Creating illegal immigrants

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Abstract. This paper considers the prospects for successful implementation by governments of guest-worker programs that are based on an intended temporary presence of foreign workers. A means of enforcement of temporary presence is a penalty imposed for overstaying the permissible time period. Employers who are obliged to post bonds for their foreign workers are provided with an incentive to ensure that their workers leave at the end of their contractually specified stay. We consider the consequences of such a bond when foreign workers can leave legal employers for illegal employment. We also investigate the effectiveness of deferred payments to foreign workers as a means of discouraging transition from legal employment to illegal presence. In the final analysis, although the policy intention is a temporary stay, we conclude that if foreign workers do not wish to return home, there is an almost inevitability to the creation of a population of illegal immigrants (whose presence may be subsequently legalized).

1. Introduction

Economic studies of illegal immigration have considered how border controls and internal apprehension can be used to control illegal presence (see for

example, Wilfred Ethier 1986; Andreas Jahn and Thomas Straubhaar 1995; Klaus Zimmermann 1995). In this paper we consider compliance with immigration laws when people enter a country legally for purposes of temporary employment, and where there is at the same time no credible and effective internal apprehension mechanism should a foreign worker decide to switch to illegal unemployment and overstay the permissible contractually specified time period of legal presence. Since entry into the country takes place legally, border controls are of no relevance to our study, nor is there a role for internal apprehension under the circumstances we consider.

The circumstances which we investigate arise when a legal employer has been granted a permit to bring in a foreign worker for a designated period of time, after which the foreign worker is obliged to depart. The intention of government policy is that guest workers should be temporary guests, to be replaced in a revolving pool of temporary foreign workers. The foreign workers, however, receive job offers in a secondary market, and can accept an offer of illegal employment if they so wish. In legal employment, workers are obliged to return home at the end of the specified contractual period, whereas in illegal employment there is no such restriction effective on the length of stay. By making the transition to illegal employment, the foreign intendedly temporary workers can be transformed to illegal permanent immigrants.

Our model will have no normative connotations. That is, we make no judgments about the social justice or social desirability of restrictive national immigration policies, and in particular of policies that permit temporary presence of a changing composition of population of foreign workers but do not permit the permanent presence of a constant population of foreign workers.

Our point of departure is the observation that countries almost universally regulate immigration. Given that this is the case, the question which we wish to consider is whether governments can be expected to be successful in an objective of enforcing temporary stay, when the source of illegal immigration is people who have entered the country legally under the terms of temporary guest-worker employment.

The ostensible purpose of guest-worker programs is to alleviate sector-specific labor shortages.[1] Foreign workers arrive in a country under short-term employment contracts. The intention of temporary stay is reflected in families left behind, and in the local employer often taking responsibility for housing, health care, and other services during the temporary stay. Yet some foreign workers may well prefer not to return home. A means of attempting compliance is a bond which is forfeited if a worker does not leave as stipulated by the employment contract. Ideally the bond would be posted by the migrant worker. A credible bond may, however, be beyond the migrant worker's means, and also there are jurisdictional and convertible-currency impediments to having immigrant workers make payments conditional on the issuance of temporary work visas. It is therefore usual that the bond is paid by the employer who has requested the foreign worker. This is, for example, the procedure in Israel and Greece. The incentive for enforcement of the contractual departure requirement is thereby shifted to the employer.

How the legal employer then fares depends on the opportunities facing the foreign worker. If foreign workers can more or less freely leave legal employment for illegal employment, the legal employer confronts the problem of devising incentives which preempt or inhibit the transition to illegal employment.

When governments choose not to deport illegal immigrants, legal employers indeed confront a compromise of contractual rights. They have paid the bond to bring in a foreign worker. They cannot, however, prevent the foreign worker, once present in the country, from making the switch to illegal employment, and if the foreign worker makes the switch, the legal employer loses the value of the bond.

This problem for a legal employer arises in a society where all residents, including intended temporary workers, are free to exercise choice of employment. The problem does not arise in those countries where the relation between employer and temporary immigrant worker can verge on indentured service or near slavery, and where foreign workers can be confined to the housing complex of the family to whom they are bonded, or to the domain of physical control of the business enterprise to which they are legally subject. In these countries the penalty for absconding from the legal employer can be harsh, and a policy which assigns to employers responsibility for departure of migrant workers can be effective. We are concerned, however, with circumstances where all employment, including that of foreign workers, is *de facto* voluntary, in the sense that, should a foreign worker choose to leave a legal employer, the costs of seeking out and deporting the absconded worker are too high to warrant the enforcement activity, by either the legal employer or the government. The legal employer then forgoes the bond, and incurs the cost of replacing the lost worker with a new legal migrant worker (which entails a new bond). The new worker may, however, likewise decide to become illegal. And so on. In this process, a stock of illegal immigrants is created, contrary to the intentions of the temporary guest-worker program.

If migrant workers are able to leave a legal employer for illegal employment, we might well ask why a domestic employer would ever choose to employ a legal migrant worker. For an employer can "poach" a worker from a legal employer without paying the bond. If all employers seek to poach, there is, of course, no supply of legal workers to be poached. In practice, some employers, out of principle or necessity, choose not to employ illegal workers. Moral imperatives may affect behavior: a worker poached from legal employers is in effect "stolen". Large-scale employers may have no choice other than to use legal workers, because of the visibility of the employment relation. In other cases, people in the public eye or anticipating public office may not wish to risk being found to be employing illegal migrant workers.

