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This paper contains preliminary findings from research work work still in progress and should not be quoted without prior approval of the author.

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ALTHOUGH migration is a central feature of the international economy, and has been for a long time, it has never received more than a trivial fraction of the attention lavished on the pure theory of international trade and the theory of international capital movements. No doubt part of the reason for this is the widely appreciated fact that much of the latter is in effect a theory of factor movements, if for no better reason than that nothing which might distinguish one factor from another is allowed to play a significant role. Thus, one might argue, we do in fact have a significant literature on migration: all that is necessary is that the word 'capital' be replaced by 'labor' in much of the theory of international capital movements. Indeed a good part of what has been written about migration has in effect done just that, with labor distinguished in no essential way from other factors.

This approach to migration is all to the good, as far as it goes. It does, after all, give us a useful theory, and it gives us that theory on the cheap. But this approach has meant that we are quite noticeably without a theory addressed in any substantive way to those aspects of migration that are distinctive to it. Which aspects are these? There are, it seems to me, three key parameters that in fact distinguish incidents of migration from each other and that any serious theory of migration must come to grips with.[1]

The first parameter involves whether the migration is intended to be temporary or permanent. This consideration is central to the role of migrants in both the source and host economies. Although temporary migration seems to be significantly more common in the contemporary world, both

types are clearly very important in practice.

The second key consideration is whether an instance of migration involves skilled labor or workers without skills. The former is in effect a simultaneous movement of labor and capital. The migration of unskilled labor seems more common at present, but, again, both types are important.

The third central parameter is the legality of the migration. Though restrictions might in principle be imposed by both source and host countries, it is the (potential) hosts which in fact do so.[2] An appraisal of the relative quantitative importance of illegal immigration is, by its very nature, hard to get a handle on, but for some countries -- notably the United States -- it seems to be at least as large as legal migration.

The various permutations of these characteristics are not, of course, of equal importance. Some can be ignored altogether: the illegal migration of skilled workers, both temporary and permanent, is of little interest simply because most countries are quite willing to admit such migrants. The permanent legal migration of unskilled labor is the natural area of application of our existing theories (those, that is, which ignore all distinctive features of labor), although this particular type seems to be of relatively modest practical importance. The migration of skilled labor has spawned its own distinctive literature (that devoted to the 'brain drain').

The temporary migration of unskilled labor, both legal and illegal, constitutes the larger part of actual migration. I have elsewhere investigated the temporary aspect of this.[3] This paper accordingly addresses the notable outstanding gap: the illegal migration of unskilled labor. As the paper ventures into untrodden terrain it will be preoccupied with the formulation of theory. I shall make many arbitrary decisions, some at least of which will turn out to be unwise, about what to include and what to exclude. I announce one of these decisions at the start: this paper will confine itself to a host country perspective. This is only a division of labor, not a

judgement of what is significant and what is not.[4]

I. Border Enforcement

The subject of illegal immigration is presumably defined by partially successful attempts to prevent that migration. The modelling of these enforcement efforts should accordingly occupy center stage in the theory to be developed. This section seeks to present, in as simple a context as possible, the salient aspects of border enforcement policy.

A Simple Model of Border Enforcement

Suppose that skilled workers (S) and unskilled workers (U) can be used to produce output (Q) via a neoclassical production function:

$$Q = Sf(u)$$

where $u = U/S$. Skilled workers are all natives. Unskilled labor consists of two parts, $U = L + I$, with L denoting the supply of native unskilled workers plus legal immigrants, and I the number of illegal immigrants employed.

Of those (M) who illegally attempt to immigrate, a certain number (C) are caught and denied entry,[5] so that $I = M - C$. The authorities' success in preventing illegal entry presumably depends upon the resources devoted to border enforcement. Denote by E the quantity, in terms of output, of such resources. An increase in E would increase the authorities' apprehension ratio, C/M, although probably at a decreasing rate. I accordingly assume that

$$C/M = g(E)$$

where $g(0) = 0$, $g' > 0$, $g'' < 0$, $g < 1$.

Since border enforcement requires real resources, it must be financed. Suppose that this is done by means of a proportional tax on production (or on all incomes) at the rate $t = E/Q$. Thus the (post-tax) wages w and v^o of unskilled and skilled workers are

(1) $\quad w = (1 - t)f'(u)$

(2) $\quad v^o = (1 - t)[f(u) - uf'(u)]$.

Although I have announced my intention to stick to a host-country perspective, it's crucial that the decision to migrate be explicitly modelled in some way. I assume that foreign workers in the source country have the choice of remaining there and earning the wage (or wage equivalent) w^*, which I take to be exogenous, or of attempting to migrate. If successful they earn the wage w, because either legal and illegal migrants are indistinguishable to firms or else the distinction is of no consequence to them. If unsuccessful the would-be migrants earn $w^* - k$, where k is the (wage equivalent of) the penalty suffered by those who are caught. The probability of a typical potential migrant getting caught is just C/M, or $g(E)$. Assuming that foreign workers are risk-neutral, attempted migration adjusts so as to equate the expected reward from migration to the local wage:

$$(w^* - k)g + w(1 - g) = w^*.$$

Thus we have

(3) $\quad w = w^* + k[g(E)/(1 - g(E))] = w(E)$.

It follows then that the wage of unskilled labor is directly determined by the effort put into border enforcement.

Suppose now that border enforcement is a tool of policy, and that some level of E is chosen by the authorities. Then this determines the after-tax, unskilled-labor wage, w, as just discussed. From (1) and the definition of u we have

(4) $\quad w(E) = (1 - t)f'([L+I]/S).$

With L and S exogenous and E set by policy, this gives the negative relation between t and I depicted in Figure 1 below as the WW curve.

