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Temporary Migration, Human Capital, and Language Fluency of Migrants

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Abstract

This paper investigates human capital investment of immigrants whose duration in the host country is limited, either by contract or by their own choice. The first part of the paper develops a model which distinguishes between temporary migrations where the return time is exogenous or optimally chosen. The analysis has a number of interesting implications for empirical work, some of which are explored in the second part of the paper. The analysis focuses on language capital and tests the hypothesis that country specific human capital investments are sensitive to the duration in the host country's labour market. The results show that the acquisition of language capital is sensitive to the intended duration in the host country.

Keywords: Temporary migration; human capital

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I. Introduction

The economic assimilation of migrant workers has attracted considerable attention in the economic literature. Starting with Chiswick (1978), numerous articles have appeared which analyse migrants' earnings assimilation for different countries, using cross-section and longitudinal data. Most studies find that the earnings of immigrants assimilate to those of native workers over the course of their migration history. This is explained by the accumulation of human capital which is specific to the host country labour market. Estimation is based on the standard specification of an earnings function, extended by years of residence, which is a measure for host country specific human capital.

If migrations are temporary, however, and if human capital requirements in the home and host country differ, then the incentive to invest in host country specific human capital depends on the expected length of time a migrant remains in the host country labor market. A measure for the time of residence alone does not capture differences in accumulated host country specific human capital. This tends to be neglected in the literature on migrants' assimilation. Difference in the time a migrant intends to remain in

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the host country labour market is a possible explanation for the disparate assimilation patterns which are observed among migrant populations of different origins. Some have argued that the country of origin may to some extent reflect differences in planned durations. Borjas (1984), for instance, finds significant differences in earnings assimilation in North America between immigrants from Cuba and other Hispanics. He explains the favorable pattern for Cubans by the fact that they are political migrants who have a lower return probability. Dustmann (1993) finds no assimilation of earnings of migrant workers to those of natives in the German labor market, and explains this by the predominantly temporary nature of labor migration to Germany.

Differences among populations of different origins have also been noted in the accumulation of a specific component of human capital, language capital. While shown to be of considerable importance in the host country labor market, the use of host country language capital in home countries is usually rather limited.[1] Chiswick and Miller (1993), for instance, find that Mexican migrants are less successful in terms of language acquisition than migrants of other origins in North America. Again, one explanation is that a higher percentage of the Mexican migrant population intends to return.

Most data sets do not provide information about the duration of migration, and this hypothesis has so far not been tested empirically. Nevertheless, there have been some attempts in the literature to investigate whether total duration in the host country affects human capital investments. Arguing that (permanent) migrants who are older at entry spend less time in the host country labor market and, accordingly, should have lower incentives to invest in host country specific human capital, some authors, e.g. Smith (1992), Friedberg (1992) and Borjas (1995), use age at entry as an additional explanatory variable in earnings regressions. Borjas (1995), for instance, finds that an increase in the entry age from 20 to 30 years decreases earnings of migrants by 5 percent.[2]

This paper has two objectives. The first is to develop a theoretical model and provide a systematic formal treatment of the investment of migrants in human capital. The analysis distinguishes between permanent migrants and temporary migrants. Temporary migrants can be either *contract migrants* or *return migrants*. While the return time for contract migrants is exogenous, a return migrant chooses this time optimally. Little emphasis has been placed

[1]The acquisition of language capital has been studied in numerous papers, for example, Carliner (1981), McManus et al. (1983), Kossoudji (1988), Rivera-Batiz (1990), Chiswick (1991), Dustmann (1994), and Chiswick and Miller (1993, 1995). Lazear (1995) explains language acquisition in a model where individuals benefit from communication.

[2]A restrictive identification assumption in all these studies is that the age-earnings effects for natives and migrants are the same.

on this distinction, which, as shall be argued, is important for the empirical analysis.

The second objective is to provide an empirical analysis and test the hypothesis that country specific human capital investments are sensitive to the duration in the host country labor market. The focus is on language capital, which is a highly important component of host country specific human capital, but at the same time not very valuable in the home country labor market. The analysis draws on survey data for Germany, which contain some unique information on the intended duration of a migrant in the host country. The results support the hypothesis that the acquisition of country specific human capital is sensitive to duration in the host country.

II. Migrants' Human Capital Accumulation

Consider a migrant at entry to the host country. The migrant's objective is to maximize utility over the remaining time in the labor force, which is divided into two periods. In the first period, the migrant resides in the host country, and the period has unit length. The second period consists of two subperiods. In the first subperiod, he lives in the host country, and in the second subperiod in the home country. The length of these sub periods is equal to $(\tau - 1)$ and $(T - \tau)$, respectively. Permanent migration is the limiting case with $\tau = T$. The migrant works a fixed amount of hours in each of the two periods, which is normalized to 1.