The legal employers then bring in legal workers. Since there are other employers who have no qualms about employing workers illegally (which allows avoidance of the bond and avoids as well the prospect of having workers poached), the legal workers provide the pool for a population of illegal immigrants.

The illegal market is in practice not organized to provide continuous market job offers. Advertising for illegal workers cannot take place because of the illegal nature of the job offer (or indeed because of the conception of theft associated with this market). Legal workers accordingly tend to receive random job offers from prospective illegal employers which they can accept or decline. Legal employers are, however, aware of the incentives that confront the foreign worker, and can therefore be expected to make allowance in their wage payments for the likelihood than their legal workers will receive illegal job offers. Employers who have chosen to employ illegal workers could alternatively have chosen to bring in legal workers. If illegal employers are in-

different between importing legal workers themselves and poaching other employers' legal workers, the wage for illegal employment is *ceteris paribus* greater than for legal employment, since the legal employer incurs the cost of the bond while the illegal employer does not. The wage premium for illegal employment makes illegal offers attractive for migrant workers. A move to illegal employment before the end of the legal contract period has another advantage for the foreign worker, who can thereby avoid having to return home; for should the worker still be with his legal employer when the permissible stay expires, the legal employer will redeem his bond by ensuring exit of the worker from the country. There are, on the other hand, offsetting benefits when a worker chooses to remain legal. Life is easier, and also the freedom of legal residence facilitates accumulation of human capital, which is rewarded in the legal wage contract. All aspects considered, the position of the legal employer is, however, not advantageous, for job offers can be expected to arise at which the worker for whom the bond has been posted leaves to accept illegal employment.

Against this background, the government's discretionary policy instruments are (1) the value of the bond paid by the legal employer, and (2) the period of time of permissible legal employment after which the migrant is legally obliged to return home. Our model will consider the prospects, given these policy instruments, of a government achieving an objective of a rotating transient worker migrant pool.

We proceed as follows. Section 2 describes the interactions among legal and illegal employers and foreign workers. Section 3 evaluates the prospects of ensuring via a bond that workers adhere to the conditions of temporary stay. Section 4 considers changes in market conditions. Section 5 considers a response by the legal employer, to protect his interests, by offering workers a payment deferred to the day of required departure from the country, so in effect shifting the bond to the worker; we establish the employer's optimal pre-exit wage offer, but moral hazard will make workers reluctant or unwilling to accept such an arrangement. In Sect. 6 we consider an attempt by government to establish a deferred payment scheme by taxation of foreign workers; this solution does not suffer from moral hazard, but is subject to other implementation difficulties. The final section summarizes the conclusions, which do not point in the direction of high likelihood that temporary or guest-worker programs can avoid the growth of a population of illegal immigrants.

2. The model

We shall consider three types of economic agents, migrant workers, employers who only use legal workers, and employers for whom illegality is not a problem. All agents are risk-neutral. Migrant workers are attracted by a wage differential which compensates for the non-monetary costs of relocation (absence from family and friends, foreign culture and language, etc.), and are available in elastic supply. Access to the destination country requires an employment contract with a domestic employer. Thus, the migrant has a job upon arrival, and his wage on arrival is set in advance. The employment contract is for a fixed time period after which the migrant worker is required to return home, and ties the worker exclusively to the legal employer. Before emigrating, workers know only the wage they will receive in the first year in legal em-

ployment and lack information regarding alternative illegal employment possibilities.[2] The wage received by migrants had they stayed in their own country plus the non-monetary costs of being away from home establishes the reservation wage for emigration W^r, and workers emigrate or stay if the wage they receive in the destination country is greater. An additional monetary cost of emigrating, C, is borne by the employer.[3]

Providing they receive an appropriate wage offer, migrants wish to remain in the country for a maximum of three periods.[4] This is longer than the legally permissible stay (which is either one or two periods). Once legally employed, a worker receives a single non-recallable offer per period of alternative illegal employment with probability P. This probability depends on the share of employers who are willing to employ illegal workers. The illegal offers are drawn from an exogenous wage distribution,

$$W^I \in [\,\underline{W}^I(1+\delta)^{n-1}, \overline{W}^I(1+\delta)^{n-1}\,],$$

where n is the number of periods during which the worker is employed in the legal sector, and $\delta > 0$ is the increase in human capital in legal employment. The latter is the sole advantage of legal employment (for example, on-the-job training including formally learning the language in the host country, etc.).[5] In equilibrium, it must be the case that $\underline{W}^I \geq W^r$, to entice the worker to remain in the country.

The migrant worker's problem is to decide whether to accept or reject the offer which he receives in a period. Given that $\underline{W}^I \geq W^r$, any offer received in the last year of the legal contract will be accepted, since, by exiting the legal market to illegal employment, the worker can remain in the country rather than return home.

Legal employers employ migrants for two periods, but the migrants wish to stay for three. That is, migrants want to stay in the country longer than is legally permissible. We assume, for simplicity, that the demand for these workers by the legal employers is perfectly inelastic (the implications of relaxing this constraint are, however, noted throughout the paper). A legal employer petitions the government for a permit to bring a foreign worker into the country. The permit is granted for a fixed period and requires the deposit of a bond, B, which the employer forfeits if the worker does not leave the country when the permit expires. The employment contract specifies a wage in the first year equal to the worker's reservation wage, and, if there is a second year, guarantees at least that wage in the second year. However, a legal employer may choose to pay a higher wage in the second year, in order to provide an incentive for the worker to stay on rather than accept an offer of illegal employment.

