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Murat G. Kırdar
Department of Economics
Middle East Technical University
Ankara 06531 Turkey
kırdar@metu.edu.tr

Economic Research Center
Middle East Technical University
Ankara 06531 Turkey
www.erc.metu.edu.tr

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Preliminary and Incomplete

Murat G. Kirdar[1]

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Abstract

This paper analyzes return migration and asset accumulation in a stochastic dynamic model using a longitudinal dataset on legal immigrants in Germany. Our model gives a number of implications about the *level*, *timing* and *selection* of return migration along with the savings profiles of immigrants. In addition, we examine how the return and savings behavior of immigrants vary according to their country of origin and demographic characteristics. The model is used to determine the impact of a number of counterfactual policy experiments on the composition of immigrants, such as changes in the unemployment insurance program and the payment of bonuses conditional on their employment status and duration of residence to encourage immigrants to return home. In addition, we assess the impact of counterfactuals in the macroeconomic environment, like changes in wages in Germany and in purchasing power parity between Germany and the source countries.

List of Themes: Migration, Labor Market Policy

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JEL Codes: J61, D91, J64, J65, J68

1 INTRODUCTION

Many European countries see immigration as a potential solution to the social security crisis they face due to an aging native population, rising health costs and low fertility rates.[1] Immigration brings in younger workers who often pay into the social security system for many years and then return home before collecting benefits.[2] However, immigrants can become a financial burden on the host country if they come at or stay until older ages when they draw from public health and social insurance systems more than they contribute to them. Higher fertility rates among immigrants may help slow down the aging of the host country population, but they may also bring about higher education and welfare costs. Whether immigrants become a burden also depends in part on whether they are selective of more or less able workers in their home country, whether the stayers are selective of the most or least economically successful immigrants, as well as on the economic assimilation of the stayers.

The return behavior of immigrants has important economic implications for the source country as well. A major motivation for immigration is asset accumulation. Although an exodus of workers seeking to take advantage of higher wages in other countries may impose a cost on the source country economy, migrants who return home often bring with them significant amounts of assets. Moreover, many of them invest their assets in small businesses.[3] Another major contribution of immigrants to the source country economy is their remittances.[4] Since the amount of assets immigrants can accumulate depends on their

[1] Boerch-Supan and Schnabel (1999) report the following for the German social security system: "In 1993, social security benefits amounted to 10.3 percent of GDP, a share more than two and a half times larger than in the United States."

[2] According to Bohning (1981), in the Federal Republic of Germany, 9 in 10 Italian, 8 in 10 Spanish, 7 in 10 Greek, 5 in 10 Yugoslav, and 3 in 10 Turkish workers admitted to work during the years 1961-76 left during this period.

[3] Based on a survey of Turkish emigrants from Germany in Turkey, Dustmann and Kirchkamp (2002) report that only 6 percent worked as salaried workers after return, whereas 51 percent of the returners operated small businesses. The other 43 percent were retired. Another interesting fact that Dustmann and Kirchkamp report is that the median age of the retirees among the returners was 45. This suggests that some immigrants were able to accumulate enough assets by a relatively early age to spend the rest of their lifes as rentiers. The facts that half of these migrants engaged in entrepreneurial activities after return and that most of the rest lived as rentiers suggest that the major motivation for their immigration was asset accumulation.

[4] Immigrants' remittances are a huge support factor for the balance of payments of some source countires.

economic performance in the host country, immigrants' economic success in the host country is also important for the source country.

In order to influence the number and demographic composition of immigrants, some host countries adopted policies to motivate immigrants to return to their home country. For instance, in 1983 Germany implemented a policy that provided financial aid to immigrants conditional on returning, especially oriented towards certain nationalities and the unemployed.[5] At the same time, Germany adopted other seemingly countervailing policy changes aimed at increasing the social assimilation of immigrants. Recently, the German government has implemented changes in the citizenship laws that make it easier for the children of immigrants to acquire German citizenship. In this paper, we analyze the impact of various financial aid schemes as well as the impact of the policies designed to increase the social integration of immigrants on return migration flows and on the demographic composition and labor market outcomes of the stayers.

An important policy issue in many host countries is immigrants' take-up of welfare benefits. Many host countries are taking steps in the direction of restricting benefits to immigrants.[6] One reason for higher welfare participation among immigrants in Germany is their higher unemployment rate compared to that of the natives. In December 1999, the unemployment rate was 23.3% for Turks and 18.4% for Italians. Therefore, a question of interest to policy makers is how changes in the unemployment compensation system affect immigrants' return decisions.

This paper develops and estimates a dynamic model of joint return migration and savings decisions under uncertainty. In the model, migrants are subject to earnings, employment and assimilation shocks and they make decisions about what fraction of their income to save and about whether and when to return to their home country. The structural framework of the model allows us to analyze the impact a number of counterfactual policy experiments on both savings and return migration decisions. In addition, since we model the migrants' decisions in a dynamic setting, we are able to explore the effects of these policies not only on migrants' return decision but also on their duration of residence. The model also incorporates

For instance, for India, the top receiver country, remittances are equal to 2.6% of its GDP. For Mexico and Turkey, these figures are 1.7% and 2.3%, respectively (IMF, 1999).

[5]Dustmann (1996) reports that the return aid amounted to 10,500 DM for each worker. In addition, there was a 1,500 DM bonus for each child. (Roughly, 2 DM is equal to 1 US $.)

[6]For instance, in the U.S., a law passed in 1996 denied immigrants most types of welfare benefits. In Germany, immigrants without permanent residence may lose their right to stay if they live on welfare benefits.

unobserved heterogeneity in migrants' permanent skill endowments and location specific preferences.

In our model, the reasons that migrants return to their home country are lower prices in the home country, location-specific preferences, and unexpected events such as shocks to earnings and preferences. We exploit the variation in the price levels across source countries to identify the effects of purchasing power on migrants' decisions and investigate how changes in the purchasing power parity, which could happen as a result of a devaluation in the source country or as a result of the exchange rate policies of the source country governments, influence migrants' savings and return decisions. Our model also incorporates variation in the earnings potential across the source countries. This would be especially important in the return decision of younger immigrants. We assess the response of immigrants to changes in the wage differential between the source country and Germany. A number of policies that the German government could implement would change the wage differential. For instance, implementation of anti-discrimination or economic integration policies would increase migrants' earnings in Germany. On the other hand, foreign investment in the source countries or trade agreements with them would increase migrants' potential earnings back at home. We compare the response of migrants to an increase in their earnings in Germany to their response to an increase in their potential earnings in their home country.

The model is estimated using a unique longitudinal dataset from Germany that contains information on guestworkers who immigrated to Germany in the 1960's and 70's under bilateral agreements signed by the German government with five Mediterranean countries; three of which now belong to the European Union (Greece, Italy and Spain) and two that do not (Turkey and ex-Yugoslavia).

The data reveal several interesting patterns concerning return migration flows and savings behavior. Immigrants from wealthier countries (EU countries) are more likely to return. The Kaplan-Meier hazard function estimated on non-EU migrants displays a hump shape, reaching its peak at around 16 years of residence, whereas the hazard rates for EU migrants are the highest within the first 6 years, then level off until around 20 years of residence, after which they slightly increase again. Despite having similar income levels, non-EU migrants save more compared to EU migrants during 10 to 20 years of residence. After 20 years of residence, there is a significant drop in the level of the annual savings of non-EU migrants while EU migrants maintain their previous level of annual savings. In other words, most of non-EU returners return within the first 25 years and the savings profile of non-EU stayers

display a significant downward trend during this time; whereas the fraction of late returners is higher among EU returners and the savings profile for EU stayers is much flatter. In addition, migrants who enter at older ages are more likely to return regardless of EU status. However, the difference is more pronounced for non-EU migrants. Non-EU migrants that enter at older ages also save a higher fraction of their income compared to cohorts that enter at younger ages, whereas there is no significant difference in the savings behavior of EU migrants by their age of entry. With regard to selection, the data indicate that return migrants have lower earnings and are more likely to be unemployed compared to migrants who stay.

We estimated the parameters of our model using simulated maximum likelihood estimation. The results indicate that our model can account for the above facts. We find that a significant fraction of immigrants who contribute to the social security system leave before they draw any benefits. This fraction is as high as one third for EU immigrants. We also find that immigrants who return hold significantly more assets than those who stay in Germany. The average amount of assets that returners take with them when they return to their home country is estimated to range from 115,000DM for Italian immigrants to 193,000DM for Yugoslavian immigrants.

In addition, we used the estimated parameters to assess the impact of a number of policy experiments on savings and return migration decisions. We find that decreasing the replacement rate of the unemployment compensation system is not effective in increasing the return rates of immigrants. Nor is it successful in selecting out the unemployed among those who change their return decision as a result of the policy. On the other hand, targeting the unemployed with financial bonuses conditional on return is more successful in selecting out the unemployed in encouraging return. Financial bonuses conditional on return before immigrants qualify for pension benefits are successful in achieving the intended goal of increasing the return rate of immigrants that return before qualifying. However, many of the extra-returners as a result of the policy are those who would leave anyway in the succeeding years and the policy makes little impact in increasing the cumulative hazard rates after longer periods.

We also find that an increase in German wages, in fact, decreases the survival rate among non-EU immigrants between 10 and 20 years. This is a result of the hump of hazard function becoming even more pronounced because immigrants can save at a faster pace. However, the survivor rate after 20 years of residence for non-EU immigrants and survival rates at

all duration of residences for EU immigrants increase because the substitution effect -the difference between German wages and home country wages increase- dominates the income effect from higher wealth at each period. An increase in wages in Germany noticeably increases the savings of non-EU immigrants and makes their savings profile steeper; whereas, the impact on the savings behavior of EU immigrants is much smaller.

Our simulations also indicate that an increase in the purchasing power parity between Germany and the source countries brings about a remarkable increase in the hazard rates and savings of all immigrant groups. However, immigrants from EU countries are more responsive to the proportional changes in the purchasing power parity. There are stronger decreasing returns in the decrease of the survival rate for EU countries, though.

In the next section, we give background information and review part of the relevant literature. In section 3, we present the model and its solution. Section 4 describes the data and section 5 presents some descriptive analysis. Section 6 covers the estimation method and section 7 has our estimation results. The results of policy experiments and the counterfactuals on the macroeconomic environment are presented in sections 8 and 9, respectively. Section 10 concludes.

2 BACKGROUND AND RELEVANT LITERATURE

The literature has identified a number of determinants of return migration. Borjas and Bratsberg (1996) emphasize that return migration may be part of an optimal life-cycle location decision. At the time they immigrate, migrants realize that after they acquire physical or human capital in the host country, it may be optimal for them to return because the returns to that type of capital are higher in the home country. If the home country has lower prices, the assets that migrants accumulate in the source country will have higher purchasing power at home. Another reason for return migration, noted by Hill (1987), is that migrants have a preference for location. Return migration may also be the result of unexpected events, either in the host country or in the home country (Berninghaus and Siefer-Vogt, 1992). Unexpected changes in earnings or in preferences for living in Germany, for instance due to the death of family members back at home, might alter migrants' decisions.

This study analyzes the behavior of the guestworkers of 1960's and 70's who immigrated to Germany under the bilateral agreements signed by the German government with 5 Mediterranean countries. (3 European Union countries: Greece, Italy and Spain; and 2 non-EU

countries: Turkey and ex-Yugoslavia). The initial goal of the guestworker recruitment system was to have these migrants work in Germany for a limited number of years and replace them with new ones once their permit expired. While most of the migrants in fact went back, some stayed. Paine (1974) reports that, in practice, if these guestworkers maintained their employment status in Germany for a few years, they were able to stay. In 1973, after the oil price shocks, recruitment of new immigrant workers came to a halt. However, immigration continued mostly in the form of family reunification. [7]

The German government actively recruited immigrant workers by opening recruitment posts in the capitals and major cities of these countries. Residents of these countries who were willing to go to Germany registered at these agencies and were matched with employers in Germany. There was a high demand in these countries for immigration to Germany, which meant that German agencies could be selective. According to Martin (1980) "With 10 Turks wanting to work in Germany for each one recruited by employers, the Germans could be selective, and they were. Some 30 to 40 percent of the Turks recruited to work in Germany were skilled workers in Turkey who worked as manual laborers in Germany. By 1970, for example, 40 percent of Turkey's carpenters and stonemasons were employed in Germany, often as assembly line or unskilled workers." Paine (1974) reports a similar experience for Yugoslavia in that most of the urban migrants belonged to the skilled elite rather than the unemployed. Therefore, there was positive selection in the immigration of guestworkers from non-EU countries.

Immigrants constitute a relatively significant part of the German work force. The Federal Ministry of the Interior reports that "1.95m foreigners had a job that made them liable to pay social security contributions in the western federal territory, meaning they account for 8.9 per cent of all gainfully employed persons." Return migration of these immigrants has remained at a significant level. Between 1993 and 1998, around 45,000 Turks returned to Turkey each year on average (Federal Ministry of the Interior). Given that there are around 2 million Turkish immigrants in Germany, this amounts to a 2% annual hazard rate.

As Martin reports, most of these guestworkers took jobs as unskilled workers. Therefore, it is quite unlikely that their goal in moving to Germany was to acquire human capital. Even if they acquired some skills, these skills would be specific to the German labor market, which is a more capital-intensive production environment, and would not fit to the needs of the home country labor market. In addition, based on a survey of Turkish emigrants from

[7] Only 10% of the migrants in our sample entered Germany after 1973.

Germany in Turkey, Dustmann and Kirchkamp (2002) report that only 6 percent worked as salaried workers after return whereas 51 percent of the returners were self-employed. The other 43 percent were retired. Another interesting fact that Dustmann and Kirchkamp report is that the median age of the retirees among the returners was 45. This suggests that some immigrants were able to accumulate enough assets by a relatively early age to spend the rest of their lives as rentiers. The facts that half of these migrants engaged in entrepreneurial activities after return and that most of the rest lived as rentiers suggest a savings motive for immigrating to Germany. If the goal of guestworkers was to accumulate assets, we would expect their savings rates to be high. Based on a empirical investigation of Turkish households in Germany, Kumcu (1989), in fact, finds evidence for very high savings rates.

