

Stark, Oded

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Return and Dynamics: The Path of Labor Migration when Workers Differ in their Skills and Information is Asymmetric

*Oded Stark**

University of Oslo, Norway, and Harvard University, Cambridge, MA, USA

Abstract

An implementation of the theory of labor migration under asymmetric information shows that return migration arises from the reinstatement of informational symmetry which induces low-skill workers, who are no longer pooled with high-skill workers, to return. When workers in an occupation constitute more than two skill levels, say four (without loss of generality), the following patterns emerge: Migration is sequential, that is, it proceeds in waves. Each wave breaks into workers who return and workers who stay; within waves the returning migrants are the low-skill workers. The average skill level of migrants is rising in the order of their wave.

I. Introduction

Drawing on the general assumption that information is asymmetric, this paper addresses the issue of return migration. Return migration is shown to constitute an integral part of the dynamics of labor migration, and is a cause of additional dynamics. The questions why and which migrants return lie at the very frontier of research on international migration. If the skill composition of migration flows can be shown to be responsive to concrete policies, real-world concerns are well served by the provision of clear answers to these questions. And real-world concerns, in this context,

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are real indeed because the numbers of those who return are, generally speaking, anything but trivial.

Demonstrating that return migration is not miniscule is somewhat onerous. Yet in spite of the difficulties in assessing the magnitude of return migration, there are reasons to believe that the numbers involved are often large, even in those countries ordinarily viewed as countries of destination, not of departure, such as the United States and Germany. Until 1957 the US collected information on both the arrival and departure of migrants. Looking at historical data, of the 15.7 million migrants admitted between 1908 and 1957, 4.8 million departed — nearly one-third; cf. LaLonde and Topel (1993). Based on the Central Registry of Aliens, the foreign population in Germany in 1988 was no larger than it was in 1983; cf. OECD (1990). During this six-year period, the outflow of foreign population was 2,378,000. Of course this outflow includes asylum seekers whose request was refused. The number of asylum seekers received by Germany during the period 1983–88 is 389,000. Obviously, there are lags involved, but even if we abstract from this consideration and subtract *all* the asylum seekers, we are still left with an outflow of two million. We do not know that the outflow is return, but all indications are that this is largely so.

A considerable reprieve from measurement, estimation and interpretation difficulties is provided by the interesting case of return migration from the US to Puerto Rico. The usefulness of this particular case arises from the absence of administrative barriers to migration between Puerto Rico and the US; issues of asylum, work permits and so on do not arise. From the returns of the 1980 Census of the Population of the United States (US 1983, 1984) we learn that in 1980, approximately a million people born in Puerto Rico were residing in the US. But we also find that in 1980, 283,000 had returned to Puerto Rico from the US where they had resided between 1970 and 1980.

A recent representative sample of young Irish labor market participants is a unique micro-data set that provides additional helpful evidence; cf. Reilly (1994). A December 1987 – January 1988 follow-up survey of 1981–82 Irish school-leavers contains information on educational qualifications, whether the individual migrated, and if so when and to where, and on whether or not the migrant returned. The emphasis on young workers is appropriate given that they have historically comprised a sizable proportion of the outflows. Of 1,299 school leavers, 378 migrated at least once between leaving school and 1988; of these 117 had returned by 1988. Analysis based on a bivariate probit model reveals that the educational qualifications of the returnees were significantly lower than those of the migrants who remained. Controlling for labor market conditions at destination, return migration is more likely from non-UK European Union countries in which employers are said to “fail to

recognize Irish qualifications," than from the UK (or, for that matter, from Australia and New Zealand).

To imply that the questions posed in the opening paragraph of the paper were not addressed before is wrong. Stark (1991) contains chapters that analyze the implications for migrants' performance of an exogenous probability of return migration; it also includes references to research by others. The present paper, however, takes a step beyond that work. This arises from an evolution of thinking and builds on preceding work; after all, behavior and motivations are far too rich and complex to be fully captured by a single — or even few — inquiries.

The underlying assumption here, which also further distinguishes this paper from preceding work, is that information is not perfect. Ordinarily, when meeting to conduct a transaction, agents do not fully know the characteristics of fellow agents that impinge on the outcome of the transaction. In the context of an employment relationship, this applies to the skill level of (new) employees. Of late, the implications of asymmetric information and incomplete information have been studied extensively in several fields in economics. But there has been little work on the repercussions of imperfect information for migration outcomes. Since, as this paper demonstrates, the explanatory and predictive powers of analyses based on the assumption of imperfect information are considerable, one implication is that additional useful results are likely to arise from further investigation of the consequences of different states of information.

