Return Migration and Saving Behavior of Foreign Workers in Germany

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Abstract

In this paper, I develop a dynamic stochastic model of joint return migration and saving decisions that accounts for uncertainty in future employment and income and estimate this model using a longitudinal dataset on legal immigrants in Germany. The model gives a number of implications about the level, timing and selection of return migration as well as asset accumulation of immigrants according to their country of origin We also calculate the net lifetime contributions of immigrants to the pension and unemployment insurance systems of the host country. The estimated model is used to determine the impact of a number of counterfactual policy experiments on the return and savings behavior of immigrants as well as on their net contribution to the social security system. These counterfactuals include changes in the unemployment insurance program, payment of bonuses to selected groups to encourage return home, and exchange rate premiums by the source countries. In addition, I 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 slows down the aging of population by bringing in younger workers. Due to their age composition, immigrants are more likely to be conributing to the social security system rather than receiving benefits. In addition, return of immigrants to their home countires is significant. These immigrants pay into the social security system for many years before returning home but receive no benefits if they return before qualifying to pension benefits or little benefits even after that if they do not reside in the host country for a long time. Moreover, those who choose to stay in the host country for the rest of their lives will be drawing pension benefits for a shorter period of time because immigrants coming from less developed countries generally have lower life expectancies. However, immigrants can become a financial burden on the host country if they come at or stay until older ages because in that case they could draw from public health and social insurance systems more than they contribute to them. Moreover, if they are more likely to be unemployed compared to the natives, their withdrawal of unemployment benefits will be higher than their contributions to the unemployment insurance system. Whether immigrants become a burden also depends in part on whether the returners are selective of the most or least economically successful immigrants. One goal of this paper is to evaluate the impact of immigrants on the host country social security system by calculating their net lifetime contributions to the pension and unemployment insurance systems.

Another important policy issue regarding immigrants in many host countries is their take-up of welfare benefits. Many host countries are taking steps in the direction of restricting benefits to immigrants.[2] In Germany, one reason for higher welfare participation among immigrants is their higher unemployment rate compared to that of the natives. In December 1999, the unemployment rate was 23.3% for Turkish and 18.4% for Italian immigrants in Germany. Therefore, a question of interest to policy makers is whether immigrants would be less likely to stay if the unemployment insurance system were less generous. For this purpose,

[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] 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.

I analyze how changes in the unemployment compensation system affect immigrants' return decisions.

In order to influence the number, demographic composition and labor market status 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.[3] In this paper, I also analyze the impact of various financial aid schemes on return migration flows and on the demographic composition and labor market outcomes of the stayers as well as on immigrants' net lifetime contribution to the social security system.

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.[4] I calculate the amount of wealth that enters the source country with the returning migrants and evaluate the impact of source country policies aimed to increase this amount.

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 preference 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 evaluate the impact a number of counterfactual policy experiments. In addition, since I model the migrants' decisions in a dynamic setting, I am 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 unobserved heterogeneity in migrants' permanent skill endowments and preferences.

In the model, the reasons that immigrants return to their home country are higher purchasing power of accumulated assets in the home country due to lower prices there and immigrants preference to live in their home country rather than in Germany. I exploit the variation in the price levels across source countries to identify the effects of purchasing power on immigrants' decisions. I also investigate how counterfactual changes in the purchasing

[3] 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 $.)

[4] Dustmann and Kirschkampf (2002) report that, based on a sample of Turkish return migrants, 51 percent operated small businesses.

power parity influence immigrants' savings and return decisions. The model also incorporates variation in the earnings potential across the source countries. This would be especially important in the return decision of younger immigrants. I assess the response of immigrants to changes in the wage differential between the source country and Germany.

The model is estimated using a unique longitudinal dataset from Germany that contains information on legal immigrants from five different countries, which include EU member as well as non-member countries. The pieces of information employed from the dataset include immigrants' labor market status and earnings as well as their return migration and saving choices. In the estimation of the model, a simulated maximum likelihood technique is used. The results indicate that the model can account very well for the key features in these four pieces of information according to EU status.

The model provides a characterization of immigrants' return and saving behavior by country of origin. 61 percent of Turkish, 31 percent of ex-Yugoslavian, 88 percent of Greek, 83 percent of Italian and 92 percent of Spanish immigrants return to their home countries during their lifetime. The hazard function of non-EU immigrants is hump-shaped and peaks around 15 years of residence whereas EU immigrants' hazard function is initially a fast-decreasing one that levels off after 10 years of residence before rising slightly again at retirement. The savings profiles of both immigrant groups are downward-sloping. It is steeper for non-EU immigrants, though. Both EU and non-EU immigrants save one third of their income right after arrival. The saving rate gradually drops to 10 percent in the next 20 years. It keeps dropping for non-EU immigrants and the savings rate averages around zero after 30 years of residence whereas for EU immigrants it stays at around 10 percent from 20 to 30 years of residence, then gradually drops to around 5 percent.

This paper provides the first estimate, to my knowledge, of the amount of wealth that return migrants bring to their home country. I find that Turkish return migrants take on average 92,857 DM, ex-Yugoslavians 91,407 DM, Greeks 94,093 DM, Italians 42,619 DM and Spanish 84,129 DM to their home countries. Using information on the total number of Turkish return migrants between 1993 and 1998, I estimate that the total amount of returned wealth to Turkey was almost a billion DM per year in this time interval.

Using the estimates, I calculate the net contribution of immigrants to the pension and unemployment insurance systems by country of origin and age at entry. Immigrants from all five countries of origin, in particular those coming from non-EU countries, make positive net lifetime contributions to the pension insurance system. This ranges from 5,662 DM for Greek

immigrants to 21,461 DM for Turkish immigrants. On the other hand, net contribution to the unemployment insurance system is negative for non-EU immigrants. It stays positive for EU immigrants, though. When I examine the total net contributions to these two systems, I find that all four nationalities but ex-Yugoslavians make positive net contributions. For ex-Yugoslavians, the net contribution is -1,095 DM. The positive net contributions ranges from 5,844 DM for Turkish immigrants to 11,712 DM for Spanish immigrants.

An important contribution of this paper to the literature on immigrants' impact on the host country social security system is that it analyzes net contributions of immigrants when return migration is a choice. In fact, I show that treating return migration as an exogenous factor causes a serious underestimation of net lifetime contributions.

In a policy experiment, I show that the German government can in fact increase the net contributions to these two insurance systems by providing financial bonuses to the unemployed conditional on return. This policy is more effective on non-EU immigrants. For non-EU immigrants, I find that the optimal amount of bonus is in the 45,000 to 50,000DM range regardless of the duration of residence at which the bonus is received when the bonus is given at one point in time. The impact of the policy in decreasing unemployment rate of immigrants is significant at the time the policy is implemented. However, the fall in the unemployment rate diminishes over time. When such a policy is kept in effect all the time rather than at a single point in time, net contributions to the two insurance systems can still be increased. In this case, upper limits on age or duration of residence for qualification would be needed in order to prevent the immigrants from first receiving the unemployment benefits then taking the bonus before retirement and leaving.

I also examine the impact of a policy that restricts the generosity of the unemployment insurance system, which is the elimination of unemployment assistance –the second phase of the benefits–. Given the high unemployment rates of immigrants in Germany, a less generous unemployment insurance system.could increase the return rates of immigrants. However, I find that this policy has a very small impact in terms of increasing the return rates of immigrants.

In another policy experiment, I assess the impact of an exchange rate premium provided by the source country governments on the amount of assets that immigrants take with them when they return to their home country. Such policies have been used by various source countries in order to boost the amount of returned wealth. Even though this policy increases the fraction of returners, it also decreases the amount of average asset holdings of a returner

because the average duration of residence of returners shortens. Moroever, the latter affect dominates the former and the amount of returned wealth from all emigrants from the source country decreases.

The way immigrants' return and savings choices respond to counterfactual changes in the macroeconomic environment is also analyzed. The variables of the macroeconomic environment influencing immigrants' return and saving decisions are wages in Germany, expected wages in the home country and purchasing power parity between the home country and Germany. Whenever the theoretical impact of a change in these variables is ambiguous, the counterfactual simulations allows us to find out the empirical answer. For instance, an increase in German wages has conflicting income and substitution effects on the return decision. I find that substitution effect dominates and immigrants become more likely to stay. On the saving decision, an increase in ppp has conflicting income and substitution effects. In this case, I find that the income effect dominates and immigrants save less.

Next section provides background information, reviews the relevant literature and highlights the main contributions of this paper. In section 3, the model and its solution is described. Section 4 presents the data and some descriptive analysis. Section 5 covers the estimation method and section 6 presents the estimation results. The implications of the results as to the host country social security system and the return of wealth to the home country along with the returning migrants is examined in section 7. 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

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 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. 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.[5]

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 roughly amounts to a 2% annual hazard rate.

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. The assets that guestworkers accumulate in Germany have higher purchasing power at the home country due to the lower prices there. On the other hand, since most guestworkers took jobs as unskilled workers, 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 fact, 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 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 were to accumulate assets, they would have high saving rates. Based on a empirical investigation of Turkish households in Germany, Kumcu (1989), in fact, finds evidence for very high savings rates. Another reason

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

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 immigrants' decisions.

There is very limited empirical evidence concerning the relationship between savings and return migration. The existing empirical 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. In a similar but more extended model, I conduct the first empirical analysis of this joint saving and return migration decisions.

There has been a number of studies involving the impact of immigrants on the host country social security system. Analyzing the redistribution caused by public transfers, old-age pensions, and tax and social security contributions in the German context, Buchel and Frick (2001) find that immigrants are net payers. They attribute this fact mainly to the age composition of immigrants, which makes them less likely to receive old-age pensions. This study examines net contributions in a few years and therefore is likely to be influenced with the particular age composition or labor market situation in that few years. On the other hand, this study conducts a longitudinal analysis; therefore, it accounts for the changes in immigrants' contributions over their life cycle. Lee and Miller (2000), using detailed demographic and fiscal environment projections, calculate the net fiscal impact of immigration over the life-cycle and generations in the U.S and find that the impact of changing the level of immigration would be rather small. However, using similar aggregate demographic and employment projections to calculate the contribution rate to the social security system under various migration scenarios that would keep the budget of the pension system balanced, Borsch-Supan (1994) finds that immigration reduces the increase in the contribution rates by 50 percent and that the positive impact of immigration through the alleviation of dependency ratio dominates the negative impact of immigration through its depressing effect on the wages. In a calibrated overlapping generations general equilibrium model, Storesletten

(2000) finds the annual immigration necessary to balance the government budget as well as the net present value of admitting an immigrant. Unlike Lee and Miller, he finds that the quantitative impact of immigration on the fiscal policy can be significant and under certain immigration policies it would be possible to sustain current fiscal policy.

Unlike the above mentioned studies whose findings are based on calibrated values, my results come from a maximum likelihood estimation in which I use a rich longitudinal dataset and to my knowledge, this is the first estimated structural model of migration behavior and its impact on the host as well as source countries. In order to estimate my model, I had to keep it simpler, though. For instance, I ignore the indirect effects on wages and on native productivity. However, empirical studies conducted so far on this issue found that there is no evidence for immigrants depressing the labor market conditions for natives. Friedberg and Hunt (1995) in their survey of the impact of immigration on the host country and Lalonde and Topel (1991) point out that the effect of immigration on equilibrium wages is negligible. Moreover, given the rigid institutional features of the German labor market, this becomes even more likely. On the other hand, one might expect the impact on the employment of natives to be more important. However, Piscke and Velling (1997) find no employment displacement effects of immigration on natives in Germany. Therefore, I think that a partial equilibrium approach for this study is appropriate.

I also limit the analysis to first-generation immigrants only. An intergenerational extension of this study would require modeling fertility choices of the first-generation immigrants, which would severely increase the computational burden. On the other hand, I also introduce more general modeling features. All of above-mentioned studies on the fiscal impact of immigration take return migration as exogenous. However, return migration is very much linked to household income and labor market status and this has important implications for the net fiscal impact of immigrants. For instance, fiscal impact will be more positive when immigrants who are less successful in the labor market are more likely to return compared to that under a random outflow of immigrants. Moreover, it will also be important whether immigrants are more likely to return in the early periods or in later periods in calculating their net contributions. By explicitly modeling the return migration choice, I am able to account for the effect of the timing as well as selection in return migration on the net contributions of immigrants. I also add a new dimension to the studies on the fiscal impact of immigration.by examining policies from the return perspective. I analyze the results of a number of policies aimed at altering the selection process in return migration in order to

increase the net contributions of immigrants to the pension and unemployment insurance systems.

3 THE MODEL

In this section I present the basic structure of the model and its solution in the dynamic setting.

3.1 Basic Structure

The basic structure is the discrete choice dynamic programming approach, as outlined in Eckstein and Wolpin (1989). Immigrants choose among a finite set of mutually exclusive alternatives over a finite horizon. I model the decisions of male household heads.

3.1.1 Choice Set

The elements of the choice set are return migration and savings decisions. Each period, immigrants realize their labor market status and earnings and decide first 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

Immigrants have preferences over consumption (c_t) and location of residence. Their marginal utility of consumption (μ) varies by their labor market status (l_t), age and their permanent unobserved preference characteristics.[6] Below, $\rho(.)$ 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 varies by their duration of residence in Germany, as they adjust to the new surroundings, as well as by their age at entry and unobserved permanent characteristics.

$$u_t(.) = \mu(l_t, age_t, type)\frac{c_t^{1-\lambda}}{1-\lambda} + \rho(t, age_0, type)\exp(\eta_t^s)$$

[6] Individuals are allowed to differ in their permanent unobserved characteristics as well as in their observed characteristics. We group the immigrants into a finite number of types according to these unobserved characteristics and assume that immigrants within a type group share the same unobserved heterogeneity.

Above, λ is the constant relative risk aversion parameter and η_t^s is a random shock to preferences.

Constraints Given their net earnings (y_t) and asset income (rA_t), immigrants make their consumption and saving decisions. A_t is asset holdings at period t and $c_{\min}$ is the minimum consumption level, which is equal to the subsistence income set by the German government. In this model, minimum consumption level is an institutional feature because this consumption level is guranteed by the German government through its social assistance for subsistence income program. I allow this subsistence income, which depends on family size, to vary by age and nationality (z). (This is explained later in the social assistance subsection.) In addition, borrowing is not allowed.[7]

$$\begin{aligned} c_t + (A_{t+1} - A_t) &\leq y_t + rA_t \\ c_t &\geq c_{\min}(age_t, z) \\ A_t &\geq 0 \end{aligned}$$

3.1.3 Labor Market Status in Germany

I assume that all male household heads who are not retired are willing to work. Therefore, whether they are unemployed or employed depends only on whether or not they receive job offers.

There are three potential paths to retirement: 1) One can retire after age 65. 2) Retirement is also possible at age 63 conditional on having a long service life, which is 35 years. 3) Conditional on a qualifying period of at least 15 years, workers who have been unemployed for 52 weeks can retire at age 60.[8]

If an immigrant does not qualify for retirement according to the above rules, random job offers determine whether they are employed ($l = 1$) or unemployed ($l = 0$). The job offer probability, (l_t) varies according to the labor market status in the previous period, age, age at entry to Germany, nationality as well as permanent labor market characteristics.

