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Abstract

This paper analyzes return intentions of temporary migrants. An intertemporal model will be developed where the point of return to the home country is endogenous. Hypotheses implied by the theory are then empirically tested, using micro data on migrant workers to Germany. The empirical analysis follows two steps: first, the intention of the migrant whether or not to return is analyzed. Secondly, the length of expected duration of those who want to return is investigated. The empirical results are consistent with the implications of the theory.

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1 Introduction

Return migration[1] was, and is a widely observed phenomenon. This is true not only in Europe and between European and extra-European countries, but also in Asia as well as between Asian countries and countries of the Middle East. Migration decisions of return migrants are induced mainly by economic motives. Return migrants do not initially have a strong desire to live in the target country for other than economic reasons.

The target countries of return migration are generally characterized by an excess demand for labor in at least some segments of the labor market. This labor can not be supplied by the local workforce either in the quantity requested, or at adequate prices, or both. The emigration countries usually exhibit an excess supply of labor and/or wage rates that are far below those offered in the target countries.[2]

Economic theory has little to say about return migrants. There are a number of open questions. First of all, why do return migrants initially intend to return? And why, after living for some time in the host country, some do return, and others would like to stay permanently? Are there measurable characteristics that help to distinguish between those who want to return, and those who want to stay? And why do some migrants stay longer than others?

Answers to these questions may help policy makers to control return migration and to target eventual incentive programs more efficiently. Migration policy could be designed to influence the migrant's decisions so as to correspond deliberately to the targets of policy makers. The understanding of the migrant's decision process is an important presupposition for the construction of effective migration policies.

This paper will try to give answers to some of the questions raised above. Section 2 develops a theoretical model of return migration. The model implies that the time a migrant worker intends to further remain in the host country (and, in the limit, the intention whether or not to return at all) depends essentially on 4 factors: the earnings situation in the host country relative to that in the home country, the perception of

[1]The term *return migration* will here be used to characterize a situation where migrant workers return, or, at least, initially intend to return to their country of origin after a significant period abroad.

[2]In the 50's, 60's and 70's, the labor requirements of Western Europe's industrial economies and poverty as well as unemployment in Southern European countries and in Turkey induced an immigration boom from the periphery countries into the core of Europe. At present, a similar situation can be found between Asian countries, like Thailand, and the Gulf states. It is likely that return migration will start in the near future between Europe's Eastern countries and industrialized Western economies.

environmental factors (social relations, climate etc.) abroad relative to that at home, the remaining lifetime horizon, and the stock of savings accumulated so far. In section 3, the qualitative implications of the theory are empirically tested, using micro data on temporary migrants to Germany. The data set contains information about the intention of the migrant whether to stay permanently in Germany or not. For those who do not wish to stay permanently it includes information about the number of years migrants want to stay before returning home. The empirical analysis follows two steps: first, logit models are estimated, differentiating between the subsample of those who want to return and those who want to stay permanently. Secondly, and restricting the analysis to those migrants who want to return, a duration analysis is performed on the migrant's intended further duration in the host country.

The study provides some insight into the dependence of migrants return probabilities and intended spells of further duration on measurable characteristics.

2 Theory

The classical argument to explain migration is the following: neglecting any fixed costs of migration, a worker has an incentive to migrate when, given his stock of human capital, his potential earnings are higher in the host- than in the home country. Therefore, if earnings differentials were the only determinant for migration decisions, migrants would only return when the economic situation changes so that earnings at home will significantly increase relative to those of the host country.[3] However, since return migration is a phenomenon that can be observed even without such changes of economic situations in the countries concerned, migrants are obviously not only maximizers of lifetime income. Without exogenous restrictions on their choice set, such behavior indicates that migrants are not simply maximizers of lifetime income. They rather maximize a utility function that contains some arguments that may explain the temporary nature of migration.

It is a common observation that utility created by the consumption of goods depends not only on the quantities consumed, but also on the *environment* where such consumption takes place. More specifically, it seems to be the case that the environment where consumption comes about is complementary to the utility created by the

[3]When real wages are higher in the host country, but prices are lower in the home country, a temporary migration may be optimal even when the migrant is a maximizer of lifetime income. Such considerations, however, are likely to play a minor part in the decision to return and are not further considered here.

consumption good itself. The notion environment as it will be used here could comprise social relations, subjectively perceived life quality parameters, like climate, social regulations etc., family and friends. When analyzing agents' consumption behavior in a relatively stable environment, any interactions between environment and the utility gained by the consumption of some good may be neglected. However, when analyzing agents who may, involuntarily or by choice, meet their decisions over their life cycle in two completely different environments, such interactions should be considered. This would be especially the case when investigating migrants who may return to their home countries.[4] The purpose of this section is to model their migration and re-migration intentions.

To formalize the notion *environment*, define an index N that summarizes all parameters that determine this environment. Let N be a further argument in the individual's utility function. N is assumed to be complementary to consumption.[5] Turning to the situation of the migrant worker, let $N = G$ when the migrant resides in the home country and $N = F$ when he stays abroad. The migrant's migration- or re-migration decision is now based on the wage differential between home- and host country as well as on these environment indices.

Whenever $G > F$ (the environment index is higher in the home- than in the host country), and wages are higher abroad, the migrant worker may decide to migrate only temporarily. Both, F and G may, and probably will, change over the migrant's migration history. The longer the migrant stays abroad, the more he integrates into the new society, finds friends etc., and the less he feels attached to his home country environment. This process of social integration or disintegration is likely to affect strongly the size of the environment variables F and G, and is usually not perfectly foreseeable for the migrant worker. The migrant may therefore determine an optimal time to stay abroad at the beginning of his migration history, basing his decision on how he perceives F and G at that moment, or he may as well determine an expected path of F and G, $E\{F(t)\}_{t^0}^{T}$ and $E\{G(t)\}_{t^0}^{T}$, where T is the horizon to be considered and t^0 the

[4]An important point seems to be worth emphasizing in this context: the difference between permanent migrants (migrants who migrate with the firm intention to stay permanently) and return migrants who initially intend to return but eventually stay forever. The economic behavior of both groups in the host country is likely to be very different. A return migrant who in the end stays permanently may have had over a long period of his stay in the host country the intention to return. As long as he wants to return, his economic decisions are sensitive to this intention, and it is irrelevant whether he finally stays permanently.

[5]Complementarity is here defined in the sense of Edgeworth and Pareto: *Y is complementary to X in the consumers budget if an increase in the supply of X (Y constant) raises the marginal utility of Y* (Hicks (1978), p.42).

point of decision making. Should now F and G change over the migration history in a way not previously foreseen by the migrant worker, he will reoptimize and redefine the time he further intends to stay abroad. Eventually, a previously intended temporary migration may become permanent - and this is an often observed phenomenon.

To clarify these ideas, a formal dynamic model in continuous time will be set up, describing the migrant's optimization problem. After some simplifications, an explicit solution for the time the migrant considers as optimal to still remain in the host country will be presented. The theoretical model implies qualitative predictions of the impact of explanatory variables on the migrant's intentions. It therefore provides the theoretical framework for the empirical analysis in section 3.

2.1 A Formal Model

Consider a migrant worker who decides at some point of his migration history how long he further wants to remain in the host country.[6] Assume that he has the following simple utility structure:

$$U = \begin{cases} U^I = U^I(c^I(t), F(t)) & : \quad t < \hat{t} \\ U^E = U^E(c^E(t), G(t)) & : \quad t \geq \hat{t} \end{cases} \tag{1}$$

with $U_1^i > 0$, $U_2^i > 0$, $U_{11}^i < 0$, $U_{22}^i < 0$, $U_{12}^i > 0$, $i = I, E$, where I signifies the immigration (host) country and E the emigration (source) country. The subscripts $1, 2$ indicate derivatives with respect to the first or second argument, respectively. The flow of consumption in country i is denoted by c^i, and F and G are the respective indices for environment as described above. $\hat{t}$ is the optimal time of return. Note that $\hat{t}$ is endogenous. F and G may change over time, but they are assumed to be independent of the migrant's decisions.[7]

To get some analytical results, assume that U is a Cobb-Douglas utility function. The migrant's lifetime utility function is then of the following form:

$$V = \int_{t^0}^{T} [c^I(t)^\alpha F(t)^{\alpha-1} e^{-\rho t}]\lambda(t) + [c^E(t)^\alpha G(t)^{\alpha-1} e^{-\rho t}][1 - \lambda(t)]\, dt \tag{2}$$

[6]The migrant will solve the same problem when he has to decide whether or not to migrate.