Migrants choose to return, despite persistingly higher wages in the host country, for three motives. First, they enjoy living and consuming in their home countries more than in the host country. Reasons may be factors which are locationally fixed and which provide positive externalities, like climate, friends, language, family, food and culture. At the same time, there may be factors in the host country which provide negative externalities, like racial attitudes, discrimination, etc. Second, relative prices are higher in the host country. A return allows the migrant to take advantage of high wages in the host country and low prices at home. And third, rates of return on human capital, acquired in the host country, are higher in the home country labor market. The first return motive was initially analysed by Djajic and Milbourne (1989). The latter two motives were first explored by Dustmann (1994a).

The migrant maximizes lifetime utility over the two intervals he resides in the home (source) and the host country (denoted by indices S and H), with length τ and $T - \tau$, respectively:

$$\max_{s,\tau,c^S,c^H} U = [\tau]u^{\mathrm{H}}(c^{\mathrm{H}}) + [T - \tau]u^{\mathrm{S}}(c^{\mathrm{S}}), \tag{1a}$$

subject to the budget constraint

$$[\tau]c^{\mathrm{H}} + [T-\tau]c^{\mathrm{S}}p - r^{\mathrm{H}}H[1-s] - [\tau-1][r^{\mathrm{H}}H + \rho^{\mathrm{H}}f(s;\ H)]$$
$$- [T-\tau][r^{\mathrm{S}}H + \rho^{\mathrm{S}}f(s;\ H)] = 0, \quad (1b)$$

where p is the relative price level between the host and home country, and u^{H} and u^{S} are (strictly concave) utility functions over the flows of consumption in the host and home region, c^{H} and c^{S}.

The stock of human capital upon arrival is denoted by H. For simplicity, it is assumed that human capital does not depreciate. The rent on the stock of human capital H in the host country equals r^{H}, and in the home country r^{S}. The migrant may allocate his time in period 1 to two activities: human capital production and the labor market. The fraction of time devoted to human capital investment is denoted by s, with $0 \leqslant s \leqslant 1$. The production of human capital is represented by the function $f(s;\ H)$, which exhibits the following properties: $f_s > 0$, $f_{ss} < 0$, $f(0;\ H) = 0$, where subscripts denote derivatives. The amount of human capital the migrant is endowed with upon arrival, H, affects the production of further human capital positively: $f_H > 0$, $f_{sH} > 0$ (human capital is self productive); see Ben-Porath (1967) and Heckman (1976) for similar formulations.

The rent on one unit of human capital which the migrant acquires in the first period equals ρ^{H} in the host country, and ρ^{S} in the home country. The case $(\rho^{\mathrm{H}} - \rho^{\mathrm{S}}) > 0$ may be considered as the normal case. There are, of course, situations where human capital acquired abroad is more productive in the home than in the host economy, the implications of which are explored below.

The first-order conditions with respect to consumption imply that

$$u_c^{\mathrm{H}}(c^H) = u_c^{\mathrm{S}}(c^{\mathrm{S}})(1/p) = \pi. \quad (2a)$$

If $u_c^{\mathrm{S}}(k) > u_c^{\mathrm{H}}(k)$, or if $p < 1$, the consumption flow in the home country is higher than in the host country. The optimal return point τ is jointly determined with the optimal investment ratio s and the marginal utility of wealth π.

The remaining first-order conditions, pertaining to the choice of τ and s, are given by

$$[u^{\mathrm{S}}(c^{\mathrm{S}}) - u^{\mathrm{H}}(c^{\mathrm{H}})] = \pi[[r^{\mathrm{H}} - r^{\mathrm{S}}]H + [\rho^{\mathrm{H}} - \rho^{\mathrm{S}}]f + [c^{\mathrm{S}}p - c^{\mathrm{H}}]], \quad (2b)$$

$$r^{\mathrm{H}}H = [\tau-1]\rho^{\mathrm{H}}f_s + [T-\tau]\rho^{\mathrm{S}}f_s, \quad (2c)$$

and the budget constraint (1b).

Contract Migration

First consider the case where the time in the host country, τ, is exogenous. This corresponds to what was termed a *contract migration* above. In this case, the optimal investment in human capital s is determined solely by (2c).[3]

Condition (2c) says that the optimal rate of investment is chosen in such a way that forgone earnings from investment in period 1 are equal to gains in period 2. Comparative statics are easily derived from expression (2c), and displayed in Table 1.

Investments increase in ρ^{S} (the value of human capital acquired abroad in the migrant's home country), and this effect is the larger, the longer the migrant stays in the host country. An increase in r^{H} decreases human capital investments, since costs of investment in period 1 are increasing. An increase in ρ^{H} (the return on human capital, acquired in the first period, in the host country) increases investments. This effect is the larger, the longer the migrant's contract τ.