The key concerns of this paper can be posed as follows: Why do some migrants return even though the inter-country wage differential is not reversed? And can we fully characterize the ones who return? To provide answers, the theory of labor migration under asymmetric information is implemented. This implementation generates an integrated set of predictions. The key results are the prevalence of return migration, and a complete characterization of the migrant workers who return. In particular, in the discrete case with only two skill levels, the low-skill workers return while the high-skill workers stay. The wage of the latter increases over time, but not as a result of skill enhancement. The basic idea is that when information pertaining to the individual skill levels of migrant workers is unknown to employers at destination, all migrant workers receive a wage based on the average product of the group of migrants. This wage formation procedure invites low-skill workers who, absent averaging, would have stayed behind, to move along with high-skill workers. When informational symmetry is restored through monitoring and observation and wages are adjusted accordingly, the low-skill workers return. The high-skill workers stay and their wages rise. Since now the individually identified (high-skill) stayers and (low-skill) returnees are removed from the pooling process, migration as above is replicated by yet a higher quality

subset of workers. And so on. By migrating, workers constituting the first subset block the migration of workers constituting a higher quality subset(s). But by subsequently exposing themselves to identification, these workers pave the way for the migration of higher quality workers. Thus, migration proceeds in waves with each wave breaking into workers who stay as migrants and workers who return, and within waves the returning migrants are the low-skill workers.

We conclude these introductory comments with a brief reference to how our results relate to and are distinguished from other recent work on return. The theoretical literature on labor migration is remarkably silent on return migration. Yet the number of migrant workers in any country is just as dependent on departures as on arrivals and, as already demonstrated, there is evidence that the duration of migration is often shorter than the duration of life or of working life. With conventional migration theory attributing migration to a positive wage differential, a conventional explanation of return migration is, not surprisingly, a negative wage differential; cf. Dustmann (1993, p. 2). While this explanation might be correct, considerable return migration appears to take place in the absence of a reversal of the relative wages of the sending and receiving countries.

Speaking generally, the typical explanations are that migrants return because of failure, or because of success. If reality does not tally with expectations or the draw from a mixture of good and bad draws (random shocks) is bad, migrants may return. Alternatively, migrants whose returns on human or financial capital are higher at home than abroad may find it optimal to return. A recent insightful study by Borjas and Bratsberg (1992) gives precisely these two reasons for return migration.

The set of reasons is richer, however. We offer two examples. First, a member of a family might migrate in order to diversify the familial income-earning portfolio. If income away from home and income at home do not covary fully, and there is post-migration pooling and sharing of income, the family's risk is lowered. Just as bearing one risk makes agents less willing to bear another risk, *not* bearing that one risk makes agents more willing to bear another risk; cf. Pratt and Zeckhauser (1987) and Kimball (1993). This then allows for experimentation at home with a relatively high-risk, high-return option, for example, a high-yield seed variety in agriculture. When such an experiment is successful, the need for migration-provided insurance ceases. Thus, the reason for return migration is not that the migrant accumulated capital with an expected high return at home but rather that his or her migration facilitated a high-return investment at home by others; cf. Stark (1991). Second, return migration may take place because of the higher purchasing power of savings (generated from work abroad) at home than abroad. Other researchers have been sensitive to the possibility that consumption at

home is preferable to consumption abroad, and have incorporated this preference into carefully argued models; cf. Hill (1987) and Djajic and Milbourne (1988). In research in progress, Stark, Helmenstein and Yegorov (1994) attempt to identify what underlies such a consumption preference, if it exists, and to account for return migration even if the said preference is absent. Specifically, we investigate the role of purchasing power parity in rendering given amounts of savings to facilitate different levels of consumption at home and abroad. While Stark (1991, Chapter 27) considered the effect of the probability of return migration on migrants' optimal savings, this analysis develops a reverse line of inquiry: How migrants' savings determine the optimal timing of return. *Inter alia*, this work points to a negative relationship between the optimal duration of migration and the purchasing power differential. Further, in some (but not all) cases, it shows a negative relationship between the optimal duration of migration and the wage abroad.

Yet return migration may be due to reasons beyond the disposition of savings or the elimination of risks. And as LaLonde and Topel (1993) lament, little is known "about whether it is high- or low-skilled workers who choose to return home."

In this implementation of the theory of labor migration under asymmetric information, return migration is an integral, structural part of the migration process. The addition of an explicit intertemporal dimension to the static model of labor migration under asymmetric information, cf. Stark (1991), amplifies the model and renders it possible to systematically differentiate and fully characterize workers who stay put, workers who migrate and stay at their destination, and workers who migrate and subsequently return home.

Suppose first that workers constitute two skill levels — low and high. An implementation of the theory offers the following predictions: Migration is *ex post* fully positively selective even though to begin with it is not; migration breaks into workers who stay as migrants and workers who return; and the returning migrants are the low-skill workers. The judgment concerning the selective nature of migration is thus sensitive to the time at which the judgment is made. Whereas the end result of migration is not sensitive to the information regime (symmetric or asymmetric), the migration path is — it is of one phase under symmetric information, but of more than one phase under asymmetric information. With the introduction of some auxiliary structure, the theory identifies a procedure that allows the receiving country to skim off the high-quality workers without engaging in (costly) screening.