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

[7] Immigrants are there to save.

[8] We assume that this structure is unchanged during the life-cycle of an immigrant (In fact, there were a slight upward adjustment in the retirement age.) and that immigrants expect no change.

Once one of the above three retirement rules becomes applicaple, immigrants may enter retirement ($l = 2$), which is an absorbing state. Employment status in this case is modeled using a multinomial logit.

3.1.4 Income in Germany

Gross Earnings Labor market earnings of an immigrant at period t, $\overline{y_t}$, depends on how much human capital he has acquired and on the rental price of human capital, p. The level of human capital at any period, H_t, depends on the years of residence, age at entry, nationality and permanent skill characteristics of the immigrant. In addition, there is a random productivity shock,.η_t^y.

$$\begin{aligned} \overline{y_t} &= pH_t \exp(\eta_t^y) \\ H_t &= H(t, age_0, z, type) \end{aligned}$$

Social Security Contributions Workers in Germany pay three types of social security contributions: pension insurance, unemployment and health insurance premiums. Pension insurance contribution is applied at a rate of 9.35% (τ^p) and unemployment insurance contribution is applied at a rate of 2.15% (τ^u), both up to a earnings maximum of 85,000DM ($y^{\max}$) (1998 prices). The health insurance contribution is applied at a rate of 7% (τ^h) up to a earnings maximum of $0.75y^{\max}$ (in 1998 prices). Earnings below 6,000DM ($y^{\min}$)(1998 prices) are exempt from social security taxes.[9][10]

$$\Gamma(\overline{y_t}) = \begin{array}{ccc} 0 & \text{if} & \overline{y_t} \leq y^{\min} \\ (\tau^p + \tau^u + \tau^h)\overline{y_t} & \text{if} & y^{\min} < \overline{y_t} \leq 0.75y^{\max} \\ (\tau^p + \tau^u)\overline{y_t} + \tau^h y^{\max,1} & \text{if} & 0.75y^{\max} < \overline{y_t} \leq y^{\max} \\ (\tau^p + \tau^u)y^{\max,2} + \tau^h y^{\max,1} & \text{if} & y^{\max,2} < \overline{y_t} \end{array} \quad (1)$$

Net Earnings Net earnings, y_t is gross earnings net of social security contributions and income taxes.

$$y_t = (1 - \tau\left[\overline{y_t} - \Gamma(\overline{y_t})\right])\left[\overline{y_t} - \Gamma(\overline{y_t})\right]$$

[9] When earnings is below the tax-exempt level, employer still makes a insurance contribution and this period counts toward pension qualifying period for the worker.

[10] There has been very small changes in the social security contribution rates. We assume that immigrants expect the contributions rates to stay at this level when they make forecasts about the future in the forward-looking nature of the model.

Above, $\tau\left[\overline{y_t} - \Gamma(\overline{y_t})\right]$ is the average income tax rate for $\overline{y_t} - \Gamma(\overline{y_t})$, earnings net of social security contributions. $\tau(.)$ is calculated according to following marginal tax rate schedule: Income below subsistence income is tax free. Above that level, the marginal tax rate rises from 22% to 56% up to an earnings level of 120,000DM (in 1998 prices)[11]

Unemployment Benefits and Unemployment Assistance Immigrants 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. The entitlement duration varies from 180 to 960 days depending on the age and experience of the worker. However, there is a second phase of the unemployment insurance system. 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 and there is no limit to the duration of unemployment assistance after the exhaustion of unemployment benefits.

For tractability, I take unemployment benefits and assistance at any period as the above percentages of expected net earnings at that period rather than as percentages of the realized last net earnings.[12] In addition, I take the duration of entitlement to unemployment benefits equal to two years (which is equivalent to one period in the solution of the model). Therefore, an immigrant who is unemployed for two consecutive periods receives unemployment assistance instead, which is ten percent less. Moreover, unlike unemployment benefits, unemployment assistance is means tested according to asset income. Both unemployment benefits and assistance are net earnings and, therefore neither social security nor income taxes are applicable.

[11] These numbers are chosen to average the values for the years 1965 to 2000. Even though there has been changes in these values, they were small in magnitude.We assume that immigrants do not expect any changes in the marginal tax rate schedule in the future when solving the forward-looking model.

[12] There is an additional approximation here in that taxes are calculated based on expected earnings. Expected value of taxes could be different from taxes calculated based on expected earnings due to the kinks in the tax function.

$$y_t = \left\{ \begin{array}{c} 0 \qquad \text{if} \quad \text{not qualified for benefits} \\ 0.67 \left(pH_t e^{\sigma_y^2/2} - \Gamma(pH_t e^{\sigma_y^2/2}) \right) \left[1 - \tau \left(pH_t e^{\sigma_y^2/2} - \Gamma(pH_t e^{\sigma_y^2/2}) \right) \right] \\ \text{if} \qquad (l_t = 0 \text{ and } l_{t-1} = 1) \\ 0.57 \left(pH_t e^{\sigma_y^2/2} - \Gamma(pH_t e^{\sigma_y^2/2}) \right) \left[1 - \tau \left(pH_t e^{\sigma_y^2/2} - \Gamma(pH_t e^{\sigma_y^2/2}) \right) \right] - rA_t \\ \text{if} \qquad (l_t = 0 \text{ and } l_{t-1} = 0 \text{ and qualified for benefits}) \end{array} \right\}$$

Immigrants who have never been employed since their entry to Germany do not qualify for unemployment benefits. I assume that after 4 years of residence, all immigrants qualify for unemployment benefits. In other words, residence in the host country without work experience can not last more than 4 years.[13]

Pension Benefits German pension insurance system is mandatory to all workers except for the self-employed and those with very low incomes. For these two groups, which is a small fraction of the immigrant population, I assume that they choose to enroll in the pension insurance system.

The minimum contribution period to qualify for pension benefits is five years in Germany. Since periods of unemployment are included in the qualifying period in the German pension insurance system and in the model all immigrants are willing to work, everybody with a duration of residence longer than the qualifying period is entitled to pension benefits.

Pension benefits in Germany depend on workers' history of labor market earnings and on their duration of contribution. The replacement rate, defined as pension benefits over average net earnings of all employed workers, for a worker with forty-five year earnings history and average lifetime earnings is 72 percent. In addition, pension benefits are proportional to duration of contribution. Therefore, for the worker with average lifetime earnings, each additional year of earnings history amounts to a 1.6 percent increase in the replacement rate.

For tractability, I generalize this property for the worker with average lifetime earnings to all workers. This assumes that the replacement rate does not depend on the relative income level of workers, i.e. there is no redistribution. Borsch-Supan and Schnabel (1999)

[13]It would be impossible to maintain residence status after 4 years of unemployment for non-EU immigrants. Moreover, many of the guestworkers were already assigned to German employers at the time of entry. Besides, further residence after 4 years of unemployment would be very unlikely for any economic migrant with zero earnings.

report that there is in fact very little redistribution in the German pension insurance system, except for those with very high incomes –those whose income are three times as much as the national average–. Given the relatively low incomes of immigrants in Germany, there is a very tiny of fraction of them in this income range.

Again for tractability, in calculating pension benefits at period t, I assume that replacement rate is applied to the average of expected net earnings at all periods until period t rather than to the average of realized net earnings. Below, $\widetilde{y_t}$ is this baseline earnings position to which the replacement rate of $0.016t$ is applied.

$$\widetilde{y_t} = \sum_{j=1}^{t} \frac{\left(pH_t e^{\sigma_y^2/2} - \Gamma(pH_t e^{\sigma_y^2/2})\right)\left[1 - \tau\left(pH_t e^{\sigma_y^2/2} - \Gamma(pH_t e^{\sigma_y^2/2})\right)\right]}{t}$$

Pension beneficiaries do not pay contributions to the pension or unemployment insurance systems. Only health insurance contributions, Γ^H, according to the rules in equation 1 above, are applied. Pension beneficiaries do not pay income taxes either. Thus, pension benefits can be written as follows:

$$y_t = 0.016t\widetilde{y_t} - \Gamma^H(\widetilde{y_t}) \qquad \text{if } l_t = 2 \text{ and } t \geq 5 \text{ years}$$

Social Assistance for Subsistence Income Immigrants can also receive social assistance if their 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[14], 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, that varies from 50% to 90% depending on the age of the child.

Marriage status and the number of children are not included in the model as state variables. However, marriage status and number of children is strongly correlated with age and nationality. Therefore, I write the subsistence level income as 520DM times a family multiplier that varies by age and nationality. The dependence of the multiplier on age and nationality is estimated outside of the model. Details of the calculation of this multiplier is

[14]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.

provided in Appendix C.

$$y_t + rA_t >= 520 * family\_multp(age_t, z) \quad \text{DM per month}$$

3.1.5 Preferences in the Home Country

Once an immigrant returns to his home country, he exits the panel. As a result, I have no information on his labor market status, earnings or savings decisions after return. Therefore, the utility an immigrant receives from returning to his home country to spend the rest of his life there, $V^L(\ \widetilde{S}_t)$, is written as a function of a subset of the state variables at the time of return. These state variables include assets interacted with purchasing power parity, age, duration of residence and nationality. This part of immigrants' preferences is deterministic.

$$V^L(\ \widetilde{S}_t) = V^L(pppA_t, age_t, t, z)$$

This function is explained in detail in Appendix A along with the other functional specifications.

3.2 The Problem in Recursive Formulation

Given the current realizations of the shocks to their earnings and preferences, immigrants calculate the value of staying in Germany, $V_t^S(S_t)$, and the value of returning to the home country, $V_t^L(\ \widetilde{S}_t)$, and make their return decision accordingly. S_t is the state space at time t. The decision spell starts when an immigrant enters Germany and goes until he dies or returns to his home country. Mortality is deterministic and the age of mortality is taken as 70 for Turkish immigrants, 72 for Yugoslavian and 76 for Italian, Greek and Spanish immigrants in accordance with life expectancies for males in these countries.

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

If immigrants choose to stay in Germany, they make a saving decision over K alternatives to maximize the present discounted value of their remaining lifetime utility.[15] Below $d_\tau^k = 1$ if alternative k is chosen at period τ and =0 otherwise. δ is the discount factor. The expectation is taken over the distribution of shocks to earnings and preferences.

$$V_t^S(S_t) = \max_{\Delta A_t^k} E\left[\sum_{\tau=t}^{T}\sum_{k=1}^{K} \delta^{\tau-t} u_\tau^k d_\tau^k | S_t\right]$$

[15] The saving choice is discretized into 10 separate values, which are ±(10,000, 20,000, 30,000) and 0, +40,000, +50,000 and +60,000.

The above problem can be recast in the following dynamic programming form.

$$V_t^S(S_t) = \max_{A_{t+1}} \{u(A_{t+1}, \boldsymbol{\eta}_t) + \delta E_t V_{t+1}(S_{t+1})\}$$

The solution to this problem is given by a decision rule that takes the points of the state space to the optimal saving choice. In the last period of the problem, the continuation value is a bequest function that depends on the level of assets and the permanent preference characteristics.

$$V_{T+1}(S_{T+1}) = B(A_{T+1}, type)$$

The solution of the problem is not analytic and a numerical backward solution algorithm is used. One peculiar thing about this problem is that its solution involves the calculation of $E_t V_{t+1}(S_{t+1})$, which requires calculation of multi-dimensional integrals due to the number of stochastic elements in the model. This is calculated using Monte-Carlo integration over the joint distribution of shocks to preferences and earnings at all possible points of the state space for all periods. Since the number of the state space points at which the problem needs to be solved depends on the decision horizon, I take the decision period as two years to alleviate the computational burden.

4 DATA

The dataset used in this study 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). I use the 2000 version of the GSOEP, which is conducted annually from 1984 to 2000. The initial sample contains 1326 households.

I analyze the behavior of male immigrants who made the choice to immigrate to Germany. Therefore, I restrict the sample to households with a first-generation immigrant male. A first-generation immigrant is defined as one who entered Germany after the age of 18. 1055 households have a first-generation male household head. In addition, 9 households have a first-generation male whose family status is registered as a spouse. Defining these 9 males as household heads, I end up with 1064 households with a first-generation male household head. Two of these are dropped because these male household heads entered Germany after the age

of 50. Consequently, the final sample contains 1062 male first-generation household heads.[16] The surveys on these household heads contain detailed information on return migration, savings, labor market status and earnings.

Return migration is reported as "moved out of country" in the sample by information gathered from other family members, relatives, neighbours, and so forth. Of course, it is possible that some of these immigrants were elsewhere in Germany but mistakenly reported as "moved out of the country". The model incorporates this possibility by allowing for classification error in return migration outcomes.

Savings information is available only after 1991. Immigrants are asked about their monthly savings. However, they are not asked about their dissavings; therefore, the data is censored at zero. Since the saving choice can take negative values in the model, I treat the zero saving values in the data as zero or negative in the estimation.

Information on immigrants' labor market status is available from their year of entry to Germany. The part from their year of entry to 1983 is available in a yearly form, gathered from retrospective questions. The data on labor market status after 1983 is available in a monthly form I also have information on income annually from 1983 on, including amounts for each type of income. In accordance with the sources of income in the model, I use labor income, unemployment benefits and assistance, pension benefits, subsistence income and asset flows components. All the income data in the paper are reported in 1998 prices.

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 observed is in 1985.) This implies that when I compute the Kaplan-Meier hazard functions for return, I assume that there are no cohort effects.

Another issue in the data with regard to the model is that there is no information about asset holdings, which is a state variable of the model. To deal with this problem, I use a particular estimation method that solves the problem of missing state variables in dynamic

[16] In addition, there are 28 other first-generation males who enter the sample later, after 1984, mostly through marriages to the initial members of the sample. However, since this group is a selected sample of immigrants who entered Germany after 1984 through their higher propensity to marry, we exclude this group.

panel data models.

Macro data are also used in the estimation. These are the purchasing power parity of the source countries with Germany, which determine the purchasing power of accumulated wealth in Germany, and the ratios of expected wages in the source countries, which is used as a measure of the relative attractiveness of the labor markets in the source countries. In calculating the expected wages, unemployment rates and replacement rates of unemployment benefits in the source countries are taken into consideration. Since there is no calendar year in the model, averages of time series data are taken.[17] The macro data are displayed in Table 4.1.

4.1 Descriptive Statistics

Figure 4.1.1 illustrates the employment probability and mean income according to duration of residence by EU status. For both EU and non-EU immigrants, employment probability drops significantly by duration of residence. Analyzing this by age-at-entry cohorts reveals that this is caused by the aging of immigrants rather than duration of residence per se. The downward profile is much more prominent for non-EU immigrants. The income profiles in Figure 4.1.1 indicate that per period income levels lie between sixty thousand and seventy-five thousand DM. There is no significant difference in income levels according to EU status. EU immigrants have only slightly higher income levels. In the few last periods, as immigrants retire, income levels drop. The profile is rather flat for both EU and non-EU immigrants. Despite increasing unemployment rates, income levels are not decreasing. Table 4.1.1 displays the transition into retirement for all immigrants. The earliest age of retirement is sixty, at which 37 percent of immigrants enters retirement. At age 66, ninety-two percent of the immigrants are already retired. Retirement information is not disaggregated to EU status level due to limited number of observations at these ages.

