is a positive function of the attractiveness of undocumented migration, as measured by V^u, and negatively related to the attractiveness of the competing migration option, which in the present context is represented by V^g.

$$F = f(V^u, V^g),\ f_1 > 0,\ f_2 < 0. \tag{28}$$

For a given source-country wage and initial asset holdings, our analysis of Section 2 implies that the utility of an undocumented migrant can be written as $V^u = u(w^u, K^u, \lambda)$, where $u_1 > 0, u_2 < 0, u_3 < 0$ and the utility of a documented guest worker may be expressed as $V^g = g(w^g, K^g, \tau)$, where $g_1 > 0, g_2 < 0$, and $g_3 > 0$. The sign of the last inequality is based on the realistic assumption (at least in the East-Asia context) that the maximum allowed duration of stay of a guest worker in the host country is shorter than a worker's preferred duration of stay.

In what follows, we treat the stock, S, of undocumented migrants in the host country as an endogenous variable. It is then appropriate to think of w^u as being a function of this stock

and the intensity of enforcement of employer sanctions prohibiting the hiring of illegal aliens, as represented by what we now define as a host-country policy parameter σ.

$$w^u = \omega(S, \sigma),\ \omega_1 < 0,\ \omega_2 < 0. \tag{29}$$

We assume that an increase in the stock of undocumented labor in the host country has a negative impact on w^u and so does more vigorous internal enforcement of laws prohibiting the hiring of undocumented workers. Thus in contrast with our approach in Section 3, where w^u was treated as a parameter, we now take σ to represent an immigration policy instrument with w^u being endogenously determined.

Thai migrants working in the host country without documentation are deported on average at the rate λ. Their stock, S, therefore evolves according to

$$\frac{dS}{dt} = f(V^u, V^g) - \lambda S. \tag{30}$$

In a stationary equilibrium, $dS/dt = 0$, which implies that the steady-state stock of undocumented migrants from Thailand is implicitly given by

$$S^* = \frac{f(V^u, V^g)}{\lambda}, \tag{31}$$

where $V^u = u(\omega(S, \sigma), K^u, \lambda)$ and $V^g = g(w^g, K^g, \tau)$. The impact of changes in immigration policy measures on S^* can be found by differentiating eq. (31) with respect to λ, σ, w^g, K^u, K^g, and τ to obtain

$$\begin{aligned}
\frac{dS^*/S^*}{d\lambda/\lambda} &= \frac{f_1 u_3 \lambda - f(.,.)}{\Delta_s S^*} < 0, \\
\frac{dS^*/S^*}{d\sigma/\sigma} &= \frac{f_1 u_1 \omega_2 \sigma}{\Delta_s S^*} < 0, \\
\frac{dS^*/S^*}{dw^g/w^g} &= \frac{f_2 g_1 w^g}{\Delta_s S^*} < 0, \\
\frac{dS^*/S^*}{dK^u/K^u} &= \frac{f_1 u_2 K^u}{\Delta_s S^*} < 0, \\
\frac{dS^*/S^*}{dK^g/Kg} &= \frac{f_2 g_2 K^g}{\Delta_s S^*} > 0, \\
\frac{dS^*/S^*}{d\tau/\tau} &= \frac{f_2 g_3 \tau}{\Delta_s S^*} < 0,
\end{aligned}$$

where $\Delta_s = \lambda - f_1 u_1 \omega_1 > 0$.

To study the relative effectiveness of immigration policy instruments in influencing S^*, we follow an approach similar to that of Section 3. An important difference is that here, for a 1% increase in the variable i (displayed in the column on the extreme left), Table 2 below shows the percentage change in the policy variable j (displayed in the top row) that has an identical impact on the *stock* of undocumented migrants in the host country. Thus each entry in Table 2 is defined as $Z_{i,j} = (\frac{dS^*/S^*}{di/i})/(\frac{dS^*/S^*}{dj/j})$. Noting that $Z_{i,j} = 1/Z_{j,i}$, explicit solutions are provided only for values of $Z_{i,j}$ below the diagonal.

Our objective here is to simply examine how the relative effectiveness of immigration policies in influencing the *stock* of unauthorized foreign workers relates to our measure of relative effectiveness of policies in influencing a worker's choice between U and G, as presented in Table 1. For expositional purposes, Table 1 is reproduced in a summary form as Table 3 below. Let us begin with the last row of Table 2, where the effectiveness of border control measures, as reflected in the cost of undocumented migration, K^u, is evaluated in relation to other immigration policy variables. Note that f_1 measures the impact of a unit increase in V^u on the flow, F, of undocumented migrants, while f_2 measures the impact of a unit increase in V^g on that same flow. Since an improvement in the conditions facing undocumented migrants attracts a larger flow, $f_1 > 0$, while an increase in V^g encourages workers to choose G rather than U, $f_2 < 0$. Moreover, starting from an initial point where $V^u = V^g$, it is natural to assume that a proportional increase in both V^u and V^g entails an *increase* in the flow undocumented migrants so that $f_1 > |f_2|$.

