ISSN 0316-5078

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MIGRANTS IN A GUEST-WORKER SYSTEM: A UTILITY-MAXIMIZING APPROACH*

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DISCUSSION PAPER 661

October 1986

ABSTRACT

This paper examines the behavior of utility-maximizing migrants in a system of guest-worker migration. Their pattern of leisure and commodity consumption at home and abroad is analysed and related to those chosen by the natives of the host country and the non-migrants of the source country. The paper also highlights an important distinction between permanent and temporary migration. While a permanent migrant is primarily interested in the real-wage differential between countries of immigration and emigration, a guest worker's decision to migrate depends on both the real and the nominal differential. The relative importance of the nominal differential is found to be inversely related to the degree of concavity of his instantaneous utility function.

1. Introduction

Interest in issues related to international migration has grown considerably over the last two decades. In the 1970s, the focus of attention was on the "brain-drain" problem and related source-country issues.[1] By contrast, in the late seventies and early eighties, rising unemployment in labor-importing countries has attracted attention to the host-country problem of controlling immigration.[2]

In the economies of northern and central Europe, where an operational guest-worker system exists, tighter restrictions on immigration have been implemented through a reduction in the number of temporary work permits issued per year as well as through measures which essentially reduce the length of time over which the permits are valid. In the U.S., where this type of a mechanism for controlling the stock of migrant labor is not in place, the problem has been addressed by increasing the degree of enforcement of existing immigration restrictions, particularly those which apply to the significant inflows of illegal aliens.

Tighter enforcement of existing regulations, however, is seen by the U.S. Congress as a temporary solution. New laws governing immigration into the U.S. have been in the making for several years. The most likely outcome of this lengthy legislative process is that a large proportion of the current "illegal" flow of migrants will be absorbed into the U.S. economy under the new regulations as part of a controlled guest-worker program.

Although the guest-worker system has played an extremely important role in Europe and the Middle East, and is likely to assume an important role in the future in the U.S. and other economies, it has attracted very little attention in the theoretical literature.[3] Understanding the nature of the guest-worker

system and the implications of policy measures taken within it, requires that we examine the behavior of agents and institutions which participate in the system. The present study takes a step in this direction by investigating the behavior of the system's leading actor: the guest worker.

In section 2, a representative guest worker is described as a utility-maximizing individual with a finite working life. Assuming he is granted the right to work in the host country for a specified period of time, he faces two related problems: to choose a) the optimal rate of saving while abroad and b) the optimal allocation of his time (both at home and abroad) between work and leisure.

The solutions to these problems explain a number of observed features of guest-worker behavior. In particular, it is shown that under typical conditions a guest worker might be expected to a) consume abroad less and work harder than the native workers of the host country, and b) to consume more and work less upon returning to the homeland than the non-migrants of the source country.

Section 3 employs the model to examine a guest worker's optimal response to a shift in immigration policy of the host country as well as to changes in the prices of labor and commodities at home and abroad. Finally, section 4 deals with one of the fundamental distinctions between permanent and temporary migration. In contrast with the former, the latter type of labor mobility offers migrants the option of consuming in the source country part of the income earned in the host country. Accordingly, while a permanent migrant would not choose to move to an economy with a relatively lower <u>real consumption wage</u>, a guest worker might find it in his interest to do so provided that the <u>absolute wage</u> rate of the host country is sufficiently higher than that of the source country. The degree of concavity of the potential migrant's instantaneous utility function is found to play a crucial role in determining whether the real- or the nominal-wage differential between the two countries is of relatively greater significance

to his decision to migrate.

2. The Migrant's Problem

Let us suppose that the host country grants temporary immigration permits to foreign workers entitling them to work in the economy for a period of θ years. Let us assume that the permits are not renewable and that they are granted to applicants at the beginning of their working life, a period defined to last from the age of 0 to T.[4] Moreover, let us suppose that the wage paid to migrants in the host country, w*, is greater than w, the wage available in the source country. Both wages are measured in terms of an international standard of value, say, a unit of gold.

A typical migrant is endowed with a flow of L units of productive labor per unit of time. In each country, he must choose how much of this flow to sell on the labor market at the going wage and how much of it to consume in the form of leisure. Income from the sale of work effort is spent over time on units of a standard commodity bundle.