The impact of an increase in the initial stock of human capital H on investment is ambiguous and consists of two counteracting effects. On the one hand, a higher H upon arrival increases the marginal product of each unit of time invested in human capital production. On the other hand, a high

Table 1. *Comparative statics, contract migration*

Variable	Derivative	Effect on s
ρ^{S}	$\dfrac{[\tau - T]f_s}{D}$	(+)
r^{H}	$\dfrac{H}{D}$	(−)
ρ^{H}	$\dfrac{-(\tau - 1)f_s}{D}$	(+)
H	$(r^H - f_{sH}[[\tau - 1]\rho^H + [T - \tau]\rho^S])/D$	(?)
τ	$\dfrac{[\rho^{\mathrm{S}} - \rho^{\mathrm{H}}]f_s}{D}$	(?)
T	$\dfrac{-\rho^{\mathrm{S}} f_s}{D}$	(+)

Note: $D = f_{ss}\ [[\tau - 1]\rho^{\mathrm{H}} + [T - \tau]\rho^{\mathrm{S}}] < 0$.

[3]To focus the analysis, only interior solutions are considered here. Obviously, no investment takes place if the equality in (2c) is replaced by "$>$", and if this inequality holds for $s \to 0$. Furthermore, the migrant invests all his available time in human capital production if the equality in (2c) is replaced by "$<$", and this inequality holds for $s \to 1$.

H upon arrival increases opportunity costs of investments in period 1. The total effect depends on how productive H is in human capital production, and on the rate r^{H}.

An increase in the contract length τ increases human capital investment as long as the rate of return on produced human capital is higher in the host country ($\rho^{\mathrm{H}} > \rho^{\mathrm{S}}$). This may be considered the normal case for labour migrations. Accordingly, shorter contracts imply lower investments in host country specific human capital. Finally, an increase in T increases human capital investments, as long as $\rho^{\mathrm{S}} > 0$. For a population of migrants with the same contract length, investments should therefore be higher for those who arrive at younger ages.

Return Migration

Turning to migrations where the migrant chooses the return point optimally, the analysis becomes slightly more involved. Using (2c) and the budget constraint, both s and π may be written as functions of the return point τ, which is then determined by (2b).[4]

The term on the LHS of (2b) denotes the cost of remaining one further unit of time in the host country in terms of forgone utility. The term on the RHS is the marginal benefit from remaining a further unit of time in the host country. If return is induced by a higher marginal utility from consumption in the home country, or by a higher purchasing power in the home country ($p < 1$),[5] these costs are positive ($u_c^{\mathrm{S}}(k) - u_c^{\mathrm{H}}(k) > 0$). The migrant returns when costs are equal to benefits, so (2b) becomes an equality at the optimal return point τ.

The third reason for a return relies solely on human capital considerations. If the migrant is indifferent between consumption in the host and the home country, and if $p = 1$, then (2b) reduces to $[r^{\mathrm{H}} - r^{\mathrm{S}}]H + [\rho^{\mathrm{H}} - \rho^{\mathrm{S}}]f$. Still, a temporary migration may be optimal also in this case. The first term in brackets ($r^{\mathrm{H}} - r^{\mathrm{S}}$) should always be positive, reflecting a higher rent on human capital upon arrival (H) in the host than in the home country. The second term is positive if the rent on human capital acquired in the host country is higher in host than in home country

[4]The optimal consumption flows c^{S} and c^{H} can be expressed as functions of π, which follows from (2a).

[5]There are a number of reasons why the host country currency may have a higher purchasing power in the migrant's home country. For instance, if wages are higher in the host country, non–traded goods and services tend to be less expensive in the home country. Furthermore, migrants may have different consumption patterns, due to cultural or religious differences. Some essential goods may be more expensive in the host than in the home country, since they have to be especially imported.

($\rho^{\mathrm{H}} > \rho^{\mathrm{S}}$). If $\rho^{\mathrm{H}} < \rho^{\mathrm{S}}$, however, re-migration may occur despite the fact that the migrant is indifferent between consuming in the host or the home region. In this event, both τ and s are determined such as to make this expression equal to zero. One situation where this return motive is important are student migrations. Another situation is migration from countries which are in the process of industrialization to highly industrialized countries. Basic knowledge about work efficiency, organization at the workplace, etc. acquired in the industrialized country increases the migrant's productivity only slightly in the host country, but is important and highly valued in the home country.

The duration decision and the investment decision are now determined simultaneously. To illustrate this point, differentiate the first-order conditions (2b) and (2c), write c^{S}, c^{H} as a function of π using (2a), and substitute out the change in π, $\mathrm{d}\pi$, using (1b), which yields the two equations

$$\mathrm{d}s = -\left[\frac{B_\tau}{B_s}\right]\mathrm{d}\tau - \left[\frac{B_x}{B_s}\right]\mathrm{d}x,$$

$$\mathrm{d}\tau = \left[\frac{A_s}{A_\pi(C\tau/C_\pi)}\right]\mathrm{d}s + \left[\frac{A_x - A_\pi(C_x/C_\pi)}{A_\pi(C_\tau/C_\pi)}\right]\mathrm{d}x, \tag{3}$$

where A_i, B_i and C_i are the partial derivatives of the expressions in (2b), (2c) and (1b) with respect to the variable i, $i = s, \pi, \tau, x$ (for details, see a technical appendix available on request). If the return on host country specific human capital is higher in the host country ($\rho^{\mathrm{H}} > \rho^{\mathrm{S}}$), then the effect of an increase in τ on changes in s is positive ($-B_\tau/B_s > 0$). A change in some parameter x affects the optimal investment intensity s directly, but also indirectly via changes in the optimal return point τ. Comparative statics are now mostly ambiguous. If $\mathrm{d}\tau$ equals zero, the indirect effect vanishes, and the effect of a change in any parameter x on investments s equals that for contract migrations.[6]

The partial effects of changes in x on changes in s (term (B_x/B_s)) are structural effects in the sense that they are purged from any indirect effects via τ. To recover these structural effects in a statistical model and, at the same time, to estimate the effect of τ on s, requires introducing a measure of τ into the investment equation. Since s also determines τ, the estimation strategy has to take account of this simultaneity. This is attempted below.