Reading the bottom row of Table 2 from left to right, we observe that the effectiveness of K^u in relation to w^g in influencing S^* is simply a multiple f_1/f_2 of its relative effectiveness in influencing the choice between U and G in Table 3. The same is true when we look at the effectiveness of K^u in relation to that of τ. An increase in τ reduces the flow of undocumented migrants by increasing the utility of the G option. Lowering K^u to keep migrants indifferent between G and U after an increase in τ results in a larger inflow of undocumented foreign

workers and therefore an increase in the steady-state stock. Keeping the *stock* unchanged therefore calls for a *smaller* reduction in K^u. In this sense K^u is proportionately more potent in relation to τ when it comes to influencing S^* than it is in maintaining $V^u = V^g$, with the factor of proportionality being $|f_1/f_2|$. This is the case throughout Table 2 whenever we are comparing the effectiveness of policy variables that have a direct impact on V^u with those that have a direct impact on V^g. Thus in comparing the effectiveness of a change in K^u relative to that of a change in K^g, we have $Z_{K^u,K^g} = (f_1/f_2)X_{K^u,K^g}$.

Turning to the effectiveness of K^u relative to σ in terms of influencing S^* on the one hand and the choice between U and G on the other, we find that it is identical: $Z_{K^u,\sigma} = \eta_{w^u,\sigma} X_{K^u,w^u}$. As both policies have a *direct* impact on the utility of undocumented migration, their capacity to influence S^* is the same as their capacity to influence the legal composition of migration flows. Accordingly, f_1/f_2 does not appear in the expression for $Z_{K^u,\sigma}$ in Table 2. The elasticity of w^u with respect to σ (i.e., $\eta_{w^u,\sigma} = -(\partial w^u/\partial\sigma)(\sigma/w^u) > 0$), which translates the impact of σ in terms of a change in w^u, does appear in the expression for $Z_{K^u,\sigma}$ (and all other expressions involving σ) simply because we no longer treat w^u as a parameter of the model, but rather as an endogenous variable which is a function of S and σ.

Turning to the second row from the bottom of Table 2, which shows the impact of λ relative to that of w^g, τ and K^g, we see that the effectiveness of λ in influencing S^* is not only greater by a factor of f_1/f_2 in relation to that of the instruments directed at documented guest workers, but even more so, as reflected in the additional term that captures the direct impact of an increase in λ on the stock of undocumented migrants. With the exception of λ, all our policy instruments affect the stock of undocumented migrants only by *deterring* undocumented inflows (as in the case of an increase in w^g, τ, σ and K^u) or by encouraging them (as in the case of an increase in K^g). A tougher deportation policy (i.e., a higher value of λ) does it as well, with its deterrent power reflected in the first term of $Z_{\lambda,w^g}, Z_{\lambda,\tau}, Z_{\lambda,K^g}, Z_{\lambda,\sigma}$ and Z_{λ,K^u}. An increase in λ has an additional *direct* impact on the stock, as it results in a larger number of undocumented workers being removed from the territory of the host

country. This is captured by the second term, where $\eta_{F,w^g} = -(\frac{\partial F}{\partial V^g}\frac{V^g}{F})(\frac{\partial V^g}{\partial w^g}\frac{w^g}{V^g}) > 0$, $\eta_{F,\tau} = -(\frac{\partial F}{\partial V^g}\frac{V^g}{F})(\frac{\partial V^g}{\partial \tau}\frac{\tau}{V^g}) > 0$, $\eta_{F,K^g} = (\frac{\partial F}{\partial V^g}\frac{V^g}{F})(\frac{\partial V^g}{\partial K^g}\frac{K^g}{V^g}) > 0$, $\eta_{F,w^u} = (\frac{\partial F}{\partial V^u}\frac{V^u}{F})(\frac{\partial V^u}{\partial w^u}\frac{w^u}{V^u}) > 0$, and $\eta_{F,K^u} = -(\frac{\partial F}{\partial V^u}\frac{V^u}{F})(\frac{\partial V^u}{\partial K^u}\frac{K^u}{V^u}) > 0$ are the elasticities of undocumented flows with respect to the key variables that influence migration decisions. As for the remaining cells of Table 2, the relationship between their entries and those in Table 3 can be easily interpreted along the lines of the preceding discussion, noting in particular that policies directed at documented guest workers are just as effective *relative to each other* in influencing S^* as they are in influencing the choice between U and G. Thus $Z_{K^g,w^g} = -X_{K^g,w^g}$, $Z_{K^g,\tau} = -X_{K^g,\tau}$ and $Z_{\tau,w^g} = -X_{\tau,w^g}$.