There is scant empirical evidence concerning the relationship between savings and return migration. Galor and Stark (1990) argue that since migrants who return spend the second part of their life in an environment where the wages and prices are lower, they would save more compared to natives and to migrants who do not plan to go back. The existing empirical research papers on the savings behavior of immigrants - Merkle and Zimmermann (1992), Kumcu (1989) - treat return migration as exogenous. However, Dustmann (1995) shows that treating return decision as exogenous in analyzing the savings behavior of migrants could give false implications in policy experiments. The research on the joint return and savings decisions of immigrants has been theoretical so far. Berninghaus and Seifert-Vogt (1992) provide a theoretical analysis of optimal savings and return migration strategies in a stochastic dynamic model where the cause of return is higher purchasing power parity. Our paper builds on their model by also allowing for location-specific preferences, employment after return and unobserved heterogeneity; and carries out the first empirical investigation of the joint return migration and savings decisions of immigrants. In addition, we provide the first estimates of the response of immigrants to counterfactual policy experiments like changes in the unemployment compensation system.

3 THE MODEL

In this section we present the basic structure of the model and its solution in the dynamic setting. We model the decisions of male household heads. These male household heads are allowed to differ in their permanent unobserved characteristics, in particular with respect to

their preferences for living in Germany and their labor ability.

3.1 Basic Structure

3.1.1 Choice Set

The elements of the choice set are return migration and savings decisions. Each period, immigrants first decide whether to stay in Germany or go back to their home country. If they choose to stay, they also make a decision about how much to save.

3.1.2 Preferences in Germany

Migrants have preferences over consumption (c_t) and location of residence. Their marginal utility of consumption (μ) varies by age as well as by labor market status (l_t). We also allow the marginal utility of consumption to vary by nationality (z) as a function of the average number of children for that nationality. $\rho(.)$ stands for immigrants' psychic cost of living in Germany. This is the difference between the psychic utility in Germany and that in the host country. Immigrants' pyschic cost depends on their duration of residence in Germany as they adjust to the new surroundings and on their permanent characteristics in their preferences for living in Germany.

$$u_t(.) = \mu(age_t, l_t, z)\frac{c_t^{1-\lambda(type)}}{1-\lambda(type)} + \rho(t, type) + \eta_t^s$$

λ is the constant relative risk aversion parameter and η_t^s is a shock to location-specific preferences.

Constraints Given their earnings (y_t) and assets (A_t), migrants make their consumption and savings decisions.

$$\begin{aligned} y_t + (1+r)A_t &\geq c_t + A_{t+1} \\ c_t &\geq c_{\min} \\ A_t &\geq 0 \end{aligned}$$

Above, r is the fixed market rate of interest and $c_{\min}$ is the minimum consumption level, which is equal to the subsistence income set by the German government.[8] Borrowing is not

[8] This is explained in detail in the social assistance section below. A savings choice is feasible as long as the consumption level it implies does not fall below this level.

allowed.[9]

3.1.3 Labor Market Status in Germany

Transitions in the labor market are modeled as stochastic exogenous functions. Before age 60, there are only two states: employed ($l = 1$) and unemployed ($l = 0$). This is determined by a logit regression. After age 60, migrants may enter retirement ($l = 2$), which is an absorbing state. Therefore, employment status is determined by a multinomial logit. Labor market status at each period is assumed to depend on the labor market status in the previous period, age, age at entry to Germany as well as nationality.

$$l_t = L(l_{t-1}, age_t, age_0, z)$$

3.1.4 Income in Germany

Earnings when Employed: Earnings of a migrant, y_t, depend on how much human capital he has acquired and on the rental price of human capital. The level of human capital at any period, H_t, depends on the years of residence and permanent skill characteristics of the migrant.

$$\begin{aligned} y_t &= pH_t \exp(\eta_t^y) \\ H_t &= H(t, type) \end{aligned}$$

where η_t^y is an iid shock to productivity.

Unemployment Benefits and Unemployment Assistance: Migrants who worked for at least 360 days in the last 3 years can receive unemployment benefits, which are equal to 67% of their last net earnings if they have at least one child (60%, otherwise). The entitlement duration varies from 180 to 960 days depending on the age and experience of the worker. However, workers who are no longer eligible for unemployment benefits can receive unemployment assistance. This is equal to 57% of their last net earnings if they have at least one child (53%, otherwise) and there is no limit to the duration of unemployment assistance after the exhaustion of unemployment benefits.

We assume that all unemployed migrants qualified for unemployment benefits at some point in the past by working one year in a period of three years. Therefore, even if their

[9] Migrants are there to save.

unemployment benefits entitlement duration is over, they are eligible for unemployment assistance. We average the replacement rate of unemployment benefits and assistance as 60%. Therefore, we can write earnings conditional on employment status as follows.

$$y_t = 0.6pH_t e^{\sigma_y^2/2} \quad if\ l_t = 0$$

Social Assistance for Subsistence Income: Migrants can also receive social assistance which is provided by the German government to families whose income is not high enough to provide for their basic needs. Eligibility depends on net income and asset holdings. If the sum of monthly net income and asset flows of residents falls below the subsistence income level[10], the government makes up for the difference. Subsistence income for a family depends on its size and varies across states. In 1998, the payment for the head of the household averaged around 520 DM across states. The spouse of the household head receives 80% of this amount and there is an additional payment for each child, which we take as 50% of the standard payment.[11] In calculating the total subsistence income, we take the typical household head as married and allow the number of his children (n) depend on his nationality. Therefore,

$$y_t + rA_t >= 520 * [1.8 + 0.5(no\_child)_z] \quad \text{DM per month}$$

Retirement Benefits: Migrants' social security contributions and, therefore, their retirement benefits depend on their earnings and duration of contribution. As a measure of their earnings, we take their expected earnings at age 60 and adjust this by a fraction (τ) that depends on the duration of contribution, which is determined by their age of entry to Germany.[12]

$$y_t = \tau(age_0)pH_{age=60}e^{\sigma_y^2/2} \quad if\ l = 2$$

[10] According to the German Ministry for Health and Social Services, this subsistence income includes expenses on food, housing, clothing, toiletries, household goods, heating and everday personal necessities, and -within resonable limits- expenses for socializing.

[11] In fact, the rate for children varies from 50% to 90% of the standard payment according to their age. For tractibility, we take this 50%, which is the amount that corresponds to younger children.

[12] It would be a better approximation if we took average earnings rather than earnings at age 60 since the latter does not account for the productivity shocks a migrant receives during his stay in Germany. However, again for tractability we choose the former approach.

3.1.5 Preferences in the Home Country

Once a migrant returns to his home country, he exits the survey. As a result, we have no information on his labor market status, earnings or savings decisions after return. Therefore, we write the utility a migrant receives from returning to his home country to spend the rest of his life there, $V^L(\widetilde{S}_t)$, as a function of the state variables at the time of return. This part of migrants' preferences is deterministic.

3.2 EMPIRICAL SPECIFICATIONS

3.2.1 Risk Aversion Parameter

$$\lambda = \lambda_0 + \lambda_1 I(type2)$$

3.2.2 Marginal Utility of Consumption in Germany

$$\mu_t = \mu_0 + \mu_1 age_t + \mu_2 age_t^2 + \mu_3 n_z age_t + \mu_4 n_z age_t^2 + \mu_5 I(l_t = 1) + \mu_6 I(l_t = 2)$$

where n_z denotes the average number of children for nationality z.

3.2.3 Psychic Costs in Germany

$$\rho_t = \rho_0 + \rho_1 I(type2) + \sum_{i=1}^{3} \rho_{1+i} I(t = i) + [1 + \rho_5 I(type2)] * (\rho_6 t + \rho_7 t^2)$$

Note that both the psychic costs at entry and the acclimatization rate are allowed to change by permanent characteristics.

3.2.4 Bequest Function in Germany

$$B_t(.) = \beta_0 * (1 - \exp(\beta_1 * A_t)) * \beta_2 I(type2) * (1 + \beta_3 n_z)$$

3.2.5 Preferences for Living in the Home Country

$$
\begin{aligned}
V^L(\widetilde{S}_t) \;=\; & \sum_{country=z} \pi_{0z} I(z) \Delta^1_{age} \\
& + \sum_{country=z} I(z)(\pi_1 + \pi_2 p_{age})(1 - \exp[(\pi_3 + \pi_4 p_{age}) ppp^z A_t]) \\
& + I(t >= 3)\Delta^1_{age} \left(\sum_{country=z} I(z) \left(\frac{ppp^z}{ppp^{Turk}} \right) [\pi_5 (1 - \exp(\pi_6 t))] \right) \\
& + \sum_{country=z} I(z) \left(\frac{\hat{w}^z}{\hat{w}^{Turk}} \right) \max\{\pi_7 + \pi_8 age_t + \pi_9 age_t^2, 0\}
\end{aligned}
$$

where ppp^z is the purchasing power parity ratio between Germany and the source country and $\hat{w}^z$ is the expected wages in country z.

$$p_{age} = (76 - age_t)/2$$

is the number of periods left till death.

$$\Delta^1_{age} = \frac{1 - \delta^{p_{age}}}{1 - \delta}$$

is the sum of discount values for the remaining part of one's life.

$$\Delta^1_{age} = I(age_t \geq 60)\Delta^1_{age} + I(age < 60) \left(\frac{1 - \delta^8}{1 - \delta} \right) \delta^{(60 - age_t)/2}$$

is the discount factor for pension benefits, which a migrant can start receiving only after age 60.

The following is an explanation of the terms in the above equation.

1st line: (Country Dummy): This is a discounted sum of per period country dummy which is a measure of the general attractiveness of the source country. It would depend on the source country characteristics like distance from Germany, whether or not the country has a socialist regime, income inequality, amenities and so forth.[13]

[13] This dummy includes the transportation cost of return, which would vary by country of origin according to its distance from Germany. We would not be able to separately identify the effect of monetary cost of moving.

2nd line: (Utility from Assets): The utility from assets includes age interaction terms because in his home country a migrant's per period consumption of the assets he acquired in Germany would depend on the remaining length of his life. Level of assets is interacted with purchasing power parity.

3rd line (Utility from German Pension Benefits): In order to qualify for German pension benefits, one must have worked for at least 5 years (3 periods). Pension benefits depend on migrants' duration of residence. (Periods of unemployment are counted toward pension benefit contribution. Since, in our model migrants are always in the labor market, duration of time in the labor market is equal to duration of residence.) The purchasing power of the German pension benefits would depend on the country in which it is consumed.

4th line (Utility from Potential Earnings at Home): The present discounted value of migrants' utility from their earnings in their home country would depend on their age at return as well as the average earnings level in that country.

3.3 SOLUTION OF THE MODEL

3.3.1 Decision Period

Since the number of the state space points at which the problem needs to be solved depends on the decision horizon, we take the decision period as two years to alleviate the computational requirement. The decision spell starts when a migrant enters Germany and goes until he dies[14] or returns to his home country.

3.3.2 Choice Set

The savings decision, which is a continuous choice variable, is discretized into 10 separate values. $\Delta A = A_{t+1} - A_t = \{\Delta A_1, \Delta A_2, .., \Delta A_{10}\}$ where ΔA denotes the discretized level of savings. Therefore, the choice set has 11 elements:

$\{\{m_t = 1\}, \{m_t = 0, \Delta A = \Delta A_1\}, .., \{m_t = 0, \Delta A = \Delta A_{10}\}\}$ where m_t denotes the return migration choice.

3.3.3 State Variables

- assets: A_t
- lagged labor market status: l_{t-1}

[14] We assume that all migrants die at age 75.

- duration of residence: t
- age at entry: age_0
- nationality: z
- duration of residence at 1983: t_{1983}
- permanent characteristic: $type$ [15]
- $\boldsymbol{\eta}_t = (\eta_t^s, \eta_t^y)$: vector of contemporaneous shocks to location-specific preferences and earnings. These shocks have the following joint distribution.

$$\begin{pmatrix} \boldsymbol{\eta}_t^s \\ \eta_t^y \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_s^2 & . \\ \sigma_{sy} & \sigma_y^2 \end{pmatrix}\right)$$

Initial Conditions: $\{A_0, age_0, l_{-1} = 1\}$

Let $S_t = (\boldsymbol{\eta}_t, \widetilde{S}_t)$ denote the state variables where
$\boldsymbol{\eta}_t = (\eta_t^s, \eta_t^y)$ and $\widetilde{S}_t = (A_t, l_t, , t, age_0, z, t_{1983}, type)$.

3.3.4 Solution of the Migrants' Problem

Migrants maximize the present discounted value of their lifetime utility. We write the migrants' problem in a dynamic programming framework and solve it by backward induction.

Given the current realizations of their earnings and location specific preferences, migrants calculate the value of staying in Germany and the value of returning to the home country and make their decisions accordingly.

$$V_t(S_t) = \max\{V_t^S(S_t), V_t^L(\ \widetilde{S}_t)\}$$

Above, $V_t^S(S_t)$ denotes the value of staying and $V_t^L(\ \widetilde{S}_t)$ denotes the value of leaving for the home country.

Value of Staying in Germany The value of staying can be written as the maximum over the value functions that correspond to the different savings alternatives.

$$V_t^S(S_t) = \max\{V_t^{S,1}(S_t), V_t^{S,2}(S_t), .., V_t^{S,10}(S_t)\}$$

[15] We group migrants into a finite number of types according to their permanent characteristics.

We can rewrite this in the following Bellman equation form according to the structure of our model.

$$\begin{aligned} V_t^S(S_t) &= \max_{A_{t+1}} \{u(A_{t+1}, \boldsymbol{\eta}_t) + \delta E_t V_{t+1}(S_{t+1})\} \\ s.t. \qquad & c_t + A_{t+1} \leq y_t + (1+r)A_t \\ & c_t \geq c_{\min}, \qquad A_t \geq 0 \end{aligned}$$

where δ is the discount factor. The solution to this problem is given by the following decision rule:

$$A_{t+1} - A_t = D(S_t)$$

The last period in the problem, the Bellman equation we solve is slightly different in the sense that the continuation value is now a bequest function that depends on the level of assets, type and average number of children for that nationality.

$$\begin{aligned} V_T^S(S_T) &= \max_{A_{T+1}} \{u(A_{T+1}, \boldsymbol{\eta}_T) + \delta B(A_{T+1}, type, z)\} \\ s.t. \qquad & c_T + A_{T+1} \leq y_T + (1+r)A_T \\ & c_T \geq c_{\min}, \qquad A_T \geq 0 \end{aligned}$$

4 DATA

The data set we use is the German Socio-Economic Panel (GSOEP). This is a longitudinal dataset of households in Germany that contains an oversampled group of immigrants from five Mediterranean countries, of which three are members of the European Union (Greece, Italy and Spain) and two are not (Turkey and Ex-Yugoslavia). We use the 2000 version of the GSOEP, which contains annual information from 1984 to 2000 on return migration, earnings, labor market status and savings[16] as well as retrospective information on labor market status. There are 1326 households in the initial sample.