[6]Since $B_s = f_{ss}[[\tau - 1]\rho^{\mathrm{H}} + [T - \tau]\rho^{\mathrm{S}}]$, and B_x is equal to the derivative of (2c) to any parameter x, this creates the marginal effects in Table 1.

III. Analyzing Language Capital

Data and Variables

The data used for the empirical analysis stem from the first wave (1984) of the German Socio-Economic Panel (SOEP). Migrants included in the survey are labor migrants who came to Germany mainly between 1955 and 1973. They are oversampled, and of Turkish, Italian, Greek, Spanish, and Yugoslavian origin. All these migrants are free to decide whether and when to return to their home countries. In the above terminology, they are therefore return migrants.[7]

The sample used for the analysis is restricted to males. All individuals are excluded who were younger than 17 at entry to the host country. The reason for this selection is that those who emigrated at a younger age may not be in the host country by their own choice, but have accompanied parents or relatives. After excluding observations with missing values in relevant variables, the final sample reduces to 729 observations.

Information on return plans of migrants is crucial for the analysis. The survey questionnaire includes two related questions. The first question *How long do you intend to remain in Germany?* allows for three possible answers: 1. *I intend to return within the next 12 months*; 2. *I would like to remain some more years in Germany*, and 3. *I would like to remain in Germany forever.* If the respondent chooses 2, he is asked to specify the exact number of years.

Two variables were constructed from this information. One variable measures the total number of years the migrant stays in the German labour market (TOTDUR). It is built by adding up the intended future number of years, and the number of years he had already spent in Germany. If the migrant intends to remain permanently (which is the case for 33 percent of the sample), or if a return is envisaged only after retirement age (which is set at 64), then this variable equals the total number of years in the labour force of the host country, calculated as retirement age minus age at entry. For these observations, the variable is right censored, with individual specific censoring points. The second variable is a (0–1) variable and reflects the more fundamental decision of whether or not to remain permanently in the host country (variable PERM).

It may be argued that a measure for the total number of years abroad, based on intentions, is not appropriate, since intentions do not necessarily reflect realizations. However, intentions rather than realizations matter for conditioned behaviour: an individual's behaviour today is conditioned on

[7]See Dustmann (1996) for more information about labour migration during this period.

intended actions in the future. Even if these intentions are not realized, they will have caused a certain past behavioural pattern.[8]

Proficiency in the spoken language is self-reported and observed on a scale from 1 to 5.[9] About 41 percent of the sample reports speaking the German language well or very well, 40 percent on an intermediate level, and 19 percent poorly or very poorly. For the empirical analysis, the language information is condensed into a binary variable, being equal to 1 if the migrant reports speaking the language well or very well, and zero otherwise. This follows a common practice in this type of analysis, and simplifies the estimation considerably.

Table 2 presents some numbers on the variable TOTDUR (rows 1, 2), the percentage of individuals who classify themselves into the language category *well or very well* (row 3), and the number of years of a future intended duration (rows 4, 5). 269 observations (36.9%) are right censored in the sense that individuals intend to return after retirement age, or to remain permanently. It is clear from the numbers in the table that the distribution of durations is skewed to the right, and it peaks at durations of between 16 and 20 years.[10] The numbers in the third row indicate that language proficiency

Table 2. *Total and intended future duration*

	Total Duration (Years)								
	1–5	6–10	11–15	16–20	21–25	26–30	31–35	36–40	>40
No. Obs.	3	21	66	136	134	98	91	81	93
Percentage	0.41	2.88	9.05	18.65	18.38	13.44	12.48	11.11	12.75
Language well or very well (percentage)	0.00	35.00	25.75	32.35	39.55	37.14	40.65	49.38	64.51
	Intended Future Duration (Years)								
No. Obs.	270	185	76	79	38	50	23	6	2
Percentage	37.03	25.37	10.42	10.83	5.40	6.85	3.15	0.82	0.27

[8]This line of reasoning underlies Galor and Stark's (1991) conclusion that positive return probabilities lead to higher performance of migrants, as compared to natives.

[9]The problem of using self-reported language skills has been emphasized repeatedly in the literature. However, test-based measures of language abilities are rarely available in microdata sets, and language studies are almost exclusively based on self-reported measures. An exception is Rivera-Batiz (1990).