The main conclusions to be drawn from the analysis of this appendix are the following: 1) Deportation probability is not only the most potent policy variable in influencing the legal composition of Thai emigrants in East Asia, but it is even more effective in relation to all other policy instruments if the objective of the authorities is to control the stock of undocumented workers in the host country. This stems from the fact that deportations affect the stock of undocumented immigrants not only through their power to deter undocumented migration, as do other measures, but they also have a *direct* impact on the stock through the process of physically removing undocumented aliens 2) Policies that have a direct impact on the utility of an undocumented migrant, as opposed to those that have a direct impact on the utility of a documented guest worker, are more potent by a factor of $|f_1/f_2|$ in terms of their influence on the stock of undocumented workers than they are in terms of their impact on the legal composition of migration flows.

i \ j	w^g	τ	K^g	σ	λ	K^u
w^g	1	$\frac{1}{Z_{\tau,w^g}} > 0$	$\frac{1}{Z_{K^g,w^g}} < 0$	$\frac{1}{Z_{\sigma,w^g}} > 0$	$\frac{1}{Z_{\lambda,w^g}} > 0$	$\frac{1}{Z_{K^u,w^g}} > 0$
τ	$Z_{\tau,w^g} = -X_{\tau,w^g} > 0$	1	$\frac{1}{Z_{K^g,\tau}} < 0$	$\frac{1}{Z_{\sigma,\tau}} > 0$	$\frac{1}{Z_{\lambda,\tau}} > 0$	$\frac{1}{Z_{K^u,\tau}} > 0$
K^g	$Z_{K^g,w^g} = -X_{K^g,w^g} < 0$	$Z_{K^g,\tau} = -X_{K^g,\tau} < 0$	1	$\frac{1}{Z_{\sigma,K^g}} < 0$	$\frac{1}{Z_{\lambda,K^g}} < 0$	$\frac{1}{Z_{K^u,K^g}} < 0$
σ	$Z_{\sigma,w^g} = -\frac{f_1}{f_2} X_{w^u,w^g} \eta_{w^u,\sigma} > 0$	$Z_{\sigma,\tau} = -\frac{f_1}{f_2} X_{w^u,\tau} \eta_{w^u,\sigma} > 0$	$Z_{\sigma,K^g} = -\frac{f_1}{f_2} X_{w^u,K^g} \eta_{w^u,\sigma} < 0$	1	$\frac{1}{Z_{\lambda,\sigma}} > 0$	$\frac{1}{Z_{K^u,\sigma}} > 0$
λ	$Z_{\lambda,w^g} = \frac{f_1}{f_2} X_{\lambda,w^g} + \frac{1}{\eta_{F,w^g}} > 0$	$Z_{\lambda,\tau} = \frac{f_1}{f_2} X_{\lambda,\tau} + \frac{1}{\eta_{F,\tau}} > 0$	$Z_{\lambda,K^g} = \frac{f_1}{f_2} X_{\lambda,K^g} - \frac{1}{\eta_{F,K^g}} < 0$	$Z_{\lambda,\sigma} = \frac{X_{\lambda,\sigma}}{\eta_{w^u,\sigma}} + \frac{1}{\eta_{F,w^u} \eta_{w^u,\sigma}} > 0$	1	$Z_{\lambda,K^u} = -X_{\lambda,K^u} + \frac{1}{\eta_{F,K^u}} > 0$
K^u	$Z_{K^u,w^g} = \frac{f_1}{f_2} X_{K^u,w^g} > 0$	$Z_{K^u,\tau} = \frac{f_1}{f_2} X_{K^u,\tau} > 0$	$Z_{K^u,K^g} = \frac{f_1}{f_2} X_{K^u,K^g} < 0$	$Z_{K^u,\sigma} = \frac{X_{K^u,w^u}}{\eta_{w^u,\sigma}} > 0$	$Z_{K^u,\lambda} = \frac{1}{Z_{\lambda,K^u}} > 0$	1

Table 2: Relative effectiveness of policy-dependent variables in influencing S^* and how it relates to their effectiveness in influencing the choice between documented and undocumented migration.