[7]This is, of course, not necessarily the case. The migrant may consciously influence (and, therefore, control) the adoption to his environment, e.g. by investment into country specific human capital (see Dustmann (1991)). At least F would then be partly endogenous.

where ρ is the rate of time preference and $[T - t^0]$ is the horizon considered. $\lambda(t)$ is a switching variable that takes the value 1 or 0, with $\lambda(t) = 1$ for $t < \hat{t}$ and $\lambda(t) = 0$ for $t \geq \hat{t}$. The intertemporal budget constraint is given by:

$$\dot{K}(t) = \lambda(t)\,[y^I(t) - c^I(t)] + [1 - \lambda(t)]\,[y^E(t) - c^E(t)] + r\,K(t) \tag{3}$$

where $y^i(t)$ are earnings per unit of time, evaluated at t, in country $i = I, E$, and r is the rate of interest. $K(t)$ is the migrant's wealth at t. Accordingly, $\dot{K}(t)$ are savings at t. The migrant's optimization problem consists of the maximization of (2) subject to (3), where he chooses the path of c^i, $i = E, I$, and the path of $\lambda(t)$. He thereby determines the point of return. When the optimal path for λ is $\lambda(t) = 1\,\forall\, t,\ t \in [t^0, T]$, then the migrant will not return to his home country. Likewise, should it be optimal to set $\lambda(t) = 0\,\forall\, t,\ t \in [t^0, T]$, then the migrant will return immediately.[8] In what follows, the interior solution will be considered: it will be assumed that there exists a switching point of λ over the interval $[t^0, T]$.

The problem is a dynamic optimization problem. Setting up the Hamiltonian H, application of the maximum principle gives the necessary conditions for $\hat{c}^I(t), \hat{c}^E(t), \hat{K}(t), \hat{\lambda}(t)$ being an optimal solution to the problem (together with (3)):

$$\frac{dH}{dc^I} \;:\; \pi(t) = [\alpha\, c^I(t)^{\alpha-1}\, F(t)^{1-\alpha}]\, \epsilon^{-\rho t} \tag{4-a}$$

$$\frac{dH}{dc^E} \;:\; \pi(t) = [\alpha\, c^E(t)^{\alpha-1}\, G(t)^{1-\alpha}]\, \epsilon^{-\rho t} \tag{4-b}$$

$$\frac{dH}{d\lambda} \;:\; \pi(t)\,[y^I(t) - y^E(t) + c^E(t) - c^I(t)] + [U(c^I(t), F(t)) - U(c^E(t), G(t))]\,\epsilon^{-\rho t} = 0 \tag{4-c}$$

$$-\frac{dH}{dK} \;:\; \dot{\pi}(t) = -\pi(t)\,r \tag{4-d}$$

$$[K(T) - \bar{K}]\,\pi(T) = 0 \tag{4-e}$$

The Hamiltonian is given by:

[8] When considering this decision problem before the migrant has migrated, the latter case would signify that no migration were the optimal policy, while in the former case the migrant would intend to migrate permanently.

$$H = [\lambda(t)\, U^I(c^I(t), F(t)) + [1-\lambda(t)]\, U^E(c^E(t), G(t))]\, e^{-\rho t} + \pi(t)\, \dot{K}(t) \qquad \text{(4-f)}$$

The costate of the system, indicating the inner value of a change in the stock of savings, is denoted by $\pi(t)$. (4-e) is the transversality condition, where $\bar{K}$ denotes the desired stock of savings at the end of the planing horizon. Note that, since $\lambda(t) \in \{0,1\}$, the paths of c^I, c^E and λ have a discontinuity at $t = \hat{t}$. Note further that (4-c) is only defined for $t = \hat{t}$. It follows from (4-d):

$$\pi(t) = \pi(T)\, e^{r(t-T)} = \bar{\pi}\, e^{r(t-T)} \qquad (5)$$

The optimal paths of consumption abroad and at home are then given by:

$$c(t)^I = F(t)\, \left[\frac{1}{\alpha}\, \bar{\pi}\, e^{r(t-T)+\rho t}\right]^{\left[\frac{1}{\alpha-1}\right]} \quad \text{for } t < \hat{t} \qquad \text{(6-a)}$$

$$c(t)^E = G(t)\, \left[\frac{1}{\alpha}\, \bar{\pi}\, e^{r(t-T)+\rho t}\right]^{\left[\frac{1}{\alpha-1}\right]} \quad \text{for } t \geq \hat{t} \qquad \text{(6-b)}$$

Substitution of (6-a) and (6-b) into (4-c), and arranging terms, results in the following expression:

$$\left[\frac{1}{\alpha}\, \bar{\pi}\, e^{r(t-T)+\rho\, t}\right]^{\frac{1}{\alpha-1}} \left[\frac{1-\alpha}{\alpha}\right] [G(t) - F(t)] = [y^I(t) - y^E(t)] \qquad (7)$$

Solving equation (3) gives the following:

$$K(t) = \begin{cases} K(t^0)\, e^{rt} + \int_{t^0}^{t} e^{r(t-s)}\, [y^I(s) - c^I(s)]\, ds & : \quad t < \hat{t} \\ K(\hat{t})\, e^{rt} + \int_{\hat{t}}^{t} e^{r(t-s)}\, [y^E(s) - c^E(s)]\, ds & : \quad t \geq \hat{t} \end{cases} \qquad (8)$$

It follows for $K(T)$:

$$K(T) = \left[e^{r\hat{t}}\, K(t^0) + \int_0^{\hat{t}} e^{r(\hat{t}-s)}\, [y^I(s) - c^I(s)]\, ds\right]\, e^{r(T-\hat{t})} + \int_{\hat{t}}^{T} e^{r(T-s)}\, [y^E(s) - c^E(s)]\, ds \qquad (9)$$

When $[G(t) > F(t)]$ and $y^I(t) > y^E(t)\ \forall t$, then it follows from (9) that $\dot{K}(t) > 0$ for $t < \hat{t}$ and $\dot{K}(t) < 0$ for $t \geq \hat{t}$. Accordingly, the migrant will accumulate savings while being abroad, and he will use up his stock of savings when back in his home country. This behavior of migrants is often referred to as *target saving* and it is a common feature of return migration.

Equations (6-a), (6-b), (7), and (9) determine the optimal paths' of consumption at home and abroad, $\hat{c}^E$ and $\hat{c}^I$, the stock of savings, $\hat{K}(t)$, and the time of return, $\hat{t}$.

For illustration, the problem will now be simplified to get an analytical solution for $\hat{t}$. Assume, for simplicity, that the stock of savings the migrant worker intends to hold in $t = T$, $K(T)$, is equal to zero: $K(T) = 0$. Denote the stock of savings at t^0 as K^0. Furthermore, set $y^I(t) = w^I$ and $y^E(t) = w^E$. This assumption implies that the migrant considers his wage level, either at home or abroad, as remaining at the same level over the whole time horizon considered. In other words, the migrant assumes his stock of human capital as constant over his future life. Finally, let the migrant base his decision on the current size of F and G: $G(t) = G$ and $F(t) = F$. Normalizing $t^0 = 0$, and setting $\rho = r = 0$ and $\alpha = 0.5$, equation (9) simplifies to:

$$K^0 + \hat{t}[w^I - w^E] + \hat{t}[c^E - c^I] + T\,[w^E - c^E] = 0 \tag{10}$$

Note that, under the above assumptions, it follows from (6-a) and (6-b) that the flow of consumption is constant in each country: $c^E(t) = c^E$ and $c^I(t) = c^I$. (7) may then be rewritten as:

$$\bar{\pi}^2 = \frac{1}{4}\,\frac{G - F}{w^I - w^E} \tag{11}$$

Denoting the wage differential $[w^I - w^E]$ as Δ and the differential of the environment indices, $[G - F]$, as Γ, and solving (6-a), (6-b), (10) and (11) for $\hat{t}$, one gets:

$$\hat{t} = \frac{T\,[G\Delta - w^E\,\Gamma] - K^0\,\Gamma}{2\,\Delta\,\Gamma} \tag{12}$$

The optimal time the migrant intends to further stay abroad is a function of the wage differential Δ, the differential of the environment indices, Γ, the lifetime horizon T and the stock of savings at $t = 0$, K^0. Totally differentiating (12) and rearranging terms results in the following expression:

$$d\hat{t} = \left[\frac{T\,w^E + K^0}{2\Delta^2}\right] d\Delta - \left[\frac{T\,G}{2\Gamma^2}\right] d\Gamma - \left[\frac{1}{2\Delta}\right] dK^0 + \left[\frac{\Delta\,G - \Gamma\,w^E}{2\,\Delta\,\Gamma}\right] dT \tag{13}$$

Accordingly, for $\Gamma > 0$ and $\Delta > 0$, the time the migrant intends to further remain in the host country depends positively on the wage differential Δ and his future lifetime horizon T. It depends negatively on the degree of attachment to the home country, relative to that of the host country, as represented by Γ, as well as on the accumulated stock of savings when the decision is taken, K^0.