The price of this standard bundle in the source country is denoted by p and in the host country by p*. To the extent that the bundle contains non-traded goods, p may differ from p* even under free trade and in the absence of transport costs. On the basis of empirical evidence [see Kravis, Heston and Summers (1978) and Bhagwati (1984)] a strong case can be made in favor of the presumption that $p^* > p$. In any event, w, w*, p, and p* are taken to be constant.

The problem for the migrant is to choose the time paths of leisure and commodity consumption so as to maximize

$$V = \int_0^T u(c_t, \ell_t) \exp(-\delta t)dt \ , \qquad (1)$$

subject to the intertemporal budget constraint

$$\int_0^\theta p^* c_t \exp(-rt)dt + \int_\theta^T p c_t \exp(-rt)dt + k \leq$$

$$\int_0^\theta w^*(L-\ell_t) \exp(-rt)dt + \int_\theta^T w(L-\ell_t) \exp(-rt)dt . \qquad (2)$$

In (1), the instantaneous utility function $u(\cdot,\cdot)$ is homogeneous and concave. Its arguments c_t and ℓ_t are the migrant's rates of consumption of commodities and leisure at the age of t. The positive constant δ is the migrant's subjective rate of time preference and the constant k represents the present value of the round-trip cost of migration.[5] Finally, the constant r is the market rate of interest on loans denominated in terms of gold.

First-order conditions for the maximization of (1) with respect to (2) are given by the budget constraint (2) and the following two relationships.

$$u_c(c_t,\ell_t) \exp(-\delta t) = \lambda \pi_t \exp(-rt) , \qquad (3)$$

$$u_\ell(c_t,\ell_t) \exp(-\delta t) = \lambda \omega_t \exp(-rt) , \qquad (4)$$

where $\pi_t = p^*$, $\omega_t = w^*$ for $0 \leq t \leq \theta$ and $\pi_t = p$, $\omega_t = w$ for $\theta < t \leq T$. Equations (2) - (4) enable us to solve for λ, the shadow value of gold measured in terms of utility, and for the optimal paths of consumption and leisure $\{c_t,\ell_t\}_{t=0}^T$, as functions of the model's parameters.

In order to facilitate the analysis of the migrant's problem, we shall assume that the utility function resides within the constant relative risk aversion family.

$$u(c_t,\ell_t) = \frac{\left(c_t^\alpha \ell_t^{1-\alpha}\right)^{1-R}}{1-R} , \quad R \geq 0, \ 0<\alpha<1 , \qquad (5)$$

where the constant R is the coefficient of risk aversion. The greater the value of R, the smoother the desired time profile of utility, given the time

profile of commodity and leisure prices. When $R = 1$, $u(c_t, \ell_t) = \alpha\log(c_t) + (1-\alpha)\log(\ell_t)$. The constants α and $(1-\alpha)$ are the expenditure shares of commodities and leisure in the migrant's flow of spending.

Assuming that the utility function is given by eq. (5) and that $\delta = r$,[6] we may express the necessary conditions (3) - (4) as

$$(\alpha/c_t)\left(c_t^{\alpha}\ell_t^{1-\alpha}\right)^{1-R} = \lambda\pi_t \ , \tag{6}$$

$$[(1-\alpha)/\ell_t]\left(c_t^{\alpha}\ell_t^{1-\alpha}\right)^{1-R} = \lambda\omega_t \ . \tag{7}$$

From (6) - (7), it follows that

$$c_t = \ell_t[\alpha/(1-\alpha)](\omega_t/\pi_t) \ . \tag{8}$$

By substituting (8) into (7), we may now solve for ℓ_t as a function of only λ and the parameters of the model.

$$\ell_t = [(1-\alpha)/\lambda\omega_t]^{1/R}\,[\alpha\omega_t/(1-\alpha)\pi_t]^{\alpha(1-R)/R} \ . \tag{9}$$

Since the optimal shadow value λ is constant, eq. (9) reveals that ℓ_t is constant along the optimal path whenever the wage rate and the price of the standard commodity bundle is constant. Recalling eq. (8), we note that the same is true for c_t.[7]