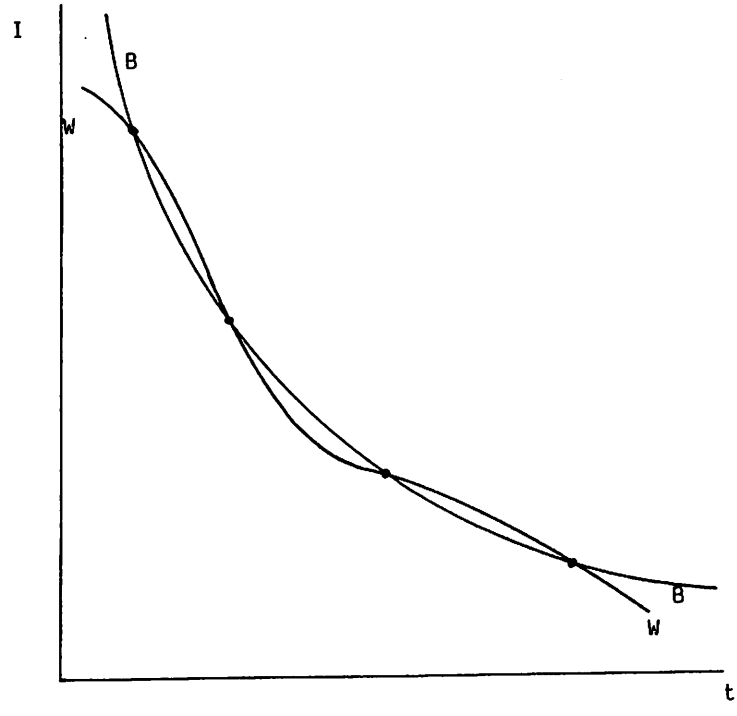

Figure 1

This relation, which I term the wage schedule, shows for each tax rate t the volume of illegal migration required to bring the value of the marginal product of labor, after taxes, into equality with the level of w determined by the given enforcement policy. This schedule slopes downwards,

but has no necessary curvature. An increase in enforcement effort will raise w and thereby shift the WW schedule towards the origin.

It is also necessary that E be financed, E = tQ, or

(5) $tSf([L+I]/S) = E.$

This gives another relation between t and I, depicted in Figure 1 as the BB curve. This budget schedule shows for each tax rate t the volume of illegal immigration that produces just enough national output so that government revenue equals E. This curve also slopes downwards and is convex to the origin. An increase in E shifts the budget schedule outwards.

An intersection of the wage and budget schedules determines an equilibrium consistent with the given level of enforcement, E. Such an intersection yields I and t which then determine the technique $u = (L + I)/S$ and, from (1), the wage received by skilled workers.

Paradoxical Enforcement and the Indeterminate Results of Border Enforcement Policy

As illustrated in Figure 1, the curvatures of the wage and budget schedules are such that multiple equilibria cannot be ruled out without further information. Thus the combination of I and t resulting from any particular enforcement policy E need not be determinate, and, indeed, we cannot be confident that any combination actually attained need be preserved for any extended period of time. In the above analysis I and t allowed us to deduce v^o, so this sorry conclusion applies also to the wage received by skilled workers. On the other hand, we have seen that the authorities' choice of e directly determines what w must be.

We are accordingly driven to the conclusion that border enforcement policy -- in the form of a choice of E -- is an effective means of influencing the wage paid to those native unskilled workers and legal migrants that compete directly with illegal immigrants, but that it could well be an unpredictable and unstable influence upon both the number of illegal immigrants who actually enter the country and upon the wages of native skilled workers who compete only indirectly with the migrants.

These conclusions of course have implications for the effects of a change in border enforcement policy. As we have seen, an increase in E shifts the wage schedule in toward the origin and the budget schedule out. It is then clear from Figure 1 that I and t must change in opposite directions, but that which direction each moves depends upon the relative slopes of the two curves. If there are multiple equilibria, some will move northwest and some southeast; the effects of an intensification of border enforcement are unpredictable, even in a qualitative sense, without further information. If at some equilibrium the wage schedule intersects the budget schedule from above, an increase in border enforcement will actually cause the level of illegal immigration to rise!

This paradoxical result and the possible indeterminacy are themselves interesting conclusions, but of course they also motivate an investigation into what implies that the two schedules intersect just once and in a particular way. Manipulation of (4) and (5) reveals that, at an intersection, the budget schedule is steeper than the wage schedule if and only if

$$(6) \qquad t < \theta_S/[e + (1-e)\theta_S] = 1/[1 + e(\theta_U/\theta_S)]$$

where e denotes the elasticity of substitution of unskilled labor for skilled labor in production, θ_S denotes the distributive share of skilled labor, and $\theta_U = 1 - \theta_S$ denotes that of unskilled labor. If this condition is met at all equilibria, there can in fact be only one equilibrium, and

we can be confident that an increase in border enforcement will increase the wage of unskilled workers, reduce the volume of unskilled immigration, require an increased tax rate, and, as a consequence, reduce the wage received by skilled native workers. If (6) is violated at each equilibria there will again be only one equilibrium, but a rise in E will produce paradoxical results.

Evidently the critical value of t in (6) depends upon e and θ_S. If immigrants are essentially perfect substitutes for native skilled workers, so that e is extremely high, (6) will not hold in equilibrium. The equilibrium will be unique for a given level of enforcement, but changes in the latter will definitely induce paradoxical results. If, on the other hand, migrants and native skilled workers really are 'different', in the sense of significant complementarity in production, satisfaction of (6) becomes more problematic. For example, if e is less than or equal to unity, (6) must be met unless t exceeds θ_S, that is, unless the country spends more on border enforcement than the entire income of all skilled workers!