Let temporary work permits be granted for a period of two years. In the first period, a migrant worker receives W^r, which costs the employer $W^r + C$. By the end of the first period, the immigrant has "learned" about market conditions, and has full knowledge of the wage W_2^L he will receive if he continues in his current place of employment in the second period, and the distribution of wages in the illegal market. The migrant worker then receives a wage offer W^I of illegal employment with probability P. If he chooses to accept this offer, he then receives that wage for the next two periods (since no human capital accumulation occurs in illegal employment). If he either does not receive an offer or rejects the offer, he is paid the wage for legal employ-

ment W_2^L during the next period. In that case, the worker receives, at the end of the second period with probability P, an/another offer, which he can accept or reject. If, at the end of either period, the employee accepts the offer of illegal employment, the initial legal employer forfeits his bond.

Government policy is to allow transitory stays in the country by migrant workers, while avoiding permanent immigration. The government sets the time period for permits for legal employment and the size of the bond paid by the legal employer.

We describe first the employee's problem, and then use the solution to determine optimal behavior by employers. We present first the case when the permit for legal employment is issued for one period only, and then show how behavior changes if the duration of the permit is extended to two periods.

2.1 A one-period permit

When permits are granted for a single period only, the employee faces a simple decision. Any offer of illegal employment will be accepted, since $\underline{W}^I \geq W^r$. Thus, for every cohort of legal workers, a proportion P (those receiving offers of illegal employment) remains in the country illegally. There is no incentive for the legal employer to offer a higher wage, since this cannot encourage the employee to remain in legal employment. Consequently, as a result of the employer's desire for two years of services, the average share of eventual illegal immigrants brought in by each employer is:

$$p_l = 2P, \tag{1}$$

and the total expected cost to the employer of receiving the services is

$$E(TC) = 2(W^r + C + P \cdot B), \tag{2}$$

since the employer always brings in two workers over the two year period.

2.2 A two-period permit

2.2.1 The worker's problem. To solve the problem from the perspective of the worker, we start from the last period. Assume that wage offers from the illegal sector are distributed with probability distribution function $f(W^I)$, and cumulative distribution function $F(W^I)$. These probabilities are conditional on receiving an offer, i.e., $\int_{\underline{W}^I(1+\delta)}^{\overline{W}^I(1+\delta)} f(W^I)\,dW^I = 1$. Thus, the probability of receiving an offer of W_1^I is $Pf(W_1^I)$. Given that $\underline{W}^I \geq W^r$, the worker accepts any offer he receives in period 2. Then the worker's expected income *after* working in the legal sector for two periods (but before receiving – or not receiving – an offer in the illegal market) is

$$E(V_2 \,|\, \text{in legal sector}) \equiv E(V_2) = \int_{\underline{W}^I(1+\delta)}^{\overline{W}^I(1+\delta)} W^I P f(W^I)\,dW^I + (1-P)W^r$$

$$= P \cdot E(W^I) + (1-P)W^r, \tag{3}$$

where $E(W^I)$ is the expected wage level in the illegal market. Thus, $E(V_2)$ is the expected wage in the third period.

Moving back a period, assume that, after the end of the first period, the worker receives an offer of W_1^I. If he accepts this offer, he will receive W_1^I for two periods, and if not, he will receive the second period wage in the legal market, W_2^L, for one period and $E(V_2)$ for one period. The worker will choose the alternative which gives the highest expected wage over his worklife, so his expected income in the first period is:

$$E(V_1) = \text{Max}\,[2W_1^I,\ W_2^L + E(V_2)]. \tag{4}$$

Define the wage rate at which he is indifferent between the options as

$$\hat{W}^I = \frac{E(V_2) + W_2^L}{2}. \tag{5}$$

His expected income before receiving an offer after the first period, conditional on receiving an offer, is thus:

$$E(V_1) = \int_{\underline{W}^I}^{\hat{W}^I} [E(V_2) + W_2^L]Pf(W^I)\,dW^I + \int_{\hat{W}^I}^{\overline{W}^I} W^I Pf(W^I)\,dW^I. \tag{6}$$

2.2.2 *The employer's problem.* Again, working from the end period, define the realization that the worker is still employed by the original legal employer in the second period S_1. The probability that this will occur is

$$p(S_1) = PF(\hat{W}^I) + (1 - P). \tag{7}$$

The first term is the probability that he rejects an offer from the illegal market, and the second term is the probability that he does not receive an offer. The probability that he will still be in legal employment and sent home at the end of the second period is

$$p(S_2) = (1 - P)p(S_1), \tag{8}$$

where S_2 is the realization that he will still be in legal employment at the end of the second period, because he accepts any offer in the second period.

The cost of employing a worker for two years depends on whether the legal worker who is initially employed remains with the legal employer in the second period, and on whether the employer has had to pay the bond. We assume that, if the legal employee made the transition to illegal employment after the first period, the employer imports another employee for one year, and that this latter employee will leave legal employment after a year if he receives an offer in the illegal market. Note that this second employee is substantially different from the first in that his initial contract is for a single year only. Thus, with probability P the employee jumps to the illegal sector, and the employer forfeits a second bond. With probability $(1 - P)$ the second employee remains with the legal employer and is sent home, and the employer regains the second bond.

The expected cost of receiving the desired services for the two years is consequently

$$E(TC) = W^r + C + p(S_1)W_2^L + [1 - p(S_2)]B$$
$$+ (1 - p(S_1))[W^r + C + P \cdot B]. \tag{9}$$

The first four terms refer to costs incurred as a result of the first legal worker. The first term is the wage paid in the first period, the second is the cost of bringing in the worker, and the third is the wage paid in the second period if the worker did not leave for illegal employment multiplied by the probability of that having occurred. The fourth term is the bond multiplied by the probability that the employer has to forfeit the bond (i.e., the probability that the worker has left him). The final term is the probability that the employer brings in a second employee multiplied by the cost of employing the worker, including the expected bond forfeiture with respect to this worker. The employer's problem is to choose the wage for legal employment W_2^L so as to minimize $E(TC)$ subject to market conditions, the worker's behavior, and the government policy in place.