[10]This pattern seems to be consistent with findings for other countries. LaLonde and Topel (1992) report that in the US, some return migration occurs shortly after arrival, although a great deal occurs several decades after immigration. Since the data used for this analysis stem from 1984, but active recruitment of labour migrants had stopped as early as 1973, the data undersample those migrants who remained only for short periods.

is positively related to the total intended duration of the migrant in the host country.

Chiswick and Miller (1995) define language fluency as a function of three key components: economic incentives, efficiency, and exposure. In terms of the model developed above, variables which affect efficiency are those which determine the technology of human capital production, while incentive variables include the various rents on human capital. Exposure variables control for heterogeneity among individuals in their exposure to the host country language. The explanatory variables, which are described in Table 3, include various measures of these three elements.

The efficiency of human capital production depends on human capital upon arrival, and a direct measure is the number of years of basic schooling and after basic school education (SCH and EDU) the migrant has received. A most important factor which enhances the ability to acquire language knowledge is literacy. Literacy is approximated by an indicator variable, which is based on the migrant's self-reported writing ability in his home language. The variable HW is equal to 1 if the migrant reports being very proficient in his written home language, which applies to about 54 percent of the sample.

Incentive variables are the various rates of return on human capital. Most of these rates are not observed, and the empirical specification may be considered as a reduced form in this respect, where return rates are reflected by educational attainment and the migrant's country of birth. Country of birth may also reflect language distance, and therefore affect the efficiency

Table 3. *Descriptives and explanation of variables*

Code	Mean	Std Dev	Description
YSM	15.559	5.047	Years since migration
SCH	1.307	2.747	Years of schooling (after age 15)
EDU	1.318	2.435	Years of after-school education (after age 15)
AGEENT	27.748	6.589	Age at entry to Germany
TOTDUR	26.982	10.023	Total intended duration in German workforce
HW	0.544		Dummy; good or very good in written home language
T	0.297		Dummy; Turkish nationality
J	0.233		Dummy; Yugoslavian nationality
G	0.155		Dummy; Greek nationality
I	0.197		Dummy; Italian nationality
S	0.173		Dummy; Spanish nationality
PERM	0.326		Dummy; intention to stay permanently
CHILD < 6	0.916		Number of children below 6 years old in household
CHILD > 6	0.315		Number of children above 6 years old in household
M	0.941		Dummy; married
FE	0.331		Dummy; father lives in emigration country
ME	0.533		Dummy; mother lives in emigration country
No. Obs	729		

of language production; see Dustmann (1994) for a discussion. The above analysis has shown that, conditional on the total duration in the host country, investment in host country specific human capital decreases with the age of the migrant upon immigration. The age at entry may, besides capturing an incentive effect, also reflect the decay in the technology of acquiring human capital.

Variables which measure exposure to the host country language are years of residence and the number of children below and above six years old. Children may enhance exposure by forcing parents to become involved in the host country environment. They may also teach parents the host country language. On the other hand, children may prevent parents from activities which are language enhancing, such as going out with friends from the native community. The first effect would be expected to be more dominant for pre-school children, while the second effect should dominate for older children. Therefore, two variables were constructed, which measure the number of children below and above six years old in the household.

The Econometric Model

The theoretical model suggests that for migrants who choose their return optimally, human capital investment is jointly determined with return plans. Furthermore, the measure on a migrant's duration intention tends to be noisy, leading to an error in variables model. Both problems call for simultaneous estimation of the language and duration equations. Since interest is focused on the effect of duration on language acquisition, the duration equation is specified as a reduced form equation. The latent variable specification is given by

$$l^* = Z'\alpha + \gamma t + \epsilon_l, \tag{4a}$$

$$t^* = X'\beta + \epsilon_t. \tag{4b}$$

Observed are l and t, with $l = 1$ (speaks language well or very well) if $l^* \geqslant 0$ and zero otherwise, and $t = t^*$ if $t^* < T$ and $t = T$ otherwise. The variable t is a measure for the total duration of the migrant in the host country, and corresponds to the variable TOTDUR. This variable is considered as censored if the migrant intends to remain permanently, or to return after retirement age, with the individual specific censoring point T being equal to (64 − age at entry).

The model in (4a) and (4b) could be estimated in two stages, by finding an expression for the conditional expectation $\mathrm{E}(\epsilon_l | Z, t, X)$ and adding it as an additional regressor to equation (4a), c.f. Blundell and Smith (1989), or simultaneously by maximum likelihood. Here the second option is chosen,

since it avoids tedious corrections of the standard errors. The error terms ϵ_l and ϵ_t are assumed to be jointly normally distributed, with $\text{Corr}(\epsilon_l, \epsilon_t) = \rho$. The variance of ϵ_l is normalized to 1, and the variance of the censored regression model can be estimated. The model is a mixed probit/tobit model, and the likelihood function is derived in the Appendix. If language is conditioned on the more fundamental decisions to remain permanently or temporarily, then t is a (0, 1) variable, with $t = \mathbf{1}(t^{**} > 0)$, and the model is a bivariate probit model. Both specifications are estimated.