Suppose next (without loss of generality) that workers in a profession constitute four skill levels. A plausible implementation of the theory of labor migration under asymmetric information generates the following

predictions: Migration is sequential or phased; not all workers who end up as migrants move at the same point in time. Each wave (or cohort) of migration (of migrants) breaks into workers who stay as migrants and workers who return. The century old “law of migration” of Ravenstein (1885, p. 199) that “each main current of migration produces a compensating counter-current” — often quoted but not generated analytically — turns out to be a derivative of a variant of the asymmetric information approach to migration. Within waves (cohorts) the returning migrants are the low-quality workers; thus, migration is *ex post* positively selective within cohorts. When the migration process is fully completed, migration is mildly positively selective — the average quality of migrants is superior to the average quality of workers found at origin — but not all migrants are of higher quality than all workers at origin. (Only in the case of two types of workers does migration turn out to be *ex post* fully positively selective.) Cohort by cohort, the average quality of migrants is rising.

The next section presents the basic model of labor migration under asymmetric information. Section III traces migration patterns arising from a two-skill-levels example. Section IV examines a four-skill-levels case and derives the resulting migratory patterns. Section V further places our approach in the context of related research on labor migration. Section VI concludes.

II. Labor Migration under Asymmetric Information: The Basic Model

Assume a world consisting of two countries: A rich country, R , and a poor country, P . In a given occupation let the net wages for a worker with skill level θ be $W_R(\theta)$ and $W_P(\theta)$ in the rich country and the poor country, respectively¹ (such that $\partial W_P(\theta)/\partial\theta > 0$ and $\partial W_R(\theta)/\partial\theta > 0$; thus workers' productivities in the sending and receiving countries are identically ranked). To reflect the fact that R is rich and P is poor, it is assumed that $W_R(\theta) > W_P(\theta)$ for all θ .² Also, without loss of generality, let θ be defined on the closed interval $[0, 1]$ and let the density function of P workers on θ be $F(\theta)$.

¹ To make the analyses tractable, we assume throughout that the wages in both R and P are dependent only on a worker's skill level and not on the excess supply of or demand for labor. In this we follow the similar assumption made in the optimal tax literature. Thus, for example, $W_R(\theta)$ and $W_P(\theta)$ may be linear in θ such that $W_R(\theta) = r_0 + r\theta$, $r_0 > 0$, $r > 0$ and $W_P(\theta) = p_0 + p\theta$, $p_0 > 0$, $p > 0$. It can be shown that these equations are reduced equilibrium forms where in each equation the l.h.s. is the equilibrium wage, whereas the r.h.s. is the productivity of a worker with skill level θ ; cf. Stark (1991, Chapter 12).

² This may, for example, result from a higher capital-to-labor ratio in R , from a superior technology in R , or from externalities arising from a higher average R country level of human capital per worker.

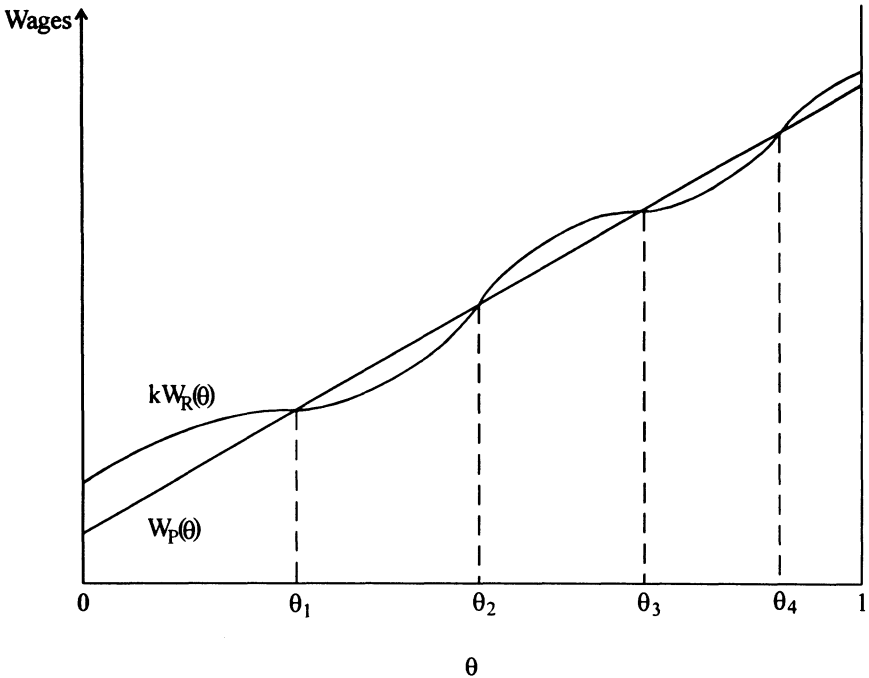


Fig. 1.