Of course one might employ stability analysis to limit the range of possibilities, excluding the paradoxical ones. A possible dynamic hypothesis would be that, given their enforcement policy E, the authorities adjust t so as to balance their budget, that is, that t is changed so as to approach the budget schedule BB. The volume of illegal immigration I could vary in response to disequilibrium in the market for unskilled labor, that is, so as to approach the wage schedule WW. These dynamic hypotheses would render (6) the stability condition, so that one could assume it is in fact met in observable equilibria, and the paradoxical outcomes are excluded. Under this interpretation, we could regard illegal immigration as ensuring that (6) actually holds.

The model is simple enough to render these results reasonably transparent. The way I have presented the migration decision, summarized in equation (3), guarantees that an intensification of border enforcement E must raise the domestic wage received by unskilled workers, quite

independently of the rest of the model. There are two ways this can come about. One is to reduce the number of unskilled workers per skilled worker, so that the marginal product of the former rises. This requires a reduction of immigration. A low elasticity of substitution between the two types of labor obviously makes it easier to produce a change in real wages in this way.

The second method is to increase national product enough (certainly by more than the increase in E) so that the after tax wage received by unskilled workers rises, even if their marginal product falls. Such an increase in output can come about only if more migrants are employed. This method is facilitated by a high elasticity of substitution between the two types of workers (which limits the decline in the migrants' marginal product when more of them are employed) and by a large share of unskilled labor in national income (which limits the proportional rise in I necessary to expand output significantly).

The possibility of multiple equilibria, it should be noted, depends upon enforcement policy taking the form of setting E. If authorities instead set t at some level and then spend whatever revenue they obtain on enforcement, equilibrium will be unique. Furthermore, a rise in t will always reduce I. The paradoxical case will manifest itself in an increase in t producing a fall in actual enforcement, E.

Objectives of Enforcement

Why should a nation have an enforcement policy? The international capital movements literature, with its emphasis on the optimal rate of taxation of foreign earnings, suggests one answer: to exploit market power with respect to mobile labor, that is, to maximize national income. A second policy objective could be the internal distribution of income: control of w and its associated v^o. A final objective consistent with the present model is I itself; the authorities might wish

to control the number of immigrants in the country for social reasons.

What policy instruments are available to the authorities to help achieve these three targets? There is, of course, border interdiction, E. The tax rate t is clearly not a distinct policy tool. However, L, the number of legal unskilled workers, is a second policy tool, because it is determined by the authorities' decision of how many migrants to admit legally. Thus, in the context of the present model, there are apparently three potential policy targets and two potential instruments.

The actual situation, however, differs in several ways from the potential one. It will prove convenient if, before examining these differences, I modify the model somewhat.

Now that the possibilities of multiple equilibria and paradoxical enforcement are understood, I wish to simplify matters and abstract from these complexities. Perhaps the easiest way to do this is to assume that E is financied by a tax on the wages of skilled workers only. Then

$$w = f'(u) \tag{7}$$

$$v = f(u) - uf'(u) \tag{8}$$

$$E = t\,v\,S \tag{9}$$

where v now denotes the pre-tax wage received by skilled native workers. Now E determines w from (3), as before, w then determines u from (7), (8) gives v, and (9) determines the tax rate t. Then each value of E yields a unique equilibrium, and an increase in E will raise w, reduce v, u and I, and require a larger t.

Now consider the first potential policy target, the maximization of national income through the exploitation of market power in the migrant labor market. One would expect border enforcement to be inferior to a tax on migrant wages in this regard, since the former uses up revenues instead of generating them. But a migrant wage tax may not be feasible -- much is infeasible in this area

of inquiry. At any rate, my model at present gives the home country no market power to attempt to exploit. In order to investigate the issue, I accordingly no longer take w^* as exogenous, but instead suppose that it is negatively related to employment in the source country. The latter will in turn be negatively related to M, the number attempting to migrate. So assume that

$$(10) \qquad w^* = \phi(M)$$

where $\phi' > 0$. Now $M = I + C = I/[1 - g(E)] = (uS - L)/[1 - g(E)]$. Thus for any enforcement policy E, (10) gives a relation between u and w^*. Substitution of (10) into (3) then gives a relation between u and w, depicted as the MM curve in Figure 2.

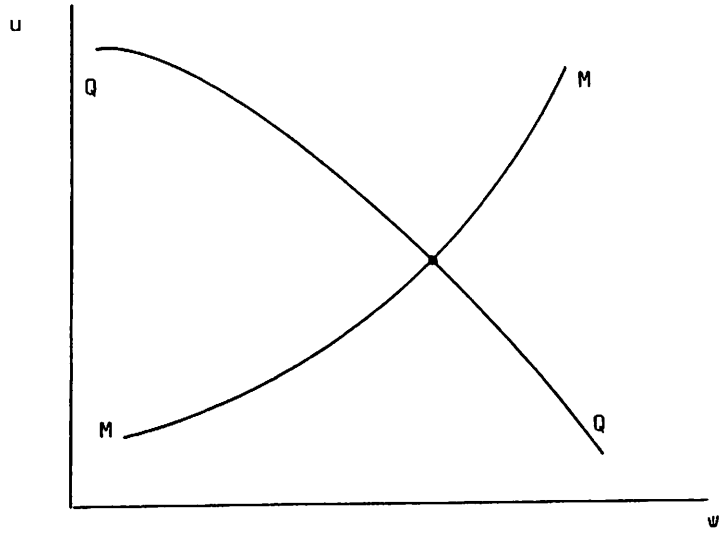

Figure 2

The MM schedule has a positive slope, as illustrated, and a rise in border enforcement shifts it up. This line, which shows for each wage w what value of u will be produced by the resulting immigration, would be horizontal with an exogenous w^*; higher values of ϕ' make the curve steeper.