Let ℓ^* and c^* denote the constant optimal flows of leisure and commodity consumption enjoyed by the migrant abroad, and let ℓ and c denote the corresponding flows after his return to the homeland. Since $\omega_t = w^*$ and $\pi_t = p^*$ for $0 \leq t \leq \theta$, and $\omega_t = w$ and $\pi_t = p$ for $\theta < t \leq T$, we may use (9) to express the ratio of ℓ to ℓ^* as a function of relative prices. That is, $\ell/\ell^* = (w^*/w)^{1/R}\,[(w/p)/(w^*/p^*)]^{\alpha(1-R)/R}$. After multiplying both sides of this relationship by w/w^* and using the fact that $w^*\ell^* = \alpha E^*$ and $w\ell = \alpha E$,

where $E^* \equiv w^*\ell^* + p^*c^*$ and $E \equiv w\ell + pc$ (i.e., E^* and E measure, in terms of gold, the migrant's optimal flow of nominal expenditure on commodities and leisure abroad and at home, respectively), we obtain the following simple relationship.

$$\frac{E/X}{E^*/X^*} = \left(\frac{X^*}{X}\right)^{1/R}, \tag{10}$$

where X^* is an index measuring the migrant's cost of living abroad and X is the value of the same cost-of-living index at home. The index is a geometric average of commodity and leisure prices in the corresponding economy. Specifically, $X^* \equiv p^{*\alpha} w^{*1-\alpha}$ and $X \equiv p^{\alpha} w^{1-\alpha}$.

Equation (10) confirms our intuition that the ratio of a migrant's real spending at home to his real spending abroad is directly related to the ratio of the foreign to the domestic cost of living. In addition, the sensitivity of the migrant's real spending pattern to the ratio of cost-of-living indices of the two economies is shown to be directly related to $1/R$, a parameter which is often referred to as the elasticity of intertemporal consumption substitution. As $1/R \to 0$, the migrant's desired time profile of utility becomes absolutely flat, regardless of the time profile of prices over his planning horizon. Accordingly, he chooses $E/X = E^*/X^*$ for any value of X^*/X.[8] At the other extreme is the case in which $R = 0$. Now the instantaneous utility function is linear homogeneous so that the migrant does not care about the time profile of utility. He enjoys it only when it is cheapest to attain, abstaining completely from the consumption of commodities and leisure in the economy where the cost of living is relatively higher.

The empirically relevant case is, of course, somewhere between the two extremes. Thus, if both leisure and commodity prices are higher in the host country than they are in the source country, as seems realistic to assume,

we may expect a typical guest worker to choose $E/X > E^*/X^* > 0$. Because instantaneous utility is directly related to total real spending on commodities and leisure (see fn. 8), this in turn implies that the flow of utility enjoyed by the migrant is lower during his tenure as a guest worker than it is after his return to the homeland.

It is also useful to rewrite (10) so as to highlight the relationship between nominal expenditure flows undertaken by the guest worker in the two economies.

$$E/E^* = (X^*/X)^{(1-R)/R} \tag{11}$$

Whether his nominal spending is higher or lower in the economy with the higher cost of living depends on whether R is greater or less than unity. If $R > 1$, his real expenditure pattern is inelastic with respect to the relative cost of living. Accordingly, his nominal spending is relatively higher in the high-cost country. Alternatively, if the elasticity of intertemporal consumption substitution exceeds unity (i.e., $R < 1$), his nominal spending in the high-cost country is relatively lower.

Having analysed the relationship between the migrant's total expenditure at home and abroad, we may proceed to study his leisure and commodity consumption pattern in the two economies. Since $p^*c^* = \alpha E^*$, $pc = \alpha E$, $w^*\ell^* = (1-\alpha)E^*$, and $w\ell = (1-\alpha)E$, it immediately follows from (11) that

$$\frac{c}{c^*} = \left(\frac{p^*}{p}\right)^{1/R} \left(\frac{w^*/p^*}{w/p}\right)^{(1-\alpha)(1-R)/R}, \tag{12}$$

$$\frac{\ell}{\ell^*} = \left(\frac{w^*}{w}\right)^{1/R} \left(\frac{p^*/w^*}{p/w}\right)^{\alpha(1/R)/R}. \tag{13}$$

Thus, if the relative price of leisure in terms of commodities is the same in the two countries (i.e., $w^*/p^* = w/p$), we should expect the migrant to consume

a greater flow of commodities (leisure) in the economy where commodities are (leisure is) relatively cheaper.[9] However, if $w^*/p^* \neq w/p$, his pattern of commodity and leisure consumption in the two countries is related to relative prices in a less obvious way. We shall focus our attention on eq. (12) which determines c/c^*. The analysis of eq. (13) is symmetric.