Mean non-negative savings profile[18] according to EU status is illustrated in Figure 4.1.2.[19]

[17] One could argue that not having calendar time, we could miss the impact of a time trend in the macroeconomic conditions in the source countries. In particular, this is the case for Spain which saw an improvement in labor market conditions after joining the EU. However, these changes would be much less important for older generations and most of the Spanish guestworkers were beyond their prime-age when the positive changes in Spanish labor market took place.

[18] This is mean non-negative savings because savings data are censored below at zero.

[19] Since the savings data is available only after 1991, the earliest savings observation we have is at the fifth period.

The most prominent feature of the figure is the difference in the shape of the profiles according to EU status. There is a significant decrease in the mean non-negative savings of non-EU immigrants over duration of residence while that of EU immigrants seem to be relatively constant over time. This is not caused by the differences in their income profiles; their income profiles as can be seen in Figure 4.1.1 are very similar. Between the 5th and 10th periods, non-EU immigrants save on average more than EU immigrants whereas after the 12th period, EU immigrants save more.

Figure 4.1.3 displays the smoothed Kaplan-Meier hazard contributions according to EU status[20]. EU immigrants are more likely to return. A comparison of the survivor functions by EU status reveals that they are significantly different. There are important diffferences in the timing of return as well. EU immigrants are much more likely to return in the earlier periods. Their hazard rates drop precipitously in the first five periods and after that their hazard rates pretty much smooths out at a six percent level, with a slight rise as immigrants reach retirement age. On the other hand, for non-EU immigrants the hazard function has a hump-shape that peaks at around the 7th to 8th periods (15 years of residence) at a level of five and a half percent.

5 ESTIMATION METHOD

The observed outcomes in the data are return migration choice (m_t), savings choice ($A_{t+1} - A_t$), earnings of the migrant (y_t), and 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 $\mathbf{O}_i^{obs} = \{\{m_{it}\}_{t=1}^{T_i}, \{A_{it} - A_{it-1}\}_{t=t_{i,1991}}^{T_i}, \{l_{it}\}_{t=1}^{T_i}, \{y_{it}\}_{t=t_{i,1983}}^{T_i}\}$ 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, in the last period, $\overline{T}_i$, the other outcomes are not observed.

One of the endogenous state variables, assets, is not observed. Therefore, I 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

[20] This is based on a weighted kernel smooth of estimated hazard contributions. A relatively narrow bandwidth is chosen in order not to smooth to much.

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), I incorporate into the 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, I take a similar approach; however, in this case the measurement errors have continuous distributions.

5.1 Generation of Simulated Outcomes

Using the initial state variables, $\{A_0 = 0^{21}, l_0 = 1^{22}\}$ and the sequence of random shocks drawn for each individual and period, I simulate N choice histories, $D^{sim} = \left\{\{m_t, (A_{t+1} - A_t)\}_{t=1}^{T_i}\right\}_{n=1}^{N}$, and histories for exogenous covariates, $X^{sim} = \left\{\{e_t, y_t\}_{t=1}^{T_t}\right\}_{n=1}^{N}$ for each individual i. Unbiased classification errors are also constructed using these simulated values. (See Appendix B for the specifications of these classification errors.)

5.2 Likelihood Function

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

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. This simulator is conditional on staying in Germany until 1984 because the sample contains only immigrants who stayed in

[21] Since most of these immigrants are unskilled young people from poor regions that chose to work in a foreign country, we assume that their initial wealth is zero.

[22] Since employment transition is a first-order Markov chain and that most immigrants were employed in their first period in Germany –being guestworkers, they were already assigned jobs before entry–, this restriction that everybody was employed before entry would have very little impact on the results.

Germany until 1984.

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

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, this probability can be calculated even when some of the state variables are not observed.

Unobserved heterogeneity enters the estimation in the following way: Following Heckman and Singer's (1984) non-parametric modeling of unobserved heterogeneity, I 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 I generate the simulated outcomes for individual i and calculate the above simulator, I do it separately 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.

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

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

Measurement error distributions and classification error rates are used to calculate these probabilities. See appendix B for these calculations. For the optimization method, the Downhill Simplex Algorithm is used.

6 RESULTS

In this section, maximum likelihood estimation results based on the full solution of the dynamic model are presented.

6.1 Model Fit

I first illustrate and discuss how the model's predictions as to the return migration and savings choices as well as the exegenous transitions fit the observed features of the data. Figure 6.1.1 compares the actual and predicted hazard functions for non-EU immigrants. The model captures both the level and timing of return migration very well. In fact, the predictions are almost identical to the actual values. Model predictions of the hazard rates of EU immigrants are compared to the actual values in Figure 6.1.2 Again, the model captures the level and timing of return migration very well. The fit in the first five periods and in the few last periods are not as good, though. This is expected because the number of observations in these ranges is smaller. However, the model captures the flat region around 6 percent hazard rate very well.

Figure 6.1.3 displays how the predicted savings from the model compare to the actual savings according to immigrants' EU status. For non-EU immigrants, the model captures the downward-sloping profile of savings. The level of savings fit well, too. The only exceptions, again, are the first and last few periods where the observations are fewer. As can also be seen from the figure, the model predicts the flat profile of the savings function of EU immigrants around 9,000DM very well. The model also captures the decline toward the last few periods. However, this decline is not as strong as it is seen in the data. Once more, this is due to the fact that the strong decline in the data is brought about by a few observations who are smoothed out by the higher frequency of observations in the middle ranges.[23]

The exogenous transitions whose outcomes are used in the estimation include employment, retirement, and earnings functions. Figures E.1 presents the fit of employment status according to EU status. In both cases, the predictions match the data quite well. They capture the decreasing profile of the employment probability as well as the difference between the immigrants according to their EU status in their employment probability. Furthermore, the levels are very similar. The fit for retirement transition is shown in Table E.1 for all

[23]Note that we can not compare the saving predictions of our model in the first 5 periods as there is no savings information at these periods in the data. Our model predicts that both EU and non-EU immigrants save more than a third of their income right after arrival. This high saving rate is consistent with the findings of the literature as to immigrants' savings in Germany. Paine (1974), based on a report by the State Planning Organization of Turkey in 1971 –when all Turkish guestworkers would be in Germany for less then 5 periods–, reports a saving rate of 36 percent. Based on a study conducted by the Central Bank of Turkey in 1986, which gathered saving and income information according to immigrants' duration of residence, we find that the saving rate of Turkish immigrants with less than four years of residence was 39 percent.

immigrants. I keep this at a more aggregated level because the number of observations gets too small. Although the model overstates the percentage of retired immigrants, in particular at ages 62 and 64, it provides a good approximation to the actual transition to retirement. The prediction of the model for the income variable is presented in Figures E.2 separately for EU and non-EU immigrants. In both cases, the model predicts the level and shape of the profile well. It captures the fact that the hump is weak as well as the fact that it is weaker for non-EU immigrants. As always, the fit is worse in the beginning and ending periods where the data are sparse.

I believe that the above evidence of the model fit provide a good case for the credibility of the model. Obviously, the credibility of the implications of the model and the results of the counterfactual experiments hinges on the credibility of the model.

6.2 Parameter Estimates

The estimated parameters and their standard errors are presented in Appendix D. There are 124 parameters in the model. I am not interested in the estimated value of any parameters per se; however, here I will examine the parameters of value of returning home function –because this is the most ad hoc part of the model and I would like to check whether the estimated values are reasonable– and the estimated values of type characteristics because the differences among the types help us understand the key features of the behavior of immigrants as well as the results of counterfactuals in the following sections.

In the value of living in the home country function, estimated values of country dummies are all as expected. Non-EU countries have much lower values because of not only the less attractive economic conditions but also the insititutional differences. Within the EU group, Greece is less attractive compared to the other two and within the non-EU group Yugoslavia is less attractive. In the former case, economic conditions are more likely to be the cause while political conditions probably play a more important role in the latter case. With respect to the value of earnings in the home country after return, the estimated parameters and the age distribution at the time of return imply that 13 percent of Turkish return migrants receive some level of utility form employment earnings after return. Dustmann and Kirsckampf report, based on a sample of Turkish return migrants, that only 6 percent were salaried workers. In their study, return migrants were sampled two years after their return from Germany. Therefore, my estimate provides an upper bound to theirs and is consistent with the number they report.

I assumed that immigrants differ in terms of their unobserved permanent characteristics with respect to their psychic costs of living in Germany, bequest motive, marginal utility of consumption and labor market ability. According to the estimated parameteres Table 6.2.1 ranks the four types for each of these characteristics and Figure 6.2.1 displays the hazard function and mean savings profile for all immigrants by type.

Type 2 and type 4 immigrants can be classified as returners. They have higher psychic costs compared to the stayer types. Moreover, they have a lower bequest motive and a higher marginal utility of consumption which also increases their willingness to return and decumulate their asset holdings. While the psychic costs of type 2 immigrants do not change much over their life cycle, type 4 immigrants show a faster acclimatization to Germany. This causes the decline in the hazard function in the first 10 periods for type 4 immigrants. Another distinguishing feature of type 2 immigrants from type 4 immigrants is their higher savings ability due to higher labor market ability. As a result of this, more of the type 2 immigrants are middle-aged workers who return to live on their accumulated wealth in their home country. Type 4 immigrants have very high return rates after retirement because the difference between the values of staying and returning is the smallest and, therefore, the increase in the value of returning at retirement makes the biggest difference for this group.

One key feature of the saving decision by type is that while the profile is relatively flat over time for stayers, it is downward sloping for the returner types. In fact, returner types dissave in later periods. This is especially prominent for type 2 immigrants whose higher saving ability compared to the other returner type let them accumulate more assets in earlier periods. The marginal utility of holding assets changes over time because that utility depends on the length of the remaining lifetime and after a certain age the marginal utility of dissaving assets exceeds the marginal utility of holding them for immigrants with relatively low bequest motives and high marginal utility of consumption. That is the returner types, especially type 2 immigrants, start dissaving after a certain age. Another reason to the downward-sloping profile of type 2 immigrants is the out-selection dynamics within this type. Some can save faster than others due to their higher earnings and/or lower minimum consumption needs. Those that can save the fastest also return the earliest. As the highest savers are selected out, savings of the remaining ones decrease. A comparison of the saving behavior of stayer types reveals that type 1 immigrants save more than type 3 immigrants because they have higher earnings. Besides, their bequest motive is higher.

If return migration 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 and this is what we see in Figure 6.2.1. Despite having lower income, type 2 immigrants save more than type 3 immigrants and have higher asset holdings except for toward the end of their lifetime at which time their strong decumulation motive causes a fall in their asset holdings.

Table 6.2.2 lists the proportion of each type by nationality over duration of residence. At arrival, the fraction of returner types, types 2 and 4, is higher among EU immigrants. Their share is around forty percent for ex-Yugoslavian immigrants and sixty-one percent for Turkish immigrants. This share rises to eigthy pecent for Italian immigrants, it is above eighty-five percent for Greek and above ninety percent for Spanish immigrants. Among the returner types, a higher share is type 2 among non-EU immigrants, especially so for Turkish immigrants. For Greek immigrants, type 2 and type 4 immigrants are half and half whereas Spanish and Italian immigrants have a higher share of type 4 immigrants, especially Italians.

One key difference between the two returner types is their labor market ability. Type 2 immigrants have higher income. Both stayer types have even higher income. Since EU immigrants have a lower fraction of type 2 immigrants among the returners as well as a lower fraction of stayers, they have lower incomes on average at arrival. This is consistent with the findings of literature on guest-workers. Martin (1980) reports that there was a high demand in Turkey for emigration during the recruitment scheme, which meant that German agencies could be selective.[24] 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. On the other hand, a higher fraction of the immigrants coming from the EU countries were villagers from poor areas of these countries.

7 IMPLICATIONS OF THE RESULTS

Here, I discuss two important implications of immigrants' return and savings behavior. One is important from the host country's perpective, net contributions of immigrants to the pension insurance and unemployment insurance systems, and the other is important from

[24] 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."

the source countries' perpective, how much assets immigrants bring with them when they return.

7.1 Net Pension and Unemployment Insurance Contributions

In this section, I analyze the value at arrival of immigrants' net lifetime pension and unemployment insurance contributions. Figure 7.1.1 presents the net contributions to the pension and unemployment insurances separately by country of origin and age at entry.

Net contributions of non-EU immigrants to the pension insurance system are much higher. Non-EU immigrants have shorter life spans; therefore, their lifetime pension benefits are lower. In addition, higher return rates of EU immigrants in the early periods imply that they contribute for a shorter duration of time. A shorter contribution period implies that when the net contribution of each additional year of residence is positive, lifetime contributions will include a fewer number of positive net contributions and, therefore, will be lower. The net contribution from staying one more year is higher in the earlier periods, except for period three which is the qualification period. However, staying longer than that makes up for the negative contribution in period three. The contribution of each additional year is lower at later periods because immigrants are more likely to be unemployed and, therefore, making no contributions. Besides each additional year's contribution at later periods is discounted more whereas the increase in present value of benefits caused by an additional year of residence does not depend on the total duration of residence.

As can also be seen in the figure, net contributions of younger age-at-entry groups to the pension insurance are higher. Holding income constant, older age-at-entry groups will claim lower benefits after retirement due to their shorter contribution periods; therefore, the net contribution of each additional year of residence is higher for them. On the other hand, a shorter contribution period also implies that, when the net contribution of each additional year of residence is positive, lifetime contribution will include a fewer number of positive net contributions. Moreover,.since the fraction of worklife spent as unemployed is lower for younger age-at-entry groups, their contributions are higher. The last two facts dominates the first one and as can be seen from the figure net contributions fall as age-at-entry inceases. This decline in net contributions as age-at-entry increases is faster for non-EU immigrants. This is caused by the fact that non-EU immigrants that enter at younger ages have significantly higher incomes than older age-at-entry cohorts of non-EU immigrants; whereas the income gap according to age-at-entry for EU immigrants is much smaller.

Another interesting feature of Figure 7.1.1 is that net contributions after middle age-at-entry values for Italians rise unlike those for the Greek and Spanish. For all EU groups, incomes at entry for older age-at-entry groups are higher. However, for Italian immigrants, the difference between the incomes of older age-at-entry groups and younger age-at-entry groups is bigger. In addition, the difference between the return rates of older and younger age-at-entry cohorts is bigger as well. Younger age-at-entry groups of Italian immigrants are much more likely to return, keeping their contributions at a low level.