3 Empirical Analysis

The data used for the empirical analysis are drawn from the first wave of the German Socio-Economic panel (1984). The panel comprises 4500 households of German nationality and 1500 households of foreign nationality. The vast majority of the latter group consists of so-called *guest-workers*, migrants with Spanish, Yugoslavian, Turkish, Greek and Italian nationality, who migrated to Germany mainly before 1973[9]. This migration was meant to be temporary by the German government and, at least initially, by the migrants themselves.

The panel contains information about all persons living in a respective household, as well as on the household as such. The data used for this analysis stem from the subsample of migrant workers, and concern only personal characteristics. The analysis is based on a question in the personal questionnaire which related to the foreigner's intention about how long to remain in Germany. Migrants were asked whether they would like to stay in Germany forever, or whether they want to return to their home countries in either the next 12 months or in some years. Those who replied that they intend to return in some years time were further requested to specify the number of years they want to remain in Germany.

According to this information, the stock of migrants in the sample can be separated into two groups: those who want to stay permanently in Germany (452), and those who want to return to their home countries after a specific number of years (1282).

Consider these two groups on the basis of the above theoretical analysis. For those migrants who would like to stay forever the solution of the optimization problem in section 2 would be a corner solution ($\lambda(t) = 1 \, \forall \, t, t \in \{t^0, T\}$). On the other hand, for those who specify the number of years they would like to stay in Germany before returning, the solution of the above optimization problem would be an interior one. According to equation (13), differences in the number of years a migrant wants to remain before returning home are explained by differences in the perceived environment at home and abroad, Γ, individual wage differentials between home- and host country, Δ, the remaining lifetime horizon, T, and the amount of savings allocated so far, K^0.

[9] For some details on guest-worker migration to Germany, see Mehrlaender (1980) and Dustmann (1992)

Accordingly, for the latter subgroup the theory provides hypotheses for the qualitative impact of a set of explanatory variables on the migrant's intention. The theory also implies that those factors which have a positive effect on the time the migrant decides to stay further in Germany should help to differentiate among the two subgroups of those who want to stay forever, and those who want to return sometime in the future.

3.1 Estimation Methods

For the empirical analysis, each of the environmental factors will be characterized by a vector of variables available in the data set. The analysis will be conducted in two steps:

First, logit models will be estimated to determine the impact of a set of explanatory variables on the probability that a migrant will want to return to his home country. Secondly, and using only the subset of those migrants who intend to return, a duration analysis on the time the migrant still wants to remain in Germany will be performed.

Logit Analysis

The logit specification may be derived directly from the underlying theory. Define a dichotomous variable Y which takes the value 1 when the migrant does not want to return, and 0 otherwise. Should the migrant meet his decision right at the point of the interview, then Y is determined by:

$$Y = \begin{cases} 1 & \text{if} \quad T - \hat{t} > 0 \\ 0 & \text{if} \quad T - \hat{t} \leq 0 \end{cases} \tag{14}$$

where $\hat{t}$ and T are defined as in section 2. Assuming a linear relation between $\hat{t}$ and a vector of explanatory variables, and introducing an additive random component u, one gets:

$$T - \hat{t} = \alpha' X - u \; ; \quad X' = [1, \Delta^*, \Gamma^*, K^{0*}, T^*] \tag{15}$$

where $\Delta^*, \Gamma^*, K^{0*}, T^*$ are empirical specifications of Δ, Γ, K^0, T. It follows that the probability that a migrant stays is given by:

$$P(Y = 1) = P(\alpha' X - u > 0) = F\left(\frac{\alpha' X}{\delta}\right) \tag{16}$$

where δ is used to standardize the random variable u and F is the CDF of u/δ. Assuming u/δ to have a logistic distribution with mean 0 and variance $\pi/3$, the logit model evolves:

$$P(Y=1) = \frac{exp(\theta' X)}{1 + exp(\theta' X)} \tag{17}$$

where the estimated parameter vector is given by $\theta = (\alpha/\delta)$.

Duration Analysis

The second step of the analysis relates only to the subsample of those who want to return after a specific number of years.

The remaining intended duration of stay in the host country and, afterwards, the time back at home may be considered as two states which will sequentially be occupied by the migrant worker. At the point of expected return, a transition between these two states takes place. Given a migrant population, it is now of interest to investigate how these transitions, or, in other words, completions of spells, are distributed over time and how they depend on individual characteristics of the migrant. Remember that the analysis is performed on expectations of remaining durations, not on actually performed durations. Furthermore, the data available are data on the current stock of migrants in 1984. The estimates refer therefore to the (possibly selected) population of migrants in Germany in 1984, not to the population of migrants entering Germany at any one time.

The appropriate analytical tools are provided by the hazard function method, or transition analysis. The central concept of these methods is the *hazard* function $\xi(t)$. Applied to the problem on hand, the hazard $\xi(t)$ would be defined as the conditional probability that a migrant's intended further duration of stay, τ, will end in t, given that it lasts until t (in continuous time):

$$\xi(t) = \lim_{dt \to 0} \frac{P(t \leq \tau \leq t + dt | \tau \geq t)}{dt} = \frac{f(t)}{1 - F(t)} = \frac{f(t)}{S(t)} \tag{18}$$

In (18), $f(t)$ is the density function of the random variable τ, $F(t)$ is the distribution function and $S(t)$ is usually referred to as the *survivor* function. In parametric hazard models, $F(t)$ is known up to a vector of unknown parameters which has to be estimated. An estimate of the hazard function is then easily constructable. However, the underlying population is, especially in economic applications, not always homogeneous. The hazard, although following the same distribution, may vary among individuals with different characteristics. To take account of such heterogeneity in the underlying sample population, the parameters of the distribution may be made functions of a vector of explanatory variables, or covariates.

The parametric approach imposes a strong restriction on the hazard: it has to follow a certain pattern as predetermined by the underlying distribution. Parametric methods are therefore justified only when the choice of the distribution of τ, $f(t)$, is based on some economic theory. Although the deterministic theoretical model of section 2 provides some guidance regarding the choice of covariates and their qualitative impacts, it does not help to justify any distributional assumptions. Furthermore, parametric models impose a smooth shape on the baseline hazard function. This, however, contrasts with the lifetable estimates, as depicted in figure 1.

Therefore, two methods are chosen here that allow the estimation of the impact of covariates on the hazard without imposing strong restrictions on the behavior of the hazard over time: the proportional hazard model, as proposed by Cox (1972), and the piecewise constant exponential model. The latter method, though being parametric, is very flexible and should yield results that are similar to those of the non-parametric approach.

Cox's Proportional Hazard Specification

A proportional hazard is defined as:

$$\xi(X,t) = \phi(X,\beta)\,\xi_0(t) \tag{19}$$

where X is a vector of covariates, β is a parameter vector and ξ_0 is usually referred to as the *baseline hazard*. When X is time invariant, which will be the case throughout the analysis, the proportional hazard specification implies that the quotient of the hazards of two individuals with regressor vectors X_1 and X_2 is constant for all t and equal to $\phi(X_1,\beta)/\phi(X_2,\beta)$.

Cox (1972, 1975) suggested the method of partial likelihood to estimate the unknown parameter vector in $\phi(X,\beta)$, without specifying the form of the baseline hazard $\xi_0(t)$. The main idea of this method is that, when no information about the baseline hazard is available, only the order of the durations are used to infer the unknown coefficients of the covariates.[10]

[10] The method is described in detail in Lancaster (1990).