There are two shortcomings in this data set. One is that the initial sample of immigrants is a random sample of the immigrants in Germany in 1984. Since some immigrants already returned to their home country by 1984, this is not a random sample of the initial cohorts of immigrants. Therefore, the information on their return behavior, for instance, within the first ten years only comes from the immigrants who entered Germany after 1975. (The first return we observe is in 1985.) This implies that when we compute the Kaplan-Meier hazard functions for return, we assume that there are no cohort effects.

Another issue in the data with regard to our model is that there is no information about asset holdings. However, we do know their annual savings. To deal with this problem, we use a particular estimation method that solves the problem of missing state variables in dynamic panel data models.

The sample we use is restricted to males who entered Germany after the age of 18. We want to analyze the behavior of immigrants who made the choice to immigrate to Germany. That is why we drop the immigrants who were younger than 18 at the time of entry to Germany, who presumably could not have made the decision to migrate themselves, but were tied movers along with their family. After this restriction, we are left with 1040 household heads.

[16] Savings information is available only after 1991.

5 DESCRIPTIVE STATISTICS

5.1 RETURN DECISION

5.1.1 Kaplan Meier Survival and Hazard Functions According to EU Status:

Figure 5.1.1 displays the survivor function conditional on staying for one period (two years) according to EU status.[17] There is a significant difference in the return behavior of EU and non-EU migrants. Migrants from wealthier countries (EU countries) are more likely to go back. Conditional on staying for 2 years, 45% of the non-EU migrants return within the next 40 years while around 75% of the EU migrants return.

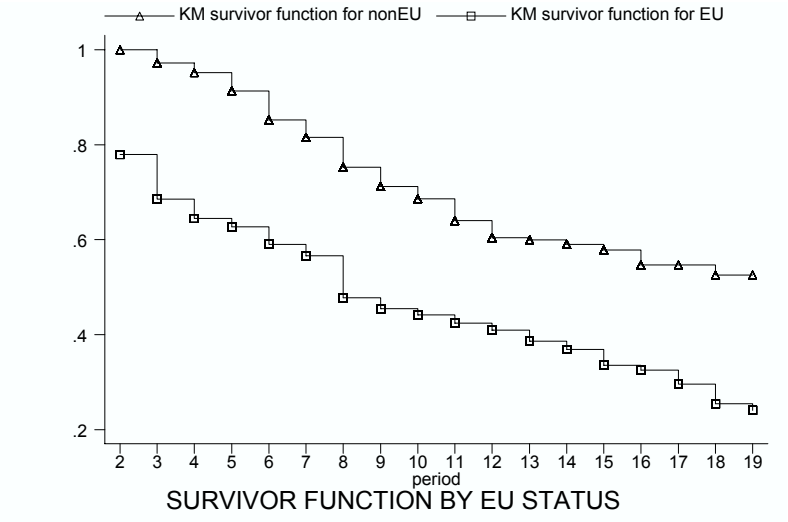


FIGURE 5.1.1

In order to examine the differences in the timing of return migration according to EU status, we next compare the hazard functions.

[17] We do not show it for the 1st period and after the 19th period because the sample sizes are too small. In addition, for non-EU migrants, return at very early years of residence may not be a choice but rather an obligation. (One can apply for permanent residence permits after 5 years.) Among the non-EU migrants, the earliest return we observe is at the 2nd period (2-4 years). Therefore, it is assumed that somebody who survives 2 years in Germany can freely make his return choice. Paine (1974) reports that, in practice, migrants who survived the first couple of years in Germany were able to stay.

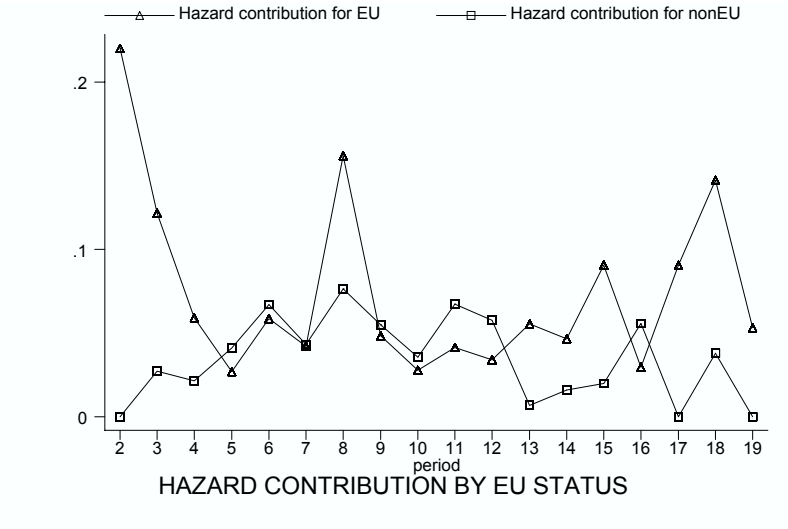


FIGURE 5.1.2

Figure 5.1.2 displays a comparison of the Kaplan-Meier hazard functions according to EU status. We see a difference in the hazard rates of EU and non-EU migrants up to the 4th period (within the first 8 years) and again after 13th period (after 24 years of residence). Between 8 to 24 years of residence, there is no significant difference in the return behavior according to the EU status. Higher return rates in earlier periods for EU migrants suggests that disappointment factor plays a stronger role in the return of EU migrants. Since the opportunity cost of returning, the wage differential between Germany and the home country, is smaller for EU migrants, there is a smaller difference between the value of staying and value of leaving. Therefore, a negative shock to either the earnings or the preferences is more likely to push the value of leaving above the value of staying. Another important difference in the hazard functions is that while the return rates show a downward trend for non-EU migrants after 11th period, they actually increase for EU migrants.

5.2 SAVINGS DECISION

Figures 5.2.1 and 5.2.2 display savings and income profiles of all immigrants by quartiles [18] Savings of immigrants demonstrate a clear downward trend over their duration of residence. Their income levels play no role in this decline as we can see from the income graph that migrants' median income, in fact, rises until the 11th period. The savings profile of immigrants

[18] We have no information on savings for less than 5 periods since the survey contains this information only after 1991. The figure for income is drawn for the same periods for comparison.

is relatively constant between the 9th and 16th periods, before decreasing again after 16th period. During this stage, after 10 periods, savings behavior is more parallel with income levels.

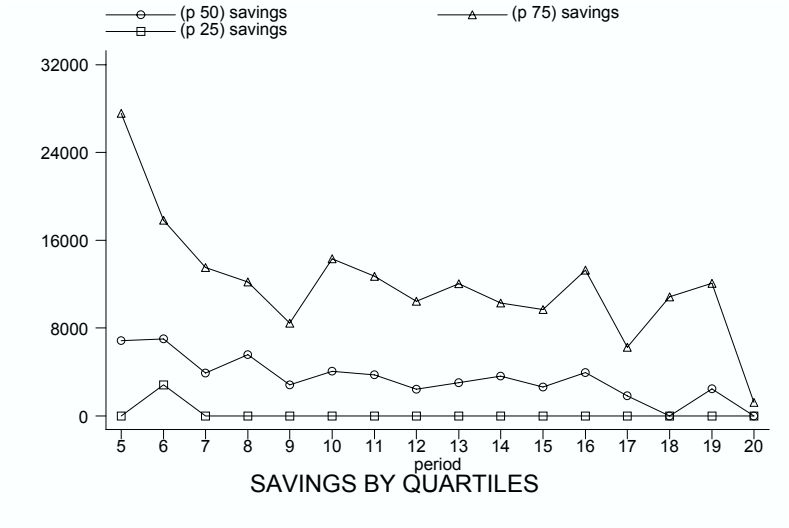


FIGURE 5.2.1

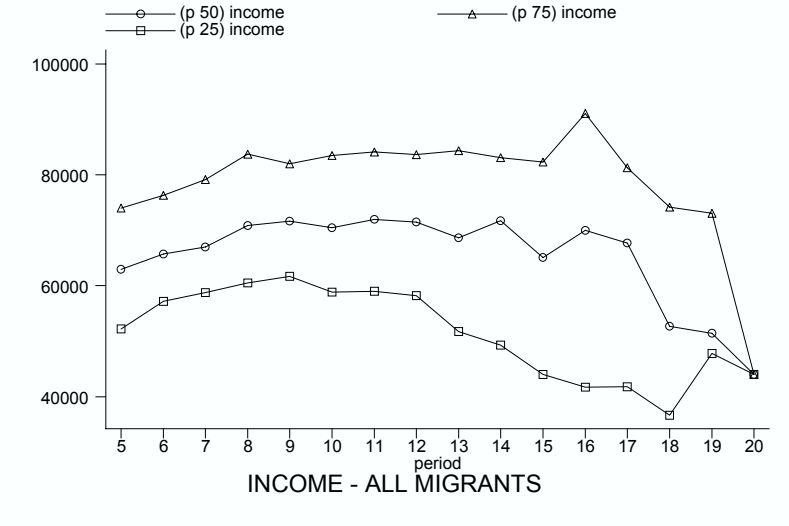


FIGURE 5.2.2

Selection in return migration could be one reason for the decrease in immigrants' savings. If the return is in fact part of an optimal life cycle plan of asset accumulation in the host country, we would expect the returners to save more than the stayers. After the 10th period, this trend becomes much weaker as the fraction of people with high propensity to return in

the sample decreases. Now, most migrants' savings behavior is more like natives' savings behavior. It more closely follows their income profile and there is a downward trend at old age.

One confounding factor may be the time effects on migrants' income. A higher fraction of the people for whom we utilize the information to draw the above graph on the left-hand side come from later year-of-entry cohorts. Therefore, they potentially have higher lifetime incomes which would allow them to save more. However, the initial downward trend is too precipitous for this to be the case and this would not explain why the profile levels off after some time before decreasing at the end again.

5.2.1 Savings By EU Status

A disaggregation of savings and income behavior according to immigrants' EU status is illustrated below in Figures 5.2.3 and 5.2.4**.** The most striking fact when we compare the savings behavior of EU and non-EU migrants is the difference in the profiles over duration over residence. There is a significant decrease in the savings of non-EU migrants while the savings of EU migrants seem to be relatively constant over time. Between the 5th and 8th periods, non-EU migrants save on average more than EU migrants even though their income levels are very similar. However, after the 11th period, EU migrants save more than non-EU migrants despite similar levels of income on average.

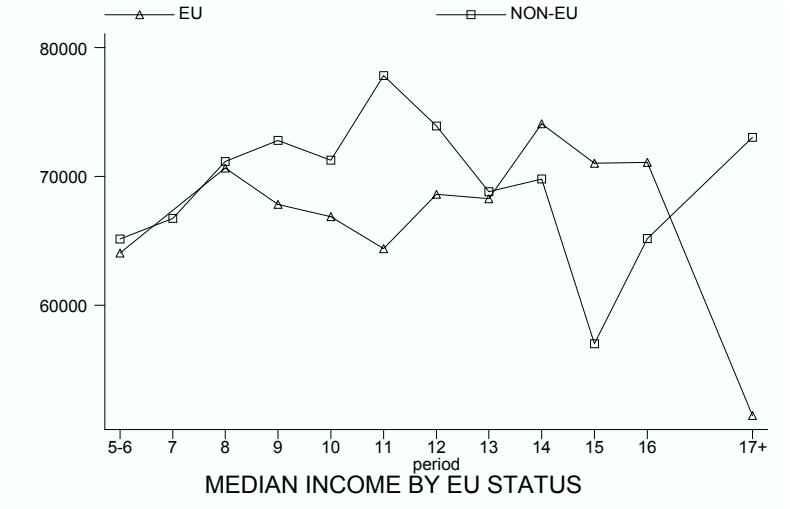


FIGURE 5.2.3

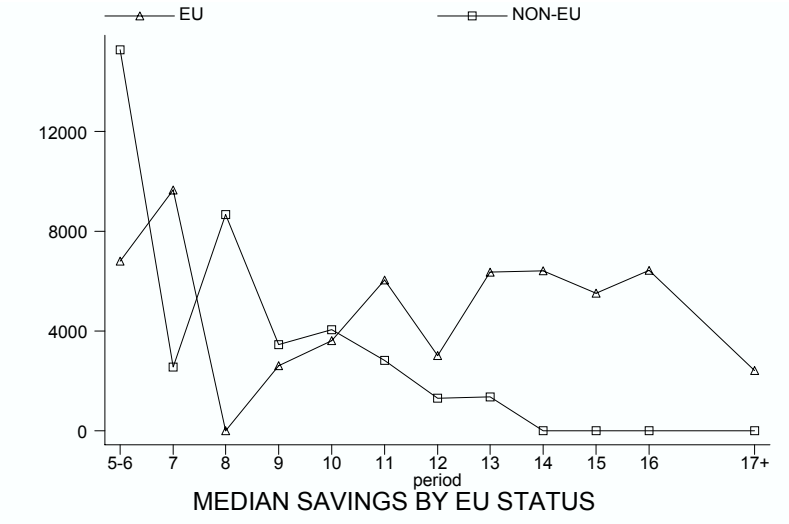


FIGURE 5.2.4

This savings behavior seems to be consistent with the hazard rates shown above in a model where the motivation to return comes from accumulated assets. The hazard function for the non-EU migrants reaches the peak of its hump at the 8th period. What we see in the above savings profile is that their savings are the highest before 8th period. After the 8th period, as the savings profile moves downward, the return rate also goes down for non-EU migrants. After the 12th period, both the return rates and savings of non-EU migrants are much lower than those of EU migrants. This suggests that a much smaller fraction of people with high propensity to return is left in the sample for non-EU migrants during this time. On the other hand, the hazard function for EU migrants displays an increase after the 12th period. When we look at their savings behavior, we see that EU migrants maintain their previous level of savings in this interval. This suggests that unlike the non-EU migrants, there still exists a sizeable proportion of returners in the pool of EU migrants even after the 12th period.