Next, I examine the net contributions of immigrants to the unemployment insurance system. The two key features of the figure are that immigrants from non-EU countries have much lower net contributions and that net contributions decrease as immigrants' age at entry increases for all nationalities. Both features result from the employment transition of immigrants as shown above in Figure 4.1.1. Unemployment rates of non-EU immigrants are higher than those of EU immigrants and since all immigrants are much more likely to be unemployed at older ages, older age-at-entry cohorts spend a larger fraction of their residence in Germany as unemployed.

An interesting feature of Figure 7.1.2 is that for immigrants who enter before the age of 34, Turkish immigrants have higher net contributions than ex-Yugoslavian immigrants whereas afterwards it is vice versa. Unemployment rates of Turkish immigrants are higher regardless of age at entry. However, their return rates are also higher. Unemployment really becomes an issue at older ages and among the younger age-at-entry cohorts, a much higher fraction of Turkish immigrants return before reaching older ages compared to ex-Yugoslavian immigrants. For instance, for those who enter at the age of 18, sixty percent of the Turkish immigrants return by the age of fifty whereas only thirty-five percent of the ex-Yugoslavian immigrants return by the same age. For older age-at-entry cohorts higher return rates of Turkish immigrants do not matter as much because unemployment rates immediately get higher and there is a smaller difference between the hazard rates of the two nationalities for older age-at-entry cohorts. This is another feature that emphasizes the importance of return behavior in determining the impact of immigration.

In order to get a more aggregate look at immigrants' impact on the host country social security system, I combine the net contributions to the pension and unemployment insurance systems.[25] The results are displayed in Figure 7.1.2. Younger age-at-entry cohorts make

[25] The only element of the social security system we are missing here is the health insurance system. Since participation in this insurance system entitles not only the immigrant himself but also his family to benefits,

higher net contributions for all nationalites. The decline by age-at-entry is faster for non-EU immigrants. All age-at-entry groups of Spanish immigrants make positive contributions; for Italian immigrants those who were younger than 48 at arrival and for Greek immigrants those who were younger than 44 make positive net contributions. This age-at-entry threshold falls to 34 for Turkish and 28 for ex-Yugoslavian immigrants. The highest contributions are made by Turkish immigrants who enter Germany at very young ages. The net lifetime contribution of a Turkish immigrant who enter Germany at the age of 18 to the German pension and unemployment insurances together is just below 22,000DM[26] at the time of his entry.

Next, I aggregate the values in Figure 7.1.2 to the country of origin level. These are reported in Table 7.1.1. I find that all nationalities but the ex-Yugoslavians make positive net contributions. The levels are higher for EU countries. Spanish immigrants who have the highest propensity to return and lowest unemployment rates contribute the most by 11,712 DM on average.

The studies done so far that investigate the impact of immigration on the host country social security system (Storesletten, 2000; Lee and Miller, 2000) treat return migration as exogenous. In order to analyze the impact of a such a restriction, I eliminate the return migration decision in the model and instead take a constant hazard rate for each nationality that preserves the lifetime survivor rate. What I find is that such a restriction cause a serious underestimation of net contributions of immigrants to both insurance programs. The problem with this restriction is that even though it preserves the level of return migration, it completely ignores the timing of and selection in return migration. The hazard rates of EU immigrants in the first couple of periods are very high. In fact, 34 percent of all EU immigrants return within the first four year years. These immigrants contribute to the social security system during their residence in Germany but return before qualifying to receive pension benefits. Missing this fact causes a huge drop in the net pension insurance contribution of these immigrants. For instance, for Italian immigrants, net contrib utions to the pension insurance sytem drop from 6,165DM to 2,671DM. Similarly, missing the out-selection of immigrants with worse labor market outcomes causes an underestimation of their net contribution to the unemployment insurance system. Turkish net unemployment

calculation of the time profile of benefits would require modeling the dynamics of the family structure.

It is not clear which way inclusion of the net contribution to the health insurance system would tip the balance. Immigrants' shorter life span implies lower benefits. On the other hand, they have a higher dependency ratio.

[26] 1998 prices

insurance contributions go down from -15,617DM to -21,177DM.

7.2 Asset Accumulation

Figure 7.2.1 illustrates immigrants' saving rates over duration of residence in Germany by EU status. Immigrants' saving rates are very high.right after arrival. They save one third of their income in the first two years in Germany. Their saving rate drops gradually to 10 percent after 20 years of residence for both EU and non-EU immigrants. However, the saving rates of EU and non-EU immigrants start to deviate after this time. After 20 years of residence, the saving rate of non-EU immigrants keeps falling and it approaches zero after 30 years of residence whereas for EU immigrants the saving rate stays around 10 percent between 20 and 30 years of residence, then decreases to 5 percent after 40 years of residence and stays at that level thereafter.

As we saw in Figure 6.2.1, returner types save more in the earlier periods but less in later periods. In fact, they dissave in later periods. Consequently, their assets profile over duration of residence is hump-shaped. Moreover, the selection dynamics makes the hump-shape more pronounced. In the later periods there is a higher fraction of type 4 immigrants – the returner type with low earnings and assets– among the returners. This decreases the level of assets of returners in later periods even more. On the other hand, stayer types continue saving all throughout their residence. As a result, their profile is monotonically increasing. This is why when we compare the asset holdings of stayers with those of returners by EU status in Figure 7.2.2, we see that assets of returners increase at a faster pace compared to those of stayers and the difference reaches a maximum at around 10 periods after arrival. After this time, the difference starts shrinking and in fact, after the 13th period, asset holdings of returners start decreasing and assets of stayers overtake those of returners. Among the returners, asset holdings are the highest for those who return after between 20 and 30 years of residence for both EU and non-EU immigrants. Asset holdings of these return migrants top 120,000DM.

The hump-shape of the asset profile for returners is more prominent for non-EU immigrants because they have a higher fraction of type 2 immigrants –returner type with higher savings capacity– and this type has the fastest downward-sloping saving profile. Asset holdings of stayers, though increasing in both cases, exhibit significant difference in the rate of it. It increases at a much faster pace for EU stayers because EU stayers have a higher fraction of type 1 stayers –who have the highest earnings and lowest margninal utility of

consumption of all types– and this type of stayers have higher savings all throughout their residence compared to the other type of stayer.

Table 7.21 reports the average asset holdings of a returner. Immigrants from both non-EU countries take home on average more than 90,000DM. Greek immigrants take home slightly more, at just above 94,000DM. Italian return migrants take home on average much lower assets because they are much more likely to return at earlier periods. Due to the same reason, even though Spanish migrants return home with higher assets.conditional on duration of residence, the average level of assets of Spanish return migrants is lower at 84,000DM than those of immigrants from non-EU countries.

Table 7.2.2 reports the average assets that return to the host country from all immigrants that leave for the host country. Greek and 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 as there is a higher fraction returning at later periods

8 POLICY IMPLICATIONS

This section analyzes the impact of a number of counterfactual policy experiments. The results of these counterfactuals are driven from the changes in the return migration and savings choices of existing immigrants in Germany. However, changes in the surrounding institutional framework could very well affect the initial immigration decision to Germany, and, therefore, the distribution of observed as well as unobserved characteristics of immigrants. This is not particularly problematic in this study due to the institutional framework and the macroeconomic changes that have taken place. Immigration from non-EU countries to Germany is not possible anymore except for family unification purposes. Although immigration is still possible for the citizens of the EU countries, due to the improvements that took place in the economies of these countries since the guestworkers, there is little immigration pressure. Therefore, these policies would make little impact on the composition of immigrants in Germany originating from the five source countries in this study. Nonetheless, these policy changes would influence the behavior of current immigrants to Germany, like those from the new accession states to EU. On the other hand, the counterfactuals on financial bonuses could be limited to particular nationalities or to immigrants with longer duration of residence to target the guestworkers. The other couterfactuals I conduct from

the host country perpective include those with regard to the rules of the unemployment insurance system. These policies are suggested not with the intent of targeting particulary the immigrants but the overall population. Therefore, these are not analyzed to see whether or not they are good policy tools for immigrants; but, to find out their impact on immigrants currently in Germany given that such policies are in fact in the German political agenda.

8.1 Financial Bonuses to Encourage Return

As it was reported in the introduction, unemployment rates of immigrants in Germany are very high. Unemployed workers in Germany draw significant amount of benefits for extended periods of time. Moreover, they do not pay pension insurance taxes but their unemployment period counts toward the contribution period used in calculating pension benefits. Therefore, each additional year of residence of an unemployed worker has a negative net contribution to the pension insurance system as well. In addition, there is strong persistence in the unemployment state, especially for older working-age immigrants, which implies that negative net contributions to the both insurance sytems will likely to persist in the future. Therefore, rather than incurring these net contributions for extended periods of time, the German government could provide financial bonuses to unemployed immigrants conditional on return. This would potentially be a less-expensive way to deal with the unemployment of immigrants for the taxpayers in Germany.

In fact, this would potentially be a less-expensive way to deal with the unemployment of not only immigrants but also natives in Germany. In other words, such policies could be implemented on the whole population, including the natives. However, the peculiar thing about immigrants is that they prefer to live in their home country. The estimation results indicate that they show a willingness to live in their countries even after long periods of residence in Germany. Therefore, it will be much less cheaper to implement such policies for immigrants than natives. In general, this could be an effective policy in economic downturns when the unemployment rates rise.

8.1.1 One-Time Policy

In this policy, financial bonuses conditional on return are provided at a single period in time to all immigrants with unemployment spells longer than two years.[27] Table 8.1.1 presents

[27] It is assumed that immigrants do not expect the implementation of such a policy.

the impact of various amount of bonuses on the net contributions to the pension and unemployment insurance systems according to the period the bonus is implemented. An entry is in bold if that amount of bonus is the best one at that period.

As can be seen from the table, the optimal amount of bonus for both Turkish and ex-Yugoslavian immigrants is around 45,000 to 50,000DM. For Turkish immigrants, this amount of bonus makes a positive contribution regardless of the duration of residence. For ex-Yugoslavian immigrants, it makes a positive contribution except for the latest period, where the change is negligible. Therefore, for non-EU immigrants we can conclude that this policy is going to increase their net contributions to the pension and unemployment insurance systems regardless of the distribution of duration of residence when the policy is implemented.

For EU immigrants, the optimal amount of bonus increases with duration of residence. A bonus of 40,000DM increases net contributions at all periods but the very early and late ones. To prevent the decrease in net contributions in early periods, the policy for EU immigrants could be restricted to those with at least 6 periods of residence. Moreover, since the bonus is also restricted to those younger than 58, there will be few immigrants who qualify for the bonus at later periods. Therefore, the small decreases in net contributions of EU immigrants that recieve the bonus at later periods will be dominated by the increases for those who receive them at earlier periods and the total change in net contributions for EU immigrants will be positive as well.

That the policy is more effective for non-EU immigrants is expected because their unemployment rates are higher. Moreover, the purchasing power of the bonus is higher in non-EU countries. Also, conditional on type, non-EU immigrants have lower asset levels. Therefore, the marginal effect of the bonus is stronger.

At earlier periods, unemployment rates are lower; therefore, fewer people are qualified to receive the bonus. On the other hand, the effectiveness of the bonus is stronger because at earlier periods asset holdings are lower on average. For Turkish immigrants, it is more effective at earlier periods. In fact, the biggest improvement in net contributions take place if the bonus is received at period 6. Since unemployment rates of Turkish immigrants rise faster, a higher fraction of them is qualified to receive the bonus. The most effective period is 12 for ex-Yugoslavian, Greek and Spanish immigrants and 14 for Italian immigrants when unemployment rates reach significant levels.

Even though the policy makes a positive impact on the net contributions of immigrants to

the two insurance systems, the magnitude of the change is modest. For Turkish immigrants, the improvement is bounded above by 221DM per person. (This would be the case if all immigrants had 6 periods of residence at the time of the receipt of the bonus.). However, this is only part of the big picture Unemployed immigrants do not pay income taxes either. Moreover, their lower income implies that they will be more likely to receive other forms of welfare.

Table 8.1.2 compares the baseline unemployment rates of Turkish immigrants to those under a 45,000DM bonus that everybody receives at the 6th period. As a result of the bonus, unemployment rate at the 6th period goes down from 4.1 to 3.4 percent. This is an important drop in the unemployment rate. However, one thing that yields the policy less effective can be seen in the following periods. Even though more unemployed immigrants return the period the policy is implemented, fewer unemployed immigrants return in the following periods. In the following periods the gap between the baseline and bonus unemployment rates shrink as a result of higher out-selection of unemployed immigrants in the baseline case. Out-selection of unemployed immigrants after the 6th period is lower in the bonus case because some of the unemployed immigrants that return in the baseline case after the 6th period already left at the 6th period in the bonus case. In fact, a comparison of the hazard functions indicates that after the increase in the hazard rate at the 6th period, hazard rates fall.

8.1.2 Policy In Effect All the Time

Unlike the previous case, immigrants now know that whenever they are unemployed for the last 2 years, they will be able to receive the bonus conditional on returning. Table 8.1.2 lists the change in total net contributions to the two insurance systems when an upper limit is imposed on the age at which the bonus can be received. This age limit prevents the immigrants with long spells of unemployment from first collecting unemployment benefits and then taking the financial bonus just before retirement and returning. On the other hand, it limits the reach of the program because those who are first-time unemployed after the age limit can not receive it. The entries taken in boxes are the best values for each nationality over all age limits.

As can be seen from Table 8.1.2, bonuses with a lower maximum age limit are more effective for non-EU countries. Since non-EU immigrants are more likely to be unemployed at earlier ages, compared to EU immigrants, they become more likely to take advantage of the fact that they can first recieve the benefits and then the bonus as well. In addition, there

are fewer new qualifiers after the limit age because those who are unemployed after the age limit are more likely to be unemployed before that due to longer unemployment spells.

Another finding of the experiment is that when the maximum age limit is lowered, higher amounts of bonuses become optimal. A lower age limit forces the unemployed immigrants to return earlier, which means that a longer stream of unemployment benefits will not be paid. Therefore, the government can instead pay higher amount of bonuses.

According to country of origin, the policy is most effective for ex-Yugoslavian immigrants. Since the return rates are the lost for this nationality, less is paid to those who would return anyway. In addition, lor prices in the source country yields a higher marginal effect of the bonus on immigrants' return behavior for this group. When a bonus of 30,000DM is limited to those younger than 52, the net contribution of an ex-Yugoslavian immigrant increases by 155DM. Hover, for other nationalites the increase is rather small. It is always less than 55DM per person on average. Among the EU immigrants, the policy is more effective for Italians because they have a higher fraction of returner types with low incomes. For these types, accumulated assets are lor; therefore, the marginal por of the bonus is stronger.

Next, instead of putting age restrictions I put a restriction on duration of residence, which is 10 years. This restriction is more binding for younger age-at-entry cohorts because it implies a lower age limit for them. The results of such a policy is presented in Table 8.1.3 below. Compared to the above table, the biggest change takes place for Turkish immigrants. Now, the amount of increase in net total contributions is 105DM per person on average. Since Turkish immigrants have the highest unemployment rates and are more likely to unemployed within the first ten years of residence, the reach of the program is less limited for them and receiving both the unemployment benefits for long periods and the bonus is prevented.