The specification chosen here for $\phi(X,\beta)$ is: $\phi(X,\beta) = exp(X'\beta)$. When no spells are censored (which is the case for the duration data used here), and when the completed durations are ordered, $\tau_1 < \tau_2 < \tau_3 < ... < \tau_N$, the partial likelihood may be written as a function of the parameter vector β:

$$L^P(\beta) = \prod_{i=1}^{N} \left[\frac{exp(x_i'\beta)}{\sum_{j=i}^{N} exp(x_j'\beta)} \right] \tag{20}$$

where the term in brackets is the conditional probability that observation i concludes a spell at τ_i, given that any of the remaining observations $j > i$ could have ended a spell at τ_i. The partial likelihood function as depicted in (20) corresponds to the likelihood function estimated here.

It should be noted that Cox's partial likelihood method is problematic if more than one individual experiences an event in the same time interval (tied ending times). As it is obvious from table 4 in the appendix, this is the case with the data used here. With tied data, the exact calculation of the partial likelihood becomes very complicated. Approximate formulas reduce in this case the computational burden. The approximation used here is that proposed by Breslow (1974). However, the adequacy of such approximations is sometimes questioned.[11] To check the validity of the results for the continuous Cox model, discrete time models are additionally estimated. The method and the results are outlined in the appendix.

Piecewise Constant Hazards

The piecewise constant hazard specification is based on the exponentially parametric model. However, unlike the exponential model, which implies a constant hazard over the entire horizon considered, the piecewise exponential model allows the hazard to change between predetermined time intervals. The method is therefore appropriate when the underlying theory does not justify any distributional assumptions on τ.

In the piecewise-constant formulation, the hazard may be written as:

$$\xi^P(X,t) = \phi(X,\beta)\, exp\,(\xi_i); \quad n_{i-1} \leq t < n_i\,;\; i = 1,...,m\,;\; n_0 = 0,\, n_m = \infty \tag{21}$$

where m is the number of time intervals chosen and $(n_i - n_{i-1})$ is the length of the i^{th} interval. Note that the intervals do not have to be of equal length. The baseline hazard

[11] See, for example, Farewell and Prentice (1980).

$exp\,(\xi_i)$ is constant over the interval $[n_{i-1}, n_i)$ and determined by the parameters ξ_i, which have to be estimated. The specification of the intervals follows from table 4 in the appendix. Data points on the expected duration clump at 5, 10, 15 etc years. The intervals for the piecewise constant specification are chosen so as to contain these critical numbers. $\phi(X'\beta)$ is some functional form of time-invariant covariates, with unknown parameter vector β. The specification used here is the same as for the Cox model: $\phi(X'\beta) = exp\,(X'\beta)$.

In the piecewise constant model, density- and survivor functions have discontinuities at the limits of the respective intervals. For time invariant regressors, the piecewise constant hazard is (piecewise) proportional.

The hazard specifications in (21) and (19) are similar: both are proportional, and the baseline hazard in the Cox model, $\xi_0(t)$, corresponds to the piecewise constant baseline hazard $exp(\xi_i)$ in the exponential specification. The interpretation of the vector of coefficients is accordingly analogous in both specifications: $\beta^c = (\delta\, ln\xi^c)/(\delta\, X)$ and $\beta^p = (\delta\, ln\xi^p)/(\delta\, X)$, where β^c and β^p denote the coefficient vectors in the piecewise constant and the Cox model, respectively. The estimated coefficients indicate therefore the percentage change in the hazard when the respective variable changes by one unit.

Some Remarks

Before proceeding, some remarks on the interpretation and comparability of the results in the two steps of the analysis seem appropriate. The logit analysis differentiates between two groups: those migrants who want to remain in Germany, and those migrants who want to return home at some future point in time. However, a migrant who replies that he wants to remain in the host country may have made this decision a long time before the interview. Therefore, measured characteristics of this migrant at the time of the interview are not necessarily those that determined his decision, when this decision has been taken in the past and when the relevant variables change over time. In other words, the probability of return may not be sensitive to all those factors implied by the theoretical considerations above. On the other hand, the number of years migrants want to stay before returning should be sensitive to the respective factors as they are measurable at the time of the interview. Accordingly, the explanatory value of the same set of variables may well differ in the two stages of the analysis.

3.2 Data and Specification of Variables

The logit analysis is based on migrant workers with Italian, Spanish, Yugoslavian, Turkish, and Greek nationality, full-time employed, part-time employed or unemployed at the time of the interview, who specify whether or not they want to return to their home countries. After excluding all observations with missing values in relevant variables, the final number of observations used for the analysis reduces to 1734.

The duration analysis is based on the subset of those who intend to return home and who specify the time they wish to remain in Germany. Migrants could respond that they wish to return in the next 12 months or they could indicate a number of years. The duration variable DUR is set equal to one when the migrant wants to return in the next 12 months, otherwise it takes the value of the number of years specified. The number of observations available for the analysis is here 1094.[12]

Environment

The environmental differential Γ is represented by the following set of variables: the variable TRANSFER is a dummy variable and equal to 1 when the migrant transfers money back to his home country. PARTNER is a dummy variable that takes the value 1 when the migrant's partner is living in Germany. Both variables are indicators for social links to the home country. HSP and GSP are dummies that are equal to 1 when the migrant speaks the home country language or the host country language well or very well, respectively. The knowledge of the German language may be an indicator for the migrant's integration potential (or, likewise, his integration) into the foreign society. Good or very good knowledge of the host country language could be an indicator for the link to the home country environment. The dummies SCHOOL and EDU assume the value 1 when the migrant attended a school in Germany or when he undertook a job-specific education in Germany. Finally, the variable YSM describes the years since migration. This variable may be an indicator for how much the migrant has alienated from his home country environment and adjusted to that of the host country.

Wage Differentials

The second factor that should influence the migrant's intention is the perceived earnings differential between host- and home country.[13] Any intention of the migrant is based on

[12] 188 of those migrants who answered that they wish to return (1282) did not specify how long they want to remain in Germany. They therefore had to be excluded from the duration analysis.

[13] Note that, for the migrant's intention, only expectations matter, not possible realizations.

the subjectively perceived earnings differential, which could be constructable were the migrant to have been asked about how much he expects to earn back home. However, the only data that are available are earnings in Germany of those who were employed at the time of the interview.

To construct an approximation for the individual, potential earnings differential of migrant workers, an earnings variable for those who are unemployed has first to be created. This could be done by estimating a human capital earnings equation for employed workers and using the coefficients of the estimation equation to predict earnings of those who are unemployed. However, such a procedure may possibly result in a sample selection bias. Therefore, the predictions of earnings for the unemployed are constructed by using a two-stage estimation procedure, as suggested by Heckman (1979). The method is outlined in the appendix. Estimation results are given in table 5 in the appendix. The predicted earnings series is then used as an approximation of earnings potentials of unemployed migrants.

As a second step, earnings differentials have to be constructed. Data on earnings potentials of individual migrants in the home countries are not available, but only their earnings in Germany and their nationality. Under some assumptions it is, however, possible to construct from these information approximations of earnings differentials.

Denote the earnings of some migrant i with a given stock of human capital in Germany as EG_i, and the earnings he would receive back home as EH_i. Assume that when migrant A from country j receives earnings in Germany that are x_j% higher than those of migrant B from country j, then Mr. A receives back home earnings that are likewise x_j% higher than those Mr. B would receive.[14] This implies:

$$x_j = \frac{EG_i - EH_i}{EG_i} \tag{22}$$

Under the assumption that x_j is constant for all migrants from country j, the perceived earnings differential of some migrant i from country j, with earnings EG_i in Germany, may be formulated as:

$$(EG_i - EH_i) = x_j \, EG_i \tag{23}$$

[14] In other words, earnings in either country are a linear function of the stock of human capital. Assume that the stocks of human capital of Mr. A and Mr. B are given by H_A and H_B, respectively, with $H_A > H_B$. Assume further that the rental rate on a unit of human capital in the host country is given by r^G and that in the home country by r^E. Then (22) implies that $r^H \, H_A / r^G \, H_A = r^H \, H_B / r^G \, H_B$ = constant for each pair of countries G, E.

Define a country index k, $k = 1, ..j, ..n$, and a dichotomous variable d_k, where d_k equals 1, should some migrant's home country be $k \neq j$, and 0 otherwise. Assuming linearity, the effect of the wage differential may be formulated as:

$$\beta_1 \, x_k \, EG_i + \beta_k \, d_k \, x_k \, EG_i \tag{24}$$

The coefficient β_1 captures the impact of the wage differential, perceived by migrant i from country k, on his intention. However, a perceived wage differential of the same size may affect two migrants differently, when they come from different countries. Reasons for this could be different costs of living in the two emigration countries, additional payments, tax systems, working conditions etc. The impact of this second effect is represented by the coefficient β_k.