6 ESTIMATION METHOD

The outcomes we observe in the data are:

- the return migration choice made by the migrant. (m_t)
- the savings choice made by the migrant. $(A_{t+1} - A_t)$
- the earnings of the migrant. (y_t)
- the labor market status of the migrant. (l_t)

Let $\{O_i\} = \{D_i, X_i\}$ denote observed outcomes for individual i, where $D_i = \{d_{it}\} = \{\{m_{it}\}, \{A_{it} - A_{it-1}\}\}$ is the history of observed choices and $X_i = \{x_{it}\} = \{\{l_{it}\}, \{y_{it}\}\}$ is the history of observed exogenous covariates.

The data are:

$$When\ m_{T_i} = 1 \qquad \mathbf{O}_i^{obs} = \{\{m_{it}\}_{t=1}^{T_i}, \{A_{it} - A_{it-1}\}_{t=t_{i,1991}}^{T_i-1}, \{l_{it}\}_{t=1}^{T_i-1}, \{y_{it}\}_{t=t_{i,1983}}^{T_i-1}\}$$

$$When\ m_{T_i} = 0 \qquad \mathbf{O}_i^{obs} = \{\{m_{it}\}_{t=1}^{T_i}, \{A_{it} - A_{it-1}\}_{t=t_{i,1991}}^{T_i}, \{l_{it}\}_{t=1}^{T_i}, \{y_{it}\}_{t=t_{i,1983}}^{T_i}\}$$

where $t_{i,19xx}$ is the period number for individual i in 19xx and $\overline{T}_i$ is the last period in the sample for individual i. If the return choice is to leave, for that period we do not observe the other outcomes.

One of the endogenous state variables, assets, is not observed. Therefore, we use the method introduced by Keane and Wolpin (2001) for estimating dynamic panel data models with unobserved endogenous state variables. Typically, calculation of the probabilities that form the likelihood function requires conditioning on past state variables. The novel feature of this method is that it obviates the need to calculate these conditional probabilities. The underlying idea of this estimation method is to minimize the distance between the simulated and reported outcomes. A measure of the distance between the simulated and reported outcomes is constructed by assuming that the observed outcomes are measured with error. In a recent paper, Keane and Sauer (2003) show that this estimator has good small sample properties in a more extended setting.

The key assumption, therefore, is that the observed outcomes are measured with error. By acknowledging the existence of measurement errors (classification errors in the case of discrete outcomes), we are incorporating into our likelihood calculation, for instance, the

fact that when a migrant is observed as employed, there is a positive probability that he was in fact unemployed, but his employment status was classified incorrectly in the data. In the case of observed earnings and savings, we take a similar approach; however, in this case the measurement errors have continuous distributions.

6.1 Generation of Simulated Outcomes

- For each individual and period, draw N shocks. $\left\{\left\{\{\varepsilon_t\}_{t=1}^{T_i}\right\}_{n=1}^{N}\right\}_{i=1}^{I}$
- Using the initial state variables and sequence of shocks drawn, simulate N choice histories,$\left\{\{m_t, (A_{t+1} - A_t)\}_{t=1}^{T_i}\right\}_{n=1}^{N} = D^{sim}$, and histories for exogenous covariates, $\left\{\{e_t, y_t\}_{t=1}^{T_t}\right\}_{n=1}^{N} = X^{sim}$ for each individual i.
- Using the simulated values[19], construct the unbiased classification error rates for the discrete outcomes. (See Appendix B for the specifications of these classification errors.)

6.2 Likelihood Function

$$\mathcal{L}(\Theta) = \prod_{i=1}^{I} P(\mathbf{O}_i^{obs}|\Theta)$$

The contribution to the likelihood of individual i is calculated by the below simulator, which is the probability of observing the reported outcomes conditional on the simulated outcomes averaged over the N simulated choice histories.

[19] We do not have information on assets at the time of entry to Germany. The very fact that these people chose to immigrate to Germany suggests that they did not hold significant assets when they entered Germany. However, in order to capture the differences in this that may arise due to differences at age of entry or country of origin, we write it as a deterministic function in these two variables.

$$A_0 = \alpha_0 + \alpha_1 I(z \geq 3) + \alpha_2 age_0 + \alpha_3 age_0 I(z \geq 3)$$

$I(z \geq 3)$ stands for EU countries.

$$\widehat{P}(O_i^{obs}) = \frac{\sum_{n=1}^{N} P((D_i^{obs}, X_i^{obs})|(D_{in}^{sim}, X_{in}^{sim}))}{\sum_{n=1}^{N} I(\{m_{it}\}_{t=1}^{t_{1983}} = 0)}$$

Note that $P((D_i^{obs}, X_i^{obs})|(D_{in}^{sim}, X_{in}^{sim})$ is not conditional on any of the state variables. Therefore, we can calculate this probability even if we do not observe some of the state variables.

Unobserved heterogeneity enters the estimation in the following way: We assume that there is a finite number (K) of type groups. Each individual i may belong to any of these type groups, 1 to K. It is the probability of being a certain type that differs across individuals. Therefore, when we generate the simulated outcomes for individual i and calculate the above simulator, we do it for all types. Then, the likelihood contribution for this individual is calculated as the weighted average of the above simulator over the probabilities of his belonging to each type.

$$\widehat{P}(O_i^{obs}) = \sum_{k=1}^{K} \kappa_{i,k} \left(\frac{\sum_{n=1}^{N/K} P(O_i^{obs})|(O_{ikn}^{sim}))}{\sum_{n=1}^{N/K} I(\{m_{it}\}_{t=1}^{t_{1983}} = 0)} \right)$$

where $\kappa_{i,k}$, the probability of individual i being of type k, is specified as a logit with age at entry and country of origin as arguments.

$$\kappa_k = \kappa(age_0, z, t_{1983})$$

The probability of observing the reported spells conditional on the simulated spells can be written as follows.

$$P((D_i^{obs}, X_i^{obs})|(D_{in}^{sim}, X_{in}^{sim})) =$$
$$P(M_i^{obs}|M_{in}^{sim}) \prod_{t=1}^{T_i} \Pr(A_{it} - A_{it-1})^{obs}|(A_{int} - A_{int-1})^{sim}] \Pr(y_{it}^{obs}|y_{int}^{sim}) \Pr(l_{it}^{obs}|l_{int}^{sim})$$

We use the measurement error distributions and classification error rates to calculate these probabilities. See appendix B for these calculations. For the optimization method, we use the Downhill Simplex Algorithm.

7 RESULTS

In this section, we present our maximum likelihood estimation results based on the full solution of the dynamic model.

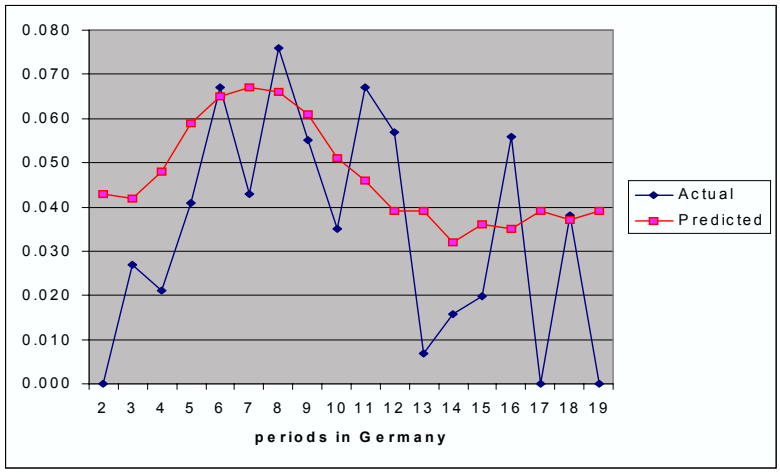
7.1 Model Fit

We first illustrate and discuss how our model's predictions as to the return migration and savings behavior of immigrants fit the observed features of the data.

7.1.1 Return Migration

Hazard Contribution By EU Status Figure 7.1.1 compares the actual and predicted hazard contribution for non-EU immigrants Both the level and the shape of the predicted hazard function match the data reasonably well. Our model certainly captures the hump shape of the hazard function. The only significant difference between the actual and predicted hazard rates exist within the first 5 periods. The sample size is rather small in this range since most of the immigrants in our sample entered Germany before 1973. The low hazard rates in the sample is probably due to the size of the sample.[20]

FIGURE 7.1.1: HAZARD CONTRIBUTION FOR NON-EU IMMIGRANTS

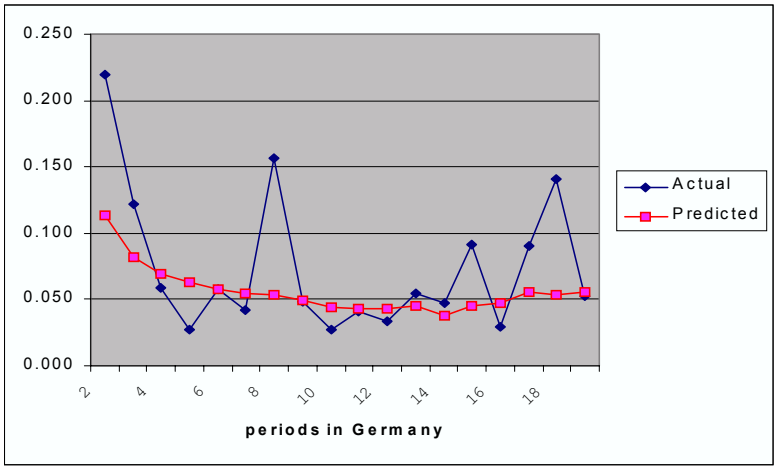


The model matches the hazard function of EU migrants well as shown below in Figure 7.1.2. It captures the decreasing profile in the early part of the graph. The predicted levels in

[20] Paine (1974) reports much higher hazard rates in the early periods for non-EU migrants.

the 2nd and 3rd periods are somewhat lower, though.[21] The model also matches the steady hazard rates around 5% in the middle part of the graph. Even though the predicted hazard rates exhibit an increase after the 15th period, it is weaker compared to what we observe in the data. The spike in the data after the 15th period could also be due to the smaller sample size in this range.

FIGURE 7.1.2: HAZARD CONTRIBUTION FOR EU IMMIGRANTS



Survival Rates By Nationality In Table 7.1.1, the model's predictions on survivor rates after 20 periods are compared to the actual values by nationality. [22] As can be seen from the table, the predictions match the actual values very well for all nationalities.

TABLE 7.1.1: SURVIVOR RATES AFTER 40 YEARS

	Turkish	Yugoslavian	Greek	Italian	Spanish
Actual*	30.4%	58.7%	22.6%	30.7%	21.5%
Predicted	30.0%	57.7%	22.4%	30.5%	22.0%
* Actual values are parametric (log-logistic).					

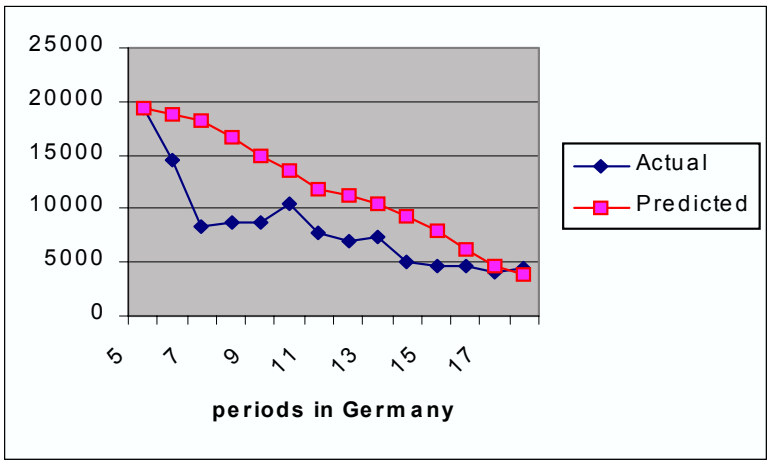
7.1.2 Savings

Figures 7.1.3 and 7.1.4 display how the predicted savings from our model compare to the actual savings according to immigrants' EU status.

[21] The sample size is small for these periods.

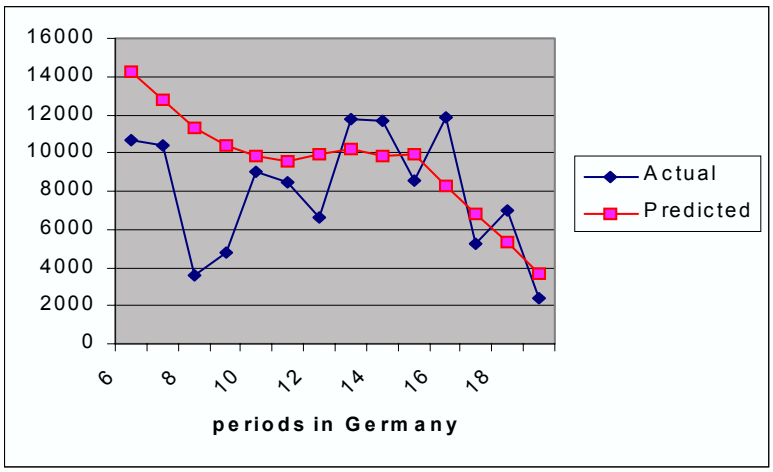
[22] The actual survivor rates are parametric as the sample size by nationality is too small to calculate nonparametric hazard rates.

FIGURE 7.1.3:MEAN SAVINGS FOR NON-EU IMMIGRANTS



Our model captures the downward sloping profile of the mean savings of non-EU migrants. However, the level of savings is significantly overpredicted between the 7th and 10th periods and somewhat overpredicted between the 11th and 17th periods. In terms of fitting the level of savings, we do much better with the EU migrants. Except for the 8th and 9th periods, our predictions are close the values in the data. In addition, our model also captures the flatness of the savings of the EU migrants until the 16th period -there is a somewhat of a slope at the beginning in our predictions, though-.as well as the downward slope after that.

FIGURE 7.1.4:MEAN SAVINGS FOR EU IMMIGRANTS



7.2 Interpretation of Types

There are two types of immigrants, distinguished with respect to their permanent characteristics as to their psychic cost of living in Germany, their risk aversion and bequest motive. The estimated parameters indicate that type 1's have a higher psychic cost at time zero that decreases at a faster rate by duration of residence in Germany. Their psychic cost at all periods of residence is higher despite the faster decline. Type 1's are also more risk averse; but have a weaker bequest motive.

In order to better understand the dynamics underlying the return migration and savings behavior of immigrants illustrated above and to interpret the results of the policy experiments of next section, we should understand the differences in the behavior of the two types. We should also keep in mind that differences in the out-migration rates change the percentage of each type in the population over time.