Increasing the amount of bonuses yields the program more effective in the sense that there are more returners. On the other hand, it also means that a higher amount of bonus is paid to immigrants who would leave even without the bonus. Which of these effects dominates depends on how many additional returners there are with the incremental increase in the amount of bonus. Both Table 8.1.2 and 8.1.3 indicate that higher amount of bonuses are more effective for non-EU immigrants. It does not pay to give higher amount of bonuses to EU immigrants because while it increases the bonuses received by those who would return anyway, it does very little difference in terms of encouraging the would-be-stayers to return. On the other hand, making incremental increases in the amount of bonus to non-EU immigrants yields higher returns in terms of changing the return behavior.

8.2 Elimination of Unemployment Assistance

Elimination of unemploymet assistance, which is the second phase of the unemployment insurance system, is proposed in Germany. Given the high unemployment rates of immigrants, this could potentially have an important influence on immigrants' aggregate return behavior as well as on their unemployment rate due to the selection process in return.

Simulation results indicate that elimination of unemployment assistance will have a very small impact on immigrants' return behavior. For instance, for Turkish immigrants, who have the highest unemploymet rates of all nationalities, there are seven additional returners at some point in their lifetime out of every 10,000 immigrants. Neither does the policy make much of an impact on the timing of return. In no period does the hazard rate increase by more than one percent and in most periods there is no change. Moreover, the policy is not effective in selecting out the unemployed in return. There is virtually no change in the unemployment rates of immigrants after the policy is implemented. This is expected given the small impact of the policy on the return behavior of immigrants and that such a policy has an impact on the currently employed workers as well as the unemployed.

The reason to the small change is that elimination of unemployment assistance does not leave the immigrants with zero income. The welfare system has one more level of protection which is the subsistence income. For instance, an unemployed immigrant with 30,000DM per year previous employment earnings would get 18,000DM as unemployment assistance. On the other hand, subsistence income for an immigrant family with two children would be at least 17,500DM. On the other hand, the earnings of an unemployed single immigrant fall down to 6,250DM. Therefore, this policy makes an impact only on immigrants with small families.

8.3 Exchange Rate Premiums by the Source Countries

Many source country governments have implemented policies in the form of exchange rate premiums in order to attract the wealth that immigrants accumulate in the host country. In this section, I analyze how this policy influence the amount of wealth that is brought back by the returning immigrants.

Table 8.3.1 displays the effect of a 5 percent premium on the exchange rate parity on the lifetime survival rate and accumulated wealth of immigrants. The premium on the exchange rate implies a higher purchasing power to the wealth accumulated in Germany when taken

back to the home country. This increases the value of returning back to the home country and, as can be seen from the table, the survivor rate of all nationalites but the Italians decrease. On the other hand, the premium decreases the average amount of wealth that is taken home by the returners. This is because the increase in the purchasing power parity changes the timing of immigrants' return. Immigrants can now return at earlier periods due to the higher ppp. This also means that returners have on average lower wealth. This works against the fact that there are more returners. Moreover, the former effect dominates the latter. As can be seen from Table 8.3.1**,** the average amount of wealth that is taken back by all emigrants from the home country, named as "Average Returned Wealth" in the table, decreases with the premium. In other words, the home country governments hurt themselves by these premiums. This is simply a result of the fact that these premiums not only affect the level of return but also the timing of it and it is this change in the timing that brings about the decrease in the amount of wealth taken to the home country.

This policy could also affect the behavior of immigrants who choose to stay in Germany throughout their lives. If these immigrants keep more of their savings in their home countries due to the exchange rate premium, this would work against the conclusion above. However, it is unlikely that immigrants who choose to stay in the host country throughout their lives would keep their assets in their native country.

9 Counterfactuals on the Macroeconomic Environment

This section examines how return migration and saving choices of immigrants respond to changes in the macroeconomic environment pertaining to their decision making. These macroeconomic variables are wages in Germany, expected wages at the home country and the purchasing power parity between Germany and the home countries.

9.1 A Change in German Wages

First, I 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 price of human capital in Germany on immigrants' return decision is ambiguous. On one hand, a higher income in Germany allows the immigrants to save faster and have higher asset holdings at each period. This increases the value of returning more than value of staying due to lower prices in the home country. In addition, a higher income implies higher pension

benefits which increases the value of returning more due to the very same reason. On the other hand, since the opportunity cost of returning increases with higher wages in Germany, immigrants become more likely to stay.

Figure 9.1.1 illustrates the change in the hazard functions according to EU status after a ten percent increase in German wages. For both groups, the hazard rates in the first couple of periods are lower because the ability to save at a faster pace increases the continuation value of staying in Germany and makes the immigrants more patient. This decline is more apparent for EU immigrants because they have a higher fraction of early returners. Non-EU immigrants' hazard function peaks earlier at a lower level. It peaks earlier because the ability to save at a faster pace shortens the average duration of residence of returners. It peaks at a lower level because first the substitution effect dominates and second higher hazard rates at earlier periods leaves a lower fraction of returners. Even though the hazard rates of non-EU immigrants are slightly higher in periods 3 to 6, at no period is the hazard rate for EU immigrants higher because income effect is stronger for non-EU immigrants, who face even lower prices in their home country.

Immigrants who choose stay instead of returning at earlier periods after the increase in German wages start returning at later periods as they age and the importance of substitution effect diminishes as a result of shorter remaining worklife. Another reason to the dimishing importance of the substitution effect is rising unemployment rates with age. Even though unemployment earnings increase by the same proportion, the amount of increase is smaller. In addition, a higher level of future stream of pension benefits brought about by higher incomes make them more likely to return as well. (An increase in pension benefits increases the value of returning more due to lower prices in the home country.) This is why in both graphs in Figure 9.1.1, hazard rates rise in later periods.

Since the income effect of an increase in German wages is stronger for non-EU immigrants, their survivor rate at certain periods is, in fact, lower. For instance, the survivor rate after 12 years decreases from 82.1 percent to 81.9 percent. However, in the following periods hazard rates are lower and the increase in the hazard rates at retirement periods is not high enough to make up for the difference and the lifetime survivor rate, as shown below in Table 9.1.1, increases from 46.3 percent to 46.7 percent. On the other hand, for EU immigrants the increase in the hazard rates at later periods is more than enough to make up for the decrease in earlier periods. As a result, the lifetime survivor rate, in fact, decreases for EU immigrants from 14.4 percent to 14.2 percent. There are two main reasons to this difference

between the EU groups: First, EU immigrants have a higher fraction of low-income returner types who have high hazard rates at later periods; therefore, the increase in pension benefits makes a bigger impact. Second, since EU immigrants receive pension benefits for a longer time on average, the increase in them is more important compared to non-EU immigrants.

Figure 9.1.2 compares the mean savings profile after an increase in wages with the baseline profile for non-EU and EU immigrants separately. The savings profile of both EU and non-EU immigrants become steeper. Higher savings ability let the immigrants save more in earlier periods and in the case that they do not return, they end up with higher assets in later periods. Therefore, they do not save as much in later periods. However, the extent of this displays a significant difference between the returner and stayer types. Since the returner types are saving as much as they can in the earlier periods, the increase in their earnings brings about a significantly larger increase in their savings. As a result, even though the savings profile of both returner and stayer types become steeper, the degree of it is larger for returner types. Since EU immigrants have a larger fraction of returner types, the degree of the rotation in their savings profile is bigger.

Compared to high-income returner types, the crossing of the counterfactual and the baseline savings profiles takes place at a later period for low-income returner types because the amount of increase in their earnings is lower after the proportional increase and their accumulated assets is lower at each period. Therefore, they keep saving at a higher level for a longer time before saving at a lower level. Since the returners among the EU immigrants contain a larger fraction of lower income immigrants, the crossing of the baseline and counterfactual profiles for EU immigrants in Figure 9.1.2 takes place later at period 13 compared to period 6 for non-EU immigrants. Even though the counterfactual savings level are higher in the first 13 periods for EU immigrants, there is a significant narrowing of the counterfactual and baseline savings values in periods 5 to 8 because there is a significant drop in the savings level of returner types with higher earnings particularly at these periods.

9.2 A Change in Home Country Expected Wages

In this counterfactual, I gauge the sensitivity of immigrants' return and savings decision on expected wages in the home country. Figure 9.2.1 presents the change in the hazard functions after a 25 percent increase in home country expected wages on the hazard functions according to EU status. Since home country wages is more important for younger immigrants who face a longer horizon of worklife after return, hazard rates increase more at earlier periods for

both immigrant groups. On the other hand, hazard rates at later periods fall because wages in the home country is not important for older immigrants as they do not plan to work after return and many of extra leavers in earlier periods are those who would leave in later periods.

The surprising result of this counterfactual can be seen in Table 9.2.1 where I present the lifetime survivior rate after a 25 percent increase in home country expected wage. Lifetime survivor rates increase for both immigrant groups, especially for EU immigrants.

The increase in home country wages would make return to the home country more likely by decreasing the wage differential. Moreover, there is not a direct effect on savings ability in Germany unlike the previous counterfactual on German wages. However, there is an indirect effect on the saving decision in Germany. Since an increase in home country wages increases the likelihood of return, it increases the amount of savings of immigrants while in Germany. This is illustrated in Figure 9.2.1 and the increase in savings can be easily seen in the figure for EU immigrants. It makes a bigger impact for EU immigrants because since the level of expected wages are higher in EU countries, the amount of change after a 25 percent increase is higher there. This is why in Table 9.2.1, the increase in the survivor rate is bigger for EU immigrants As a result of this change in saving decision, immigrants have higher asset holdings at each period.

At younger ages, the value of bequesting assets is a smaller share of the total utility due to the lower discount factor whereas the value of accumulated assets is higher because there is a longer lifetime horizon during which these assets can be decumulated. As a result, the increase in the value of accumulated assets resulting from a marginal rise in assets dominates the increase in the value of bequesting and, therefore, an increase in assets makes immigrants more likely to return to their home country and decumulate their assets. On the other hand, as immigrants age, the value of bequesting captures a bigger share of total value while the value of accumulated assets shrinks as the remaining lifetime shortens. Consequently, at older ages an increase in assets increases the value of bequesting more than the value of decumulating assets and immigrants become more likely to stay. This is why there are additional stayers after the increase in home country expected wages as seen in Table 9.2.1. These are the people who would return if the home country wages did not increase and they did not save more in earlier periods.

9.3 A Change in Purchasing Power Parity

In this counterfactual, I analyze the effect of a change in the purchasing power parity between Germany and the source countries on the return and savings decisions of immigrants. Figures 9.3.1 and 9.3.2 compare the baseline mean savings profile and hazard function with those under a 25 percent higher ppp. The figures are inclusive of all immigrant groups. The findings hold when the analysis is made separately for EU groups.

An increase in the ppp increases the value of accumulated wealth after return and, therefore, makes immigrants more likely to return. The increase in return rates is particularly strong for returners with higher assets. This is why in Figure 9.3.1 hazard rates rise at periods 3 to 9. However, higher hazard rates in these periods also implies that returners are selected out faster and, therefore, constitute a smaller fraction of the immigrant sample after the tenth period. Thus, hazard rates fall in later periods. Another feature of Figure 9.3.1 is the fall in the hazard rates in the first couple periods. The reason to this is that a higher purchasing power parity makes the early-leavers more patient because the returns to waiting and accumulating assets increase.

Table 9.3.1 presents the change in levels of return migration. After the 25 percent increase in ppp, the lifetime survivor rate of non-EU immigrants decreases from 0.463 to 0.456 while it remains constant for EU immigrants. There are two main reasons for this difference according to EU status. First of all, since this is a percentage increase and ppp levels are lower for EU immigrants, the amount of change in smaller for them. Second, this change makes the biggest impact on returners with higher assets. However, a smaller fraction of EU immigrants fall into this group. Returners among EU immigrants are more strongly selected among low asset holders as is illustrated in Figure **??**.1. Consequently, the increase in ppp brings about a change only in the timing of return migration for EU immigrants.

An increase in ppp has conflicting income and subsititution effects on saving decision. A higher ppp implies that immigrants could attain the same consumption levels in the home country with lower savings in Germany and induces the immigrants to save less. On the other hand, immigrants save more as the opportunity cost of consumption increases. Figure 9.3.2 displays the cumulative effect of these for all immigrants. As can be seen from the figure, in the first 10 periods, income effect dominates and immigrants save less. This is particularly apparent between the fifth and tenth periods.

The increase in ppp makes a very small impact on the behavior of stayer types and the returner types with low earnings. Stayer types have a very low probability of returning

to their home country and therefore ppp is relatively insignificant in their consumption smoothing over their lifetime. Even though it is an important factor for returner types with low earnings, there occurs only a very small change in their saving behavior because they are severely constrained in their saving ability. Therefore, most of the change in Figure 9.3.2 comes from the change in the behavior of returner type with higher savings. For these immigrants, income effect dominates and they save less in earlier periods. Their savings particularly drop between periods 5 and 10, which is the source of change in these periods in Figure 9.3.2. In the case that they stay in Germany until older ages, havings accumulated lower assets, they dissave less. This is the primary reason why saving levels rise after the tenth period.

10 CONCLUSIONS

In this paper, I estimated a dynamic stochastic model of joint return migration and savings choices, in which the reasons to return include higher purchasing power of accumulated assets in the home country due to lower prices there and immigrants' higher willingness to live in their home country. The immigrants whose behavior I analyze come from five different source countries that differ in terms of their general attractiveness, potential earnings of immigrants after return, purchasing power parity with Germany and life expectancy of immigrants.

I find the level of return migration to be high for EU immigrants. 88 percent of the Greek, 83 percent of the Italian and 92 percent of the Spanish immigrants return to their home countries at some point in their lifetime. On the other hand, for non-EU immigrants the return migration level is significantly lower. 61 percent of the Turkish and only 41 percent of ex-Yugoslavian immigrants return during their lifetime. There are interesting differences in the timing of return as well. The hazard function of non-EU immigrants is hump-shaped and reaches its peak around 15 years of residence whereas EU immigrants have a fast-decreasing hazard function that levels off after 10 years of residence before slightly rising again at retirement. The most prominent feature of immigrants' saving behavior is that it displays a decreasing trend over time. Immigrants' saving rate is very high.right after arrival. They save one third of their income in the first two years in Germany. This saving rate falls to 10 percent after twenty years of residence and to 5 percent for EU immigrants and to zero percent for non-EU immigrants after forty years of residence.

Immigrants bring back significant amount of assets with their return to their home coun-

try. This amount is 92,857 DM for Turkish immigrants and 91,407 DM for ex-Yugoslavian immigrants. It displays a higher variation for EU countries: Italian immigrants, who have higher return rates in earlier periods, take 42,619 DM while Greek immigrants take 94,093 DM and Spanish immigrants 84,129 DM to their home countries. The German Interior Ministry reports that around 45,000 Turks 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 to Turkey was almost a billion DM per year in this time interval. Since the literature also indicates that many of these return migrants, in fact more than half for Turkish immigrants, set up small businesses with part of this returned wealth, it would make an important contribution to the source country economy.