Let us suppose that commodities and leisure are complements in the Edgeworth sense (i.e., $R < 1$). In this case, the marginal utility of commodity consumption is directly related to the migrant's enjoyment of leisure. Consequently, he may choose $c/c^* > 1$ even if $p/p^* > 1$, provided that (w^*/w) is sufficiently larger than unity.[10] The positive complementarity effect of the greater enjoyment of leisure in the source country, where leisure is relatively cheaper, dominates in this case the negative effect on c/c^* of p/p^* being greater than unity.[11]

Alternatively, if $R > 1$, commodities and leisure are Edgeworth substitutes. A lower relative price of leisure in terms of commodities in the source country now serves to <u>lower</u> c/c^*, as the relatively greater enjoyment of leisure has a <u>negative</u> effect on the marginal utility of commodity consumption. This negative substitutability effect gives rise to the possibility that $c/c^* < 1$ even if $p/p^* < 1$. The necessary and sufficient condition for this to occur is given in fn. 10.

Finally, in order to determine the <u>levels</u> of c^*, c, ℓ^*, and ℓ, we turn to the migrant's intertemporal budget constraint (2). Optimization requires that this constraint be satisfied with equality. Knowing that the migrant's optimal flow of nominal spending is constant and equal to $E^*(E)$ abroad (at home), we may write the budget constraint as

$$\frac{(Lw^*-E^*)[1-\exp(-r\theta)]}{r} + \frac{(Lw-E)[\exp(-r\theta)-\exp(-rT)]}{r} = k \,, \qquad (14)$$

so as to emphasize the fact that the sum of the discounted flows of saving abroad and at home must be equal to the cost k of international migration. Graphically, the constraint is depicted in fig. 1 by the negatively sloped BB schedule.

At Z, which is a useful point of reference, migrant's expenditure in each economy is equal to his current gross income. Assuming that $w^* > w$, Z lies to the right of the 45^0 ray from the origin. Moreover, if migration costs must be paid by the migrant, it also lies above BB.

Eq. (11), which relates the optimal rate of nominal spending at home to that abroad, is depicted by the positively sloped OS locus. Assuming that $X^* > X$, the slope of this locus is greater or less than unity, depending on whether $R \lesseqgtr 1$. The point of intersection between BB and OS determines the migrant's optimal rates of nominal spending abroad and at home, E^* and E.[12] We may then proceed to solve for the remaining endogenous variables: $c^* = \alpha E^*/p^*$, $c = \alpha E/p$, $\ell^* = (1-\alpha)E^*/w^*$, and $\ell = (1-\alpha)E/w$.

Assuming that all workers have identical tastes and endowments (simply a flow of L units of productive labor), we can easily compare the expenditure pattern of a migrant with those of the remaining workers of the source country (REMS) and the native workers of the host country (NATS). Clearly, with $\delta = r$, the optimal rate of nominal spending of NATS is given by Lw^* and that of REMS by Lw. Fig. 1 shows that a migrant spends abroad at the rate $E^* < Lw^*$, while spending at home at the rate $E > Lw$. Moreover, assuming that he faces the same leisure and commodity prices in the host (source) country as do the NATS (REMS), his <u>ratio</u> of commodity to leisure consumption in the host (source) country is identical to that of the NATS(REMS). It immediately follows that: a) while abroad, a guest worker consumes <u>less</u> of both leisure and commodities than do the NATS and b) while at home, he consumes <u>more</u> of both leisure and commodities than do the REMS. His rate of saving out of foreign gross (of migration costs) income is given by $Lw^* - E^*$.

3. The Migrant's Optimal Response

Let us briefly consider the effects of changes in the parameters of the model on the migrant's pattern of consumption in the two economies and on his savings rate while abroad. We shall limit the analysis to a comparison of stationary equilibria.