The parameter γ is parametrically identified because the model is non-linear. Nonparametric identification of γ requires that X contain at least one variable which is not contained in Z. Furthermore, the variable excluded from Z must explain some of the variation in t^*, conditional on the other exogenous variables in the model, and affect l^* only via t. The variables chosen here are based on questions about whether, and where the parents of the individual are living. Possible answers are *residing in home country*, *residing in Germany*, and *deceased*. About 33 percent of the sample population reported that the father, and 53 percent that the mother lives in the home country. The remaining individuals reported that the father or mother has died or resides in the host country.

From this information, two indicator variables are generated, being equal to one if the father (or the mother) lives in the home country (variables FE, ME). They are valid instruments only if the migrant's return intention does not affect either the decision of the parent to remain in the host country or not, or the death of a parent. The latter certainly holds. As regards the former, it seems unlikely that the parent's decision to live in Germany is affected by the offspring's return intention. First of all, there does not seem to be any good reason for the parent to join the offspring in the host country, should he intend to remain longer, or permanently. The parent would forgo the amenities of a familiar environment, and would not gain financially, since any transfers from the offspring can easily be transferred to the home country (where purchasing power may even be higher). Furthermore, although later immigration of close family members (children and spouses) was in principle possible, immigration of other relatives was restricted, and working permits were very difficult to obtain; see Velling and Woydt (1993). Those parents who are residing in Germany are likely to be labour migrants who came independently of their offsprings' duration decisions.

IV. Results

Table 4 summarizes the marginal effects, evaluated at sample means, for the language equation. Column 2 reports results when estimating the return and language equations separately, and column 3 reports simultaneous estimations, where duration is represented by the variable TOTDUR. Column 1

Table 4. *Probit/censored regression*

	Probit-Tobit						Probit-Probit			
	1		2		3		4		5	
Variables	M.E.	t-stat	M.E.	t-stat	M.E.	t-stat	M.E.	t-stat	M.E.	t-stat
Const	0.181	1.19	0.006	0.03	−0.033	0.19	0.132	0.85	−0.061	0.33
YSM/10	0.096	2.28	0.049	1.08	0.055	1.22	0.084	2.01	0.031	0.59
SCH/10	0.119	1.89	0.120	1.94	0.116	1.89	0.109	1.74	0.057	0.79
EDU/10	0.043	0.60	0.044	0.63	0.041	0.58	0.041	0.41	0.018	0.16
AGEENT/10	−0.180	5.54	−0.152	4.43	−0.144	3.95	−0.175	5.34	−0.136	3.28
T	0.042	0.61	0.063	0.90	0.063	0.92	0.061	0.89	0.116	1.57
J	0.269	3.85	0.274	3.92	0.269	3.93	0.277	4.04	0.265	3.63
G	0.041	0.57	0.071	0.95	0.073	1.00	0.070	0.94	0.155	1.85
I	0.174	2.46	0.186	2.61	0.182	2.60	0.179	2.57	0.166	2.30
M	−0.169	1.97	−0.169	1.99	−0.164	1.96	−0.160	1.89	−0.095	1.06
CHILD < 6	−0.022	0.59	−0.018	0.48	−0.018	0.49	−0.020	0.54	−0.011	0.31
CHILD > 6	0.005	0.30	−0.001	0.02	−0.001	0.07	−0.000	0.01	−0.023	1.06
HW	0.170	4.21	0.178	4.38	0.177	4.41	0.174	4.32	0.170	4.22
TOTDUR/10			0.057	2.33	0.053	2.17				
PERM							0.106	2.45	0.492	2.42
σ^2	1.158	18.93	1.158	18.92	1.158	18.94				
ρ					−0.067	0.62			−0.620	0.89
Wald test (Instruments)						10.174				4.202
Log.-lik.		−1163.06		−1159.80		−1159.64		−859.60		−859.40

Note: Marginal effects (M.E.) are evaluated at sample means.

reports results without including a measure of duration among the regressors.

The results in column 2 clearly show that total duration in the host country has a significant and positive effect on language proficiency. An increase in total duration by 10 years increases the probability of being fluent by 5 percent. This effect changes only slightly if endogeneity is taken into account (column 3). A Wald test indicates that the instruments are jointly significant at the 1 percent level. The correlation ρ between ϵ_l and ϵ_t is negative, but not significantly different from zero. If simultaneity was the only source of endogeneity, we would expect this coefficient to be positive (as long as language proficiency has a positive effect on duration). The negative sign indicates that there is a further endogeneity problem due to a measurement error problem in the duration variable.

Columns 4 and 5 in Table 4 report results when the variable PERM is used instead as an additional regressor. Column 4 displays results which do not take into account endogeneity. The variable PERM is strongly significant, indicating that those who intend to remain permanently have a 10 percent larger probability of being proficient in the host country language. This is in line with the coefficient on the variable TOTDUR, if evaluated at the average total duration. The marginal effect increases considerably in size when endogeneity is taken into account. The set of instruments is significant at the 5 percent level, and the correlation coefficient is negative (though not significant).