For the empirical analysis, country j will now be defined as *base country.* It follows for x_k: $x_k = x_j + (x_k - x_j)$.

Inserting this into (24):

$$\beta_1 \, x_j \, EG_i + [\beta_k \, x_k \, d_k + \beta_1 \, (x_k - x_j)] \, EG_i = \xi_{1j} \, EGi + d_k \, \xi_{2k} \, EG_i \tag{25}$$

Relation (25) is constructable when only dummies on migrants nationalities are available. However, without information on x, the structural coefficients β_1 and β_k are not identifiable. The sign of the coefficient ξ_{2k} therefore depends on the difference in wage situations in country j and country k, and, furthermore, on the difference in the reaction between migrants from country k and the base country j.

Time Horizon

Equation (13) implies that the length of the time horizon T has a positive impact on the expected duration. A natural approximation for T would be the age of the migrant worker. The theory suggests then that an increase in age should have a negative impact on $\hat{t}$.

Labor Market Situation

To capture the impact of the migrant's labor market experience, two variables are included in some specifications: UNEMP is a dummy variable that equals 1 when the migrant is unemployed, and UNEMP10 is a dummy that is equal to one when the migrant was unemployed at least once over the last 10 years.

Table 1: Sample Characteristics, 1984. Whole sample and subsamples of those who wish to stay and who wish to return

VARIABLE	Whole Sample		Wish to Stay		Wish to Return	
	Mean	SD	Mean	SD	Mean	SD
MONTHLY GROSS EARNINGS (DM)	**2413**	*728*	**2477**	*753*	**2391**	*719*
YEARS SINCE MIGRATION	**14.4**	*5.1*	**15.41**	*5.5*	**14.22**	*4.91*
AGE	**38.86**	*10.9*	**38.39**	*10.9*	**39.02**	*10.9*
MALE	**0.67**	*0.46*	**0.72**	*0.44*	**0.66**	*0.47*
MARRIED	**0.82**	*	**0.76**	*	**0.84**	*
TRAINING IN GERMANY	**0.12**	*	**0.14**	*	**0.11**	*
SCHOOLING IN GERMANY	**0.17**	*	**0.2**	*	**0.16**	*
GOOD OR VERY GOOD GERMAN	**0.41**	*	**0.54**	*	**0.37**	*
GOOD OR VERY GOOD MOTHER TONGUE	**0.92**	*	**0.88**	*	**0.94**	*
TRANSFERS	**0.44**	*	**0.29**	*	**0.49**	*
PARTNER IN GERMANY	**0.76**	*	**0.74**	*	**0.77**	*
UNEMPLOYED LAST 10 YEARS	**0.29**	*	**0.29**	*	**0.29**	*
UNEMPLOYED	**0.093**	*	**0.080**	*	**0.098**	*
GREEK	**14.53**	*	**10.40**	*	**16.00**	*
ITALIAN	**19.55**	*	**22.35**	*	**18.57**	*
JUGOSLAVIAN	**20.24**	*	**26.33**	*	**18.10**	*
SPANISH	**14.71**	*	**16.54**	*	**14.18**	*
TURKISH	**30.97**	*	**24.78**	*	**33.15**	*
SAMPLE SIZE	1734		452		1282	

SOURCE: Socio-Economic Panel, wave 1, 1984.

Additionally, control variables are included for sex and marital status: the variable MALE equals one when the migrant is male, and the variable MARRIED equals one when the migrant is married.

Table 1 presents characteristics of the total sample population and of the subsamples of those who intend to stay and who intend to return. The last line indicates that 74% of the sample population intends to return home sometimes in the future. The numbers on nationalities indicate that Italian, Jugoslavian and Spanish migrants have a stronger tendency to stay in Germany than migrants from Greece or from Turkey.

An average of 14.5 years since migration signifies that the stock of the migrant population resides in Germany for a considerable amount of years. Columns (2) and (3) show that stayers are, on average, more than one year longer in Germany than returners. Average gross earnings of those who want to stay are slightly higher than of those who want to return. A higher percentage of migrants who intend to stay is male and a lower percentage is married. Transfer of money back home is considerably more common in the subsample of returners: 49%, compared with 29% in the subsample of stayers. More than half of those who want to stay speak the German language well or very well, compared with only 37% of those who wish to return.

3.3 Results

Logit Analysis

The results of the logit specifications are given in table 2.[15] The dependent variable equals one when the migrant intends to return, and 0 otherwise. The estimated coefficients indicate the impact of the respective variable on the probability that the migrant wants to return home.[16]

The impact of earnings are captured by the variables GEARN and GEARNK, $k = T, S, G, I$, where the capital letters indicate Turks, Spaniards, Greeks, and Italians, respectively. The base group are Yugoslavians. The interpretation of the estimated coefficients as the impact of earnings differentials corresponds to the assumptions above. Since in 1984 wages in all industrial and agricultural sectors were lower in the respective emigration countries than in Germany[17], the quotient x should be positive for all countries considered. It follows for the Yugoslavian base group that an increase in earnings in Germany and, according to the above assumptions, a rising wage differential should have negative effects on the return probability. This is compatible with theoretical considerations. The impact of a given earnings differential on the return probabilities of migrants from the other 4 countries is easily calculable by summing up the coefficients on GEARN and GEARNK. According to (25), the resulting expression is equal to $(\beta_1 + \beta_k\, d_k)\, x_k$, where β_k corresponds to the difference of the impact of some given differential between a Yugoslavian worker and a worker from country k. Referring to the results in column (2), this coefficient is positive only for Greek nationals. However, this does not mean that Greek nationals are acting contrary to what the theory would imply. As indicated above, the individual return probability is not necessarily very sensitive to the explaining variables, when these variables change

[15]The results of the logit analysis were obtained by using W. B. Greene's *LIMDEP* and the results of the transition analysis by using *TDA*, written by G. Rohwer.

[16]In what follows, this probability will be referred to as return probability. Note, however, that it is in this context the probability of *expected* return.

[17]see, e.g., Yearbook of Labour Statistics, 1988.

over time and when the decision to return has been taken sometime in the past. This is definitely the case for earnings differentials. It should further be kept in mind that the interpretation of the coefficients as the sensitivity of return probabilities on changes in earnings differentials underlies quite restrictive assumptions.

All variables representing the environmental differential have the expected sign and are mostly significant. The negative coefficient on the variable YSM indicates that the return probability of a migrant worker decreases with the number of years he resides in Germany. Furthermore, the probability of return is lower for those who speak a good or very good German (GSP), and whose partner is living in Germany (PARTNER). On the other side, a good or very good knowledge of the home country language (HSP) increases the return probability, as does the circumstance that the migrant transfers a part of his earnings back home (TRANSFER).

Keeping everything constant, and setting the return probability to the average sample return probability $\hat{p} = 0.65$, the results in table 3.3 indicate that males have a return probability which is about 7 percentage points lower than that of females.[18] A reason for this result may be that male immigrants integrate more easily into the foreign society. Males may further be more concerned about their economic future than females and, accordingly, evaluate economic stability and working conditions higher than females.

The coefficient on the variable AGE should denote the impact of the remaining lifetime horizon on the migrant's return probability. AGE is, however, only significant in the first model specification (column 1). Upon introducing environmental variables (column (2) and (3)), AGE becomes insignificant, indicating that this variable only captures environmental factors, but not the impact of the remaining lifetime horizon on the migrant's intention. This is not surprising. As for earnings, age changes over time, so that the migrant's age at the time of the interview may contain little information about the impact of the lifetime horizon on the decision to stay when this decision was actually taken.

Column (3) presents results when dummies for the past and current employment situation are introduced. Having been unemployed at least once during the last 10 years (UNEMP10) has no significant impact on the probability to return. However, those who are unemployed at the time of the interview (UNEMP) want to return with a significantly higher probability than those who are in the work force. This effect is relatively large: again evaluated at $\hat{p} = 0.65$, and keeping everything else constant, the return probability of unemployed migrants is 20% higher than that of their employed

[18] It follows from the logit specification (16) that $dp/dx = p(1-p)\theta$.