A second relation, depicted as QQ in Figure 2, comes from (7) and shows simply the marginal product of unskilled labor implied by each value of u. This clearly has a negative slope, so the two curves have a single intersection. A given value of E still generates a unique equilibrium.

It follows immediately that an increase in E shifts the MM curve upwards and thereby raises w and reduces u (and so I also). High values of ϕ' can dampen this movement, but they cannot reverse it.[6] It follows from this that the host country can never use border enforcement to increase its income by exploiting the migrant labor market! To see this, measure home real income as follows.

(11) $\quad Y = w\,L + v\,S - E.$

Note that we include the wages of native unskilled workers and legal migrants but exclude wages paid to illegal immigrants. From (11),

$$dY/dE = (L + S[dv/dw])(dw/dE) - 1.$$

Now from (7) and (8) we have $dv/dw = -u$ so that

(12) $\quad dY/dE = (L - uS)(dw/dE) - 1 = -I(dw/dE) - 1.$

But we have just seen that $dw/dE > 0$ regardless of the degree of host market power. Thus $dY/dE < 0$ always and the optimal border enforcement policy is no enforcement at all, when the objective is maximization of real national income.

With immigration policy ineffective in the exploitation of market power in the migrant labor market, we would appear to be left with two targets and two instruments. But this is not so. Although L can be varied directly it is not, in fact, an independent instrument. As we have seen, the amount of enforcement directly determines the technique of production, $u = [L + I]/S$. It follows, therefore, that any change in L will simply cause an offsetting change in I, and thus in

C and M also. Reducing the number of legal immigrants will increase by a greater amount those who attempt illegal entry, and by an equal amount those who succeed. We have, therefore, only one policy instrument.

We still have two potential targets, w (or the internal distribution of income) and I. But note that equation (7) inextricably binds these two targets together: w directly determines u, and therefore I. There is no way to unbundle these two targets. Unless the authorities just happen to desire a combination of w and I that is consistent with the technology, they will have to trade off one goal for the other, even before considering what tools might be available.

Suppose that the authorities have decided to limit I (or to produce the change in w and v that this implies). What is the cost? The loss in income is given by (12). The definition of u and (7) imply $dI/dE = (S/f'')(dw/dE)$ so that

$$dY/dE = (-If''/S)(dI/dE) - 1,$$

or

$$dY/dE = w[\theta_S I/\phi(L+I)](dI/dE) - 1. \tag{13}$$

Thus the trade-off will be the more unfavorable (that is, a given reduction in I will require a larger reduction in Y) the smaller is the distributive share of unskilled workers, the greater the degree of complementarity between skilled and unskilled workers, and the more important are illegal immigrants in the national supply of unskilled workers. An increase in border enforcement reduces national income, but it also increases the real wage received by unskilled workers. The entire burden of the policy, and then some, falls upon skilled workers, who both experience a lower real pre-tax wage and also have to pay the direct cost of the enforcement.[7]

II. Internal Enforcement Policy

The discussion thus far furnishes two good reasons to hunt for an additional policy tool to supplement interdiction. First, we have seen that border enforcement is necessarily costly. This raises the possibility of trying to find an assortment of policies that could produce the same result at lower cost. Public debate in the United States has for years been dominated by the belief that a border enforcement policy consistent with national goals would in fact prove far too costly to be acceptable.

The second reason is that the authorities are likely to have independent goals regarding both internal income distribution and the volume of immigration. Thus there is need for an instrument capable of unbundling these two targets.

The rest of this paper concerns a second instrument. Enforcement has thus far been assumed confined to the border so that, once inside, illegal immigrants are indistinguishable from other unskilled workers. I now consider domestic enforcement policies intended to make it relatively more difficult for illegal immigrants in the domestic marketplace. Such policies seem very promising in regard to the two reasons just discussed for looking at additional tools. First, as is suggested by the frequent public suggestions that illegal entry attempts will abate once the employment prospects of immigrants are reduced, such domestic enforcement promises to exert an effect independent from that of border enforcement. Thus a combination of such policies could potentially reduce costs. Second, if the employment of illegal immigrants is prohibited, and if this prohibition is backed up by some degree of enforcement, firms will no longer see the two types of workers as identical. Thus such a policy fosters the hope of unbundling the two goals of internal income distribution and the volume of immigration.

Domestic Enforcement

Suppose that domestic enforcement takes the form of random inspections of firms. Let J denote the number of illegal immigrants discovered at work by such inspections, and let D denote the total resources, in terms of domestic output, devoted to the inspection effort. I assume that

$$J/I = h(D)$$

where $h' > 0$, $h'' < 0$, $h(0) = 0$, $h \leq 1$. Suppose for simplicity that illegal immigrants who are caught working are paid anyway so that only employers are subjected to direct penalties. (Thus I have the direct punishment from border enforcement falling exclusively upon migrants and that from domestic enforcement falling exclusively upon firms). Suppose that this penalty can be expressed as an incremental cost of k* per discovered illegal immigrant.[8]

Continue to denote by w the wage received by illegal immigrants. Our earlier argument continues to apply, so w is still determined by border enforcement E as indicated in (3) -- I again take w* as exogenous. Now let w_L denote the wage received by domestic unskilled workers and by legal migrants. A crucial consideration is whether domestic firms are able to distinguish these workers from illegal immigrants. If they cannot, then $w = w_L$ and the effect of domestic enforcement will be to disadvantage unskilled workers relative to native skilled workers. For the firm that hires one of the former takes the risk that the new employee is an illegal immigrant and that the authorities will discover this fact, thereby increasing the expected cost to the firm of employing this worker by $k^*h(D)I/U$. But if firms can distinguish illegal immigrants, domestic enforcement will disadvantage these laborers relative to native unskilled workers and legal migrants. Thus the effect of the policy upon the welfare of this latter group is essentially sensitive to the ability of firms to distinguish between the two types of potential employees. I consider first the case where a firm can tell whether a prospective employee is in fact an illegal

immigrant or not.