Table 7.2.1 reports the hazard contribution for type 1 immigrants. Examining the hazard rates of type 1 immigrants reveals a hump-shaped profile. The peak of the hump varies by nationality. For non-EU migrants who face lower prices after return, the peak takes place earlier (9th to10th periods) compared to that for EU migrants(11th to 12th periods). The level of the hazard rates and the peak is higher for EU migrants. We also observe that the hazard rates for EU migrants in the earlier periods are very high. The biggest difference between the hazard rates of EU and non-EU migrants is in these earlier periods. This difference dies down as the number of periods increases. Another interesting fact is that even though the survivor rate of type 1 Spanish immigrants after 20 periods (0.6%) is lower than that for type 1 Italian immigrants (0.7%), the hazard rate in the initial periods for Italian migrants is much higher. This is mostly due to higher expected earnings in Italy. In the initial periods -when most of the immigrants are young-, the expected earnings back at home has a stronger bite.

TABLE 7.2.1: HAZARD CONTRIBUTION OF TYPE 1 IMMIGRANTS

Period	Turkish	Yugoslavian	Greek	Italian	Spanish
1	0.099	0.018	0.212	0.319	0.231
2	0.086	0.022	0.174	0.263	0.195
3	0.091	0.030	0.164	0.230	0.185
4	0.107	0.046	0.166	0.222	0.191
5	0.139	0.077	0.184	0.213	0.207
6	0.166	0.099	0.199	0.224	0.228
7	0.197	0.122	0.225	0.247	0.263
8	0.221	0.139	0.248	0.260	0.280
9	0.244	0.141	0.257	0.262	0.299
10	0.240	0.128	0.252	0.256	0.293
11	0.250	0.113	0.267	0.260	0.309
12	0.221	0.091	0.251	0.285	0.315
13	0.211	0.085	0.245	0.259	0.281
14	0.141	0.056	0.173	0.221	0.215
15	0.155	0.052	0.196	0.207	0.207
16	0.097	0.048	0.101	0.140	0.197
17	0.063	0.041	0.076	0.120	0.143
18	0.087	0.034	0.106	0.153	0.198
19	0.061	0.030	0.069	0.107	0.151
20	0.037	0.032	0.032	0.104	0.134

On the other hand, the hazard rates of type 2 immigrants are much lower. As can be seen from Table 7.2.2, even after 40 years of residence, more than half of the type 2 immigrants remain in Germany for all nationalities. This implies that as the number periods increase, the fraction of type 2 immigrants will increase as well. As a result, the behavioral features of type 2 immigrants will start to dominate. Since the hazard rates for type 1 EU immigrants are higher, this effect will be stronger for EU immigrants.

TABLE 7.2.2: SURVIVOR RATES AFTER 40 YEARS BY TYPE

	Turkish	Yugoslavian	Greek	Italian	Spanish
Type 1	0.040	0.229	0.018	0.007	0.006
Type 2	0.631	0.864	0.544	0.531	0.530

When we examined the hazard functions according to migrants' EU status, we observed that non-EU migrants of all types had a hump-shaped hazard profile whereas EU migrants of all types had a downward sloping profile that got leveled off after some time. The reason to this is the change in the type composition as explained in the above paragraph. As can be seen from Table 7.2.3, the out-selection of type 1 immigrants is stronger among EU immigrants; therefore, the hazard rates of type 2 immigrants start to dominate much earlier, pulling the hump-shaped profile of type 1 immigrants to much lower levels. In addition to

that, the hump of the type 1 EU immigrants take place at a later period compared to the hump of type 1 non-EU immigrants; therefore, there has been stronger out-selection of type 1 EU immigrants during the hump range.

TABLE 7.2.3: PROPORTION OF TYPE 1 IMMIGRANTS BY PERIOD

period	Turkish	Yugoslavian	Greek	Italian	Spanish
0	0.768	0.537	0.868	0.530	0.834
4	0.690	0.509	0.753	0.266	0.680
8	0.506	0.396	0.550	0.118	0.423
12	0.271	0.285	0.294	0.042	0.160
16	0.182	0.244	0.184	0.020	0.074
20	0.175	0.235	0.176	0.015	0.051

Table 7.2.4 reports the mean savings of type 1 immigrants. Given their income and minimum consumption level determined by their family size, these immigrants basically save whatever they can. On average, their savings rate is almost around 40% till the 10th period. [23] Spanish and Yugoslavian immigrants can save more each period mainly due to their higher earnings and smaller family size. Another important thing to notice in this table is the timing of the fast decline. The decline takes place earlier for Turkish and Yugoslavian immigrants who face lower prices after they return to their home country.

TABLE 7.2.4: MEAN SAVINGS OF TYPE 1 IMMIGRANTS

Period	Turkish	Yugoslavian	Greek	Italian	Spanish
0	22,863	31,354	23,455	23,090	32,285
1	25,318	33,623	25,941	25,633	34,577
2	26,951	34,791	27,618	27,281	36,249
3	27,944	35,874	28,643	27,899	36,913
4	29,345	37,526	30,247	29,968	39,366
5	31,201	40,153	32,033	31,323	41,410
6	31,691	41,229	32,831	32,214	42,558
7	33,708	41,964	35,156	35,073	45,453
8	33,361	35,114	35,009	35,137	45,106
9	34,159	22,575	36,251	36,002	44,944
10	29,309	11,393	32,766	35,444	37,780
11	17,867	3,878	24,753	32,862	25,572
12	7,075	514	13,596	27,833	13,812
13	1,408	136	4,806	18,782	4,734
14	317	76	733	8,008	532
15	121	80	16	1,792	18

[23] In fact, such high savings rates have been reported in the literature of guest-workers. (Kumcu, Paine(1974))

On the other hand, the savings profile of type 2's is rather flat and the levels are much lower. Per period savings of type 2 immigrants of all nationalities never exceed 15,000DM and are lower than 10,000DM for most of the range. The reason that we observe a stronger downward slope in the savings profile of non-EU immigrants is the same reason as above. Since type1 EU immigrants have higher hazard rates compared to type 1 non-EU immigrants, non-EU migrants have a higher fraction of type 1's left after the 5th period . As a result, the savings behavior of type 1 immigrants, a downward sloping profile, is more prominent among the non-EU migrants.

7.3 Implications of the Results

Here, we discuss two important implications of immigrants' return and savings behavior. One is important from the host country's perpective, the timing of immigrants' return pertaining to the social security system in the host country, and the other is important from the source countries' perpective, how much assets immigrants bring with them when they return.

7.3.1 Social Security Contributions and Benefits

An important policy question from the host country's perpective is what fraction of these immigrants leave before they qualify for pension benefits. Table 7.3.1 presents the cumulative hazard rates -one minus the survival rates- by the end of second and third periods. The reason we choose the second and third periods is that, in Germany, the minimum number of years of labor market experience to qualify for pension benefits is 5 years. All immigrants who left by the end of the second period (within the first 4 years) did not qualify before they left. Some of the immigrants who left in the third period (fifth or sixth year of residence in Germany) did not qualify as well.

TABLE 7.3.1: CUMULATIVE HAZARD RATES

	EU	Non-EU
2nd period	27.7%	9.3%
3rd period	33.7%	13.1%

As we see from the above table, almost a third of EU immigrants leave before they qualify; whereas, the fraction is around one tenth for non-EU immigrants. Of course, in terms of immigrants contributions and withdrawals from the social security contribution, the timing of return of immigrants is important even after they qualfy for benefits because although an

immigrant who returns after 6 years of residence[24] will receive benefits, these benefits will be very small.

7.3.2 Asset Accumulation

Figure 7.3.1 compares the asset levels of stayers and returners for Turkish immigrants. We see that immigrants who choose to return hold significantly higher assets. Although it is shown here only for Turkish immigrants, it holds for all other nationalities as well.

We observe a peak because in that range most of the leavers are type 1 immigrants, who have high propensity to save and those who leave at later periods have higher assets simply because they took a longer time to do so. However, as type 1 immigrants get older and there remains a shorter lifetime horizon, their savings rate goes down. In addition, among the type 1's, the ones with higher assets are selected (already returned). Therefore, their asset profile becomes flatter and eventually goes down. Moreover, at later periods there is a higher proportion of type 2 immigrants among the returners. Because of these three factors, the assets profiles of returners take a sharp downturn.

FIGURE 7.3.1: ASSET LEVELS OF STAYERS AND RETURNERS: TURKISH IMMIGRANTS

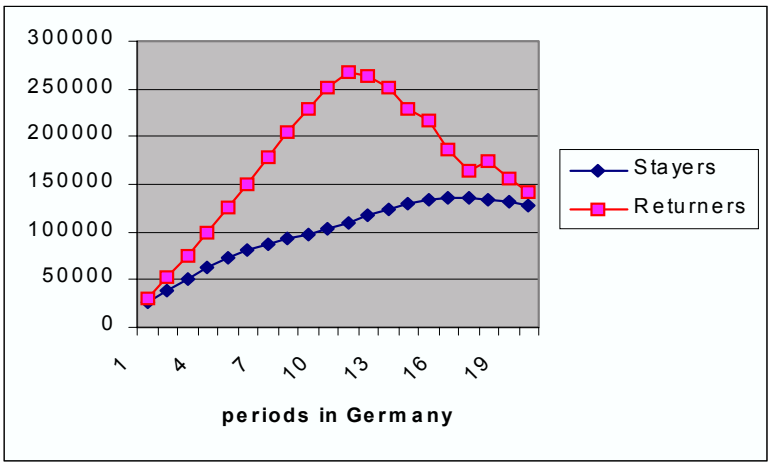


Table 7.3.2 reports the average asset level of a returner (which is calculated by weighting the values in the above graph by the hazard rates). Even though the average level of assets

[24] Since everybody is willing to be employed in our model, duration of residence is equal to the duration in the labor market. In Germany, periods of unemployment are included in the social security contribution period.

of a Spanish return migrant is lower than that of non-EU returners, when we look at the assets profile of the returners over duration of residence, we see that at each period Spanish return migrants take home more assets. However, the average over the all periods is lower because a much higher fraction of Spanish immigrants return home at the early periods.

TABLE 7.3.2: AVERAGE ASSET LEVEL OF A RETURNER

Turkish	Yugoslavian	Greek	Italian	Spanish
156,085	193,955	130,363	115,548	153,922

Table 7.3.3 reports the average assets that return to the host country from all immigrants that leave for the host country. Spanish workers who leave their country to work in the host country bring back the highest amount of assets because they are more likely to return and their returners accumulate more assets in the host country. Despite the fact that Greek immigrants are more likely to return compared to Turkish immigrants, Turkish immigrants bring back more due to higher assets of their returners.

TABLE 7.3.3: AVERAGE RETURN ASSET LEVEL FROM ALL IMMIGRANTS

Turkish	Yugoslavian	Greek	Italian	Spanish
109,260	82,043	101,162	80,306	120,059

8 POLICY EXPERIMENTS

8.1 Changes in the Replacement Rate of Unemployment Benefits

Table 8.1.1 reports how the return behavior of immigrants respond to the changes in the replacement rate of the unemployment compensation system. The experiments indicate that migrants' return decision is relatively sensitive to the replacement rate. A drop in the replacement rate from 0.6 to 0.5 decreases the survivor rate after 40 years among Turkish migrants from 30.0% to 28.6%. Although the unemployment rate among the Italian and Spanish immigrants is much lower, this policy is almost as effective in decreasing their survivor rate. It goes down from 30.5% to 29.3% for Italian immigrants and from 22.0% to 21.4% for Spanish immigrants. On the other hand, the policy is much less effective with the Yugoslavian workers despite their higher unemployment rates compared to the Italian and Spanish immigrants.

Decreasing the replacement rate further below 0.5 to 0.4 has no effect on the survivor rate of Turkish immigrants whereas it is still effective on the Italian and Spanish immigrants. This result is due to the social assistance that the German government provides which makes sure that immigrants' income do not fall below the subsistence level. As shown in the model section, this assistance depends on migrants' family size. Since Turkish migrants have on average larger families, their subsistence income is higher. Consequently, as we decrease the unemployment replacement rate, this subsistence income becomes binding at a higher replacement rate for Turkish immigrants. For instance, decreasing the replacement rate even more to 0.3 has little effect on the survivor rate of any immigrant group. Once we lower it to 0.2, there is no effect at all.

TABLE 8.1.1: EFFECT OF REPLACEMENT RATE ON THE SURVIVOR RATE AFTER 40 YEARS

	Turkish	Yugoslavian	Greek	Italian	Spanish
0.6(Baseline)	30.0%	57.7%	22.4%	30.5%	22.0%
0.55	29.3%	57.5%	22.2%	29.9%	21.7%
0.5	28.6%	57.2%	22.1%	29.3%	21.4%
0.4	28.6%	56.7%	22.0%	28.6%	20.7%
0.3	28.6%	56.5%	22.0%	28.6%	20.6%
0.2	28.6%	56.5%	22.0%	28.6%	20.6%

The interesting result from this policy experiment is that it has a stronger impact on immigrants from EU countries despite their lower unemployment rates. One reason to this, as explained above, is the fact that the subsistence benefits EU migrants receive is lower due to their smaller family size. As a result, the policy changes the income levels of a larger fraction of EU migrants. However, even before the subsistence income becomes binding, when we decrease the replacement rate to 0.5, for Italian and Spanish immigrants the program is more effective compared to Yugoslavian immigrants, who have higher unemployment rates, and as much effective as it is for Turkish immigrants, who have much higher unemployment rates. Understanding this result requires further investigation of the effect of the policy experiment by type.

TABLE 8.1.2: EFFECT OF REPLACEMENT RATE ON THE SURVIVOR RATE AFTER 40 YEARS BY TYPE

		Turkish	Yugoslavian	Greek	Italian	Spanish
Type 1	0.6(baseline)	4.0%	22.9%	1.8%	0.7%	0.6%
	0.5	3.9%	21.8%	1.8%	0.7%	0.6%
	% Change	**2.50%**	**4.80%**	**0.00%**	**0.00%**	**0.00%**
Type 2	0.6(baseline)	63.1%	86.4%	54.4%	53.1%	53.0%
	0.5	60.2%	86.2%	53.5%	50.8%	51.5%
	% Change	**4.59%**	**0.23%**	**1.65%**	**4.33%**	**2.83%**
Overall	**% Change**	**4.67%**	**0.86%**	**1.34%**	**3.93%**	**2.73%**

As can be seen in Table 8.1.2, a decrease in the replacement rate from 0.6 to 0.5 has a stronger effect on type 2 immigrants of all nationalities except for Yugoslavian immigrants. Since most of the type 1 immigrants choose to return within the 40 year period anyway, the policy has a lesser effect on them.