Table 2: Logit Analysis, Return Decisions

VARIABLE	(1)	(2)	(3)
CONSTANT	**1.35**	**1.73**	**1.79**
	(5.05)	(3.35)	(3.38)
EARN	**-0.22**	**-0.25**	**-0.29**
	(-2.32)	(-2.58)	(-2.89)
EARNT	**0.25**	**0.21**	**0.20**
	(4.06)	(3.27)	(3.09)
EARNG	**0.38**	**0.35**	**0.35**
	(4.87)	(4.24)	(4.23)
EARNS	**0.18**	**0.14**	**0.13**
	(2.46)	(1.82)	(1.76)
EARNI	**0.10**	**0.14**	**0.14**
	(1.57)	(2.13)	(2.08)
YSM	**-0.077**	**-0.061**	**-0.062**
	(-5.38)	(-4.02)	(-4.06)
AGE	**0.017**	**0.007**	**0.006**
	(2.64)	(0.88)	(0.749)
MALE	**-0.24**	**-0.34**	**-0.31**
	(-1.65)	(-2.29)	(-2.04)
MARRIED	**0.53**	**0.40**	**0.43**
	(3.43)	(2.35)	(2.55)
EDU		**0.044**	**0.019**
		(0.21)	(0.09)
SCHOOL		**0.21**	**0.19**
		(0.94)	(0.84)
GSP		**-0.47**	**-0.46**
		(-3.67)	(-3.56)
HSP		**0.74**	**0.74**
		(3.69)	(3.69)
TRANSFER		**0.85**	**0.89**
		(6.53)	(6.80)
PARTNER		**-0.77**	**-0.77**
		(-2.21)	(-2.20)
UNEMP10			**-0.10**
			(-0.74)
UNEMP			**0.58**
			(2.45)
Log – Likelihood	-951	-907	-904
No. of Obs.	1734	1734	1734
Return	1282	1282	1282
Stay	452	452	452

SOURCE: Socio-Economic Panel, wave 1, 1984.
Note: t-ratios in parenthesis. Coefficients of earnings variables are multiplied by 1000.

colleagues. This result contradicts the common view that migrants take advantage of the favorable German benefit system and would therefore rather prefer to be unemployed in Germany than returning home.

Duration Analysis

The estimated coefficients on the covariates for the duration models are reported in table 3. Note again that this analysis is performed only on the subsample of those who intend to return home, and who additionally specified the number of years they still want to remain in Germany. Furthermore, note that the analysis relates to expected future durations of a stock of migrant workers in 1984, not to completed durations.

Both duration models are of the proportional hazard form. Therefore, the coefficients can be interpreted as the constant proportional effect of the respective variable on the conditional probability of completing a spell. In other words, the coefficients indicate the percentage change in the hazard, when the respective variable changes by one unit.

A global goodness-of-fit test as proposed by Moreau, O'Quigley and Mesbah (1985) was performed to assess the validity of the proportional hazard model. The basic idea of the test is to check whether the effect of the covariates, which under the proportional hazard assumption is constant and measured by θ, varies as a step function between time intervals. To test the null hypothesis of a proportional hazard, Moreau, O'Quigley and Mesbah propose a score test. Under the null hypothesis, the appropriate test statistic is asymptotically χ^2 distributed, with degrees of freedom equal to the number of parameters.[19] The same definition of intervals as for the piecewise constant formulation is used, except for the last interval.[20] The test statistics for the small and the large model specifications (Columns (3) and (4) in table 3) are then given by 55.31 (45) and 85.66 (85), with degrees of freedom in parenthesis. Therefore, the null hypothesis of the validity of the proportional hazard specification can not be rejected in both cases.

The first two columns in table 3 report the results of specifications of the piecewise constant model.[21] Column (3) and (4) present estimated coefficients of the Cox models.

[19] Since it is supposed that the effect of covariates differs between intervals, the number of parameters equals the number of covariates times the number of intervals chosen.

[20] Since the last interval contains not enough observations, the test breaks down when performed over all intervals. Therefore, the last two intervals are merged to one interval.

[21] Coefficients of the piecewise constant baseline hazards are reported in table 5 in the appendix.

Table 3: Duration Analysis

VARIABLE	PIECEWISE CONSTANT (1)	(2)	(3)	COX (4)
EARN	**-0.145**	**-0.163**	**-0.130**	**-0.120**
	(-2.63)	(-2.78)	(-2.23)	(-2.36)
EARNT	**0.107**	**0.095**	**0.080**	**0.092**
	(3.14)	(2.66)	(2.68)	(2.23)
EARNG	**0.089**	**0.090**	**0.065**	**0.065**
	(2.17)	(2.17)	(1.61)	(1.59)
EARNS	**-0.050**	**-0.047**	**-0.047**	**-0.046**
	(-1.18)	(-1.04)	(-1.07)	(-1.02)
EARNI	**0.050**	**0.066**	**0.058**	**0.046**
	(1.22)	(1.57)	(1.13)	(1.39)
YSM	**-0.023**	**-0.023**	**-0.020**	**-0.021**
	(-2.92)	(-2.78)	(-2.58)	(-2.48)
AGE	**0.021**	**0.020**	**0.019**	**0.018**
	(5.57)	(4.47)	(5.12)	(4.09)
MALE	**0.084**	**0.067**	**0.062**	**0.048**
	(1.09)	(0.83)	(0.80)	(0.59)
MARRIED	**-0.077**	**0.309**	**-0.084**	**0.25**
	(-0.82)	(2.10)	(-0.90)	(1.72)
EDU		**-0.021**		**-0.017**
		(-0.18)		(-0.14)
SCHOOL		**0.061**		**0.063**
		(0.49)		(0.51)
GSP		**-0.058**		**-0.062**
		(-0.83)		(-0.90)
HSP		**-0.092**		**-0.067**
		(-0.71)		(-0.51)
TRANSFER		**0.139**		**0.120**
		(2.06)		(1.79)
PARTNER		**-0.361**		**-0.314**
		(-3.06)		(-2.68)
UNEMP10		**0.082**		**0.063**
		(1.07)		(0.81)
UNEMP		**0.347**		**0.318**
		(2.83)		(2.60)
No. of Obs.	1094	1094	1094	1094
Log − Likelihood	-3008	-2993	-6728	-6717

SOURCE: Socio-Economic Panel, wave 1, 1984. Note: t-ratios in parenthesis. Coefficients of earnings variables are multiplied by 1000.

As could be expected, the coefficients of the respective specifications for the Cox models and the piecewise constant models are similar in size.

The coefficients of the earnings variables are all multiplied by 1000. Estimates of both the Cox- and the piecewise constant specifications indicate that an increase in earnings has a negative impact on the hazard for all nationalities. This impact is largest for Yugoslavian and Spanish workers. Remember that this may be due to the size of x_k. It may as well be due to different effects of a given earnings differential on intentions of migrants with different nationalities, as denoted by β_k. The qualitative impact of earnings on the hazard is consistent with the theory.

The variable AGE is strongly significant in all specifications. Different from the logit results, AGE remains here significant when environmental variables are included. The coefficient may be interpreted as the impact of a change in the lifetime horizon on the migration decision. Referring to column (3), being 1 year older, which corresponds to a reduction of a fixed lifetime horizon by one year, increases the hazard by 1.9%. The size of this effect is similar in all specifications.

Turning to the environmental variables (column (2) and (4)), both a good or very good knowledge of the German language and the home country language do not influence the hazard significantly. Remember that these variables significantly influenced the return probability in the logit analysis above.

The coefficients on the variables SCHOOL and EDU are not significant as they were neither in the logit specification. Accordingly, visiting a school in Germany or getting a job specific education seems not to have an impact on the migrant's duration intention or his return probability.

The coefficient on the variable PARTNER is negative and significant. Consequently, having a partner in Germany decreases the conditional probability of ending a spell at some t. On the other side, transferring money home increases this probability (see coefficients on TRANSFER). As the coefficients on the variable YSM indicate, each additional year the migrant has been in Germany decreases the hazard by 2.3% (exponential) or 2.1% (Cox). The qualitative impact of all these variables corresponds to what the theoretical model suggested.

Being male (MALE) does not affect the hazard. This is in contrast to the findings of the logit specifications, where males had a lower return probability than females. The coefficient on the variable MARRIED is negative, but insignificant in specifications (1) and (3). It is positive and significant when introducing environmental variables.