I find that immigrants make positive contributions to the pension insurance system regardless of their age-at-entry and country of origin. However, non-EU immigrants make higher contributions than EU immigrants and younger age-at-entry cohorts make higher contributions compared to older age-at-entry cohorts. In terms of net contributions to the unemployment insurance system younger age-at-entry cohorts still make higher contributions but this time EU immigrants make higher contributions than non-EU immigrants. In fact, net contributions of non-EU immigrants are all negative except for the very young entrants. When the net contributions to these two systems are taken together, all nationality groups but ex-Yugoslavians make positive contributions. Net contributions of EU immigrants are higher. I also find that an exogenous modeling of return migration decision in the calculation of lifetime net contributions, which has been the practice of literature so far, causes a serious underestimation.

In counterctual policy experiments, I show that the German government can increase this net contribution by providing financial bonuses to unemployed immigrants conditional on return. The policy is more effective on non-EU immigrants. I find that the optimal amount of bonus for non-EU immigrants is between 45,000 and 50,000DM when the policy is applied at a single point in time. Moreover, net contributions could also be increased by having such a policy all the time. In this case, however, restrictions on qualification such as maximum age and maximum duration of residence would be required.

In other counterfactual policy experiments, I find that the proposed elimination of unemployment assistance program in Germany has a tiny impact on immigrants' return behavior and that exchange rate premiums provided by source country governments in order to boost the entry of immigrants' wealth in fact decreases the amount of returned wealth to the source

country.

In the case of an increase in German wages, immigrants become less likely to return at earlier periods but more likely to return at later periods. Their savings profile becomes steeper as a result of higher savings ability. The counterfactual in which I gauge the sensitivity of immigrants' return and savings choices on the expected wage in the home country yields an interesting result. I find that an increase in home country expected wages increases the lifetime survivor rate in Germany. An increase in home country expected wages increases return rates at younger ages. However, as a result of higher savings, immigrants end up with higher asset holdings at older ages and become more likely to stay at these periods. This, in fact, dominates the increase at earlier periods and brings about an increase in lifetime survivor rate. An increase in ppp decreases the survivor rate as well as the average duration of residence of returners. With regard to its impact on saving behavior, I find that income effect dominates the substitution effect and immigrants' savings decrease at earlier periods. Having accumulated lower assets, they save more at older ages. Thus, the savings profile becomes flatter.

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TABLE 4.1: Data on PPP and Expected Wages in the Source Countries[28][29]

	Turkey	ex-Yugoslavia	Greece	Italy	Spain
PPP	2.2	2.5	1.6	1.3	1.4
Expected Wage / Expected Wage Turkey	1	0.8	1.1	1.6	1.3

FIGURE 4.1.1: Employment Ratio and Mean Income by EU Status

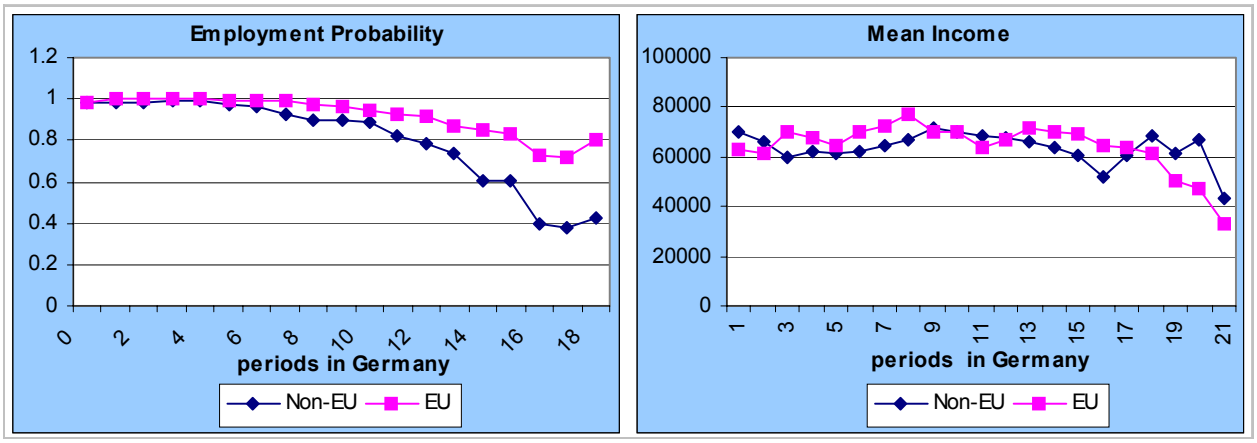
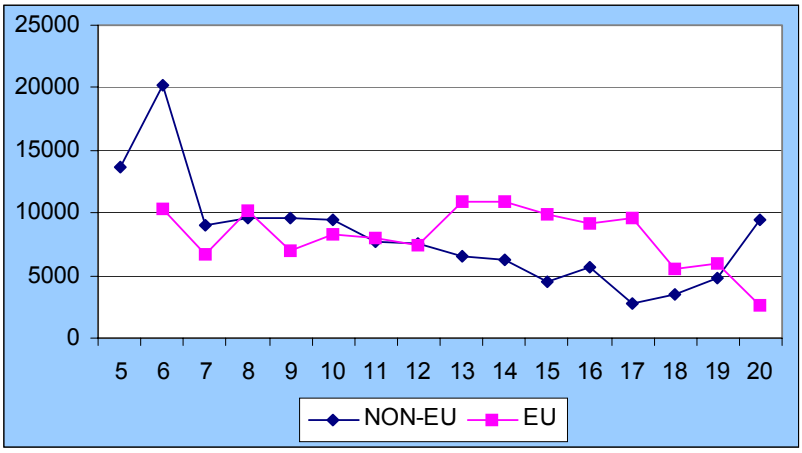


TABLE 4.1.1: Transition into Retirement

Age	*60*	*62*	*64*	*66*	*68*
Retired	37.4%	51.7%	63.7%	91.8%	94.7%

FIGURE 4.1.2: Mean Savings by EU Status



[28] Since most of the Italian immigrants are from the southern part of the country, we take the differences in prices between the South and the North into consideration in generating the numbers for Italy. We roughly take ppp 10% higher, wages 10% lower than the national averages.

[29] Expected wage ratio is at purchasing power parity.

FIGURE 4.1.3: Hazard Function by EU Status

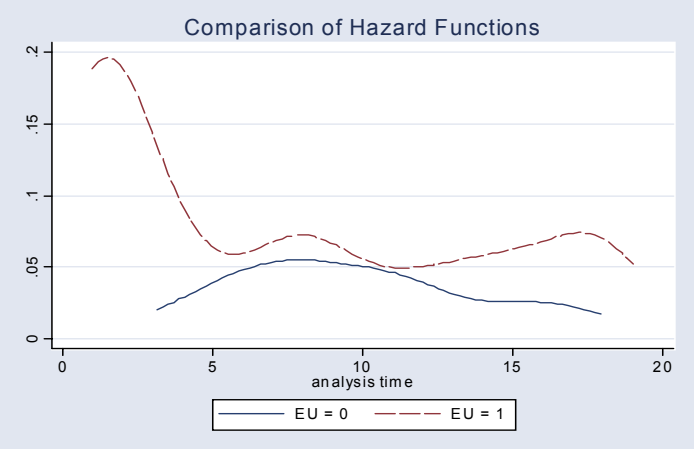


FIGURE 6.1.1: Fit of Hazard Function: Non-EU Immigrants

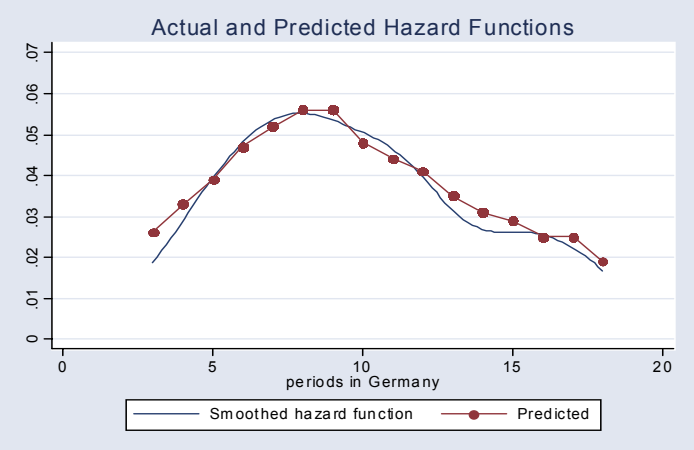


FIGURE 6.1.2: Fit of Hazard Function: EU Immigrants

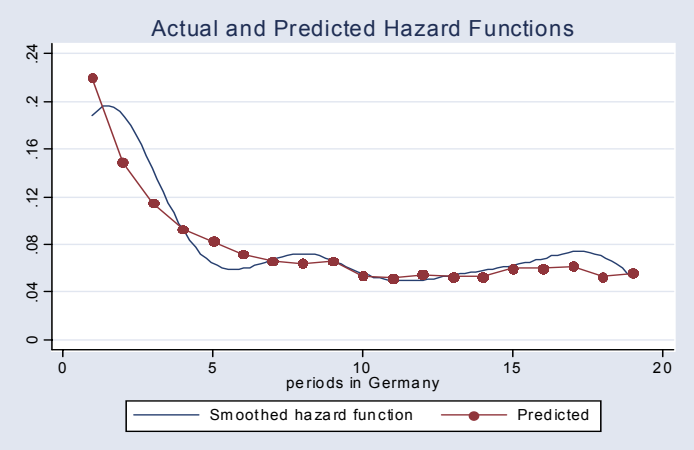


FIGURE 6.1.3: Fit of Mean Savings by EU Status

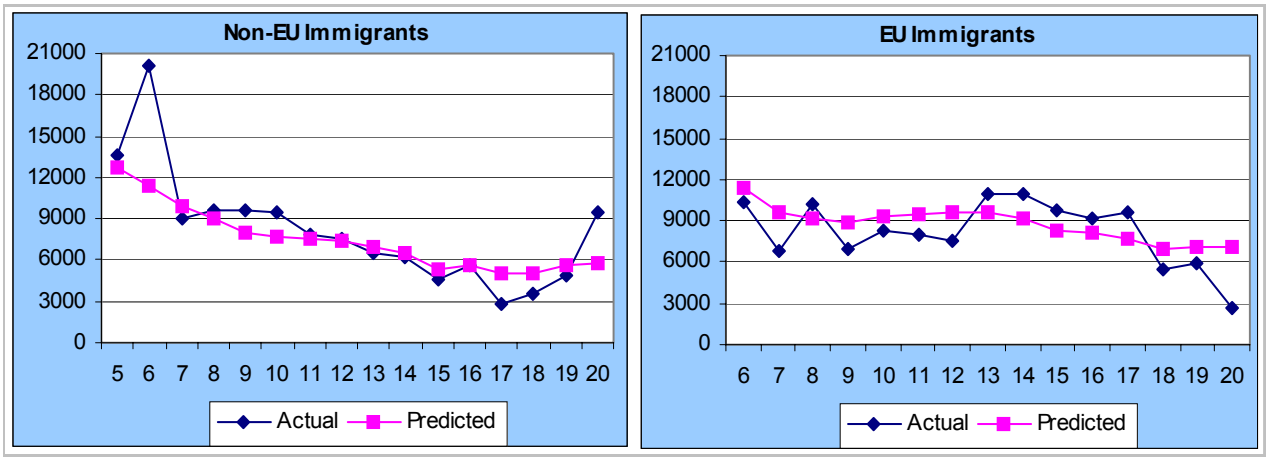


TABLE 6.2.1: A Ranking Characterization of Unobserved Types

	Initial Psychic Cost	Acclimatization Rate	Bequest Motive	Marginal Utility of Consumption	Labor Market Ability
Type 1	2	1	1	4	1
Type 2	3	4	3	3	3
Type 3	4	3	2	2	2
Type 4	1	2	4	1	4

FIGURE 6.2.1: Return and Saving Decisions by Types

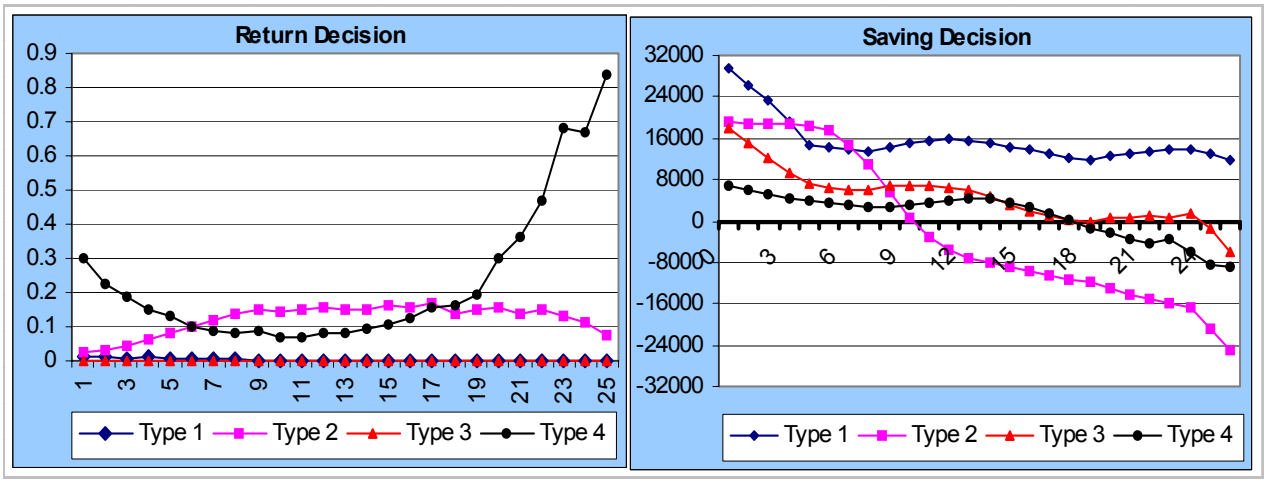


TABLE 6.2.2: Type Proportions over Duration of Residence

period	*0*	*5*	*10*	*15*	*20*	*25*
TURKISH						
Type 1	0.033	0.363	0.049	0.064	0.080	0.100
Type 2	0.559	0.517	0.343	0.180	0.097	0.076
Type 3	0.349	0.413	0.575	0.725	0.806	0.824
Type 4	0.059	0.034	0.033	0.031	0.017	0.000
ex-YUGOSLAVIAN						
Type 1	0.048	0.050	0.058	0.066	0.076	0.091
Type 2	0.320	0.284	0.176	0.096	0.052	0.039
Type 3	0.551	0.614	0.720	0.800	0.852	0.870
Type 4	0.082	0.052	0.046	0.038	0.020	0.000
GREEK						
Type 1	0.039	0.057	0.084	0.126	0.216	0.368
Type 2	0.433	0.510	0.410	0.266	0.146	0.084
Type 3	0.105	0.159	0.238	0.353	0.492	0.547
Type 4	0.423	0.275	0.269	0.255	0.147	0.001
ITALIAN						
Type 1	0.083	0.203	0.254	0.299	0.409	0.572
Type 2	0.022	0.041	0.027	0.013	0.007	0.003
Type 3	0.116	0.293	0.373	0.437	0.424	0.422
Type 4	0.779	0.463	0.346	0.252	0.161	0.003
SPANISH						
Type 1	0.066	0.116	0.178	0.275	0.490	0.733
Type 2	0.299	0.416	0.344	0.248	0.149	0.088
Type 3	0.030	0.056	0.087	0.128	0.175	0.175
Type 4	0.606	0.412	0.391	0.349	0.186	0.003