Assume, for simplicity, that wage offers on the illegal market are uniformly distributed, so that $W_2^I \sim U[\underline{W}^I(1+\delta)^{n-1}, \overline{W}^I(1+\delta)^{n-1}]$. In this case, at the end of period 1,

$$f(\hat{W}^I) = \frac{1}{\overline{W}^I - \underline{W}^I} \quad \text{and} \quad F(\hat{W}^I) = \frac{\hat{W}^I - \underline{W}^I}{\overline{W}^I - \underline{W}^I}. \tag{10}$$

Define the range of the distribution, $\overline{W}^I - \underline{W}^I$, as R, and the mean wage in the illegal sector, $(\overline{W}^I + \underline{W}^I)/2$, as A. Replacing (5) in (10), and the result in (7), we find that

$$p(S_1) = \frac{[(W_2^L - \underline{W}^I) + (E(V_2) - \underline{W}^I)]P}{2R} + (1 - P)$$
$$\Rightarrow \frac{\partial p(S_1)}{\partial W_2^L} = \frac{P}{2R} \tag{11}$$

and from (8)

$$\frac{\partial p(S_2)}{\partial W_2^L} = \frac{(1 - P)P}{2R}. \tag{12}$$

Differentiating (9) with respect to W_2^L using (11) and (12), we find that

$$W_2^{L^*} = \underline{W}^I + \frac{W^r + C + B - E(V_2)}{2} - \frac{(1 - P)}{P}R, \tag{13}$$

assuming an internal solution. The second order condition holds. Solving for $E(V_2)$ from (3), we find that

$$E(V_2) = A(1 + \delta)P + (1 - P)W^r. \tag{14}$$

Thus,

$$W_2^{L^*} = \underline{W}^I + \frac{C+B}{2} - \left(\frac{A(1+\delta) - W^r}{2}\right)P - \frac{(1-P)}{P}R. \tag{15}$$

From (15), we see that the wage the employer pays depends on the minimum wage available on the illegal market, the cost of bringing a new worker from abroad (the direct cost, C, plus the forfeited bond), the expected wage premium paid in the illegal market, and the range of prices in the illegal market. The relationships among these variables will be discussed in the following section.

The solution will be interior as above if and only if $W_2^{L^*} \geq W^r$. If this is not the case, the employer will pay exactly W^r.

From (5), (14), and (15),

$$\hat{W}^I = \frac{\underline{W}^I + W^r}{2} + \left(\frac{A(1+\delta) - W^r}{4}\right)P + \frac{B+C}{4} - \frac{(1-P)}{2P}R. \tag{16}$$

Again, the $\hat{W}^I$ calculated in Equation (16) assumes an interior solution, but now from the point of view of the employee. Should this reservation value be lower than $\underline{W}^I$, the employee always moves to the illegal sector if he obtains an offer after the first period; and if it is greater than $\overline{W}^I$, the employee does not move. In the former case the employer will pay exactly W^r, and in the latter case he will pay the greater of W^r and the wage which will make $\hat{W}^I = \overline{W}^I$.

The proportion of migrants who leave the country will equal, from (7), (8), (10) and (16)

$$p(S_2) = \frac{3(1-P)^2}{4}$$
$$+ P(1-P)\left[\frac{(A(1+\delta) - W^r)P - 2(\underline{W}^I - W^r) + (B+C)}{4R}\right]. \tag{17}$$

The expected share of illegal employees remaining in the country as a result of the employers actions will then equal

$$p_I = (1 - p(S_2)) + (1 - p(S_1))P, \tag{18}$$

where the first term on the right-hand-side is the proportion of original employees who remain, and the second term reflects the employees brought in to replace those who left in the first period, and who move over to the illegal sector after their legal permit has expired. Substituting from (8) and (7),

$$p_I = [2 - F(\hat{W}^I)]P, \tag{19}$$

and using (8) and (14),

$$p_I = 2P + \frac{(1-P)}{4} - \left[\frac{(A(1+\delta) - W^r)P - 2(\underline{W}^I - W^r) + (B+C)}{4R}\right]P. \tag{20}$$

Table 1. A numerical example

	p_I	$1 - p(S_1)$	$W_2^{L^*}$
Benchmark	0.93125	0.24375	267.5
$P = 0.45$	0.851313	0.249438	247.52
$P = 0.51$	0.947553	0.242478	274.97
$W^r = 230$	0.950000	0.262500	265.00
$W^r = 250$	0.912000	0.225000	270.00
$B = 190$	0.943000	0.256250	262.00
$B = 210$	0.918700	0.231250	272.00
$\underline{W} = 245, A = 295$	0.919000	0.234687	264.00
$\underline{W} = 255, A = 305$	0.943400	0.252812	271.00
$\underline{W} = 245, R = 110$	0.937500	0.267045	252.00
$\underline{W} = 255, R = 90$	0.923000	0.215278	282.00

Benchmark: $B = 200$, $C = 80$, $\delta = 0.1$, $W^r = 240$, $P = 0.5$, $\underline{W} = 250$, $R = 100$, $A = 300$

In the next two sections we develop the implications of the model. To demonstrate and emphasize some of the propositions to be discussed, we present, in Table 1, a numerical example, to which we refer in the course of the discussion.