3.1 A Shorter Foreign Stay

Suppose that the maximum length of a migrant's temporary stay in the host country is reduced.[13] Because the migrant is a net saver abroad, this cut in θ lowers his maximum sustainable rate of spending at home corresponding to the original rate of spending abroad.[14] Since p^*, p, w^*, and w are all held constant for the present, the position of the OS locus in fig. 1 remains unaffected. It follows that the migrant's optimal rates of spending at home and abroad fall in the same proportion (from E and E^* to, say, E_1 and E_1^*), while the commodity-leisure composition of his spending in both economies remains intact. Finally, we note that by cutting his rate of spending abroad from E^* to E_1^*, the migrant now saves foreign income at the correspondingly higher rate.

3.2 An Increase in Foreign Commodity Prices

An increase in p^* has no effect on the position of the migrant's nominal expenditure constraint. It does, however, increase the cost of living abroad, inducing the migrant to adjust his spending pattern in the two economies. As shown in eq. (11), if $R > 1$ (< 1), a rise in X^* relative to X rotates the OS ray clockwise (counterclockwise). Thus, if the elasticity of intertemporal consumption substitution, $1/R$, is less than unity, the new equilibrium value of E^* is higher and that of E lower than it was before the disturbance. Because $\ell^* = (1-\alpha)E^*/w^*$, $\ell = (1-\alpha)E/w$, $c^* = \alpha E^*/p^*$, and $c = \alpha E/p$, it immediately follows that the new stationary value of ℓ^* is higher and that those of ℓ and

c are lower. Moreover, eq. (12) shows that c^* falls proportionately more than c.[15]

Alternatively, if $1/R > 1$, the new equilibrium is characterized by a lower E^* and a higher E. In this case, both ℓ^* and c^* decline while the values of ℓ and c increase.

Using a "^" over a variable to indicate its proportional rate of change, we may summarize these results as follows:

For $1 < R < \infty$: $\hat{p}^* > \hat{\ell}^* = \hat{E}^* > 0 > \hat{E} = \hat{\ell} = \hat{c} > \hat{c}^*$.

For $1 > R > 0$: $\hat{c} = \hat{\ell} = \hat{E} > 0 > \hat{\ell}^* = \hat{E}^* > \hat{c}^*$.

Whether $\hat{p}^* \gtrless \hat{E}$ when $R \in (0,1)$, depends on the precise value of R in relation to the model's remaining parameters.

It is also interesting to note that while an increase in p^* entails a cut in the migrant's saving rate abroad when $R > 1$, it increases his propensity to save out of foreign income when $R < 1$. This follows from our earlier discussion of the relationship between the value of R and the ease of substituting consumption in the source country for that in the host country following an increase in the cost of living abroad.

Effects of a change in the price of commodities in the source country can be investigated in a similar fashion. It is sufficient to note that they are symmetric to those of an increase in p^*.

3.3 An Increase in Wages Abroad

In fig. 1, an increase in w^* shifts the migrant's expenditure constraint away from the origin. It also raises the cost of living abroad in relation to that at home, leading to a clockwise or a counterclockwise rotation of the OS ray, depending on whether R is greater or less than unity. It

follows that $\hat{E}^* \gtrless \hat{E}$ as $R \gtrless 1$. Moreover, for $R > 1$, $\hat{E}^*$ is necessarily positive. It may, however, be negative for values of R sufficiently close to zero. In addition, on the basis of (10), we observe that the migrant's real spending at home must rise in relation to that abroad. Since his real spending must rise in at least one economy, $\hat{E} > 0$ regardless of the relationship between R and unity. In order to realize this increase in spending at home, the migrant saves at a higher rate while abroad.

Noting that expenditure shares of commodities and leisure are constant, we also have the following results: $\hat{c} = \hat{\ell} = \hat{E} > 0$ and $\hat{c}^* = \hat{E}^* > \hat{\ell}^*$. Moreover, (13) implies that $\hat{\ell} - \hat{\ell}^* = \hat{w}^*[1-\alpha(1-R)]/R > 0$. In summary, we have found that:

For $1 < R < \infty$: $\hat{c}^* = \hat{E}^* > \hat{E} = \hat{c} = \hat{\ell} > \hat{\ell}^*$.

For $1 > R > 0$: $\hat{c} = \hat{\ell} = \hat{E} > \hat{E}^* = \hat{c}^* > \hat{\ell}^*$.