FIGURE 7.1.1: Net Contributions by Age at Entry and Country of Origin

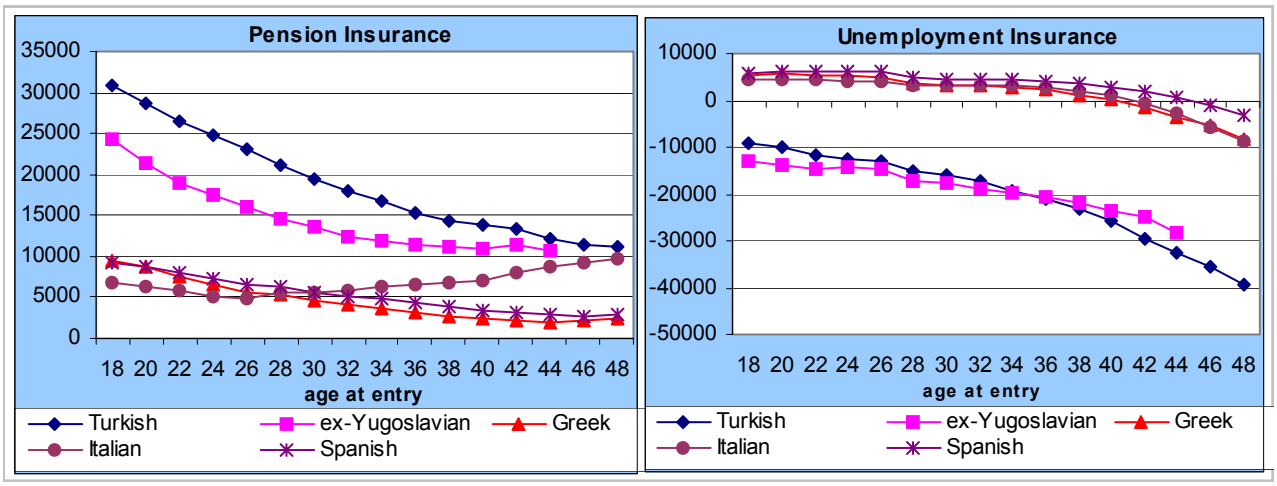


FIGURE 7.1.2: Total Net Contributions to the Pension and Unemployment Insurance Systems by Age at Entry and Nationality

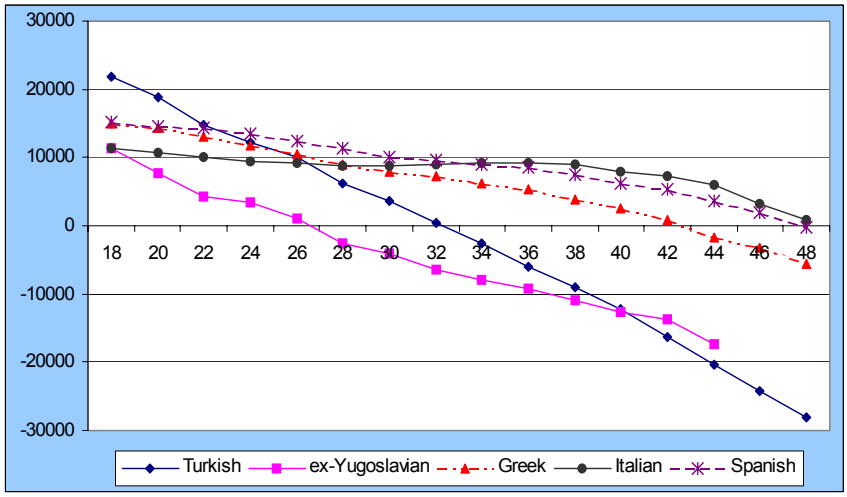


TABLE 7.1.1: Net Contributions by Country of Origin

	Turkish	ex-Yugoslavian	Greek	Italian	Spanish
Net Pension Insurance Contribution	21,461	15,788	5,662	6,165	6,588
Net Unemployment Insurance Contribution	-15,617	-16,884	3,787	3,761	5,124
Total Net Contribution	5,844	-1,095	9,449	9,927	11,712

TABLE 7.1.2: Net Contributions If Return Migration Were Exogenous

	Turkish	ex-Yugoslavian	Greek	Italian	Spanish
Net Pension Insurance Contribution	18,632	14,063	4,115	2,671	5,171
Net Unemployment Insurance Contribution	-21,177	-19,816	1,779	1,759	3,632
Total Net Contribution	-2,544	-5,753	5,895	4,431	8,803

FIGURE 7.2.1: Saving Rate in Germany by EU Status

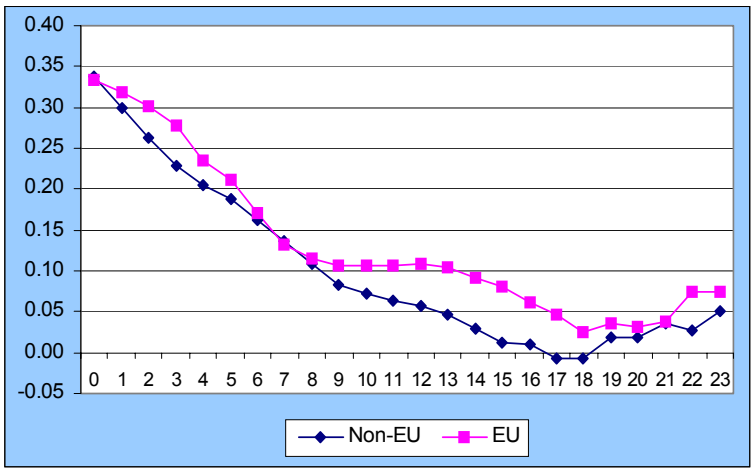


FIGURE 7.2.1: Comparison of Asset Levels of Stayers and Returners

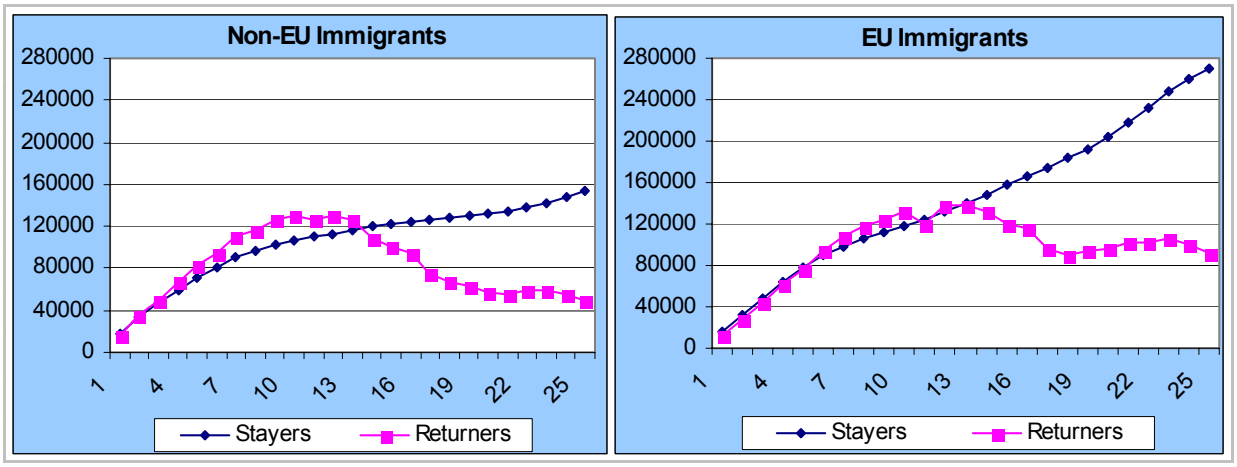


TABLE 7.2.1: Average Asset Level of a Returner

Turkish	ex-Yugoslavian	Greek	Italian	Spanish
92,857	91,407	94,093	42,619	84,129

TABLE 7.2.2: Average Asset Level that Returns per Emigrant

Turkish	ex-Yugoslavian	Greek	Italian	Spanish
56,689	37,669	82,585	35,271	77,096

TABLE 8.1.1: Total Net Pension and Unemployment Insurance Contributions with a One-Time Bonus[30]

period=4					
	Turkish	*Yugoslav*	*Greek*	*Italian*	*Spanish*
Baseline	5,844	-1,096	9,450	9,928	11,713
30,000	5,904	-1,065	**9,451**	9,923	11,713
35,000	5,916	-1,055	9,449	9,919	11,711
40,000	5,925	-1,051	9,445	9,913	11,708
45,000	5,938	**-1,050**	9,441	9,909	11,705
50,000	**5,943**	-1,052	9,437	9,905	11,699
55,000	5,938	-1,057	9,430	9,896	11,696

period=6					
	Turkish	*Yugoslav*	*Greek*	*Italian*	*Spanish*
Baseline	5,844	-1,096	9,450	9,928	11,713
25,000	5,950	-1,036	9,469	**9,933**	**11,725**
30,000	5,985	-1,011	9,476	9,930	11,725
35,000	6,023	-993	**9,478**	9,927	11,722
40,000	6,057	-983	9,478	9,924	11,717
45,000	**6,065**	**-979**	9,475	9,919	11,710
50,000	6,057	-983	9,467	9,912	11,704

period=8					
	Turkish	*Yugoslav*	*Greek*	*Italian*	*Spanish*
Baseline	5,844	-1,096	9,450	9,928	11,713
30,000	5,970	-1,030	9,467	9,937	11,719
35,000	6,003	-1,005	9,478	**9,938**	**11,721**
40,000	6,034	-991	**9,485**	9,935	11,718
45,000	**6,053**	**-989**	9,479	9,930	11,714
50,000	6,033	-998	9,470	9,922	11,706
55,000	5,997	-1,010	9,461	9,917	11,697

period=10					
	Turkish	*Yugoslav*	*Greek*	*Italian*	*Spanish*
Baseline	5,844	-1,096	9,450	9,928	11,713
30,000	5,920	-1,017	9,483	9,937	11,725
35,000	5,943	-981	9,494	9,941	11,734
40,000	5,964	-947	9,510	**9,942**	**11,738**
45,000	**5,980**	**-938**	**9,520**	9,940	11,733
50,000	5,972	-943	9,510	9,939	11,723
55,000	5,945	-957	9,492	9,936	11,714

period=12					
	Turkish	*Yugoslav*	*Greek*	*Italian*	*Spanish*
Baseline	5,844	-1,096	9,450	9,928	11,713
30,000	5,891	-1,009	9,525	9,953	11,779
35,000	5,906	-972	9,544	9,963	11,779
40,000	5,924	-927	9,553	9,964	11,780
45,000	**5,941**	**-901**	9,562	**9,967**	**11,785**
50,000	5,934	-904	**9,568**	9,965	11,777
55,000	5,904	-921	9,553	9,963	11,766

period=14					
	Turkish	*Yugoslav*	*Greek*	*Italian*	*Spanish*
Baseline	5,844	-1,096	9,450	9,928	11,713
40,000	5,891	-991	9,503	9,974	11,732
45,000	5,915	-955	9,514	9,985	11,732
50,000	**5,919**	**-945**	9,529	9,998	**11,738**
55,000	5,893	-951	9,541	**10,003**	11,735
60,000	5,857	-970	**9,543**	10,000	11,726
65,000	5,821	-998	9,538	9,986	11,715

period=16					
	Turkish	*Yugoslav*	*Greek*	*Italian*	*Spanish*
Baseline	5,844	-1,096	9,450	9,928	11,713
25,000	5,854	-1,071	9,472	9,949	**11,715**
30,000	5,853	-1,070	**9,473**	9,945	11,711
35,000	5,853	-1,067	9,472	9,944	11,708
40,000	5,860	-1,063	9,467	9,953	11,706
45,000	5,866	-1,052	9,465	9,958	11,706
50,000	**5,867**	**-1,051**	9,464	9,966	11,703
55,000	5,855	-1,054	9,456	**9,969**	11,697
60,000	5,837	-1,065	9,456	9,959	11,696

period=18					
	Turkish	*Yugoslav*	*Greek*	*Italian*	*Spanish*
Baseline	5,844	-1,096	9,450	9,928	11,713
20,000	5,846	-1,096	9,452	**9,933**	11,711
25,000	5,846	-1,096	**9,452**	9,930	11,711
30,000	5,847	-1,096	9,452	9,932	11,711
35,000	5,847	-1,097	9,451	9,931	11,711
40,000	5,848	-1,097	9,451	9,931	11,709
45,000	**5,848**	-1,098	9,449	9,928	11,709
50,000	5,848	-1,099	9,448	9,926	11,709
55,000	5,846	-1,101	9,446	9,925	11,707

TABLE 8.1.2: Baseline and Bonus Unemployment Rates of Turkish Immigrants

Period	*5*	*6*	*7*	*8*	*9*	*10*
Baseline	2.7%	4.1%	5.8%	8.4%	11.7%	16.3%
Bonus	2.7%	3.4%	5.3%	8.0%	11.3%	16.0%

[30] In this policy experiment, bonuses are restricted to those younger than 58. Therefore, the last period an immigrant can receive a bonus is period 19.