At first, one might think that the stronger impact of the policy on Italian and Spanish immigrants compared to Yugoslavian immigrants -despite the higher unemployment rates among the latter group- would be due to the differences in the type proportions. In the above table, we see that type 2 immigrants are more responsive to the policy and there is a larger fraction of type 2 Italian immigrants at any period and a larger fraction type 2 Spanish immigrants after the 9th period when the unemployment rates start to peak. This fact is true; however, there is a secondary effect as well.

Even when we condition on type 2 immigrants, we see that the impact of the policy is much stronger for Italian and Spanish immigrants compared to Yugoslavian immigrants. The reason to this is the difference between the value of spending the rest of one's life in his home country and the value of staying in Germany. This difference is much smaller for type 2 Italian and Spanish immigrants. Therefore, a decrease in the value of staying in Germany due to smaller unemployment benefits has a stronger bite in the return decisions of these migrants. It is the same reason why the policy is not so much more effective for Turks. However, compared to Yugoslavian immigrants, Turks response is stronger because the unemployment rate among them is higher and the difference between the value functions is not as acute as that for the Yugoslavian immigrants.

We would expect the additional returners -people who are induced to return as a result of the change in the compensation system- to be selected from immigrants that are more likely to be unemployed; thereby, decreasing the unemployment rates of immigrants that stay. The below table compares the unemployment rates of Italian immigrants under different

replacement rates. What we find is that the impact of a decrease in the replacement rate on the unemployment rates of immigrants is negligible.

8.2 Financial Bonuses to Encourage Return

8.2.1 Bonuses Given Before Migrants Qualify for Pension Benefits

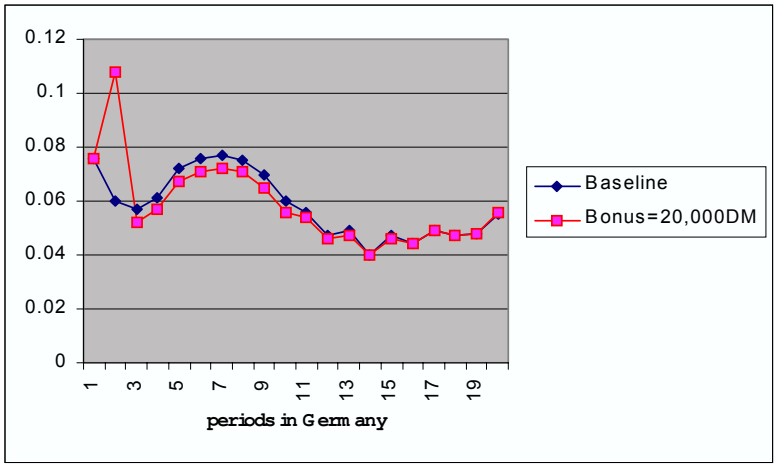
Financial bonuses given to immigrants conditional on return to their home country at the end of second period (4 years of residence) would relieve the host country from paying pension benefits to these immigrants. Table 8.2.1 presents the effect of such bonuses on the hazard rates at the second period. As can be seen from the table, the policy makes a strong impact on the second period hazard rates. The impact of the bonus depends on the purchasing power parity of the source countries with Germany. While a bonus of 10,000DM increases the hazard rate of Turkish immigrants by 35%, it does so only by 17% for Italian immigrants. We also find diminishing returns to the amount of bonuses given. The second and third 10,000DM increment of bonus increase the hazard rate of Italian immigrants by 15% and 13%, respectively.

TABLE 8.2.1: HAZARD RATES AT THE SECOND PERIOD WITH DIFFERENT BONUSES

	Turkish	Yugoslavian	Greek	Italian	Spanish
Baseline	6.0%	1.2%	12.0%	10.6%	12.9%
10,000	8.1% (35%)	1.8% (50%)	14.7% (23%)	12.4% (17%)	15.4% (19%)
20,000	10.8% (33%)	2.5% (39%)	17.8% (21%)	14.2% (15%)	18.0% (17%)
30,000	13.9% (29%)	3.5% (40%)	21.0% (18%)	16.0% (13%)	20.7% (15%)
Numbers in paranthesis are percentage changes from previous line.					

The impact of this financial bonus would not be limited to the period it is given, though. Many of the immigrants who choose to accept the financial offer and return to their home country would have done so anyway, albeit later. Figure 8.2.1 shows the impact of a 20,000DM bonus on the hazard function of Turkish immigrants. What we see is that after the spike in the second period as a result of the bonus, the hazard rates are lower compared to the baseline values.

FIGURE 8.2.1: EFFECT OF A BONUS ON THE HAZARD FUNCTION OF TURKISH IMMIGRANTS



Only some of the immigrants who accept the offer are those who would stay in Germany throughout their lives. In order to see this longer term effect of financial bonuses, we compare the cumulative hazard rates from the 2nd period, when the financial bonus is given, to the end of the 20th period. Table 8.2.2 reports these cumulative values for the baseline case and for the case with a 30,000DM bonus. When we compare the changes in the cumulative hazard rates with the financial bonus according to nationality groups, we realize that the ordering that we saw in the previous table according to purchasing power parities is lost. In fact, the percentage change is lower for Turkish immigrants compared to all EU nationalities and it is higher for Italian compared to Yugoslavian immigrants.

TABLE 8.2.2: CUMULATIVE HAZARD RATES FROM THE 2ND TO THE 20TH PERIODS

		Turkish	Yugoslavian	Greek	Italian	Spanish
ALL	Baseline	67.5%	41.7%	72.5%	62.8%	72.6%
	30,000	68.0%	42.0%	73.0%	63.3%	73.1%
	Change	**0.65%**	**0.72%**	**0.68%**	**0.83%**	**0.69%**
Type 1	Baseline	95.6%	76.7%	97.7%	99.0%	99.2%
	30,000	96.0%	77.6%	98.1%	99.3%	99.5%
	Change	**0.46%**	**1.20%**	**0.39%**	**0.30%**	**0.26%**
Type 2	Baseline	36.8%	13.5%	45.3%	45.7%	46.5%
	30,000	37.0%	13.5%	45.5%	46.4%	46.8%
	Change	**0.54%**	**0.00%**	**0.44%**	**1.58%**	**0.67%**

The reason to this becomes clear when we examine the cumulative hazard rates according to the types. Among those who return to their home country, type 2 immigrants contain a

larger share who would not return to their home country in the next 38 years but do return as a result of the bonus. In addition, within the type 2 immigrants, the percentage change in the cumulative hazard rate is higher among those coming from EU countries.

What we learn from this is that even though the immediate impact of financial bonuses would be stronger for immigrants coming from countries that have lower prices, the longer term impact may not go in the same way because such a policy is more likely to change the return decision (over their lifetime) of immigrants with lower propensity to leave. What we also learned is that among those immigrants with lower propensity to leave, it is more likely to change the behavior of immigrants from wealthier countries. Consequently, depending on the distribution of unobserved heterogeneity, this policy may end up bringing about a stronger change in the decision as to whether or not to return among the immigrants from wealthier countries. On the other hand, if that period has some particular importance -the second period has because it is right before migrants qualify for pension benefits-, such a policy is more likely to be successful among immigrants from poorer countries.

8.2.2 Bonuses Targeted Toward the Unemployed

Given the high unemployment rates in Germany both for immigrants and natives, it may be of interest to the German government to implement policies to encourage unemployed immigrants to return to their home country. Since unemployed immigrant workers will be drawing significant benefits from the unemployment insurance system and they will be likely to be unemployed in the future as well, it might make sense to pay an amount close to their unemployment benefits conditional on return.

In this policy experiment, an immigrant is offered the choice of receiving a bonus conditional on return whenever he is unemployed. Unlike the previous policy experiment, which was given at one period only, this policy is available to immigrants at all periods, restricted only to the unemployed, though. Table 8.2.3 presents the impact of bonuses equal to 30,000DM and 50,000DM -which is the range of unemployment benefits per period for most immigrants- on the survivor rates after 40 years. We find a noticable drop in the survivor rates. With a 50,000DM bonus, the survivor rate of Turkish immigrants goes down 27.8% from 30.0% and that of Italian immigrants drops to 29.4% from 30.5%. Compared to the policy experiment regarding decreasing the replacement rate of the unemployment compensation system from 0.6 to 0.5, this financial bonus policy of 50,000DM to the unemployed is more effective in decreasing the survivor rate for Turkish, Yugoslavian and Greek

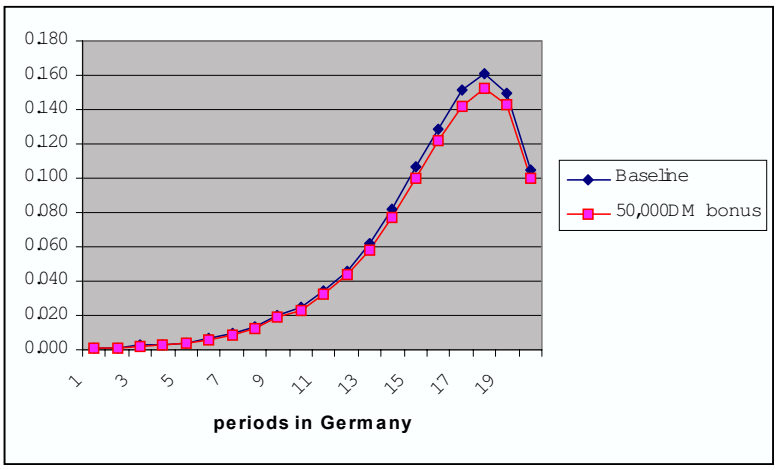
immigrants whereas for Italian and Spanish immigrants the impact of two policies are about the same.

TABLE 8.2.3: SURVIVOR RATE AFTER 40 YEARS WITH BONUSES TO THE UNEMPLOYED

	Turkish	Yugoslavian	Greek	Italian	Spanish
Baseline	30.0%	57.7%	22.4%	30.5%	22.0%
30,000	28.7%	57.1%	22.0%	29.9%	21.7%
50,000	27.8%	56.7%	21.7%	29.4%	21.4%

The result of our simulations also indicate that this policy would be successful in selecting out the unemployed immigrants from the immigrant pool in Germany. We observe a noticeable decrease in the unemployment rate of immigrants from all five country of origin groups. In the below graph, we show the change in the unemployment rate of Italian immigrants. For instance, at the 18th period, the unemployment rate falls from 16.1% to 15.2%.

FIGURE 8.2.2: EFFECT OF A BONUS ON THE UNEMPLOYMENT RATE OF ITALIAN IMMIGRANTS



In the policy experiment, in which we decreased the replacement rate of the unemployment compensation system to 0.4 from 0.6, the survivor rate of Italian immigrants went down to 28.6% from 30.5%. In the above policy experiment, where we gave unemployed immigrants a bonus of 50,000DM conditional on return, the survivor rate of Italian immigrants went down to only 29.4%. On the other hand, in the former policy experiment, there was a negligible impact on the unemployment rate of immigrants who stayed in Germany

whereas in the latter policy, as shown in the above graph, there was a noticeable change in the unemployment rate of immigrants who stayed. It is not surprising that the former policy, despite the fact that it drove out more immigrants, had a weaker impact on the unemployment rate because changing the replacement rate of the unemployment compensation system changes the lifetime income of both employed and unemployed immigrants whereas in the latter policy the impact is only on the unemployed immigrants by design.

9 MACROECONOMIC COUNTERFACTUALS

9.1 Changes in Wages in Germany

In this section, we analyze the effect of a change in the rental price of human capital in Germany on immigrants' return and savings decisions. The theoretical impact of an increase in the rental price on migrants' return decision is ambiguous. On one hand, a higher income in Germany allows the immigrants to save faster and, therefore, have a higher asset level at each period making them more likely to return to their home country. On the other hand, since the opportunity cost of returning increases with higher wages in Germany, they become more likely to stay.

Figures 9.1.1 and 9.1.2 show the change in the hazard contribution according to EU status after a 10% increase in German wages. For all immigrants, the hazard rates in the first couple of periods are lower. The ability to save at a faster pace makes the continuation value of staying in Germany higher in the very early periods and, as a result, the hazard rates decline for all immigrant groups.

However, for non-EU immigrants, after the second period, the hazard function increases at a faster pace making the hump more pronounced and decreases at a faster pace as well before leveling down at a lower level than that of the baseline. On the other hand, the new hazard function is lower at each period of residence for EU immigrants. The difference is very small between the third and seventh periods, though.

FIGURE 9.1.1 : IMPACT OF AN INCREASE IN GERMAN WAGES ON HAZARD CONTRIBUTION: non-EU IMMIGRANTS

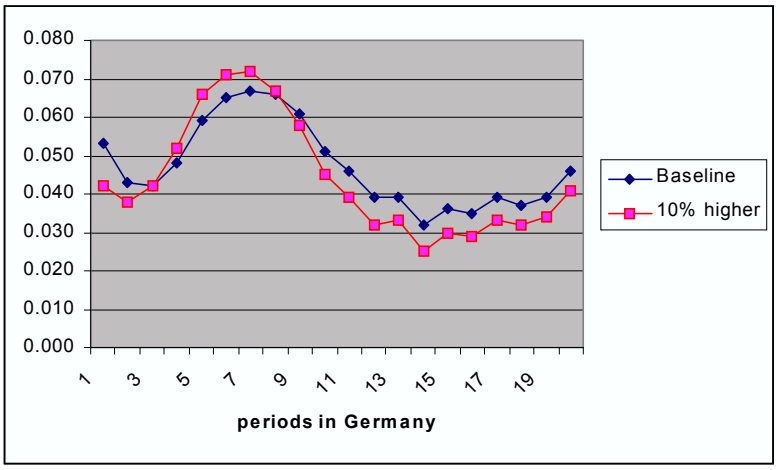
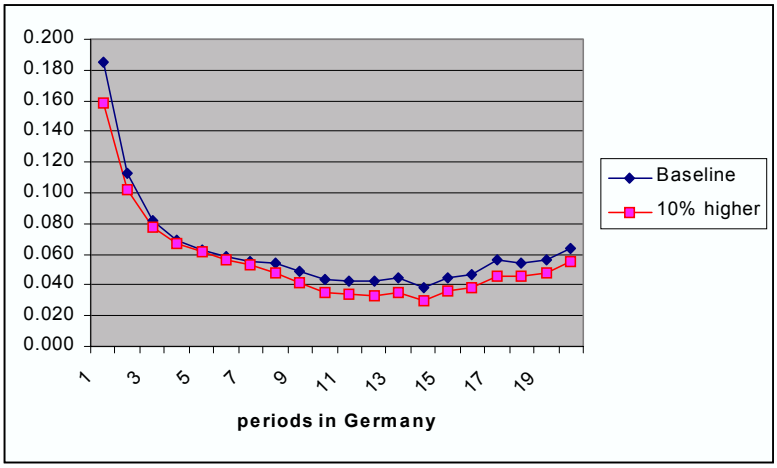


FIGURE 9.1.2 : IMPACT OF AN INCREASE IN GERMAN WAGES ON HAZARD CONTRIBUTION: EU IMMIGRANTS



A higher wage level allows type 1 immigrants, who have a high propensity to save, to accumulate assets at a faster pace. For this group, the income effect dominates and their hazard rates go up. On the other hand, for type 2 immigrants, the substitution effect dominates and they become less likely to return. The reason we see the increase in the hazard rates of non-EU immigrants in the increasing part of the hump is that the increase in the hazard rates of type 1 immigrants dominate because there is a higher fraction of type 1 immigrants in these earlier periods and the income effect is stronger for non-EU immigrants. For EU immigrants, as a result of the higher hazard rates, there is a smaller fraction of type

1 immigrants left at each period. In addition, the increase in the hazard rates of type 1 immigrants are not as high as that of non-EU immigrants due to the weaker income effect. Consequently, at no point in the hazard function we see an increase.