Determination of whether $\hat{\ell}^*$ is positive or negative requires a much more tedious evaluation of the income and substitution effects. While leaving this exercise to the interested reader, we note that either outcome is possible.

4. Permanent Versus Temporary Migration

From the viewpoint of a permanent migrant, a commitment to sell labor services abroad is also a commitment to consume commodities in that same economy. Being endowed with a flow of L units of labor, he will choose to work in the foreign country only if the relative price of labor in terms of commodities -- the real wage -- is higher abroad than it is at home (i.e., only if migration enables him to improve his terms of trade). By contrast, a guest worker is able to choose the economy in which to spend his labor income independently of where he earns it. In consequence, he may find it in his interest to work abroad even if $w^*/p^* < w/p$, provided that w^* is

sufficiently greater than w. In order to illustrate this point, let me assume that a guest worker's potential discounted income abroad (net of migration costs) exceeds his discounted income at home over the corresponding period of time. This is

$$w^* - w > rk/[1 - \exp(-r\theta)]L. \qquad (15)$$

If his instantaneous utility function is linear homogeneous (i.e., R = 0), he does not care about the time profile of his utility and enjoys it only when the basket of commodities and leisure is cheapest to obtain. Provided that (15) is satisfied, migration increases the present value of his lifetime income without affecting his ability to purchase commodities and leisure at the cheapest source. Accordingly, (15) is necessary and sufficient for migration to improve his welfare. The fact that the real wage may be higher or lower in the host country than it is in the source country does not affect his decision to migrate.

However, for progressively higher values of R along the interval from 0 to ∞, the migrant's desired time profile of utility becomes increasingly flat, given the prices of commodities and leisure in the two economies. Because he finds it increasingly more difficult to substitute consumption at home for consumption abroad, the relationship between commodity prices in the two economies (or real wages, given the levels of nominal wages) assumes a more significant role in his decision to migrate. In the limit, as $R \to \infty$, migrant's preferences call for a perfectly flat time profile of utility. In meeting this requirement, his optimal consumption program is characterized by a constant flow of real spending over the entire

planning horizon (i.e., $E/X = E^*/X^*$).[16] It is now easy to demonstrate that unless w^*/p^* is greater than w/p, it cannot be in his interest to seek temporary employment abroad, regardless of how high w^* is in relation to w.

Suppose that $w^*/p^* = w/p$, so that $X^*/X = w^*/w$.[17] In light of this relationship and eq. (11), we note that $E/E^* \to w/w^*$ as $R \to \infty$. In terms of fig. 1, when $E/E^* = w/w^*$, the OS ray passes through point Z. Given that the migrant must pay his moving costs, it follows that the OS ray intersects the BB locus at Q, a point which lies below the level Lw. It is now obvious that in this case migration cannot be in the interest of the potential guest worker, regardless of the size of the nominal wage differential; he can enjoy a higher constant flow of utility by remaining in the homeland and spending (on commodities and leisure) at the rate Lw over his entire working life. For migration to be an attractive alternative, it is necessary (although not sufficient in the presence of moving costs) that $w^*/p^* > w/p$.

In summary, whether the nominal- or the real-wage differential plays a more important role in a guest worker's decision to migrate depends on the degree of concavity of his instantaneous utility function. The greater the degree of concavity, the less freedom he has in choosing his country of consumption independently of where the income is earned. Accordingly, for progressively higher values of R, he attaches increasingly more significance to the real- and less significance to the nominal-wage differential in his decision to migrate. For $R = 0$, only the nominal differential matters; as $R \to \infty$, the real differential assumes the decisive role.

FOOTNOTES

*This paper was written while I was visiting the Institute for International Economic Studies in Stockholm. I would like to thank the Institute for the generous hospitality and the Social Sciences and Humanities Research Council of Canada for financial support. I am also grateful to Torsten Persson for helpful comments. Any of the remaining errors are, of course, mine.