Discerning Firms

If firms can tell whether a prospective unskilled employee is an illegal immigrant or not, (7) will apply only to native unskilled workers and legal migrants and so is replaced by

(7') $w_L = f'(u)$.

Risk-neutral firms will ensure that w_L equals the expected labor cost of hiring an illegal immigrant

(14) $w_L = w + h(D)k^*$.

Finally, taxes must now finance both enforcement policies:

(15) $D + E = tvS$.

Thus E determines w in (3), this then gives w_L from (14), which then determines u from (7'), v from (8), and t from (9'). Each policy pair (D,E) generates a unique equilibrium.

I wish to expose the considerations relevant to the choice of policy mix between D and E. As noted above, the authorities might be using policy to try to control the level of illegal immigration I for fundamentally social reasons, or to try to influence domestic income distribution by affecting w_L. An immediate conclusion is that the mix of policy tools is irrelevant to any trade-off between these possible targets, that is, the addition of border enforcement does not allow the unbundling of the two targets. This is because w_L is directly related to u -- and therefore to I as well -- by equation (7'), regardless of the relative

reliance of the authorities on border enforcement or on internal enforcement.

Consider, then, whether combining domestic enforcement with border enforcement might allow a reduction in the cost of whatever policy goal is chosen. Suppose that the authorities have as a policy target a particular level of $w_L = w_L^o$, either for its own sake or because of its associated level of I. Then substitution of this target value and of equation (3) into (14) yields

$$w_L^o = w^* + k\, g(E)/[1 - g(E)] + h(D)k^*. \tag{16}$$

Equation (16) determines all combinations of the policy variables D and E that will achieve the stipulated target. These combinations are graphed as the AA' schedule in Figure 3. As drawn, the schedule has a negative slope and is strictly convex to the origin.

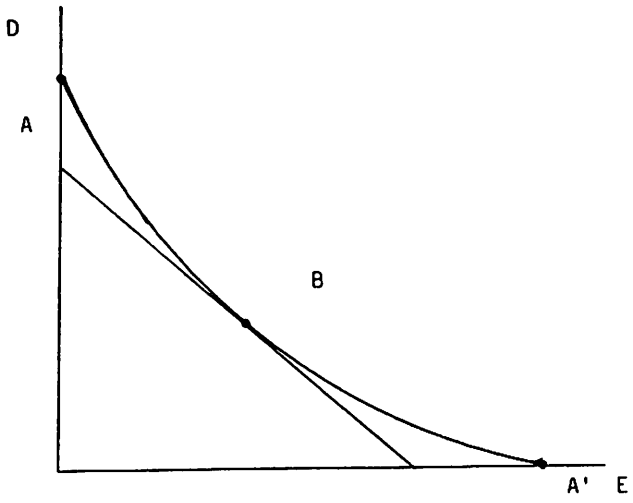

Figure 3

At point A, the wage received by illegal immigrants $w = w^*$. Moving down the schedule, with border enforcement substituted for domestic enforcement so as to keep the actual level I of illegal immigration unchanged, the wage given the latter, w, steadily rises, until at point A' it

equals w_L, the (constant) wage received by native unskilled workers and legal migrants. It is also clear that such a substitution, by raising E, must increase the ratio C/M. With I unchanged and D falling, J must fall as well.

What determines which (D,E) combination the authorities should choose? This depends, of course, upon their objectives. To minimize the total cost D + E of immigration policy, the authorities need to choose that combination of D and E for which the AA' schedule has a slope of minus unity, illustrated by point B in Figure 3. Manipulation of (16) reveals that this point is characterized by

$$(w_L - w)\, e_I\, (E/M) = (w - w^*)\, e_B\, (D/I)$$

where $e_I = h'D/h$, the elasticity of the internal enforcement schedule, and $e_B = g'E/g$, the elasticity of the border enforcement schedule.

Now consider a movement along AA' away from B in a north-west direction. This will clearly lower w. The level of I will be unchanged, as will the incomes of S and L. The fall in wI must just equal, from (14), the rise in k*J: penalties on employers are substituted for the wages of illegal immigrants.[9]

In order to find the socially optimal point on AA', it is necessary to be more specific about the employer penalties k*J. These penalties might constitute a real social cost, in the form of lost output -- as I have implicitly assumed thus far -- or they might simply be fines which accrue to the government -- in which case they should be deducted from the left hand side of expression (15). Suppose the former. Then national income, net of immigration policy, is equal to: $Sf(u) - wI - E - D - k^*J = Sf(u) - w_L I + h(D)k^*I - E - D - k^*J = Sf(u) - w_L I - E - D$. Now $Sf(u) - w_L I$ is determined by the presumed social policy. Thus national income is maximized by minimizing E + D, the cost of enforcement. If, on the other hand, the employer penalties are not real costs but

instead fines collected by the government, the term -k*J should not be included in the maximand. In this case maximizing national income is the same as minimizing E + D - k*J. But now this latter term measures the cost of enforcement. Thus in either case this cost should be minimized in order to maximize national income.

When employer penalties constitute a real social cost this will of course be at point B in Figure 3. If instead the penalties levied on firms take the form of fines, it will evidently be in the national interest to depart from point B in a northwest direction along AA'.