Table 9.1.1 reports the survivor rates after 20 and 40 years of residence with and without an increase in wages. The interesting result is that after 20 years residence, the survivor rate of non-EU immigrants do not indicate any significant difference despite higher wages in the host country. In fact, for Yugoslavian immigrants, it slightly decreases.

TABLE 9.1.1: IMPACT OF AN INCREASE IN GERMAN WAGES ON SURVIVOR RATE

	Turkish	Yugoslavian	Greek	Italian	Spanish
AFTER 20 YEARS					
Baseline	49.2%	72.1%	39.1%	48.8%	38.1%
10% higher	49.5%	71.8%	41.1%	53.5%	41.7%
Change	**0.6%**	**-0.4%**	**5.1%**	**9.6%**	**9.4%**
AFTER 40 YEARS					
Baseline	30.0%	57.7%	22.4%	30.5%	22.0%
10% higher	32.8%	59.1%	25.6%	37.0%	26.8%
Change	**8.5%**	**2.4%**	**12.5%**	**17.6%**	**17.9%**

Figures 9.1.3 and 9.1.4 compare the mean savings profile after the increse in wages with the baseline profile for non-EU and EU immigrants, respectively. Fro non-EU immigrants, the savings profile becomes steeper and the levels on average become higher; whereas, there is no significant change in the savings profile of EU immigrants.

FIGURE 9.1.3: IMPACT OF AN INCREASE IN GERMAN WAGES ON SAVINGS PROFILE: non-EU IMMIGRANTS

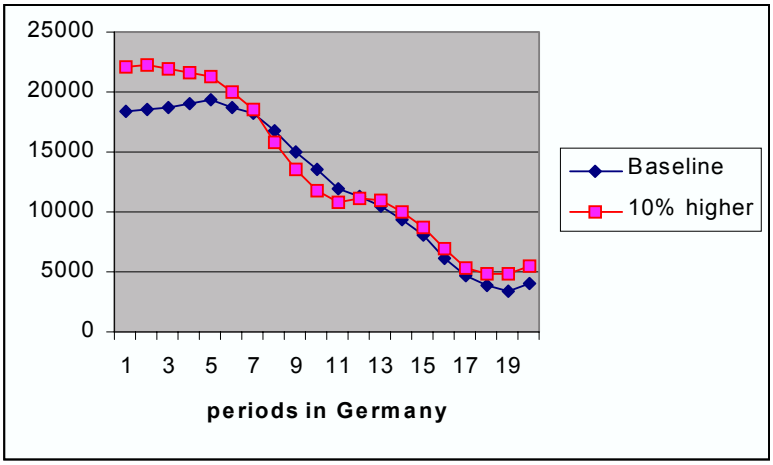
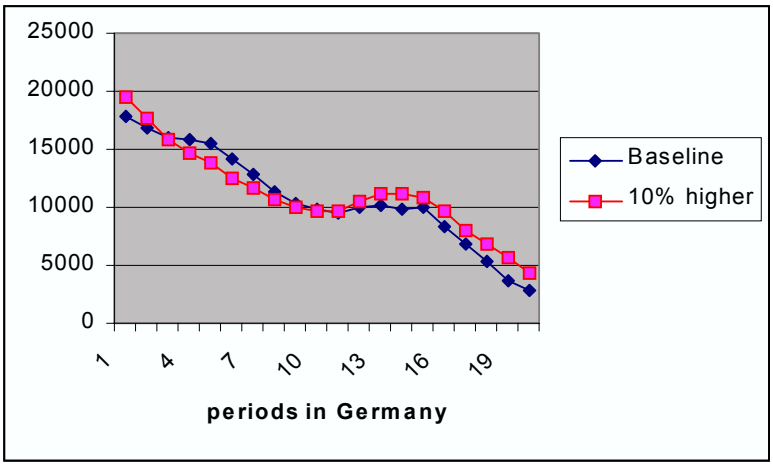


FIGURE 9.1.4: IMPACT OF AN INCREASE IN GERMAN WAGES ON SAVINGS PROFILE: EU IMMIGRANTS



A higher income level in Germany allows type 1 immigrants, who have high propensity to save, to accumulate assets at a faster pace yielding a steeper savings profile and higher assets at each period. On the other hand, since type 2 immigrants have lower propensity to save, the substitution effect dominates the income effect for them and, therefore, they become less likely to return. As they become less likely to return, they save less as well.

For both EU and non-EU immigrants, we see higher savings in earlier periods because type 1 immigrants save more and there is a higher proportion of type 1 immigrants. The first crossing of the profiles occur because due to higher return rates among type 1 immigrants, the proportion of type 1's remaining in the population decreases and the savings profile of type 2 immigrants, who save less as a result of the policy, start to dominate. The crossing takes place at a later point for non-EU immigrants because the income effect is stronger for them.

The second crossing, where the savings profile with higher wages overtakes the baseline savings profile, occurs primarily as a result of the change in the savings behavior of type 2 immigrants. As this group of immigrants became less likely to return as a result of the increase in German wages, they saved less in earlier years of residence in Germany, ending up with lower assets toward the end of their life-cycle. As a result of this as well as their bequest motive and higher earnings, they save more after the 10th period.

9.2 Changes in Purchasing Power Parity Between Germany and the Source Countries

In this counterfactual, we analyze the effect of a change in the purchasing power parity of Germany with the source countries on the return and savings decisions of immigrants. Since we do not have time effects in our model, this counterfactual corresponds to the following question: "How would the return and savings behavior of immigrants be different if the ppp over their duration of residence were different?". Figures 9.2.1 and 9.2.2 display the hazard contribution with a 10% higher ppp for non-EU and EU immigrants, respectively. Even though a proportional change implies a larger increase for non-EU immigrants -due to higher baseline values for ppp-, the impact is stronger for EU immigrants. For non-EU immigrants, the biggest impact is during the hump of the profile where the level of increase in the hazard rates is around one percent; whereas, the hazard rates of EU immigrants level off around 8% instead of 5% after the 4th period. Another effect of the rise in ppp is that the hazard rates in the first couple of periods go down because the higher purchasing power of assets accumulated in Germany make some of the potential early leavers more patient.

FIGURE 9.2.1: HAZARD CONTRIBUTION WITH DIFFERENT PPP: non-EU IMMIGRANTS

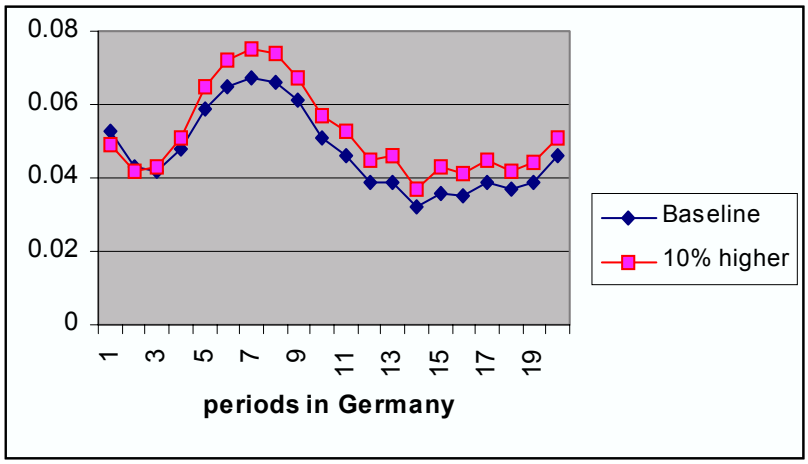
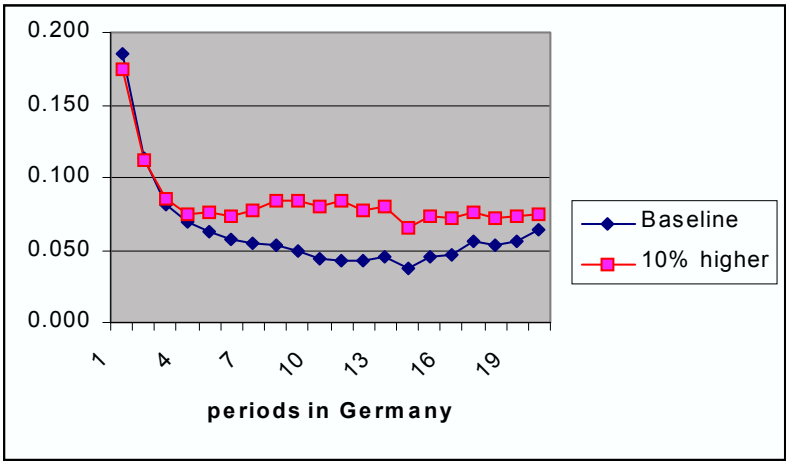


FIGURE 9.2.2: HAZARD CONTRIBUTION WITH DIFFERENT PPP: EU IMMIGRANTS



As can be seen from figures 9.2.3 and 9.2.4 that illustrate the mean savings profiles of immigrants by EU status, the stronger impact that we noticed above for EU immigrants' hazard rates is synergetic with a stronger impact on their savings decisions. While the mean savings profiles of both immigrant groups become steeper, the impact on EU immigrants' savings decisions is much much stronger. In fact, the savings profile of EU immigratns become even steeper than that of non-EU immigrants.

FIGURE 9.2.3: MEAN SAVINGS PROFILE WITH DIFFERENT PPP: non-EU IMMIGRANTS

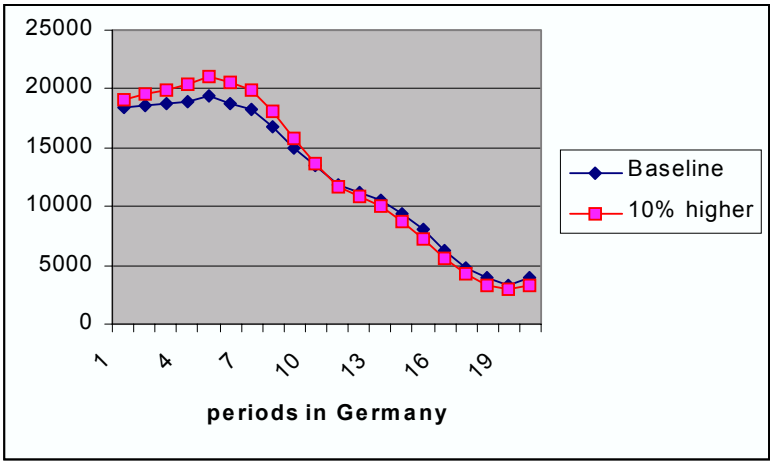
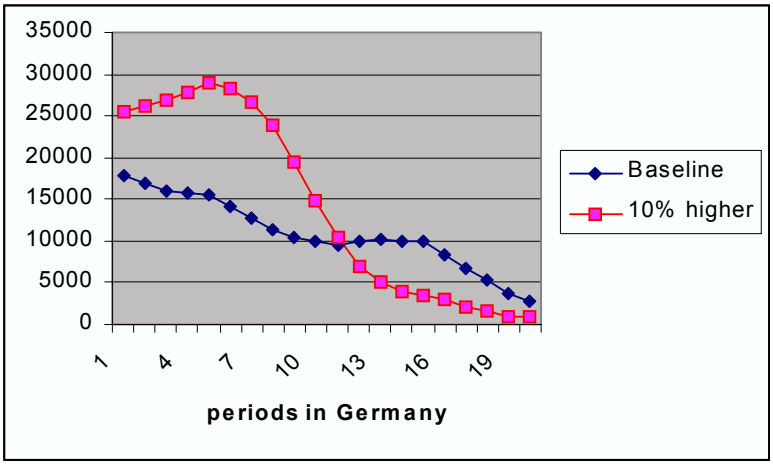


FIGURE 9.2.4: MEAN SAVINGS PROFILE WITH DIFFERENT PPP: EU IMMIGRANTS



The reason that we observe a much stronger impact for EU immigrants is the following: An increase in the ppp between Germany and the source countries does not have a significant impact on type 1 immigrants of any nationality because these immigrants have a high propensity to return anyway and save as much as they can even before the increase. Most of the change in the return and savings behavior we observe is, therefore, caused by the changes in the behavior of type 2 immigrants. Among the type 2 immigrants, there is a stronger impact on those originating from EU countries because the difference between the values of staying and returning for non-EU immigrants is so high that even though the counterfactual increases the value of assets after return more for them, the difference that it makes in their return decision is still not as big as that of EU immigrants.

We also examined the impact of even higher increases in the purchasing power parity. Even though the impact of an increase in ppp is at first stronger for immigrants from wealthier source countries -as can be seen from table 9.2.1, the impact of a 10% increase is strongest for Italian and Spanish immigrants-, there are stronger diminishing returns for them. As we increase the ppp by 20% and later 40%, the changes in the survivor rates of Greek and Turkish immigrants start to catch up with those of Italian and Spanish immigrants.