In addition, given that P workers are likely to have a preference for P life style because of cultural factors, social relationships, and so on, it is assumed that P workers apply a discount factor to R wages when comparing them to P wages. Thus, when making the migration decision, they compare $kW_R(\theta)$ with $W_P(\theta)$ where $0 < k < 1$. A P worker will therefore migrate from P to R if

$$kW_R(\theta) > W_P(\theta). \quad (1)$$

Clearly, without further restrictions on $W_R(\theta)$ and $W_P(\theta)$, there may be several values of θ for which $kW_R(\theta) - W_P(\theta) = 0$. Hence, as illustrated in Figure 1, there may be several distinct skill groups along the skill axis. Thus, the workers in skill intervals, $0\theta_1$, $\theta_2\theta_3$, θ_41 migrate, whereas those in the complementary intervals do not. We refer to a case in which there are at least three distinct groups (for example, along the θ axis, migrating, non-migrating, migrating) — a situation which can only occur if at least one of the $W_P(\theta)$ and $W_R(\theta)$ functions is non-linear in θ — as the non-convex case. Similarly, we refer to the type of case in which there are only two or fewer distinct groups as the convex case.

Let us now assume that the skill of each potential migrant is known in P where he or she has been observed for a while, but is unknown in R .

When markets are isolated in the sense that information does not ordinarily flow across them (or does not flow costlessly and freely) an employer (or employers) in one market may possess information on individual worker productivity — for example, such information may be revealed to the employer over time as a by-product of his or her normal monitoring and coordinating activities — but the information is employer- or market-specific. Also, for the moment, let us exclude the possibility that true skill is revealed in R over time.

Faced with a group of workers whose individual productivity is unknown to the employer (only the distribution of earnings abilities is known), the wage offered will be the same for all such workers and will be related to the average product of all members of the group. Let us assume that the actual individual wage offered is equal to the average product of the group³ and that wage offers are known to all workers.

Hence, denoting by \bar{W}_R the wage payable in the rich country to a migrant of unknown skill level and assuming n distinct migrating groups, \bar{W}_R is given by

$$\bar{W}_R = \sum_{i=1}^n \int_{\underline{\theta}^i}^{\bar{\theta}^i} W_R(\theta) F(\theta) d\theta \bigg/ \sum_{i=1}^n \int_{\underline{\theta}^i}^{\bar{\theta}^i} F(\theta) d\theta \quad (2)$$

where $\underline{\theta}^i$ and $\bar{\theta}^i$ are respectively the lowest and highest skill level migrating in group i , where i is one of the continuous groups migrating, and where the skill level increases with i . (Note that $0 < \underline{\theta}^1 < \bar{\theta}^n < 1$ for non-empty migrating sets.) It follows immediately that $\bar{W}_R < W_R(\bar{\theta}^n)$.

The following result (lemma) can now be established: *Under asymmetric information, if the top skill level migrating is $\bar{\theta}^n$ then any skill level $\tilde{\theta}$ where $\tilde{\theta} < \bar{\theta}^n$ will also migrate.*

To prove this result consider any $\tilde{\theta}$, such that $\tilde{\theta} < \bar{\theta}^n$. Now, since by assumption $\bar{\theta}^n$ migrates, it must be that $k\bar{W}_R > W_p(\bar{\theta}^n)$. Also, since $\tilde{\theta} < \bar{\theta}^n$ then $W_p(\tilde{\theta}) < W_p(\bar{\theta}^n)$ and hence $k\bar{W}_R > W_p(\tilde{\theta})$ so that $\tilde{\theta}$ skill levels also migrate.

The implication of this result is that under asymmetric information, everyone with a skill level less than or equal to $\bar{\theta}^n$ migrates, so that all workers in the interval $[0, \bar{\theta}^n]$ migrate. Note the contrast with the case of full information, as depicted in Figure 1, where the migration pattern could be non-convex.

³ If employers are risk neutral and production functions are linear in skills, the employer does not suffer from his or her ignorance of the true skill level of each worker, so that paying the average product per worker will be the competitive outcome. These assumptions of risk neutrality and linearity in production are the commonly accepted assumptions in the screening literature; cf. for example, Stiglitz (1975).

Thus, under asymmetric information, the wage payable to all migrating workers in R is

$$\bar{W}_R = \int_0^{\theta^*} W_R(\theta) F(\theta) d\theta \bigg/ \int_0^{\theta^*} F(\theta) d\theta \quad (3)$$

where θ^* is the top skill level migrating. Thus \bar{W}_R can be written as $\bar{W}_R(\theta^*)$.

Under asymmetric information then, workers of skill level θ for which

$$k\bar{W}_R(\theta^*) > W_P(\theta) \quad (4)$$

will migrate from P to R .⁴

Given this characterization of the migration pattern under asymmetric information we can now proceed, first, to an example of a convex (two group) case and then to an example of a non-convex case.