The fact that the migrant has been unemployed at least once during the past 10 years (UNEMP10) has no significant effect on the hazard. However, being unemployed at the time of the interview (UNEMP) increases the hazard. The effect is considerable: The conditional probability that an unemployed migrant wishes to return at some t is more than 30% higher than that of a comparable migrant who is employed at the time of the interview. Again, this result is contrary to the assertion that migrants take advantage of the benefit system. An unemployed migrant has a higher conditional probability to return at an early stage than a comparable employed colleague.

Figures 2 and 3 illustrate the survivor function for the Cox model and the hazard function for the piecewise constant exponential model (for male, turkish workers with age and earnings set to the sample mean and all dummies set to zero).

4 Conclusion

The subject of this study is the analysis of return intentions of migrant workers. Section 2 presents a theoretical analysis on the migrant's savings- and return decisions. The model explains common features of return migration, like the accumulation of savings while being abroad. The time the migrant intends to remain further abroad (and, at the extreme, the intention to stay permanently) is shown to depend basically on 4 factors: the migrant's earnings potential at home, relative to what he earns abroad, the migrant's perception and evaluation of environmental factors, such as family, friends, social regulations etc., at home relative to those abroad, the migrant's remaining lifetime horizon, and his stock of savings accumulated at the time of decision making.

The qualitative implications of the theory are empirically tested, using data from the first wave of the German Socio-Economic panel. The empirical analysis is based on the information about whether the migrant intends to return or not, and, in the case of intended return, on the number of years he still wishes to remain in Germany.

As a first step, and using the whole sample of those who want and who do not want to return, logit models are estimated, where the dependent variable is the intention of the migrant whether or not to return. As a second step, and considering only the subset of those who wish to return, a duration analysis is performed. The spell variable is the migrant's intended further duration of stay in the host country. In both stages, the empirical results are found to be mostly consistent with predictions of the theoretical model.

The logit analysis reveals that the time of residence in Germany significantly reduces the return probability, as does the presence of the partner, and the ability to speak the German language well or very well. Males are less probable to return than females. The fact of being married increases the return probability. Results on the impact of variables that capture earnings differentials and the lifetime horizon are inconclusive. The reason may be that the decision to return is likely to have been taken some time before the interview. If those variables that capture characteristics which influenced the migrant's decision in the past are measured with a considerable lag, as it may be the case here, and if, additionally, they change over time, they may not represent their impact on the past decision. Finally, being unemployed at the time of the interview has a positive effect on the return probability.

For the duration analysis, two specifications are chosen that do not impose strong restrictions on the baseline hazard: the Cox model and the piecewise constant exponential model. The results support the hypothesis that higher earnings differentials are reducing the hazard. Furthermore, the coefficients of the variable AGE are here significant and have the expected sign. This indicates that a longer future lifetime horizon decreases the conditional probability to leave the country at some t.

Variables that represent the environmental factor have, should they be significant, the expected sign. Furthermore, those who are unemployed at the time of the interview have a higher conditional probability to return at an early stage than their employed colleagues.

The analysis provides some evidence that migrants return decisions are endogenous outcomes of an intertemporal optimization of lifetime utility. The understanding of the structure of this decision procedure is important to develop efficient migration policies. This study is an attempt to provide some insight into these decision processes.

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5 Appendix

Appendix 1: Potential Earnings of the Unemployed

Earnings are only observable for those migrants who are in the labor force. This group may be a selected subsample of the whole population of employed and unemployed workers. Therefore, predictions of earnings of unemployed migrants, based on simple OLS estimates of coefficients of earnings equations for the employed, may not correctly tell what a currently unemployed worker with a given vector of characteristics would earn. To see this, define a variable I_i:

$$I_i = \begin{cases} 1 & : \quad \text{migrant } i \text{ employed} \\ 0 & : \quad \text{migrant } i \text{ unemployed} \end{cases}$$

Consider further the following relation:

$$y_i = \beta' x_i + u_i$$

The variable y_i may denote earnings and x_i are individual characteristics and human capital variables. β is a parameter vector and u_i is a normally distributed error term. Earnings are only observed for those who are employed. It follows that for these cases:

$$E(y_i) = \beta' x_i + E(u_i | I_i = 1) \tag{26}$$

Only when the process which selects individuals into the unemployment pool is independent from u_i, no selection bias will arise. To account for possible selection bias and to correctly predict the potential earnings of those who are unemployed, a simple two step procedure as proposed by Heckman (1979) is used. This procedure basically introduces a further variable, call it λ, in the regression equation so as to ensure that the last term in (26) vanishes.[22] In the first step, a probit specification is estimated on the probability that a person is unemployed. Estimation results are then used to calculate an estimate for λ, which will be added to the regressors of the OLS specification.

[22]When the selection rule is described by a simple probit model, it can be shown that $E(u_i|I_i = 1) = -\sigma[f(z_i\,\delta)/F(z_i\,\delta)] = -\sigma\,\lambda_i$, where $f(.)$ and $F(.)$ are the density function and the distribution function of a standardized normal random variable, z is a vector of variables which explains the selection process and δ the corresponding parameter vector. σ is then the covariance between the OLS error term and the standard normal random variable of the probit specification. It is now easy to see that the addition of the new variable λ_i among the regressors implies a new error term $\epsilon_i = u_i + \sigma\,\lambda_i$, with expected value equal to zero.

In the second step, OLS estimation yields parameter estimates that are unbiased and consistent.[23]

Coefficient estimates are given in table 6. The variables SCH and TRAIN denote years of schooling and job specific education, respectively, both measured after the age of 14. The variables YEMP and YEMPSQ are years of full employment and the square of years of full employment, respectively. The variables YSM and YSMSQ are years since migration and the square of years since migration. The dummy variable PART is equal to one when a person is part-time employed, and TUR, JUG, ITA and GR are dummy variables for Turkish, Jugoslavian, Italian and Greek nationality, respectively. All other variables correspond to the notation used above.

Appendix 2: Discrete Time Complementary Log-Log Models

As indicated above, the estimation of a continuous time Cox model is problematic when survival times have ties. Although algorithms exist (and are used above) to approximate the partial likelihood when dealing with tied data, it seem advisable to check the validity of the results by reestimating some discrete versions of the Cox model.

Following Allison (1982), the discrete-time hazard function that corresponds to the continuous time proportional hazard function is given by

$$\xi_t = 1 - \exp\left[-\exp\left(\alpha_t + \theta' X_t\right)\right] \tag{27}$$

The set of constants α_t (t=1,2,..) can be left unspecified. Following Mantel and Hankey (1978), α_t will here be expressed as a polynomial in t. The model will then be estimated by maximum likelihood.[24] The results for different degrees of the polynomial are given in table 7. The significant coefficients are similar in size and in sign to those obtained from the continuous Cox model.

[23]Note that the error terms of the extended OLS regression are heteroscedastic. Furthermore, standard t-tests which are based on the OLS standard errors do not help to correctly assess the significance of the results, since some of the explanatory variables are estimated (see, for example, Madalla (1983)). Reported t-statistics are based on the correct, asymptotic standard errors (for the derivation, see Greene (1981)).

[24]For a derivation of the appropriate ML-estimator, see Rohwer (1991).

Appendix 3: Tables

Table 4: Intended Durations

PERIOD	YEARS	FREQUENCY
1	1	119
	2	140
2	3	128
	4	64
3	5	170
	6	70
4	7	23
	8	37
5	9	8
	10	202
	11	3
6	12	5
	13	8
	15	62
	16	3
	17	1
7	18	4
	20	37
	25	3
	26	2
	28	1
	30	4
SUM		1094

SOURCE: Socio-Economic Panel, wave 1, 1984.

Table 5: Piecewise Constant Hazards

VARIABLE	(1)	(2)
ξ_1 (PERIOD 1)	**-2.55**	**-2.53**
	(-15.65)	(-10.82)
ξ_2 (PERIOD 2)	**-2.28**	**-2.25**
	(-13.77)	(-9.55)
ξ_3 (PERIOD 3)	**-1.67**	**-1.63**
	(10.30)	(7.01)
ξ_4 (PERIOD 4)	**-2.75**	**-2.72**
	(14.02)	(10.53)
ξ_5 (PERIOD 5)	**-1.40**	**-1.35**
	(-8.65)	(-5.81)
ξ_6 (PERIOD 6)	**-2.11**	**-2.03**
	(-11.50)	(-8.17)
ξ_7 (PERIOD 7)	**-1.42**	**-1.31**
	(7.01)	(4.93)
No. of Obs.	1094	1094

SOURCE: Socio-Economic Panel, wave 1, 1984. t-ratios in parenthesis. Piecewise constant hazards correspond to $\exp(\xi_i)$.