3. Policy effectiveness

3.1 The period of permissible stay

The government chooses the duration of permissible legal stay. Comparing (19) with (1), we establish

Proposition 1. *The illegal population is smaller if the permit for legal employment is granted for a longer period.*

This occurs because some of the migrant workers who receive job offers for illegal employment in the first period reject the offer, because of the assurance of continued legal employment in period 2 and the learning that takes place while in legal employment. Evidently a long enough period of permissible legal employment would eliminate illegal employment. Since, however, the objective is to permit only temporary residence for employment purposes, the permissible employment period is bounded. Proposition l indicates that the period of permissible employment should not be too short; rather it should be sufficiently long to provide incentives for the worker to reject illegal job offers and remain with the legal employer. Given that the illegal market is not well organized and only generates sporadic job offers at random wages, the consequence of lengthening the legal period of employment is that a higher proportion of foreign workers returns home.

Up to this point we have assumed a totally inelastic demand for legal workers, at least in the relevant price range. Were this assumption relaxed, the

effect would be ambiguous. This is because the possibility of keeping the same worker for a longer period can only decrease the expected cost to the employer (since he can always choose to keep each employee for a single period only). Thus, the lower wage will increase the quantity of workers demanded, increasing the sizes of both the legal and, indirectly, the illegal markets. In what follows we do not discuss this effect in the text but relegate it to footnotes.

3.2   The value of the bond

Government policy also sets the value of the bond which legal employers are obliged to deposit. Increasing the bond affects not only costs with respect to one employee; if an employee leaves, the employer will hire another legal worker and so incur the increased cost of the bond twice.

From (15) and (20) we establish that

Proposition 2. *An increase in the bond increases the wage paid for legal employment and increases the proportion of migrant workers who leave the country.*[6]

An increase in the bond increases the expected costs of legal employers, since the bond is forfeited if the worker moves to illegal employment. The expected cost to the legal employer of losing a worker is therefore increased. The legal employer consequently has a greater interest in providing an incentive structure that will keep the worker from moving to illegal employment, and the incentive is provided by a higher second-period wage for legal employment. Because of the higher wage, the probability increases that the worker will be in legal employment at the end of the permissible period of legal employment, so that the employer regains the bond and the worker returns home.

In Table 1 the benchmark bond is 200. Increasing the bond increases the legal sector wage $(W_2^{L^*})$, thus decreasing the percentage of workers who accept illegal-sector offers in the first period $(1 - p(S_1))$, thereby also decreasing the percentage of immigrants that stay in the country over the two year period (p_I).

4. Other changes

In our analysis we bifurcated the population of potential domestic employers into those who are not willing to employ illegal workers and those for whom illegality is not an issue. The relative size of the population of employers willing to employ illegal workers determines the probability P of finding an illegal job. If P increases, legally employed workers will know that they are more likely to receive a job offer after the second period, and hence will have a greater incentive to remain with the legal employer throughout period two; this in order to avail themselves of the growth in their human capital while in legal employment. As a result, as can be seen from (16), the illegal market wage at which the worker will be indifferent between leaving and staying increases.

The effect on the legal wage in the second period is, however, ambiguous, because the improved prospects of receiving an illegal job offer in the second period lead migrant workers to demand a higher wage before switching to illegal employment. Thus, for a given legal-sector wage, it is unclear how an increase in the probability of receiving an offer will affect the share of immigrants who have left for the illegal employment sector after the first period. On the one hand, migrant workers only accept higher offers, so fewer will have left, but also more workers receive offers, including high offers, which increases the share which will have become illegal. Hence, as seen in (15), the effect on the legal-sector wage, W_2^L, is ambiguous. It consequently cannot be determined whether more or fewer workers will leave for illegal employment. This can be seen in (19): since $\hat{W}^I$ increases when P increases, the effect on p_I is ambiguous. Thus,

Proposition 3. *A greater willingness by employers to employ illegal workers increases the average accepted wage for illegal employment, but can either increase or decrease the wage in the legal sector and the proportion of workers who make the transition to illegality.*[7]

In the example given in Table 1, an increase in the probability of receiving an offer has caused the legal wage to rise, which, in turn, has decreased the percentage of workers who left after the first period, but has *increased* the total size of the illegal labor force.

A reason for a legal worker not to accept a job offer is the increased rewarded future productivity due to the accumulation of human capital in legal employment. An increase in the rate of accumulation of human capital decreases the likelihood that the legal employee accepts an illegal wage offer in the first period, since, again, the reservation wage for exit from legal employment has increased, and the worker will consequently hold out for a higher wage (Equation (16)). Thus, the probability of the worker still being in legal employment at the end of period two increases with δ. For the same reason, an increase in δ decreases the wage the legal employer must pay (Equation (15)), since the worker is more likely to remain in legal employment. The former consideration clearly outweighs the latter, and, as seen in (20), the size of the illegal population unambiguously decreases. Thus,

Proposition 4. *The greater is human capital accumulation in legal employment, the greater is the propensity of foreign workers to return home after their contractually specified period of legal employment.*[8]

Changes in the illegal wage distribution have ambiguous effects on the proportion of workers who return home. In (20) such a change can be effected in a number of ways, all of which lead to ambiguous changes in p_I. For instance, an increase in the average, A, without changing the range, R, also increases $\underline{W}^I$, so the effect is ambiguous. Similarly, an increase in the range without changing the average lowers $\underline{W}^I$. Increasing $\underline{W}^I$ will, in turn, necessitate either increasing A or decreasing R. And, finally, increasing $\overline{W}^I$ will either increase the range and the average, or increase the average and $\underline{W}^I$.