III. A Convex Case: An Example

Assume that there are just two types of workers: Low-skill workers whose skill level is θ_1 , and high-skill workers whose skill level is θ_2 , with skill-related wage rates $W_i(\theta_1)$ and $W_i(\theta_2)$ in the poor country $i = P$ and rich country $i = R$. Assume that the two skill types constitute α and $1 - \alpha$ percent of workers in the profession, respectively. Suppose that no costs are associated with migration, except those embodied in k , and that k is such that $kW_R(\theta_1) < W_P(\theta_1)$ yet $kW_R(\theta_2) > W_P(\theta_2)$. This assumption is introduced to capture the differential migration incentives of the symmetric information state and the asymmetric information state. It implies that under symmetric information only the relatively high-skill workers will migrate. However, if we assume that

$$\alpha kW_R(\theta_1) + (1 - \alpha) kW_R(\theta_2) > W_P(\theta_2) \quad (5)$$

then, under asymmetric information, the θ_2 workers will again migrate but this time the θ_1 workers will migrate as well (a result that follows immediately from the above lemma). If, at the end of the first period of employment, employers in R identify costlessly and correctly the skill levels of individual workers and adjust pay accordingly, the low-skill workers will return to P while the high-skill workers will stay in R . Since θ_1 are not pooled together with θ_2 , θ_2 's R country wage can only be higher, that is

$$kW_R(\theta_2) = \alpha kW_R(\theta_2) + (1 - \alpha) kW_R(\theta_2) > \alpha kW_R(\theta_1) + (1 - \alpha) kW_R(\theta_2). \quad (6)$$

⁴ Inequality (4) provides a cutoff condition which is due to individual rationality; workers optimize by supplying (inelastically) their labor to the higher-wage market. It can be proven that the arising equilibrium is compatible with, indeed ensues from, the other side of the market, namely, the behavior of firms in the destination R ; cf. Stark (1991, Chapter 12).

By assumption, the most r.h.s. of this last expression is larger than the alternative poor country wage $W_p(\theta_2)$.

There are three simple implications of this outcome.

First, considering the entire migration experience, we see that migration is positively selective. Even though no selectivity is observed initially — both low-skill and high-skill workers leave — with the passage of time and the removal of informational asymmetry, the return of the low-skill migrants to their home country produces a feature of positive selectivity. Whereas initially migration is not selective in skills, at least it is.

Second, the judgment concerning the selective nature of migration is sensitive to the timing (phase) at which the judgment is being made. (At first migration does not appear selective; at last it is fully positively selective.) Empirical findings concerning the selective nature of migration are thus phase dependent.

Third, even though the end result of migration is not path dependent, the symmetric information single-phase path (with only workers of skill level θ_2 migrating) is different from the asymmetric information multi-phase path (with group θ_2 found in R only when migratory moves halt altogether).

What if the rich country wishes to have only high-skill migrant workers right from the start, that is, what if it is unwilling to await return migration by the low-skill migrant workers? Suppose that screening (testing) individual migrants (would be or actual) is very costly or highly unreliable. The asymmetric information approach identifies an instrument that facilitates such a differentiation. Return migration and this instrument are thus mutually exclusive.

The rich country can announce an entry tax (visa fee) of \bar{T} units. This tax must be large enough to make it unworthy for the low-skill workers to migrate under asymmetric information but not too large as to swamp the high-skill workers' own discounted wage differential. To secure these dual requirements, it is necessary to find the minimal tax that solves

$$k[\alpha W_R(\theta_1) + (1 - \alpha) W_R(\theta_2) - \bar{T}] < W_p(\theta_1). \quad (7)$$

That is, the tax \bar{T} should solve

$$k[\alpha W_R(\theta_1) + (1 - \alpha) W_R(\theta_2) - (\bar{T} - \varepsilon)] = W_p(\theta_1), \quad (7')$$

where $\varepsilon > 0$ is a sufficiently small constant, while maintaining

$$k[W_R(\theta_2) - \bar{T}] > W_p(\theta_2). \quad (8)$$

From (7) and (8) we obtain

$$k\alpha W_R(\theta_1) + k(1 - \alpha) W_R(\theta_2) - W_p(\theta_1) < k\bar{T} < kW_R(\theta_2) - W_p(\theta_2). \quad (9)$$

Existence then requires that

$$W_P(\theta_2) - W_P(\theta_1) < \alpha k [W_R(\theta_2) - W_R(\theta_1)]. \quad (10)$$

Existence is thus more likely the steeper the wage profile is by skill in the rich country relative to the wage profile by skill in the poor country. If the proportion of the low-skill workers in the occupation under review, α , is relatively large, and if the rate of location discount is not high, the entry tax that solves (7') will also fulfill (8).