1. For surveys of the issues addressed in this literature, see Bhagwati (1976) and Bhagwati and Rodríguez (1976).
2. See, e.g., the important contribution by Ethier (1986) and the works of Brecher and Choudhri (1986), Djajić (1985a, 1985b), and Rivera-Batiz (1981).
3. Among the few existing theoretical studies is the one by Ethier (1985), which deals with host-country issues, the one by Djajić and Milbourne (1985), which analyses guest-worker migration from the perspective of the source country, and the paper by Rivera-Batiz (1983), which examines the consequences of guest-worker migration in the context of a two-country model. Of related interest are the works of Krauss (1976), Ethier (1984), and Djajić (1986). Empirical studies of problems related to guest-worker migration are greater in number. See, e.g., Bhagwati, Schatz and Wong (1984), Chandavarkar (1980), Macmillan (1982), Mehrländer (1980), Swamy (1981), and Richards and Martin (1983).
4. Both assumptions can be relaxed without affecting any of the main conclusions of the paper. If the permits are valid for only one year and renewable subject to labor-market conditions in the host country, θ should be interpreted as the <u>expected</u> length of a guest-worker's tenure abroad. The other assumption (that permits are received at the age of 0) simplifies the notation by dividing the migrant's economic life into just two periods.

Moreover, it enables us to study the problem without having to specify the probability that a potential migrant attaches at each instant to the prospect of being granted a foreign work permit.

5. Purely for notational simplicity, it is assumed that the migrant moves from one country to the other instantaneously.

6. This assumption is relaxed in the discussion that follows.

7. The assumption that $\delta = r$ is crucial at this point. In the event that $\delta > r$ ($< r$) the optimal time paths of ℓ_t and c_t are negatively (positively) sloped over those intervals where commodity and leisure prices are constant.

8. By using the first-order conditions (6) - (7), and the definitions of E^*, E, X^*, and X, one can express the constant flow of utility enjoyed by the migrant in the host country as $u^* = (1-R)^{-1}[(E^*/X^*)\alpha^{\alpha}(1-\alpha)^{1-\alpha}]^{1-R}$ and that enjoyed in the source country as $u = (1-R)^{-1}[(E/X)\alpha^{\alpha}(1-\alpha)^{1-\alpha}]^{1-R}$. This shows that utility along the optimal path is monotonically increasing in what was defined as real spending. Accordingly, if the migrant is to attain an absolutely flat time profile of utility from the age of 0 to T, he must choose a flat time profile of real spending.

9. If $\delta \neq r$, c and c^* in eq. (12) should be interpreted as the migrant's optimal rates of commodity consumption the instant after and the instant before age θ, respectively. Eq. (13) gives the corresponding relationship for leisure consumption.

10. It is necessary and sufficient that $(w^*/p^*)/(w/p) > (p/p^*)^{1/(1-\alpha)(1-R)}$.

11. Another way of interpreting the influence of w^*/w on the pattern of commodity consumption is by focusing on the so-called intertemporal relative price or real-interest-rate effect. Suppose that $p^*/p = 1$, but $w^*/w > 1$, so that the price of leisure is anticipated by the migrant to <u>fall</u> from w^*

to w when he reaches the age θ. He then faces a consumption-based real rate of interest which is greater than r. If $R < 1$, his real spending pattern [given in eq. (10)] is elastic with respect to the intertemporal relative price, X^*/X. Thus, as shown in (11), with $X^* > X$, $E > E^*$. Since $c = \alpha E/p$, $c^* = \alpha E^*/p^*$, and $p = p^*$ by assumption, it follows that $c/c^* > 1$. Moreover, if the condition stated in fn. 10 is satisfied, $c/c^* > 1$ even if $p > p^*$.

12. We have shown that if $X^* > X$, an optimizing migrant enjoys a greater flow of utility at home than he does abroad. Thus, unless the flow of utility enjoyed by the migrant after returning to the homeland is greater than the flow he would have enjoyed in the absence of migration, it is not in his interest to work abroad. Accordingly, in a migration equilibrium, $E > Lw$ as depicted in fig. 1, regardless of whether $R \gtrless 1$.

13. In a world of renewable, one-year work permits, one may think of the following exercise as involving a fall in the probability of permit renewal, and hence a reduction in the expected length of the migrant's stay in the host country.

14. The budget constraint is now flatter and further in to the origin in the relevant range.

15. Logarithmic differentiation of (12) yields $\hat{c} - \hat{c}^* = \hat{p}^*[1-(1-\alpha)(1-R)]/R$, where a "^" over a variable indicates its proportional rate of change. Since the expression in the brackets is positive, it follows that an increase in p^* raises c/c^*.