i \ j	w^g	τ	K^g	w^u	λ	K^u
w^g	-1	$X_{w^g,\tau} < 0$	$X_{w^g,K^g} > 0$	$X_{w^g,w^u} > 0$	$X_{w^g,\lambda} < 0$	$X_{w^g,K^u} < 0$
τ	$X_{\tau,w^g} < 0$	-1	$X_{\tau,K^g} > 0$	$X_{\tau,w^u} > 0$	$X_{\tau,\lambda} < 0$	$X_{\tau,K^u} < 0$
K^g	$X_{K^g,w^g} > 0$	$X_{K^g,\tau} > 0$	-1	$X_{K^g,w^u} < 0$	$X_{K^g,\lambda} > 0$	$X_{K^g,K^u} > 0$
w^u	$X_{w^u,w^g} > 0$	$X_{w^u,\tau} > 0$	$X_{w^u,K^g} < 0$	-1	$X_{w^u,\lambda} > 0$	$X_{w^u,K^u} > 0$
λ	$X_{\lambda,w^g} < 0$	$X_{\lambda,\tau} < 0$	$X_{\lambda,K^g} > 0$	$X_{\lambda,w^u} > 0$	-1	$X_{\lambda,K^u} < 0$
K^u	$X_{K^u,w^g} < 0$	$X_{K^u,\tau} < 0$	$X_{K^u,K^g} > 0$	$X_{K^u,w^u} > 0$	$X_{K^u,\lambda} < 0$	-1

Table 3: Relative effectiveness of policy-dependent variables in influencing the choice between documented and undocumented migration.

References

Auriol, E., and A. Mesnard, 2016, "Sale of Visas: A Smuggler's Final Song?" *Economica*, vol. 83: 646-678.

Blundell, R., A. Duncan, and C. Meghir, 1998, "Estimating Labor Supply Responses Using Tax Reforms," *Econometrica*, vol. 66: 827-862.

Bond, E.W, and T.-J. Chen, 1987, "The Welfare Effects of Illegal Immigration," *Journal of International Economics*, vol. 23: 315-328.

Borjas, G., 1999, *Heaven's Door* (Princeton: Princeton University Press).

Camacho, C., F. Mariani, and L. Pensierosos, 2013, "Illegal Immigration and the Shadow Economy," mimeo.

Chetty, R., 2006, "A New Method of Estimating Risk Aversion," *American Economic Review*, vol. 96: 1821-1834.

CLB, 2011, "Throwaway Labour: The Exploitation of Chinese Trainees in Japan," Research Reports, China Labour Bulletin, Hong Kong.

Di Giovanni, J., A. Levchenko, and F. Ortega, 2015, "A Global View of Cross-border Migration," *Journal of the European Economic Association,* vol. 13: 168-202.

Djajić, S., 1989, "Migrants in a Guest-Worker System: A Utility Maximizing Approach," *Journal of Development Economics*, vol. 31: 327-339.

Djajić, S., 1997, "Illegal Immigration and Resource Allocation," *International Economic Review*, vol. 38: 97-117.

Djajić, S., 2001, "Illegal Immigration Trends, Policies and Economic Effects," in S. Djajić, ed., *International Migration: Tends, Policies and Economic Impact* (London: Routledge).

Djajić, S., 2013, "Some Essentials of a Workable Guest-Worker Program," *International Economic Review*, vol. 54: 739-766.

Djajić, S., 2015, "Financial Support from the Family Network and Illegal Immigration," *Review of International Economics*, vol. 23: 387-403.

Djajić, S, M.G. Kirdar and A. Vinogradova, 2016, "Source-Country Earnings and Emigration," *Journal of International Economics*, vol. 99: 46-67.

Djajić, S., and A. Vinogradova, 2013, "Undocumented Migrants in Debt," *Labour Economics*, vol. 21: 15-24.

Djajić, S., and A. Vinogradova, 2014, "Liquidity-Constrained Migrants," *Journal of International Economics*, vol. 93: 210-224.

Djajić, S., and A. Vinogradova, 2015, "Overstaying Guest Workers and the Incentives for Return", *CESifo Economic Studies*, vol. 61: 764-796.

Epstein, G.S., A.L. Hillman, and A. Weiss, 1999, "Creating Illegal Immigrants," *Journal of Population Economics*, vol. 12: 3-21.

Ethier, W.J., 1986, "Illegal Immigration: The Host-Country Problem," *American Economic Review*, 76: 56-71.

Facchini, G., and C. Testa, 2015, "The Political Economy of Migration Enforcement: Domestic Versus Border Control," *CESifo Economic Studies*, vol. 61: 701-721.

Friebel, G., and S. Guriev, 2006, "Smuggling Humans: A Theory of Debt-Financed Migration", *Journal of the European Economic Association*, vol. 4: 1085-1111.