IV. A Non-Convex Case: An Example

Assume that there are four types of workers with skill levels θ_i increasing in i , $i = 1, \dots, 4$ and corresponding wage rates of $W_P(\theta_i)$ and $W_R(\theta_i)$ in the poor country and rich country, respectively. Suppose that $F(\theta)$ is given, that is, the proportion of skill type i in the profession is α_i . Once again it is assumed that no costs are associated with migration, except those embodied in k . Suppose that even though $W_R(\theta_i) > W_P(\theta_i) \forall i = 1, \dots, 4$, the skill-specific wage rates are such that $kW_R(\theta_2) > W_P(\theta_2)$ and $kW_R(\theta_4) > W_P(\theta_4)$, whereas $kW_R(\theta_1) < W_P(\theta_1)$ and $kW_R(\theta_3) < W_P(\theta_3)$; it is efficient for the most able and third most able groups to migrate, but not for the other two. It follows at once that under symmetric information only θ_2 and θ_4 migrate. Once informational asymmetry is introduced, the set of possibilities becomes quite rich. We limit the discussion to one interesting case where $k(\sum_{i=1}^2 \alpha_i)^{-1} \sum_{i=1}^2 \alpha_i W_R(\theta_i) > W_P(\theta_2)$ and $k(\sum_{i=3}^4 \alpha_i)^{-1} \sum_{i=3}^4 \alpha_i W_R(\theta_i) > W_P(\theta_4)$, while $k(\sum_{i=1}^3 \alpha_i)^{-1} \sum_{i=1}^3 \alpha_i W_R(\theta_i) < W_P(\theta_3)$ and $k\sum_{i=1}^4 \alpha_i W_R(\theta_i) < W_P(\theta_4)$. Ruling out strategic considerations (but see the discussion at the end of this section), what this configuration means is that under asymmetric information workers of skill levels θ_1 and θ_2 will migrate whereas workers of skill levels θ_3 and θ_4 will not migrate, even though the latter workers would have found it advantageous to migrate if they could do so alone — which by the lemma of Section II we know that they cannot.

If as a by-product of the employment and production processes complete information revelation takes place at the end of the first employment period, workers of skill level θ_1 return to P while workers of skill level θ_2 stay in R . Both these groups are fully removed from the pool of workers who are subject to asymmetric information.⁵ Now types θ_3 and θ_4 find it attractive to migrate. Thus, at this time, group θ_1 is found in P whereas groups θ_2 , θ_3 and θ_4 are in R . However, if once again complete

⁵ Since θ_1 and θ_2 are removed from the averaging process, we can normalize θ_3 and θ_4 to constitute the $[0,1]$ interval and therefore, $\bar{W}_R(\theta^*)$ is fully defined as per equation (3).

information about individual skill levels is obtained after one employment period, workers of skill level θ_3 return to origin, whereas workers of skill level θ_4 stay in R . There now emerges a pattern of migration wherein workers of skill levels θ_2 and θ_4 are found in R whereas workers of skill levels θ_1 and θ_3 are in P . Once again it turns out that even though the *end* result of migration is not path dependent, the symmetric information single-phase path (with workers of skill levels θ_2 and θ_4 migrating right from the start) is very different from the asymmetric information multi-phase path (with groups θ_2 and θ_4 found in R only when migration halts altogether).

We see that when there are more than two skill levels, the asymmetric information approach to labor migration can produce several of the empirically observed migration regularities: Migration is sequential; each wave of migration produces a counterflow of return migration;⁶ and migration is positively selective but not strongly so. We expand this point as follows. The result obtained implies that migration is *ex post* fully selective within cohorts but only mildly selective across cohorts. When migration halts altogether, types θ_1 and θ_3 are found in the poor country while types θ_2 and θ_4 are in the rich country. Since skill-wise type θ_3 workers dominate type θ_2 workers, not all migrant workers have a higher skill level than all non-migrant workers. Put differently, there is a migrant group at destination — of type θ_2 — which is dominated by return migrant workers found at origin of type θ_3 . It is therefore incorrect to argue that only the low quality workers return (θ_2 do not, whereas θ_3 do) even though such a claim holds true cohort by cohort. Moreover, as in the case of two skill levels, we see that a judgment concerning the selective nature of migration is highly sensitive to the timing (phase) at which the judgment is being made. So much so that at first glance migration appears to be overall negatively selective (as θ_1 and θ_2 leave, whereas θ_3 and θ_4 stay put); subsequently, as type θ_1 return, mildly negative selective (type θ_2 are migrants, types θ_3 , θ_4 and θ_1 are not), and so on. Since the completed or final outcome of migration is revealed only intertemporally, consideration of migration patterns at a given point in time, that is, in isolation from past and expected future dynamics, produces a biased account.

We also see that migration is perpetual in the sense that a given wave of migration melts the barrier blocking a subsequent migration wave. There is a widespread belief in the migration literature that the perpetual, phased structure of migration arises from low-order waves of migrants providing employment and job-related information to subsequent waves; cf. Stark

⁶ This is Ravenstein's (1885) well-known law of migration. Indeed, the analytically derived sequential pattern of migration is also in line with Ravenstein's (1885) observation that migration streams have a *built-in* tendency to increase over time.