The affect on the legal market wage (Equation (15)) and on the worker's indifference wage (Equation (16)) is more clear cut. If $\underline{W}^I$ and $\overline{W}^I$ increase by the same amount (so that R does not change) the effect on the legal market

wage remains ambiguous, while the indifference wage clearly rises. If, however, the average wage is unchanged, so necessitating a fall in the range of wages, it is clear that both the legal sector wage and the indifference wage increase. To summarize,

Proposition 5. *An increase in the wage distribution in the illegal sector increases the wage in both illegal and legal employment, but has an ambiguous effect on the proportion of workers who convert to illegality.*[9]

Referring to Table 1, we see two types of changes in the wage distribution. In both cases the lowest wage was increased. In the first case the average was thereby increased, but the range was held constant, while in the second the average was held constant and the range was decreased. In both cases the legal wage increased, but the effect on the share of immigrants who remained in the country differed across the cases – in the first case more immigrants remain, while in the second more return home.

From (15), (16), and (20), we have:

Proposition 6. *An increase in the reservation wage, W^r, increases the legal market wage and the worker's indifference wage rate, and decrease the size of the illegal market, ceteris paribus.*[10]

These results are also shown in Table 1.

Finally here, suppose migrant workers are risk-averse. If risk-averse, they will be more inclined to accept the job offers for illegal employment with which they have been confronted, rather than deferring the move to illegal employment. The likelihood that a foreign worker will still be with the legal employer at the end of the permissible period of legal employment is reduced, and we have

Proposition 7. *Risk aversion by foreign workers increases the share of workers who make the transition from legal to illegal employment, thus increasing the size of the illegal market.*[11,12]

If there is any discretion in the matter, a government seeking to maintain a policy of temporary foreign workers should therefore choose a source country where people are not overly risk-averse (to the extent that this could ever be done).

5. Deferred wage payments – The legal employer's response

The legal employer is limited in protecting his property rights. He incurs the costs of bringing the foreign worker to the county, and provides the training and knowledge as reflected by δ, yet cannot by direct means prevent the foreign worker from accepting alternative job offers. He can, however, revise the method of market payment to make departure of the foreign worker for the illegal market less attractive. This can be achieved by deferring part or all of the payment of the income of the foreign worker until the end of the contractual period (the end of period two). In that case, the foreign worker may still move to illegal employment, but the alternative wage offer will need to be

sufficiently high to compensate the worker for the loss of the end-period payment. In effect, the bond (and perhaps even more) is transferred to the worker.

The legal employer continues to pay the worker at least a subsistence wage, which we assume, for simplicity, to be W^r. Thus, any deferment of payment comes from the second period wage. As a result of the deferred payment, the worker is more discerning about accepting an offer of illegal employment, even at the end of the second period. Defining by θ the income which is deferred, only offers for which $W^I \geq W^r + \theta$ will be accepted. Thus, (3) becomes:

$$E(V_2 \,|\, \text{in legal sector}) \equiv E(V_2)$$

$$= \int_{\underline{W}^I(1+\delta)}^{W^r+\theta} (W^r + \theta) P f(W^I) \, dW^I$$

$$+ \int_{W^r+\theta}^{\overline{W}^I(1+\delta)} W^I P f(W^I) \, dW^I + (1-P)(W^r + \theta)$$

$$= P E(W^I | W^I \geq W^r + \theta)$$

$$+ [1 - P + P F(W^r + \theta)](W^r + \theta). \qquad (3A)$$

Using the distribution function in (10), the employer's revised optimization problem is to minimize his expected costs for choice of W_2^L and θ, i.e., to minimize

$$E(TC) = W^r + C + p(S_1) W_2^L + p(S_2)\theta + [1 - p(S_2)]B$$

$$+ (1 - p(S_1))[W^r + C + P \cdot B]. \qquad (9A)$$

Observe that a second worker, who is legally employed for only one year, has no deferred income.

In the resulting equilibrium, the employer sets a positive deferred payment, which decreases the likelihood that a worker will defect. The proportion of legal workers switching to illegality thus declines. On a conditional basis (if the employee stays) the employer pays more, because any increase in the deferred payment is associated with a smaller decrease in the second period legal wage. Thus, we find that

Proposition 8. *Deferred payments to legal workers decrease the wage paid in the legal market and increase the proportion of workers who leave the country. The decrease in the legal wage is smaller that the deferred payment.*[13]

Is such deferment, however, a feasible scheme for the legal employer? What is to guarantee that the employer will pay the worker the deferred payment? And what assures that the employer will not opportunistically fire the migrant worker before the end of the legal contract when the deferred payment is due? The moral hazard problems are not solvable by simply using a third party or escrow account, because of the non-observability of the foreign

worker's behavior by outside parties (see, for example, Lazear (1986) for a discussion of seniority wages).

A conflict of interest also now arises between legal employers and the government. The government has instituted the bond to provide an incentive for the legal employer to ensure that the foreign worker returns home after the stipulated permissible period. By changing the payment schedule so as to in effect pass the bond along to the worker, the legal employer has assisted the government by decreasing the proportion of workers who remain in the country illegally. However, if the legal employer behaves opportunistically, he drives the foreign worker into illegal employment (if an offer is received). Because of the absence of monitoring and the incentives for opportunistic behavior by legal employers, migrant workers may well decline to accept such employment conditions, in which case deferred payment as a disincentive to switch to illegal employment is not feasible.