Gaytan-Fregoso, H., and S. Lahiri, 2000, "Foreign Aid and Illegal Immigration," *Journal of Development Economics*, vol. 63: 515-527.

Giordani, P.E. and M. Ruta, 2013, "Coordination Failures in Immigration Policy," *Journal of International Economics*, vol. 89: 55-67.

Hanson, G.H., 2007, "The Economic Logic of Illegal Immigration," CRS no. 26, Council on Foreign Relations, New York.

Hatton, T.J., and J.G. Williamson, 2011, "Are Third World Emigration Forces Abating? *World Development*, vol. 39 (1): 20–32.

Ihlwan, M., 2005, "A Chilly Reception For Guest Workers in South Korea," Bloomberg Businessweek, February 06, 2005. available at:. http://www.bloomberg.com/bw/ stories/2005-02-06/a-chilly-reception-for-guest-workers-in-south-korea.

Japanese Ministry of Justice, 2005, "Immigration Control Report 2005," available at http://www.moj.go.

Japanese Ministry of Justice, 2011, "Immigration Control Report 2011," available at http://www.moj.go.

Jones, H. and T. Pardthaisong, 1999, "The Impact of Overseas Labour Migration on Rural Thailand: Regional, Community and Individual Dimensions," *Jornal of Rural Studies*, vol. 15, no. 1: 35-47.

Kondoh, K., 2000, "Legal Migration and Illegal Migration: The Effectiveness of Qualitative and Quantitative Restriction Policies," *Journal of International Trade and Economic Development*, vol. 9: 223-241.

Kossoudji, S. and D. Cobb-Clark, 2002, "Coming Out of the Shadows: Learning about Legal Status and Wages from the Legalized Population," *Journal of Labor Economics*, vol. 20: 598-628.

Martin, P., 1996, "Migrants on the Move in Asia," *Asia Pacific Issues*, no. 29: 8.

Mason, A., 2001, *Population Change and Economic Development in East Asia*. Stanford: Stanford University Press.

Migration News, 1995, "Illegal Workers in Korea," vol. 2, no. 8, August. available at: https://migration.ucdavis.edu/mn/more.php?id=730

Migration News, 1996, "South Korea Contends with Foreign Workers," vol. 3, no. 12, December. available at: https://migration.ucdavis.edu/mn/more.php?id=1112

Rivera-Batiz, F.L., 1999, "Undocumented Workers in the Labor Market: An Analysis of the Earnings of Legal and Illegal Mexican Immigrants in the United States," *Journal of Population Economics*, vol. 12: 91-116.

Satoshi, K., "Japan's Internship Training Program for Foreign Workers," *The Asia-Pacific Journal*, available at http://japanfocus.org/-Kamata-Satoshi/2820, 2008.

Sobieszczyk, T., 2000, "Pathways Abroad: Gender and International Migration Recruitment Choices in Northern Thailand," *Asian and Pacific Migration Journal*, vol. 9, no. 4: 391-428.

Tamura, Y., 2010, "Migrant Smuggling," *Journal of Public Economics*, vol. 94: 540-548.

Tamura, Y., 2013, "Migrant Smuggling when Exploitation is Private Information," *Canadian Journal of Economics*, vol. 46: 1463-1479.

Tsay, C.-l., 2002, "Labour Migration and Regional Changes in East Asia: Outflows of Thai Workers to Taiwan," Paper presented at the IUSSP Conference on Southeast Asia's Population in a Changing Asian Context, Siam City Hotel, Bangkok, Thailand, 10-13 Jun 2002.

United States Department of State, 2011, "2011 Trafficking in Persons Report - Malaysia," available at: http://www.refworld.org/docid/4e12ee633c.html [accessed 1, January 2015].

Verite, 2011, "What Should You Look For? Identifying Company Risk & Vulnerability to the Human Trafficking and Forced Labor of Migrant Workers," available at http://digitalcommons.ilr.cornell [accessed January 1, 2015].

Vinogradova, A., 2014, "Legal and Illegal Immigrants: An Analysis of Optimal Saving Behavior," *Journal of Population Economics*, vol. 27: 201-224.

Vinogradova, A., 2016, "Illegal Immigration, Deportation Policy, and the Optimal Timing of Return," *Journal of Population Economics*, vol. 29: 781-816.

Woodland, A.D., and C. Yoshida, 2006, "Risk preference, immigration policy and illegal immigration," *Journal of Development Economics*, vol. 81(2): 500-513.

Yoshida, C., 2000, *Illegal Immigration and Economic Welfare*. Springer-Verlag, Heidelberg, Germany.