16. This has been shown in fn. 8.

17. $X^*/X \equiv p^{*\alpha} w^{*1-\alpha}/p^{\alpha} w^{1-\alpha} = (w^*/w)[(w^*/p^*)/(w/p)]^{-\alpha}$. Thus, for $w^*/p^* = w/p$, $X^*/X = w^*/w$.

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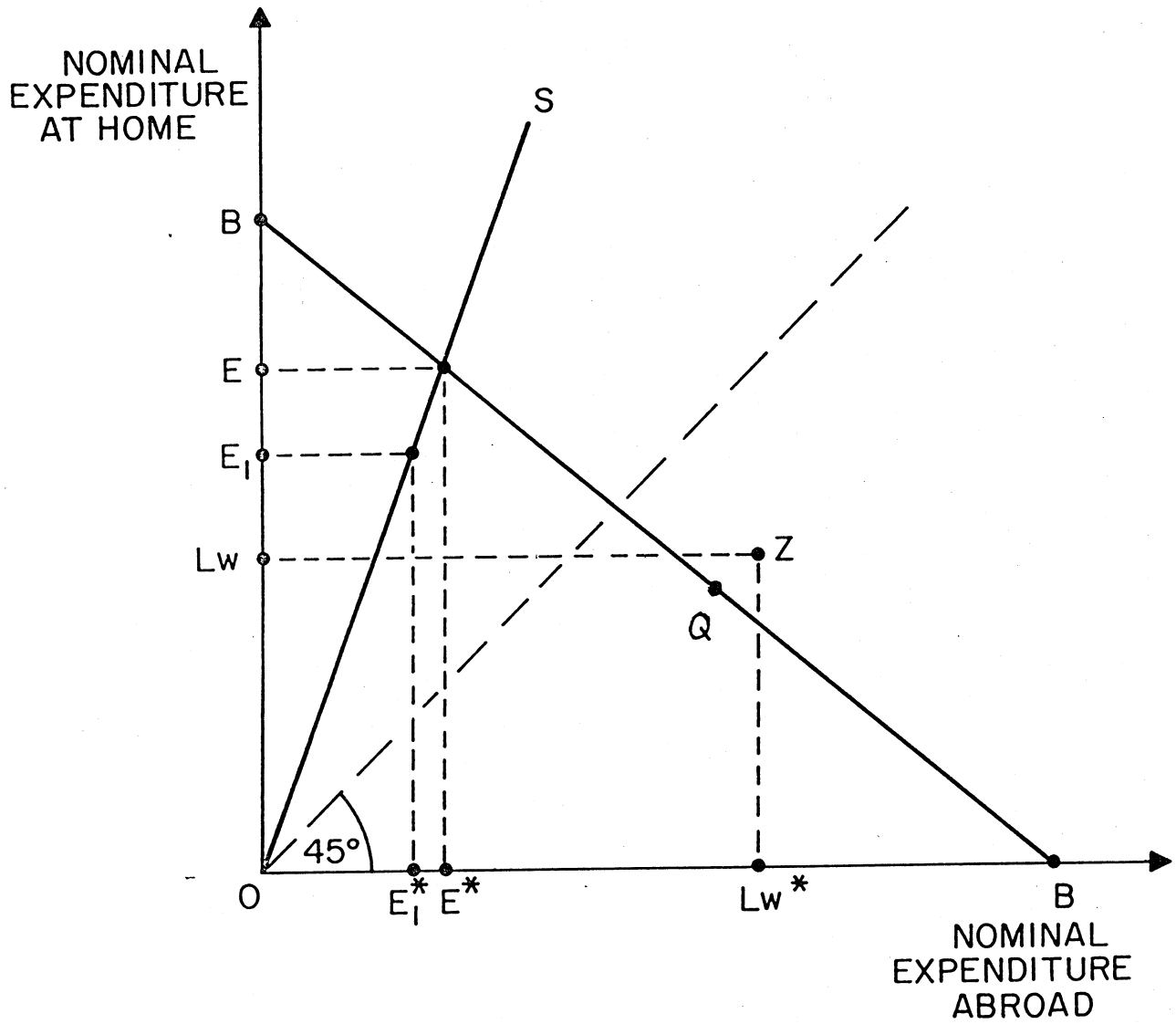
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