(1991). The asymmetric information approach suggests a new explanation of the externality that a given wave confers on subsequent waves: High-order waves (for example, the wave consisting of types θ_3 and θ_4) migrate only because a cloud of informational asymmetry dissipates, thereby removing the low-order wave workers (types θ_1 and θ_2) from the pool of workers who are lumped together. By migrating, θ_1 and θ_2 block the migration of θ_3 and θ_4 ; but by subsequently exposing themselves to identification, these returnees and stayers pave the way for the migration of higher quality workers. "Information" then does play a role, but a very different role than the one conventionally assumed.

It should also be noted that the approach predicts that the average quality of migrants rises in the order of their cohort.⁷

Finally, we need to address the possibility that workers time their migration strategically. Consider the earning sequence of the θ_4 workers. In period 1 they earn $W_P(\theta_4)$, in period 2 $-(\alpha_3 + \alpha_4)^{-1}[\alpha_3 W_R(\theta_3) + \alpha_4 W_R(\theta_4)]$, and in period 3 $-W_R(\theta_4)$. The reason for this earning profile is that the period wherein the θ_4 workers earn in R a wage based on their own skill level alone must be preceded by a period in R wherein their wage is based on an averaging of skill levels. Why then not bring forward (from 3 to 2) the period at which $W_R(\theta_4)$ is earned by bringing forward (from 2 to 1) the employment cum averaging period? Instead of earning $W_P(\theta_4)$ at the first period, θ_4 workers could earn $(\alpha_1 + \alpha_2 + \alpha_4)^{-1}[\alpha_1 W_R(\theta_1) + \alpha_2 W_R(\theta_2) + \alpha_4 W_R(\theta_4)]$ at this period — if θ_4 workers join θ_1 and θ_2 , θ_1 and θ_2 will find it advantageous to migrate *a fortiori* — and thereafter earn $W_R(\theta_4)$ per period. We know, however, that $k \sum_{i=1}^4 \alpha_i W_R(\theta_i) < W_P(\theta_4)$, and it is likely that

$$\begin{aligned}
 (\alpha_1 + \alpha_2 + \alpha_4)^{-1}[\alpha_1 W_R(\theta_1) + \alpha_2 W_R(\theta_2) + \alpha_4 W_R(\theta_4)] &< \sum_{i=1}^4 \alpha_i W_R(\theta_i) \\
 &= \left(\sum_{i=1}^4 \alpha_i \right)^{-1} \sum_{i=1}^4 \alpha_i W_R(\theta_i).
 \end{aligned}$$

The reason for this latter inequality is that compared with its r.h.s., in its l.h.s. the weights of the low wages $W_R(\theta_1)$ and $W_R(\theta_2)$ are relatively higher, while the high wage $W_R(\theta_3)$ is deleted altogether (two lowering effects), even though the highest wage $W_R(\theta_4)$ is weighted more (one increasing effect). But by transitivity, $k[\alpha_1 W_R(\theta_1) + \alpha_2 W_R(\theta_2) + \alpha_4 W_R(\theta_4)] < W_P(\theta_4)$.

⁷ Borjas (1987) provides evidence that the quality of migrant cohorts from Western Europe to the United States has been increasing over the period 1955–1979. However, his measures of quality are different from the one used in this paper.

Therefore, if we impose the additional conditions that capital markets (and other institutions) preclude borrowing against future returns to human capital investments (especially migration), and that in themselves $W_P(\theta_i)$ are too low to permit consumption smoothing, or alternatively we assume a strong time preference, a strategic migratory move will not take place. To close the argument note that θ_3 cannot possibly move along with θ_4 since if they were to do so, the rich country (multiplied by k) average wage for θ_4 , $k \sum_{i=1}^4 \alpha_i W_R(\theta_i)$, would clearly be less than their P country wage, $W_P(\theta_4)$, a shortfall which due to any of the above restrictions implies that θ_4 will not migrate.

V. Complementary Remarks

A setup where all workers know what wages will await them, where in response to this information workers either stay put, migrate and stay at destination, or migrate and return, and where stayers, movers and those who return are fully characterized is new. In a large number of professions (for example, science and engineering) where employers have only an inaccurate measure of new workers' abilities and where these abilities correlate strongly with productivity, the time induced information improvement rests with the employers, not with the migrant workers.

The sequential, relative and return attributes of migration as derived in this paper do not arise then from imperfect information about wage rates at destination. If such were the case then, even if migrants had precise information of their *expected* wage at destination, realization of wage variance could induce some to return and others to stay. But if we recognize that workers differ in their attributes then, for this line of argument to carry weight, attributes must be systematically correlated with realized wage rates. It is not enough merely to argue that return migration is a decreasing function of premigration information, as in McCall and McCall (1987), or that "migration back to an original location occurs because expectations were not fulfilled," as in Polachek and Horvath (1977).