Table 6: Earnings Equations

VARIABLE	PROBIT	LEAST SQUARES
CONST	**-2.86**	**7.08**
	(-8.73)	(160.94)
MALE	**-0.069**	**0.31**
	(-0.54)	(19.86)
MARRIED	**-0.23**	**0.076**
	(-1.50)	(3.99)
SCH	**-0.054**	**0.015**
	(-1.70)	(5.12)
TRAIN	**-0.058**	**0.008**
	(-1.64)	(2.51)
GSP	**-0.16**	**0.032**
	(-1.24)	(2.30)
YSM	**0.058**	**0.018**
	(4.22)	(3.52)
YSMSQ	*	**-0.00043**
		(-2.59)
TUR	**0.296**	**0.0066**
	(1.63)	(0.31)
JUG	**-0.019**	**0.079**
	(-0.092)	(3.49)
ITA	**-0.006**	**0.031**
	(-0.032)	(1.37)
GR	**-0.10**	**0.06**
	(-0.47)	(2.62)
YEMP	**-0.018**	**0.019**
	(-2.36)	(8.21)
YEMPSQ	*	**-0.00041**
		(-7.94)
EDU	**0.31**	*
	(1.69)	
SCHOOL	**-0.038**	*
	(-0.20)	
UNEMP10	**2.07**	*
	(13.10)	
PART	*	**-0.40**
		(-11.72)
λ	*	**0.10**
		(3.21)
No. of Obs.	1734	1572
Adj. R^2	*	0.45

SOURCE: Socio-Economic Panel, wave 1, 1984. t-ratios in parenthesis.

Table 7: Discrete Time Complementary Log-Log Models

VARIABLE	(1)	(2)	(3)	(4)	(5)
EARN	**-0.133**	**-0.173**	**-0.170**	**-0.171**	**-0.171**
	(-2.29)	(-2.94)	(-2.89)	(-2.91)	(-2.90)
EARNT	**0.086**	**0.097**	**0.097**	**0.097**	**0.097**
	(2.42)	(2.70)	(2.71)	(2.72)	(2.72)
EARNG	**0.069**	**0.091**	**0.092**	**0.091**	**0.091**
	(1.68)	(2.20)	(2.21)	(2.19)	(2.19)
EARNS	**-0.033**	**-0.055**	**-0.055**	**-0.053**	**-0.053**
	(-0.74)	(-1.22)	(-1.21)	(-1.15)	(-1.16)
EARNI	**0.068**	**0.063**	**0.066**	**0.063**	**0.063**
	(1.63)	(1.51)	(1.57)	(1.50)	(1.49)
YSM	**-0.021**	**-0.023**	**-0.024**	**-0.024**	**-0.024**
	(-2.49)	(-2.75)	(-2.81)	(-2.91)	(-2.82)
AGE	**0.016**	**0.020**	**0.020**	**0.020**	**0.020**
	(3.79)	(4.50)	(4.52)	(4.55)	(4.56)
MALE	**0.039**	**0.077**	**0.072**	**0.075**	**0.075**
	(0.49)	(0.96)	(0.90)	(0.93)	(0.93)
MARRIED	**0.26**	**0.32**	**0.33**	**0.32**	**0.32**
	(1.78)	(2.20)	(2.27)	(2.18)	(2.18)
EDU	**-0.020**	**-0.018**	**-0.015**	**-0.017**	**-0.016**
	(-0.17)	(-0.15)	(-0.13)	(-0.14)	(-0.13)
SCHOOL	**0.061**	**0.048**	**0.055**	**0.053**	**0.053**
	(0.49)	(0.38)	(0.44)	(0.42)	(0.42)
GSP	**-0.052**	**-0.062**	**-0.064**	**-0.061**	**-0.061**
	(-0.75)	(-0.89)	(-0.92)	(-0.88)	(-0.88)
HSP	**-0.069**	**-0.092**	**-0.090**	**-0.093**	**-0.061**
	(-0.52)	(-0.70)	(-0.69)	(-0.71)	(-0.71)
TRANSFER	**0.120**	**0.151**	**0.149**	**0.150**	**0.150**
	(1.82)	(2.22)	(2.19)	(2.20)	(2.20)
PARTNER	**-0.31**	**-0.38**	**-0.38**	**-0.37**	**-0.37**
	(-2.65)	(-3.21)	(-3.23)	(-3.19)	(-3.19)
UNEMP10	**0.072**	**0.093**	**0.092**	**0.091**	**0.090**
	(0.93)	(1.20)	(1.18)	(1.17)	(1.16)
UNEMP	**0.31**	**0.37**	**0.37**	**0.37**	**0.36**
	(2.54)	(3.02)	(3.00)	(2.99)	(2.98)
α_1	*	**0.049**	**0.067**	**0.115**	**0.098**
		(8.18)	(3.92)	(3.11)	(1.34)
α_2	*	*	**-0.001**	**-0.006**	**-0.003**
			(-1.10)	(-1.67)	(-0.25)
α_3	*	*	*	**0.0001**	**-0.0000**
				(1.48)	(0.06)
α_4	*	*	*	*	**0.0000**
					(0.26)
No. of Obs.	1094	1094	1094	1094	1094
Log – Likelihood	-3023	-2993	-2992	-2991	-2991

SOURCE: Socio-Economic Panel, wave 1, 1984. t-ratios in parenthesis. Coefficients of earnings variables are multiplied by 1000.

Figure 1: Life Table Estimates

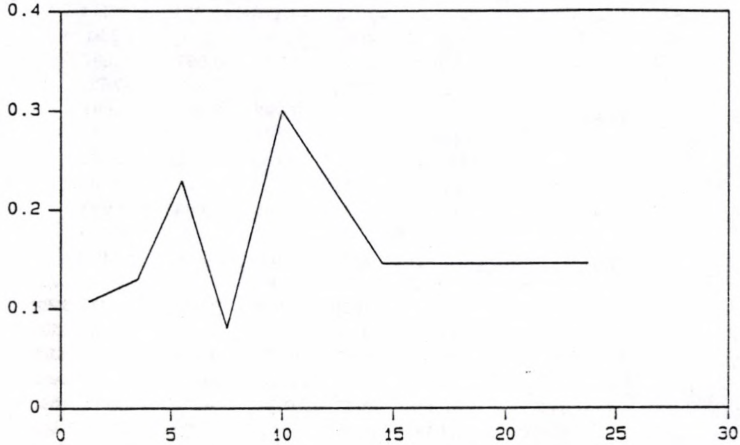


Figure 2: Cox Model Estimate of Survivor Function

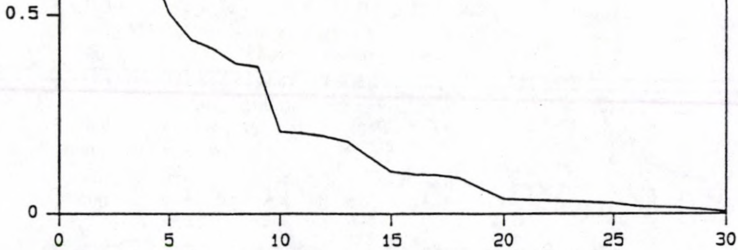
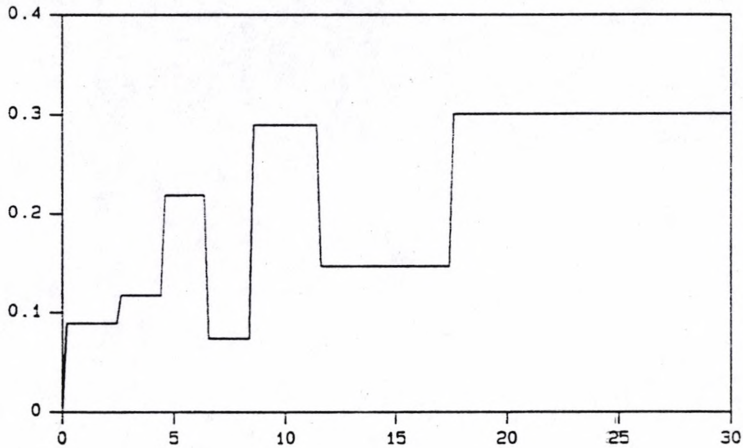


Figure 3: Piecewise Constant Hazard Rate



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