6. An income tax – An alternative?

A possible alternative to having the employer defer some of the worker's income is to have the government tax the worker's income, to be returned if and when the worker leaves the country. This scheme suffers less from the moral hazard problem to which we alluded in the previous section.

Given our assumption that the reservation wage is also a subsistence wage, any tax imposed during the first period will be directly passed on to the employer, leaving the worker unaffected during that period. This affects the employer's incentives to bring in workers, and will also affect the probability that the worker will remain in the country. However, in order to keep the analysis parallel with that of the previous section, we assume that the tax is levied on second period wages only. Note that this does not alter the analysis, since the tax could always be divided between the periods without changing the incentive structure.

In order to keep the comparison complete, assume that the tax levied equals the deferred payment so that the incentive to leave the country by the worker, *if he is still employed legally in the second period*, is the same in the two cases. Thus, (3A) remains as in the previous section, with the (lump-sum) tax, t, replacing the deferred wage, θ. From the employer's perspective, however, the problem changes, because the tax is paid in all cases, and not only if the worker moves over to the illegal sector. Thus, (9A) becomes:

$$E(TC) = W^r + C + p(S_1)(W_2^L + t) + [1 - p(S_2)]B$$
$$+ (1 - p(S_1))[W^r + C + P \cdot B]. \tag{9B}$$

Form here we can derive:

Proposition 9. *An income tax will decrease the size of the illegal labor force by more than an equivalent level of deferred income. However, this tax will increase the expected cost to the employer of importing a foreign worker by more than the deferred income, so that if demand is elastic fewer workers will be imported.*

The reasoning behind this result is as follows. We show first that the

wage paid in the second period with the tax is greater than with the deferred payment.

Define the optimal wage in the second period given the tax, $W_2^*(t)$. This wage is optimal because the marginal cost of a change in the wage (the direct affect of paying a higher wage) equals the marginal benefit (the gain from the decrease in the probability that the worker leaves to the illegal market). Assume that the wage with deferred payments, $W_2(\theta)$, equals $W_2^*(t)$. Since $t = \theta$, the wage the worker receives is the same in all cases, so his incentive to stay is unaffected. Thus, the marginal benefit remains the same. However, the marginal cost is greater than before because the probability that the deferred payment will have to be paid increases with the wage. Thus, optimally, the employer will pay a lower wage with the deferred payment scheme.

Thus, the expected cost to the employer with the tax is greater than with the deferred payment for two reasons. First, the tax is always paid, while the deferred payment is not, and second, the wage in the second period is higher with the tax. In addition, since a higher wage is paid in the second period, more workers remain in legal employment in the second period, and leave the country when their legal stay terminates.

This type of tax could be used in the place of, or in conjunction with, the bond.[14] The benefit of using such a tax instead of a bond is to transfer the incentive to leave from the employer to the employee. This is a way of taking the bond directly from the worker, while overcoming the problem of a lack of liquidity on the part of the worker. This alternative, however, is costly and may be unrealistic, since a separate tax structure would have to be created for temporary employees, with the proceeds being earmarked for return to the workers who leave. In addition, it may be difficult to collect this tax from the temporary workers given that they are not citizens and may be paid in cash. Finally, the increased cost to the employers runs counter to the purpose of allowing the import of temporary workers – to provide services which are in short supply.

7. Conclusions

Temporary guest-worker policies provide a conduit for legal entry of workers who may move to illegal employment. We have examined the effectiveness of a bond which seeks to make the legal employer the enforcement agent of the government. Our model shows how the bond affects the wage differential between legal and illegal employment of migrant workers, and thereby the incentives for transfer from legal to illegal employment. An increased bond is an additional cost imposed on legal employers. This additional cost of employing legal immigrants increases the legal wage, since there is an increased incentive for legal employers to attempt to forestall the departure of legal workers to illegal employment. The value of a bond is complementary with the legal wage; and a higher legal wage is *ceteris paribus* a greater attraction to remain legal.

Still, if migrant workers desire to remain longer than the permissible period, they will wish to avoid being with their legal employer at the end of their period of legal contractual employment. Both the government and the legal employer have an interest in ensuring that the worker returns home. The intention of the government is expressed in the policy of temporary admission

to the country, while the legal employer does not wish to forfeit his bond. Despite the government's intentions, the legal employer can find his position to be quite precarious. If his legal workers are still with him at the end of the legal period of employment, it is only because they will have rejected an illegal offer which in retrospect they should have accepted, or because they never received an offer. And, if the worker leaves the legal employer just before he is to be deported, the employer has paid twice – once via the higher second period wage, and again via the forfeited bond.

The recourse of the legal employer of offering his legal workers a lump-sum payment at the end of the legal period of employment transfers the bond to the migrant worker. The deferred payment to the migrant worker makes switching to illegality less attractive and increases the likelihood that the worker will still be legal when the period of permissible stay expires. Moral hazard nonetheless intrudes on coincidence of interests of the legal employer and the government. For the legal employer can gain by opportunistically compelling his workers to move to illegal employment after the accumulated value of deferred wage payments exceeds the value of the bond. The intent of the bond is then nullified, via a reversal of the employer's incentives. If workers anticipate such opportunistic behavior, the bond will remain with the legal employer. Then, the vulnerability of the legal employer to defection to illegal employment is also the source of vulnerability of the government's policy.

Either way, whether legal workers accept the offer of a final lump-sum payment or refuse to do so, the government's policy of ensuring that migrant workers return home is compromised. A policy of intended temporary foreign workers appears, therefore, to inevitably create a population of illegal immigrants. The question is only the size of the illegal population.