Dynamics in general and return migration in particular could be generated by changes in information in a more subtle way. For example, suppose that workers have information on wages in location i , where they are currently located, and on wages in locations j , k , l and so on. Suppose, further, that workers always have more information on the location they are actually in than on other locations; and finally, suppose that the value of locational information inversely relates to its quantity. Suppose now that workers move from i to j . Then, not only does information on j become less valuable than it was prior to the move, it could also become less

valuable than information on i , k , l and so on. Since the only way to convert information on a wage elsewhere — that is, now, on wages in i , k or l , and so on — to an actual wage is to move, a *given* move, as it reshuffles the entire information structure, may well lay the ground for subsequent moves. Clearly, one such move is back to i . Here too, then, changes in information could play a role in migration — motivating migration, including return migration — but the changes are in the information in the hands of the migrant workers, not the employers, and a systematic link with workers' attributes is missing.

A simple cobweb model could generate some dynamics if we assume, again, that realized wages differ from anticipated wages. An initial wave of migrants pushes down the wage at destination, an outcome not duly foreseen by the migrants. Consequently, some migrants return. This raises somewhat the wage at destination and pulls in some migrants. And so on. Once again, this approach also assumes homogeneity of workers' attributes, that the workers drawn in and the workers pushed out are always randomly selected, and that workers are unable to assess accurately their destination wages.

Finally, sequential migration could arise from the technology of production exhibiting economies of scale to the application of skill. Consider the following example. For each skill level θ , workers in economy R are paid more than workers in economy P , with the wage differential increasing in θ . Skills can be acquired, albeit at a cost, and migration from P to R can take place at a cost c . Initially, the system is in full equilibrium with no migration. Suppose that as a consequence of an exogenous shock, c falls such that now $W_R(\theta^n) - c > W_P(\theta^n)$ where θ^n is the top skill level. As θ^n type workers migrate, they confer both positive and negative externalities. The productivity of skilled workers in R rises due to the enlargement of the pool of skilled workers there and the operation of scale economies. This raises $W_R(\theta^n)$. Workers in P with skill levels below θ^n who previously had no incentive to invest in acquiring additional skills now find that the joint return to investment in skill acquisition and migration is greater than the sum of the returns arising from each of these investments undertaken separately. They also witness a decline in their wage earnings arising from the absence of the θ^n workers. These workers invest in skill acquisition and then migrate, thus giving rise to a second wave of migrants. Additional waves of migrants are likewise produced until the cost of migration c exactly offsets the increase in the wage differential induced by the (two ended) scale economies, or until all skilled workers leave P for R . Note that if the reason for the initial skill distribution of workers is ability, as in Miyagiwa (1991), the quality of migrants, as measured by their ability, will decline in the order of their cohort.

VI. Conclusions

Under asymmetric information pertaining to skill levels, a mixed skill group of migrant workers will decompose into low-skill workers who return and high-skill workers who stay. Migration will not be selective to begin with, but will be positively selective thereafter. Wages of the migrant workers who stay will rise. This rise occurs without an increase in the human capital of individual migrants, but as a consequence of the increase in the average level of human capital (skill level) of the group of migrants. Recalling the example of skill levels θ_1 through θ_4 , the possibility that the skill composition of migrants will be first (θ_1, θ_2) , then θ_2 , thereafter $(\theta_2, \theta_3, \theta_4)$, and finally (θ_2, θ_4) implies that empirical tests of the selectivity of migration could produce conflicting results merely because a given dynamic migration process is observed at different points of its path.⁸ Some policy implications of the analysis can also be briefly summarized. Time — an implicit policy tool — will result in the departure of low-skill workers who, under initial asymmetric information, migrated along with high-skill workers. If the country of destination is impatient, however, an entry tax of a precisely defined magnitude can be imposed to screen out the low-skill workers.

Whereas the existing migration literature tends to attribute migration-related phenomena to human capital and to changes in human capital, assuming that information is symmetric and perfect, the current paper has followed a reverse track: Migratory outcomes have been attributed to states of information and to changes in them, while human capital levels were held either unchanged or nondifferentiated. Presumably, in real-world migratory processes, information and human capital change over time with the variance in migration outcomes attributable to variations in both information and human capital. Indeed, how optimal investment by migrants in human capital — including devices and means that affect the cost and lag of skill discovery — responds to informational states lies at the edge of the research frontier of international labor migration.

⁸ We referred to ongoing research that attributes return migration to maximization of life-time consumption which, in turn, leads to disposition at home of savings accumulated abroad. And we developed the argument that return migration of low-skill workers arises from the reinstatement of symmetric information. These two explanations may be complementary. Presumably, revelation of information is quicker than accumulation of savings. Hence, in a return process that takes a long time to unravel, there will be an initial bout of information-induced return, followed by return induced by consumption maximization. LaLonde and Topel (1993) report that in the US, much of the total return migration occurs within a short span of time from arrival, with the rest spread over as much as several decades from the time of arrival (that is, until about one-third of the migrants return).

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