To where should the authorities move? To choose D and E so as to maximize $Sf(u) - wI - E - D$, subject to the condition that w_L attain the desired value, requires the condition:

$$(w - w^*)\, e_B\, [(D/I) - (w_L - w)\, e_I] = (w_L - w)\, e_I\, (E/M).$$

Finally, it should be pointed out that, given the policy variables D and E, changes in legal migration L would again be exactly offset by equal changes in I (and so also in J, M and C), leaving w_L and U unaltered. But, if $D > 0$, $w_L > w$ so that it is better (from the native point of view) to keep any migration illegal, that is, $L = 0$ is now optimal policy.

In summary, supplementing interdiction at the border with domestic enforcement does allow the authorities to achieve their chosen policy target at a lower cost than would the use of border enforcement alone. However the basic problem that the internal distribution of income and the level of immigration are rigidly linked together technologically, and thus incapable of being separately influenced by the authorities, remains.

Nondiscerning Firms

These conclusions are based on the assumption that domestic firms are indeed able to distinguish illegal immigrants from legal unskilled workers. To get a handle on the significance of this assumption, consider briefly the opposite case. That is, assume now that firms are unable to distinguish the two.[10] Then a firm will think that there is a probability equal to $I/[L + I]$ that any unskilled worker applying for a job is in fact an illegal immigrant. As before, the expected penalty for hiring an illegal alien is $h(D)k^*$. If workers are paid the expected value, to the firm, of their marginal product, then the wage received by both legal and illegal unskilled labor must satisfy

$$w = f'(u) - h(D)[1 - (L/uS)]k^*.$$

Since the immigrant wage must still be given by $w(E)$, this implies that (7) must now be replaced by

$$(7'') \qquad w(E) = f'(u) - h(D)[1 - (L/uS)]k^*.$$

It is immediate from (7") that the addition of a second policy tool has now unbundled the internal distribution of income and the level of illegal immigration. Furthermore, the instruments should be assigned to the two targets in a very specific way. Border enforcement E will determine directly the unskilled labor wage, w, irrespective of domestic enforcement D. The latter can accordingly then be adjusted to cause u (and therefore I) to assume its desired value.[11]

Notice the peculiar position in which legal unskilled workers find themselves. On the one

hand, the fact that firms cannot distinguish them from illegal aliens means that they must share the latter's fate: both are disadvantaged relative to skilled workers. But it is just this which breaks the link between w and I and so allows the authorities free rein to use interdiction policy to influence w, without concern for the effect of such policy on the volume of immigration.

Partial Discernment

I've looked at the two extreme cases where firms either completely distinguish legal unskilled workers from illegal aliens or completely fail to make such a distinction. Consider now the more realistic situation where limited discernment takes place. This will not merely constitute a mix of the two cases just considered, but will introduce distinctive features of its own, especially when account is taken of the fact that the degree of discernment will be at least partially endogenous.

Suppose, then, that firms cannot distinguish between illegal immigrants and other unskilled workers, at least not without any measures to allow such discrimination. As noted above, the effect of domestic enforcement in such a case will be to disadvantage unskilled workers (including native unskilled workers and legal immigrants) relative to skilled native workers. Thus legitimate unskilled workers have an incentive to adopt measures to distinguish themselves from their illegal rivals, and to support public policies designed to produce such distinctions.

It is not surprising, then, that such policies should be central to public debate on immigration enforcement in host countries. In an analysis of the issues they raise, two aspects seem crucial: the effort illegal immigrants devote to trying to pass themselves off as legal, and the effects on those legal residents who might be mistaken for illegal entrants.

So suppose that some policy exists which attempts to distinguish illegal migrants from legitimate unskilled workers. This presumably involves 'doing something' to the latter, since the former would not cooperate with such an effort. Think of the policy as one of issuing identification cards to legal workers.

The unskilled labor force consists, as before, of illegal immigrants I plus legal unskilled workers L who would never be mistaken for illegal entrants, but now there is also a group N of legal unskilled workers who could be so mistaken. Thus the total unskilled labor force is $U = L + N + I$. Let p denote the probability that a member of I would succeed in passing himself off as a member of N. Presumably attaining any positive value of p requires the migrant to spend some amount μ on deceptive efforts (such as the purchase of counterfeit identification cards):

$$\mu = H(p)$$

where $H(0) = 0$, $0 \leq p < 1$, $H' > 0$, $H'' > 0$. For simplicity I assume that H is of constant elasticity $e_D = pH'/\mu$, the 'elasticity of deception'.

As before, a potential migrant who attempts entry faces the probability g of failing, and thus earning $(w^* - k)$, and the probability (1-g) of gaining entry. In the latter event, he spends μ on deception and faces the conditional probability p of successfully passing himself off as a member of N, and thereby earning their wage w_N, and the conditional probability (1-p) of being recognized as a member of I and thereby earning their wage, w. Assuming as before that attempted migration M adjusts to equate the expected reward of attempting entry to that of staying behind,

$$(3') \qquad w^* = (w^* - k)g + [w_N p + w(1-p) - \mu](1-g).$$

Illegal entrants will choose μ so as to maximize their expected earnings, $w_N p + w(1-p) - \mu$. Setting the derivative of this latter expression equal to zero gives the condition

(17) $w_N - w = \mu e_D/p.$

The second order condition is $e_D > 1$, which I henceforth assume. A boundary solution, with p equal to either 0 or 1, is also possible. If p = 0, illegal immigrants in fact make no attempts at deception, and members of N are treated just like members of L: our earlier analysis of discriminating firms remains relevant. If, on the other hand, p = 1, members of N find themselves treated just like members of I, with $w_N = w(E) + \mu$. Since these boundary cases are easily understood, I now assume an interior solution.

Workers recognized as illegal immigrants will, as before, be paid the value of their marginal product adjusted for the chance that they will be discovered and their employers penalized:

(18) $w + h(D)k^* = f'(u).$

Substituting (17) and (18) into (3') then gives

$$f'(u) - h(D)k^* = w(E) + (1-e_D)k$$

where w(E) is as defined previously in (3). Rearranging this term and recalling the definition of u gives the following.