Our model has confirmed that a government can increase the likelihood of departure of workers at the end of their contractual period of employment by increasing the bond. A higher bond is effective, not only because reduced demand for legal workers decreases the potential pool of illegal workers (legal demand in the basic model is inelastic), but also because it leads to an increase in the *proportion* of legal workers who return home at the end of the con-tractual period. Appropriate choice of the period of permissible legal stay also reduces the expected size of the illegal population (the illegal population tends to become smaller, the *longer* the permissible stay, because of increased incentives for legal workers to reject illegal job offers). We have also shown that the proportion of eventual illegal workers is not necessarily increased (although this can be the case) by greater domestic willingness to employ illegal workers. Nor do higher average wage offers for illegal employment necessarily increase the proportion of eventually illegal workers.

Of course, if legal demand for migrant workers is elastic, the bond reduces the number of illegally employed workers, by reducing the pool from which illegal workers are drawn. That is, a bond is then a means of decreasing the number of legally entering migrant workers, by reducing demand for legal workers. We have, however, not viewed the bond as an instrument for re-straining the import of migrant workers. The government can exercise this control directly by the number of work permits issued. The government in-deed recognizes the domestic need for foreign workers, and is only concerned that their stay should be temporary. Since the government intends the bond to be returned, the bond is not intended to be a cost of employing foreign

workers. Yet, if legal workers do leave for illegal employment, the bond does become a cost of employment.

It is for this reason, to distinguish between the effect of the bond on the number of legal workers who enter the country and the proportion who ultimately leave, that we have formulated our model with perfectly inelastic domestic demand by legal employers. As we have shown, even with completely inelastic legal demand, a bond is effective in decreasing illegal employment (by increasing the wage offered in legal employment and thereby reducing the probability that a legal worker will make the transition to illegality by accepting and illegal job offer).

Finally, as we observed in the introduction, we have taken policy objectives as given, and have not addressed the desirability or merit of seeking a rotating pool rather than permanent body of foreign workers. It appears evident (see Hillman 1994; Benhabib 1996; Hillman and Weiss 1998) that immigration policies are often expressions of preferences for cultural homogeneity. Economic self-interest can also explain restrictive immigration policies (see for example Hillman and Weiss 1996; Benhabib 1996); in the particular case we have considered, a guest-worker program can be viewed as a short-term solution for temporary labor shortages, which is an economic explanation for the policy. But then, alternatively, a guest worker program may suggest that immigration is politically feasible only on the understanding that the presence of any particular foreigner is to be temporary. Or, returning to economic motivations, we can envisage a reluctance of the host country to provide the social capital that would be necessitated by the immigration of workers with their immediate and possibly extended families.

To conclude, then, we have shown in the context of a model of rational economic behavior, that anticipations of success of intentions of temporary guest worker programs can only be overly optimistic if the instruments of enforcement of policy are a bond and the duration of permissible stay. An employer bond diminishes the propensity of legal migrants to switch to illegal employment, but it is thereby only the expected rate of transition from legality to illegality that is reduced. Accumulation of an illegal population (which may be subsequently legalized) appears to be an inevitable consequence of a guest-worker program.

Endnotes

[1] For example, in Israel in the 1990s, temporary migrant workers have been nurses and providers of old-age care from the Philippines, building construction workers from Romania, agricultural workers from Thailand, and other specialized services from Russia and the Ukraine (catering principally to other foreign workers).

[2] This assumption could easily be changed to having the migrant know his future options. Were this the case, the following sentences would be altered so that the present value of his wage at home over the entire period will equal the present expected value of his wage in the host country plus the cost of migrating. The main conclusions would not change, but the first period wage will no longer be anchored at W^r, but would rather then be an additional decision variable.

[3] The cost of returning home could also be incorporated in the model. If the cost is paid by the worker it increases his reservation wage. If it is paid by the employer, it is paid only if the worker leaves the country when his legal stay concludes, and would be incorporated in the model much as the bond is. None of the qualitative results in the paper would be affected.

[4] For a discussion on the optimal duration of stay of temporary migrants, see Dustmann (1996) and the references therein.

[5] While learning in practice takes place in both legal and illegal employment, learning is faster in the legal sector because of the additional freedom of activity. We assume for exposition that learning takes place only while employed in the legal sector. Another source of learning is receiving information about the availability of better paying illegal jobs.

[6] If the demand for legal workers is elastic, this effect will be strengthened since the cost to the employer will increase, so that fewer workers will be brought in.

[7] It can also increase or decrease the cost of employing the legal worker, so it is not clear how the quantity demanded will be affected.

[8] However, since the legal wage decreases more workers will be demanded, which might lead to a larger illegal market.

[9] The increase in the legal market wage will lead to less demand for workers, which will, in turn, lead to a smaller illegal market, *ceteris paribus*.

[10] However, the cost of bringing in workers increases, so fewer are brought in and the sizes of the illegal and legal markets fall even more.

[11] An increase in the propensity to move to the illegal market will cause the legal employer to increase his legal-market wage, and will thus increase his costs. This will, in turn, decrease the demand for legal workers, mitigating (and perhaps even reversing) the above effect.

[12] As one referee pointed out, this result, and others, depends on there being no threat of losing one's job in the illegal market. This is assumed because, in general, alternative employment is readily available once one is already employed in the illegal market.

[13] The employer's expected costs fall (for, if not, he would not defer payments), so, if demand is elastic, more immigrants will be brought into the country, increasing the size of the illegal community.

[14] Of course, other sanctions, such as fines and imprisonment, will also discourage workers from remaining illegally.

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