TABLE 9.2.1: SURVIVOR RATE AFTER 40 YEARS OF RESIDENCE WITH DIFFERENT PPP

	Turkish	Yugoslavian	Greek	Italian	Spanish
Baseline	30.0%	57.7%	22.4%	30.5%	22.0%
10% higher	26.1%	55.6%	19.1%	17.2%	14.7%
20% higher	20.9%	53.9%	14.8%	14.8%	10.1%
40% higher	15.1%	51.1%	10.2%	11.3%	7.6%
Percent Change from the Baseline Value					
10% higher	13.0	3.6	14.7	43.6	33.2
20% higher	30.3	6.6	33.9	51.5	54.1
40% higher	49.7	11.4	54.5	63.0	65.5

10 CONCLUSIONS

In this paper, we estimated a dynamic choice model of joint return migration and savings behavior, in which the reasons to return include lower prices in the home country, location-specific preferences and unexpected events. The immigrants whose behavior we analyze come from five different source countries that differ in terms of their general attractiveness to live -this could be due to average income level, social amenities, political structure, etc -, potential earnings of immigrants after return to that country, and purchasing power parity with Germany. We find that immigrants from wealthier countries are more likely to return to their home countries. In addition, immigrants coming from countries with much lower prices display a hump-shaped hazard function; whereas, immigrants coming from countries with relatively higher average earnings and better amenities have higher hazard rates in the earlier years. With respect to the savings behavior of immigrants, we observe a downward sloping savings profile due to out-selection of those that save more.

A significant fraction of immigrants who contribute to the pension system leave before they draw any benefits. For EU immigrants, a remarkable fraction, almost a third of the immigrants leave before they qualify for pension benefits. For non-EU immigrants, this fraction is between 9.3 and 13.1 percent.

Immigrants that return hold significantly higher assets compared to those that stay. The profile of repatriated assets of return migrants over their duration of residence in Germany is hump-shaped. We estimate that Turkish immigrants who return to their home country on average bring 156,085DM with them. The German Interior Ministry reports that around 45,000 Turk left the country annually between 1993 and 1998. Assuming that this roughly

corresponds to 10,000 households implies that the amount of money that return migrants brought with them was at around 1.5 billion DM every year.

Decreasing the replacement rate of the unemployment insurance system does not make a significant impact on the return behavior of immigrants. In addition, it is not successful in selecting out the unemployed. In fact, the survival rate of the nationalities with relatively lower unemployment rates gives as strong -sometimes stronger- response. In addition, there is a negligible effect on the unemployment rates of immigrants of all nationalities. Targeting the unemployed with financial bonuses conditional on return is more effective in selecting out the unemployed. At the same amount of decrease in the survival rate resulting from a change in the replacement rate of unemployment compensation, this policy decreases the unemployment rate more.

Financial bonuses conditional on return before immigrants qualify for pension benefits are successful in increasing the hazard rates within the intended period. However, many of the program users are those who would leave in the later periods and the program makes little change in the cumulative hazard rates after longer periods.

The effect of an increase in the wages of immigrants depends on the relative prices between Germany and the source country. Immigrants from countries with lower prices display higher hazard rates during the hump of their hazard function, whereas immigrants from higher-priced source countries indicate an always lower hazard function. The survival rate after longer periods of residence increases for all nationalities. Higher wages in the host country induces immigrants from non-EU countries to save more and their savings profile takes a steeper decline; whereas, there is no significant change in either the level or the profile of the savings of EU immigrants.

An increase in the purchasing power parity between Germany and the source countries brings about a remarkable increase in both the hazard and savings rates of all immigrant groups. However, immigrants from EU countries are more responsive to the proportional changes in the purchasing power parity. There are stronger decreasing returns in the decrease of the survival rate for EU countries, though.

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APPENDIX

A DETAILS OF THE ESTIMATION METHOD

The classification error parameters and parameters that characterize the distribution of measurement errors are estimated along with the other parameters of the model.

A.1 Classification Errors

A.1.1 Unbiased Classification Errors

Classification errors are unbiased when the probability of a particular outcome is the same in the simulations and the data.

Unbiased Classification Errors in the Labor Market Outcomes: Let l_{it}^* denote the observed labor market outcome in the data and l_{it} denote the true value from the simulations. Following Keane and Wolpin's methodology, we write the classification errors in the following form.

$$\theta_{1,1}^l = P(l_{it}^* = 1 | l_{it} = 1) = E + (1 - E)\widehat{P}(l_{it} = 1) \quad (1)$$

$$\theta_{1,\neq 1}^l = P(l_{it}^* = 1 | l_{it} \neq 1) = (1 - E)\widehat{P}(l_{it} = 1)) \quad (2)$$

where

$$\widehat{P}[l_{it} = 1] = \frac{1}{N}\sum_{n=1}^{N} \Pr(l_{int} = 1)$$

and E is a parameter measuring the extent of classification error. It is estimated along with the other parameters of the model.

Unbiasedness of the classification errors requires that when we substitute equations (1 and 2) into the equation below, we get $P(l_{it}^* = i) = P(l_{it} = i)$.

$$P(l_{it}^* = i) = P(l_{it}^* = i | l_{it} = i)P(l_{it} = i) + P(l_{it}^* = i | l_{it} = i)P(l_{it} \neq i)$$

Unbiased Classification Errors in the Positive Savings: In the solution of our model, we allow the migrants to dissave. However, in the data we only observe their savings. In the survey, migrants are first asked whether or not they saved money; if they did, they are

then asked the amount of it. Therefore, if either the reported savings choice is nonpositive, we calculate the probability of observing the reported outcome conditional on the true value using classification errors.

Below, equation (3) shows the probability of correct reporting of non-positive savings and equation (4) shows the probability of reporting non-positive savings when the true state is positive savings.

$$\begin{aligned}
\theta^{ns}_{1,1} &= P(I\left[(A_{it+1}-A_{it})^* <= 0\right]=1 \mid I\left[(A_{it+1}-A_{it}) <= 0\right]=1) \qquad (3)\\
&= F+(1-F)\widehat{P}(I\left[(A_{it+1}-A_{it}) <= 0\right]=1)\\
\theta^{ns}_{1,0} &= P(I\left[(A_{it+1}-A_{it})^* <= 0\right]=1 \mid I\left[(A_{it+1}-A_{it}) > 0\right]=1) \qquad (4)\\
&= (1-F)\widehat{P}(I\left[(A_{it+1}-A_{it}) <= 0\right]=1)
\end{aligned}$$

where

$$\widehat{P}[I\left[(A_{it+1}-A_{it}) <= 0\right]=1) = \frac{1}{N}\sum_{n=1}^{N}\Pr(I\left[A_{int+1}-A_{int} <= 0\right]=1)$$

and F is the classification error parameter.

However, when both reported savings are positive, we use a measurement error distribution to find the probability of observing the reported choice conditional on the true value.

A.1.2 Biased Classification Error in Return Migration

There are two important differences in the classification error specification for return migration. First, a classification error is possible only when the reported choice is to leave because the fact that a migrant was interviewed does not leave any doubt that he was in fact in Germany. This also implies that a classification error can exist only in the last period in the sample. Second, the fact that there may be a classification error only if the observed choice is to leave implies that we have a biased classification error. In this case, $P(m^*_T=1) \neq P(m_T=1)$.

We use the following expressions in this case.

$$\begin{aligned}
\theta^{m}_{1,1} &= P(m^*_T=1|m_T=0)=\left(\frac{e^G}{1+e^G}\right)\\
\theta^{m}_{1,0} &= P(m^*_T=0|m_T=1)=0
\end{aligned}$$

where G is the parameter indicating the degree of misreporting.

A.2 Measurement Errors

The measurement error distributions of earnings and savings are independent and serially uncorrelated. They are specified in the following way.

A.2.1 Measurement Error in Earnings

$$y_t^{obs} = y_t^{sim} \exp(\varepsilon_t^y) \qquad where \;\; \varepsilon_t^y \tilde{} N(0, \sigma_{y,m}^2)$$

A.2.2 Measurement Error in Savings

$$(A_{t+1} - A_t)^{obs} = (A_{t+1} - A_t)^{sim} + \varepsilon_t^s \qquad where \;\; \varepsilon_t^s \tilde{} N(0, \sigma_{s,m}^2)$$

A.3 Calculation of the Probabilities of Reported Spells Conditional on the Simulated Spells

A.3.1 Calculation of $P(M_i^{obs}|M_{in}^{sim})$

That a classification error in the reported return outcomes can exist only in the last period in the sample implies that all simulated spells in which a return takes place before the reported return in the sample will have zero probabilities. In other words, for a simulated spell to have positive probability the simulated spell must exactly match the reported choice for all periods but the last one. Obviously, for this to happen, the outcome must be to stay.

If the simulated spell matches the reported spell at all periods but the last one and in the last period the reported choice is to return but the choice in the simulation is to stay, the simulated spell would still have a positive probability due to the existence of classification error in the last period.

$$P(M_i^{obs}|M_{in}^{sim}) = \prod_{t=1}^{T_i-1} \mathbf{I}[m_{it}^{obs} = m_{int}^{sim} = 0]. \left(\sum_{j=0}^{1} \sum_{k=0}^{1} \theta_{jk}^m \mathbf{I}(m_{iT_i}^{obs} = j, m_{inT_i}^{sim} = k) \right)$$

A.3.2 Calculation of $P(l_i^{obs}|l_{in}^{sim})$

Unlike the above case, a classification error in the reported labor market status can exist at any period. Therefore, we can write the probability of observing the reported labor market status spell conditional on the simulated spell as follows.

$$\begin{aligned}
\Pr(l_{it}^{obs} &= 1|l_{int}^{sim} = 1) = \theta_{1,1}^{l} \\
\Pr(l_{it}^{obs} &= 1|l_{int}^{sim} \neq 1) = \theta_{1,0}^{l} \\
\Pr(l_{it}^{obs} &\neq 1|l_{int}^{sim} = 1) = 1 - \theta_{1,1}^{l} \\
\Pr(l_{it}^{obs} &\neq 1|l_{int}^{sim} \neq 1) = 1 - \theta_{1,0}^{l}
\end{aligned}$$

A.3.3 Calculation of $P((A_{t+1} - A_t)_i^{obs}|(A_{t+1} - A_t)_{in}^{sim})$

$$\begin{aligned}
& P((A_{t+1} - A_t)_i^{obs}|(A_{t+1} - A_t)_{in}^{sim}) \\
= & \prod_{t=1}^{T_i} \left(\begin{array}{c} \theta_{11t}^{ns} I\left[\left((A_{it+1} - A_{it})^{obs} <= 0\right), ((A_{it+1} - A_{it})^{sim} <= 0)\right] + \\ \theta_{10t}^{ns} I\left[\left((A_{it+1} - A_{it})^{obs} <= 0\right), ((A_{it+1} - A_{it})^{sim} > 0)\right] + \\ \frac{1}{\sigma_s}\phi\left(\frac{(A_{it+1} - A_{it})^{obs} - (A_{int+1} - A_{int})^{sim}}{\sigma_s}\right) I\left[\left((A_{it+1} - A_{it})^{obs} > 0\right)\right] \end{array} \right)
\end{aligned}$$

A.3.4 Calculation of $P(y_i^{obs}|y_{in}^{sim})$:

$$P(y_i^{obs}|y_{in}^{sim}) = \prod_{t=1}^{T_i} \frac{1}{\sigma_{y,m}} \phi\left(\frac{y_{it}^{obs} - y_{int}^{sim}}{\sigma_{y,m}}\right)$$

B PARAMETER ESTIMATES

Standard errors are multiplied by 10.

Risk Aversion Parameters

λ_0	λ_1
0.5721	0.0292
(0.0125)	(0.0073)

Marginal Utility Parameters

μ_0	μ_1	μ_2	μ_3	μ_4	μ_5	μ_6
0.5340	0.5236^a	-0.0135^a	0.6658^a	-0.0039^a	-0.0094	-0.0326
(0.0747)	(1.2242)	(0.0240)	(0.8281)	(0.0099)	(0.0204)	(0.0676)

Psychic Cost Parameters

ρ_0	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5	ρ_6	ρ_7
1.9939^b	2.8756^c	1.3675^c	0.9243^c	-1.7881^b	-1.1850^c	1.1029	0.1863
(0.1360)	(11.9675)	(14.5000)	(11.5338)	(0.1327)	(0.1179)	(0.6224)	(0.0684)

Bequest Function Parameters

β_0	β_1	β_2	β_3
0.3709	9.3895^b	-0.0897^d	0.6983
(0.1740)	(3.2551)	(0.0389)	(0.2434)

Value Home Parameters

π_{02}	π_{02}	π_{02}	π_{02}	π_1	π_2	π_3	π_4
-7.6909^c	3.8763^c	5.7141^c	6.1790^c	1.4891^b	1.6297^b	-0.3368^e	0.0078^e
(5.2305)	(0.6607)	(0.5109)	(0.5566)	(0.7866)	(0.0795)	(0.0421)	(0.0018)

π_5	π_6	π_7	π_8	π_9
2.4243^c	-0.0703	5.9128^b	-0.8519^c	-0.2258
(2.5454)	(0.1081)	(0.3684)	(0.1236)	(0.1652)

Type Probability Function

κ_0	κ_1	κ_2	κ_3	κ_4	κ_5	κ_6
-0.9229	-0.0011	1.0415	-0.6801	1.0903	-0.4531	-0.0385
(5.4983)	(0.1715)	(2.7622)	(3.3745)	(2.9194)	(3.1107)	(0.3981)

Initial Assets

α_0	α_1	α_2	α_3
8.9528^b	5.1890^b	5.8044^f	9.1501^f
(7.5937)	(7.4241)	(40.7067)	(71.3837)

Classification Errors

E	F	G
0.8830	0.7264	-6.7544
(0.0964)	(0.1214)	(5.9140)

Measurement Errors

$\sigma_{y,m}$	$\sigma_{s,m}$
0.2670	0.5163
(0.0164)	(0.2145)

Error Distribution

σ_y^2	σ_s^2	σ_{sy}
0.0053	3.3451^g	6.6339^f
(0.0026)	(0.4908)	(5.6724)

Other Parameters

δ	r
0.9769	0.0073
(0.0110)	(0.0026)

NOTES:

a - Parameter multiplied by 1000.

b - Parameter divided by 1000.

c - Parameter divided by 100.

d - Parameter multiplied by 10,000.

e - Parameter multiplied by 100,000

f - Parameter divided by 10.

g - Parameter divided by $10^{7.}$