(19) $f'([N+I+L]/S) - (1-e_D)\mu = w(E) + h(D)k^*$

This expression is graphed as the II schedule in Figure 4. It depicts those combinations of illegal entrants I and deceptive efforts μ which cause the illegal labor market to clear. Everywhere along this schedule the numbers attempting to migrate are just such as to equilibrate the expected earnings from migration to the earnings from staying, successful entrants make the optimal deceptive effort, and those entrants recognized by employers for what they are receive the value of their marginal product less the expected employer penalty.

Clearly the II schedule will have a positive slope, as depicted in Figure 4, since the elasticity of deception exceeds unity. Note also that equation (19) can be written as: $w = w(E) + (1-e_D)\mu$. Recall that $w(E)$ is the wage that illegal immigrants would receive were there no possibility of deception, and w is the wage paid those perceived to be illegal. Thus migrants known to be illegal entrants are paid less than they would receive, with the same border enforcement effort, were deception impossible. For those migrants this is a secondary burden, since they also pay μ for the deception attempt. For their employers it is a benefit, since they pay less for the illegal labor they hire.

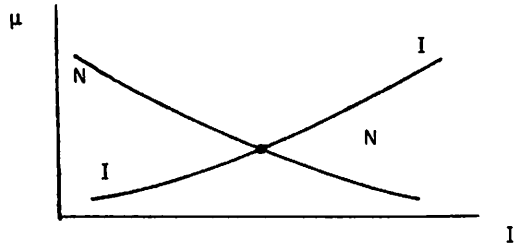

Figure 4

Next consider the markets for legal unskilled workers. Those who are clearly legal (L) will receive a wage w_L equal to the value of their marginal product, as described in (7'). But a member of N could, from the viewpoint of a prospective employer, actually be an illegal immigrant whose employment would bring with it the possibility of a penalty. The chance that an apparent member of N is actually a member of I is $pI/(N + pI)$, and the expected penalty from employing an illegal alien is hk^*. Thus members of N earn the wage satisfying

$$(20) \qquad w_N + [pI/(N + pI)]h(D)k^* = f'.$$

Subtracting (20) from (18) and using (17) gives the following

(21) $[(pI+N)/N]\mu/p = h(D)k^*/e_D$.

This relation, graphed as the NN schedule in Figure 4, shows all combinations of I and μ that clear the market for legal unskilled workers apparently of type N. Clearly the NN schedule must have a negative slope, as depicted in Figure 4, since $e_D > 1$.

It is evident from (19) and (21) that an intensification of border enforcement E will shift the II schedule to the left while leaving the NN schedule untouched. Thus an increase in E will reduce the volume of illegal immigration I but cause those entrants to devote more effort to deception. This means that the perceived volume of illegal immigration, (1-p)I, will fall by more than will I itself: the intensification of border enforcement will appear to be more successful than it really is (and than it would appear to be if there were no policy of internal enforcement).

An increase in domestic enforcement D will also shift the II schedule to the left, while in addition shifting NN to the right. Thus the rise in D has an ambiguous effect on illegal immigration but does significantly increase attempts at deception. Thus such a policy shift is likely to produce a large decline in perceived immigration, and thus appear to be quite successful, even if in fact it has little effect on I!

To proceed further, examine analytically the effects of policy changes. Differentiating the expressions for the II and NN schedules [equations (19) and (21)] with respect to E and solving yields

$$(d\mu/\mu) = -e_w[w(E)/N\Delta]\,(dE/E)$$

and

$$(dI/I) = e_w[w(E)/N\Delta][(N(e_D-1) + pIe_D)/pIe_D]\ (dE/E).$$

In these expressions, e_w denotes the elasticity of $w(E)$, $[w'E/w(E)]$, and

$$\Delta = -[\theta_S w_L/eU][(N(e_D-1) + pIe_D)/pNe_D] - (e_D-1)\mu/N < 0.$$

That is, Δ is the Jacobian determinant of the system (19),(21):

$$\Delta = \begin{vmatrix} [-\theta_S w_L]/eU & e_D - 1 \\ \mu/N & [N(e_D-1) + pIe_D]/pNe_D \end{vmatrix}.$$

These expressions confirm that an increase in border enforcement E will lower illegal immigration I and intensify attempted deception μ. The net effect on the volume of aliens successfully passing themselves off as legitimate unskilled workers, pI, is then given by

$$(dp/p) + (dI/I) = ((d\mu/\mu)/e_D) + (dI/I)$$
$$= e_w[w(E)/N\Delta][(e_D-1)/e_D][(pI+N)/pI]\ (dE/E).$$

Thus pI must fall as a result of the rise in border enforcement: the intensified deception effort does not make up for the reduction in illegal immigration.

We can now see how the increased border enforcement affects the various labor groups. The fall in I implies a fall in U and therefore in u as well; this implies, from (7') and (18), that the wages of native unskilled workers of unambiguous identity, w_L, and those of illegal migrants recognized as such, w, both increase, and in identical amounts. Because of the fall in pI, the wages of members of N (and of those illegal migrants passing themselves off as legitimate) increases even more than w_L and w. The losers are native skilled workers and those migrants who fail to gain entry as a result of the rise in E. The basic conclusion, then, is that it is the

members of that group susceptible to being confused with illegal migrants that stands to gain the most from an intensification of border enforcement, in spite of the fact that one of the consequences of such an intensification will be to induce illegal entrants to redouble their efforts to pass themselves off as members of the susceptible group.