Models which rely solely on parametric identification have also been estimated, and they give essentially the same results. The correlation between the unobservables is negative, but insignificant in all cases, and the effect of return plans on language increases in size, relative to the single equation estimation.

Comparing column 1 with columns 2–5 shows that including the variables TOTDUR or PERM as additional regressors reduces the size and significance level of the variables YSM and AGEENT, but hardly affects any of the other coefficients. Endogenizing the variable PERM reduces the size and precision of the variables YSM and AGEENT even further. This indicates that the coefficients in a reduced form equation like that in column 1 (which is usually estimated in the literature) captures some of the effects of return plans on language.

The effect of other regressors on language fluency are in line with results found in other studies. The effects of schooling and after basic school education on language proficiency are modest. The reason is that the results displayed in the table include a measure for literacy (HW).[11] The effect of

[11]Specifications which exclude this variable from the set of regressors yield larger and more significant coefficients on the education variables.

the literacy variable is quite notable: those who write very well in their home language have a 17 percent higher probability of speaking the host country language well or very well. The children variables have only a small effect, and they are insignificant.

Table 5 presents the reduced form results for the censored regression equation (variable TOTDUR), and the probit equation (variable PERM). The displayed coefficients relate to the simultaneous estimations in columns 3 and 5 in Table 4. The fact that the mother resides in the home country has a strong negative effect on duration, as expected. The effect of the father is positive, although the latter coefficient is not significant. The positive effect of the variable YSM on the decision to remain permanently (column 2) indicates that the time abroad increases the probability that the individual intends to remain permanently, while a higher entry age has the opposite effect. Education has no effect on duration, while children in the household above the age of six have a positive effect on duration propensities. This may reflect the wish of parents to allow children to complete their education in the host country. Finally, return propensities differ significantly between nationalities.

V. Summary and Conclusions

A model to analyze human capital investments and return decisions of migrant workers was developed. The analysis distinguishes between temporary migrations where the return time is exogenous, and temporary migrations where migrants choose the time of return. One testable implication of

Table 5. *Probit/censored regression models*

Dep. Var.	TOTDUR		PERM	
Variables	coef	t-stat	coef	t-stat
Const	3.275	9.08	0.147	0.34
YSM/10	1.021	9.38	0.293	2.64
SCH/10	0.132	0.74	0.312	1.62
EDU/10	−0.040	0.18	0.092	0.37
AGEENT/10	−0.458	4.99	−0.204	2.24
T	−0.612	3.40	−0.482	2.71
J	−0.168	0.99	−0.152	0.87
G	−0.792	3.55	−0.735	3.70
I	−0.243	1.39	−0.090	0.50
M	−0.155	0.83	−0.308	1.45
CHILD < 6	−0.067	0.91	−0.053	0.59
CHILD > 6	0.159	3.29	0.172	3.49
HW	−0.099	1.02	−0.082	0.78
FE	0.149	1.41	0.136	1.14
ME	−0.341	3.17	−0.222	2.00

the model is the effect of duration in the host country labour market on human capital investments. If returns on host country specific human capital are higher in the host than in the home country labour market, the incentive of the migrant to invest in host country specific human capital increases with the total time he intends to remain in the host country.

The empirical part of the paper tests this hypothesis. The analysis focuses on language capital, a particular component of host country specific human capital, which is likely to have higher returns in the host than in the home country labour market. Based on some unique information on the migrant's intended future duration in the host country, a duration variable is constructed and included as an additional regressor in a language determination equation. The results show that language fluency is negatively and significantly affected by the migrant's return propensity. These results prevail even after taking into account a possible endogeneity of this variable. The estimates therefore tend to support the hypothesis that migrants who plan to remain longer in the host country labour market invest more intensively in their human capital. The results suggest that differences in assimilation between immigrant groups of different origin, as found repeatedly in the literature, can to some extent be explained by differences in return propensities.

Appendix

Likelihood Function of Censored Regression-Probit Model

To derive the likelihood function, note that there are two regimes: $t^* \geqslant T$ (regime I) and $t^* < T$ (regime II). The likelihood contribution for regime I is given by

$$L^{c\mathrm{I}} = \mathrm{P}[\epsilon_t \geqslant T - X'\beta,\ \mu_{-1} - Z'\alpha - \gamma t < \epsilon_l < \mu - Z'\alpha - \gamma t], \tag{5}$$

where $[\mu_{-1}, \mu] = [-\infty, 0]$ if $l = 0$ and $[0, \infty]$ if $l = 1$. Assuming that ϵ_t and ϵ_l are jointly normally distributed with variance σ_t^2 and σ_l^2 and correlation coefficient ρ results in the following expression:

$$L^{c\mathrm{I}} = \Phi_2\left[\frac{-T + X'\beta}{\sigma_t}, \frac{\mu - Z'\alpha - \gamma t}{\sigma_l}, \rho\right] - \Phi_2\left[\frac{-T + X'\beta}{\sigma_t}, \frac{\mu_{-1} - Z'\alpha - \gamma t}{\sigma_l}, \rho\right], \tag{6}$$