An intensification of internal enforcement in the percentage (dD/D) produces the following results.

$$(d\mu/\mu) = -[(pI+N)/pN][e_I/\Delta][(\theta_S w_L/eU) + (e_D\mu/N)]\ (dD/D).$$

$$(dI/I) = (hk^*e_I/\Delta)([(1-p)/pI][(e_D-1)/e_D] + (1/N))\ (dD/D).$$

It follows from these expressions that an intensification of internal enforcement increases the deception effort μ, as indicated by the geometry, but also unambiguously reduces the volume of illegal immigration I. Thus the wages of clearly-legal unskilled workers (L) rise as a result of the increase in D. However the effect on pI is ambiguous, and therefore so also is the effect on the wage (w_N) of legal workers who might be mistaken for illegal immigrants. Clearly illegal immigrants are also affected ambiguously; in (18) both the value of these worker's marginal product, f'(u), and the expected penalty of employing them, h(D)k*, rise. Obviously these workers are disadvantaged relative to the clearly legal, with $w_L - w$ rising in the proportion $e_I(dD/D)$, from (18). They are also disadvantaged relative to the ambiguous group: it follows from (17) that $w_N - w$ rises in the proportion $[(e_D-1)/e_D](d\mu/\mu)$.

An intensification of either border enforcement or internal enforcement will raise the wages of those workers liable to be mistaken for illegal immigrants relative to those who clearly are illegal immigrants. But whereas more border enforcement definitely makes the former group better off both absolutely and relative to clearly legal unskilled workers, increased internal enforcement need not do so.

III. Conclusions

The more important implications of this paper appear to be the following.

- Border enforcement policy is an effective means of controlling the wage of unskilled labor.

- However such interdiction could well be an unpredictable and unstable influence upon both the number of illegal immigrants who actually enter the country and upon the wages of native skilled workers who compete only indirectly with the migrants.

- With a given interdiction policy, varying the number of immigrants admitted legally will have no effect on the number who actually enter.

- Border enforcement policy will always reduce national income, even if the country has power in the international labor market.

- The wage of unskilled workers and the volume of illegal immigration are likely to be distinct policy targets, but they are linked together technologically and can not be unbundled with border enforcement policy.

- Domestic enforcement policies will disadvantage illegal aliens relative to legal workers if firms can distinguish the former, but if they cannot distinguish the aliens such policies will harm all unskilled workers relative to skilled labor.

- A country can reduce the cost of its immigration policy by employing a mixture of border and domestic measures rather than relying on just one type of enforcement.

- Domestic enforcement cannot unbundle the unskilled labor wage and the volume of immigration if firms distinguish illegal aliens, but it can do so if they do not distinguish.

- If illegal aliens can take measures to improve their chances of passing themselves off as legal residents, both border enforcement and, especially, domestic enforcement will appear to be more successful than they actually are.

- An intensification of border enforcement will be especially attractive to those legal workers liable to be confused with illegal aliens. The use of domestic enforcement allows the authorities to unbundle the wage of this group from the volume of immigration.

It must be assumed of course that these conclusions are sensitive to the structure of the present model. That structure itself is open to question, since this paper is but a tentative first look at the subject it raises.

FOOTNOTES

*This paper has benefitted from discussions during a seminar at Indiana University and during an International Trade Workshop at the University of Western Ontario.

1. For a more detailed discussion of the implications of conventional trade theory for migration and of the distinguishing characteristics of the latter, see W. J. Ethier (1984).

2. Communist countries constitute exceptions to this, but very few of our theories have been formulated with regard to their ability to accommodate these states.

3. See Ethier (1981).

4. Although we do not have a theory of illegal immigration, we do possess a substantial amount of work on smuggling and illegal trade. See Bhagwati and Hansen (1973), Pitt (1981), and other references cited in the useful overview by Bhagwati (1981). This paper differs from that literature in important ways, beyond the obvious one that I examine factor movements rather than commodity trade. The smuggling literature is concerned with the efforts of importers (sometimes involving the expenditure of real resources) to expand trade by evading tariffs; I am concerned with the efforts of the host country (involving the expenditure of real resources) to limit the inflow of migrants. Perhaps each literature could profit by exploiting the insights of the other, but that is not the purpose of this paper.

5. M actually denotes the total number of attempts to migrate, and not the number of individuals

making such attempts. Some of those who at first do not succeed will presumably try again.

6. The possibility of a backward-bending labor supply curve seems of little relevance in the present context.

7. It might appear that the authorities could set E to attain the desired value of w, thereby determining u, and then set L so as to cause I to attain its desired value. But this does not in fact unbundle the two targets, unless the authorities' concern about I is limited to the legal status of the migrants. Varying L will not, as we have seen, change L + I and therefore will not influence the number of migrant workers actually present, which is presumably the actual policy concern.

8. This paper treats as exogenous the two penalties, k and k*. This is quite compelling as regards k, since the penalty born by aliens who fail to gain entry consists to a large degree of the opportunity cost of the time lost in being sent back. But the penalty k* levied on employers presumably would correspond in substantial part to fines and/or prison sentences, so there is a good case for treating both D and k* as policy variables. But to make k* endogenous in a satisfactory way would require addressing the relation between that variable and the performance of enforcement officials, with regard to zeal, corruption and so on. All this does not seem to me a natural and essential part of the topic of this paper, so I prefer to sidestep it by simply taking k* as exogenous.

9. Since D + E is increased by any departure from B, the <u>after-tax</u> incomes of skilled workers necessarily fall, with v remaining constant.

10. Since this case is of interest only if the government can distinguish illegal aliens when it inspects firms, it is necessary that the government have access to some means of verification not available to private firms.

11. Note that I am here interpreting the internal distribution target as concern about the wage of unskilled workers. The wage of skilled workers will still depend upon u, and the taxes they pay will depend upon D + E.

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