where Φ_2 denotes the bivariate normal distribution. The likelihood contribution for regime II is given by

$$L^{c\,\mathrm{II}} = \frac{1}{\sigma_t}\phi\left(\frac{t - X'\beta}{\sigma_t}\right)\left[\Phi\left(\frac{\mu - Z'\alpha - \gamma t - \rho\sigma_l[(t - X'\beta)/\sigma_l]}{\sigma_l\sqrt{1-\rho^2}}\right)\right]$$
$$- \left[\Phi\left(\frac{\mu_{-1} - Z'\alpha - \gamma t - \rho\sigma_l[(t - X'\beta)/\sigma_l]}{\sigma_l\sqrt{1-\rho^2}}\right)\right], \tag{7}$$

where ϕ denotes the standard normal density and Φ the standard normal distribution. Denoting individual contributions by the index i results in the log-likelihood function:

$$\ln L = \sum_i [\ln L_i^{c\,\mathrm{I}} + \ln L_i^{c\,\mathrm{II}}]. \tag{8}$$

References

Ben-Porath, Y. (1967), The Production of Human Capital and the Life Cycle of Earnings, *Journal of Political Economy 75*, 352–365.

Blundell, R. W. and Smith, R. J. (1989), Estimation in a Class of Simultaneous Equation Limited Dependent Variable Models, *Review of Economic Studies 56*, 37–58.

Borjas, G. J. (1984), The Economic Status of Male Hispanic Migrants in the United States, in R. H. Ehrenberg (ed.), *Research in Labor Economics*, JAI Press, Greenwich.

Borjas, G. J. (1995), Assimilation and Changes in Cohort Quality Revisited: What Happened to Immigrant Earnings in the 1980's?, *Journal of Labor Economics 13*, 177–201.

Carliner, G. (1981), Wage Differences by Language Group and the Market for Language Skills in Canada, *Journal of Human Resources 16*, 384–399.

Chiswick, B. C. (1978), The Effect of Americanization on the Earnings of Foreign-Born Men, *Journal of Political Economy 86*, 897–921.

Chiswick, B. R. (1991), Reading, Speaking, and Earnings among Low-Skilled Immigrants, *Journal of Labor Economics 9*, 149–170.

Chiswick, B. R. and Miller, P. (1993), Language in the Immigrant Labor Market, in B. R. Chiswick (ed.), *Immigration, Language and Ethnicity: Canada and the United States*, AEI Press, Washington, DC.

Chiswick, B. R. and Miller, P. (1995), The Endogeneity between Language and Earnings: An International Analysis, *Journal of Labor Economics*, *13*, 201–246.

Djajic, S. and Milbourne, R. (1988), A General Equilibrium Model of Guest Worker Migration, *Journal of International Economics 25*, 335–351.

Dustmann, C. (1993), Earnings Adjustment of Temporary Migrants, *Journal of Population Economics 6*, 153–168.

Dustmann, C. (1994), Speaking Fluency, Writing Fluency and Earnings of Migrants, *Journal of Population Economics 7*, 133–156.

Dustmann, C. (1994a), Return Intentions of Temporary Migrants – Theory and Evidence, *CEPR* Discussion Paper no. 903.

Dustmann, C. (1996), Return Migration – The European Experience, *Economic Policy 22*, 215–250.

Friedberg, R. M. (1993), The Labor Market Assimilation of Immigrants in the United States: The Role of Age at Arrival, mimeo, Brown University.

Galor, O. and Stark, O. (1991), The Probability of Return Migration, Migrants' Work Effort, and Migrants' Performance, *Journal of Development Economics 35*, 399–405.
Heckman, J. J. (1976), A Life Cycle Model of Earnings, Learning and Consumption, *Journal of Political Economy (Supplement) 84*, S511–S544.
Kossoudji, S. A. (1988), English Language Ability and the Labor Market Opportunities of Hispanic and East Asian Immigrant Men, *Journal of Labor Economics 6*, 202–228.
Lazear, E. P. (1995), Culture and Language, NBER Working Paper no. 5249.
LaLonde, R. J. and Topel, R. H. (1992), The Assimilation of Immigrants in the US Labor Market, in G. Borjas and R. Freeman (eds.), *Immigration and the Work Force: Economic Consequences for the United States and Source Areas*, University of Chicago Press, 67–92.
McManus, W., Gould, W. and Welch, F. (1983), Earnings of Hispanic Men: The Role of English Language Proficiency, *Journal of Labor Economics 1*, 101–130.
Rivera-Batiz, F. (1990), English Language Proficiency and the Economic Progress of Immigrants, *Economics Letters 34*, 295–300.
Smith, J. (1992), Hispanics and the American Dream: An Analysis of Hispanic Male Labor Market Wages, 1940–1980, Rand Corporation, place?
Velling, J. and Woyed, M. (1993), Migrationspolitiken in ausgewählten Industriestaaten, ZEW Discussion Paper, University of Mannheim.

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