TABLE 8.1.2: Total Net Pension and Unemployment Insurance Contributions

	Age < 54					Age < 56				
	Turkish	Yugoslav	Greek	Italian	Spanish	Turkish	Yugoslav	Greek	Italian	Spanish
Baseline	5,844	-1,096	9,450	9,928	11,713	**5,844**	-1,096	9,450	9,928	**11,713**
5,000	**5,846**	-1,064	9,476	9,938	**11,718**	5,832	-1,066	9,473	9,945	11,706
10,000	5,833	-1,037	9,479	9,964	11,705	5,797	-1,044	**9,483**	9,961	11,701
15,000	5,827	-1,005	9,484	9,970	11,694	5,743	-1,026	9,475	9,976	11,693
20,000	5,817	-985	**9,488**	**9,972**	11,683	5,709	-1,011	9,479	**9,980**	11,670
25,000	5,790	-970	9,472	9,961	11,677	5,647	**-1,010**	9,461	9,947	11,652
30,000	5,750	**-961**	9,458	9,928	11,651	5,563	-1,027	9,421	9,929	11,622
35,000	5,690	-978	9,427	9,907	11,628					

	Age < 50					Age < 52				
	Turkish	Yugoslav	Greek	Italian	Spanish	Turkish	Yugoslav	Greek	Italian	Spanish
Baseline	5,844	-1,096	9,450	9,928	11,713	5,844	-1,096	9,450	9,928	11,713
5,000	5,848	-1,075	9,467	9,943	11,714	5,849	-1,068	9,469	9,944	**11,717**
10,000	5,859	-1,045	9,462	9,963	**11,715**	5,858	-1,037	9,478	**9,968**	11,703
15,000	5,875	-1,027	**9,471**	**9,969**	11,705	5,868	-1,007	**9,485**	9,967	11,697
20,000	**5,882**	-996	9,467	9,957	11,695	**5,878**	-983	9,480	9,963	11,688
25,000	5,877	-975	9,456	9,946	11,693	5,872	-962	9,473	9,954	11,681
30,000	5,878	-958	9,456	9,936	11,678	5,839	**-941**	9,463	9,932	11,669
35,000	5,876	**-953**	9,445	9,918	11,653	5,807	-943	9,447	9,920	11,647
40,000	5,846	-953	9,428	9,892	11,641					

	Age < 46					Age < 48				
	Turkish	Yugoslav	Greek	Italian	Spanish	Turkish	Yugoslav	Greek	Italian	Spanish
Baseline	5,844	-1,096	9,450	9,928	11,713	5,844	-1,096	9,450	9,928	**11,713**
5,000	5,858	-1,087	9,460	9,941	**11,714**	5,856	-1,081	9,466	9,948	11,711
10,000	5,864	-1,071	9,457	9,942	11,712	5,862	-1,058	9,466	9,954	11,708
15,000	5,863	-1,059	**9,457**	**9,944**	11,707	5,873	-1,041	**9,468**	**9,956**	11,701
20,000	5,873	-1,051	9,450	9,934	11,701	5,889	-1,024	9,461	9,945	11,693
25,000	**5,880**	-1,036	9,450	9,927	11,696	**5,890**	-1,004	9,455	9,939	11,684
30,000	5,878	-1,025	9,442	9,915	11,685	5,888	-993	9,454	9,924	11,672
35,000	5,865	**-1,016**	9,426	9,903	11,667	5,886	-984	9,440	9,908	11,656
40,000	5,863	-1,017	9,413	9,886	11,656	5,872	**-983**	9,422	9,887	11,641
45,000						5,846	-996	9,398	9,858	11,624

TABLE 8.1.3: Total Net Pension and Unemployment Insurance Contributions When Bonus Can Be Received Only in the First Ten Years of Residence

	Turkish	ex-Yugoslavian	Greek	Italian	Spanish
Baseline	5,844	-1,096	**9,450**	9,928	**11,713**
5,000	5,866	-1,086	9,448	9,929	11,712
10,000	5,881	-1,074	9,444	9,929	11,710
15,000	5,894	-1,065	9,440	**9,930**	11,707
20,000	5,913	-1,055	9,437	9,924	11,703
25,000	5,925	-1,044	9,431	9,919	11,699
30,000	5,939	**-1,039**	9,425	9,909	11,690
35,000	**5,949**	-1,041	9,416	9,897	11,678
40,000	5,948	-1,048	9,405	9,882	11,668
Also restricted to age<56					

TABLE 8.3.1: Effect of a Exchange Rate Premium on the Return of Wealth to the Source Countries

	Turkish	Yugoslavian	Greek	Italian	Spanish
BASELINE					
Survivor Rate	0.3895	0.5879	0.1223	0.1724	0.0836
Average Wealth of Returners	92,857	91,407	94,093	42,619	84,128
Average Returned Wealth	**56,689**	**37,669**	**82,585**	**35,271**	**77,095**
5% PREMIUM					
Survivor Rate	0.3874	0.5869	0.1218	0.1727	0.0832
Average Wealth of Returners	91,793	90,251	93,281	42,848	83,805
Average Returned Wealth	**56,232**	**37,283**	**81,919**	**35,448**	**76,832**

FIGURE 9.1.1 : Impact of an Increase in German Wages on Hazard Function

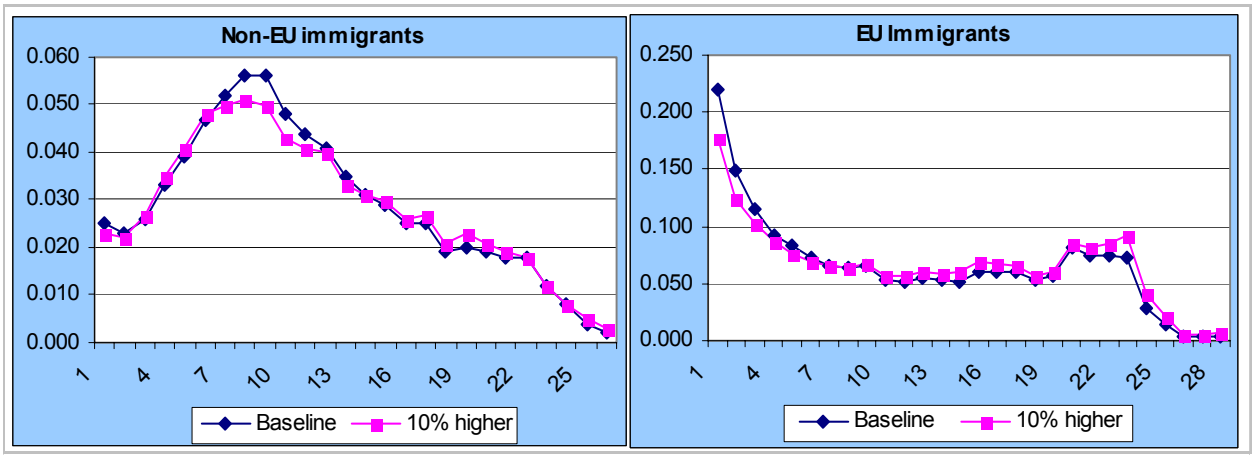


FIGURE 9.1.2: Impact of an Increase in German Wages on Savings Profile

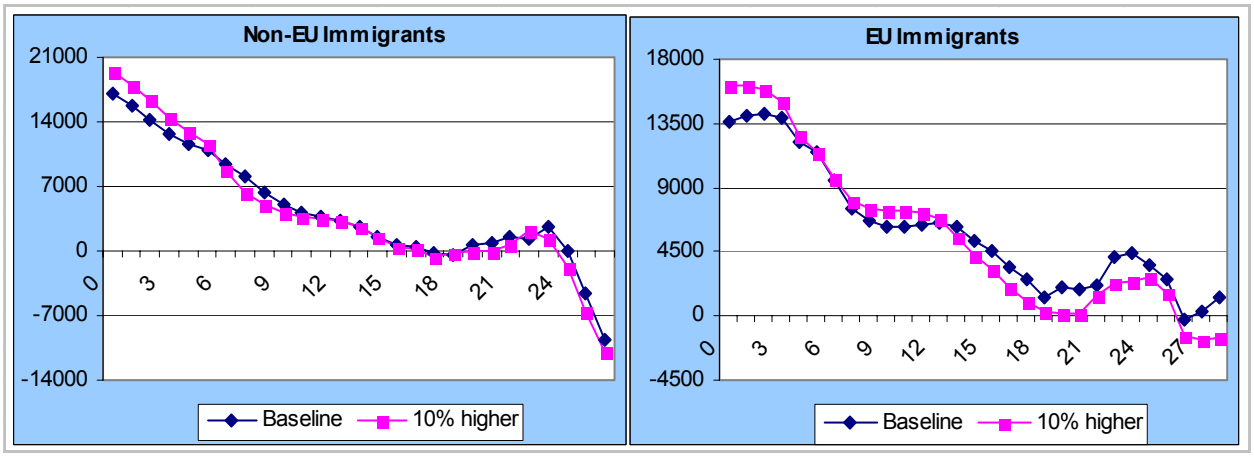


TABLE 9.1.1: Lifetime Survivor Rate After an Increase in German Wages

	Non-EU	EU
Baseline	0.463	0.144
10% Increase	0.467	0.142

FIGURE 9.2.1: Impact of an Increase in Home Country Wages on Hazard Functions

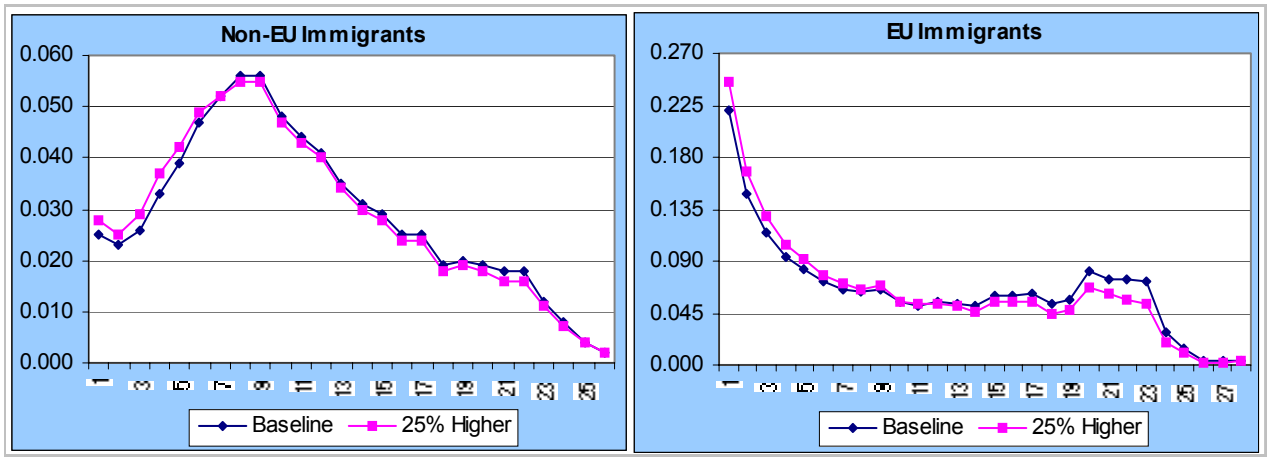


FIGURE 9.2.1: Impact of an Increase in Home Country Wages on Saving Profile

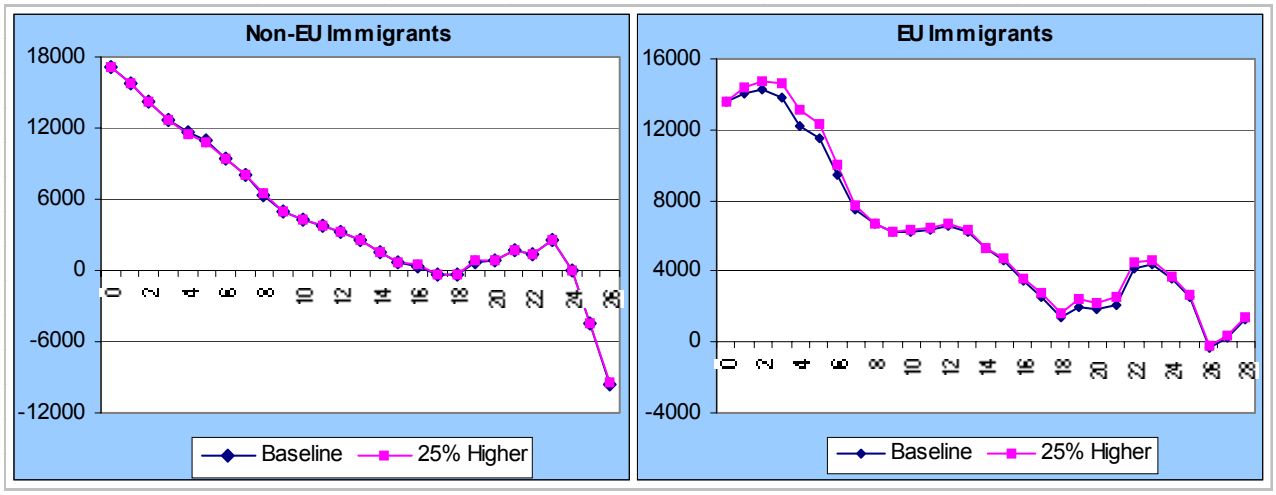


TABLE 9.2.1: Lifetime Survivor Rate After an Increase in Home Country Wages

	Non-EU	EU
Baseline	0.463	0.144
25% Increase	0.464	0.148

FIGURE 9.3.1: Hazard Function with Different PPP : All Immigrants

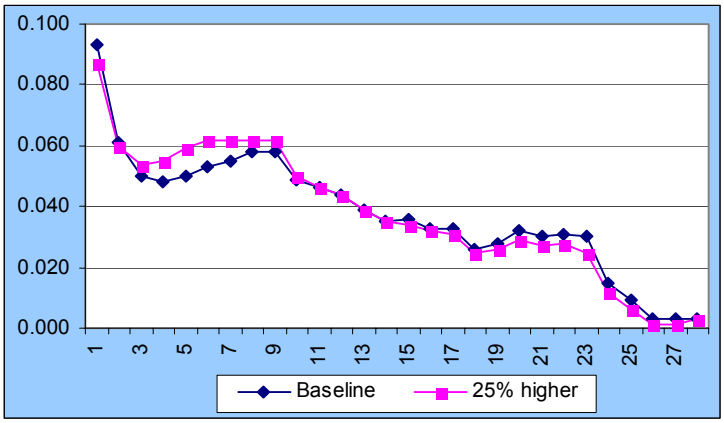
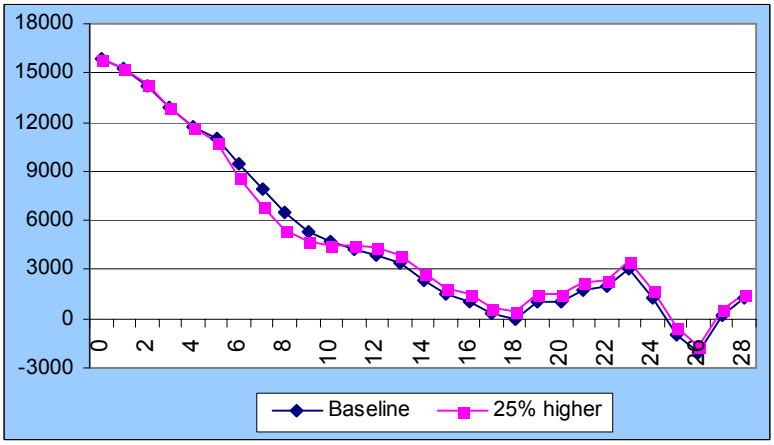


TABLE 9.3.1: Lifetime Survivor Rate After an Increase in PPP

	Non-EU	EU
Baseline	0.463	0.144
25% Increase	0.456	0.144

FIGURE 9.3.2: Mean Savings Profiles with Different PPP : All Immigrants



APPENDIX

A EMPIRICAL SPECIFICATIONS

A.1 Marginal Utility of Consumption in Germany

$$\mu_t = \sum_{k=1}^{4} \mu_k I(type = k) \exp \left[\begin{array}{c} \mu_5 I(l_t = 0) + \mu_2 I(l_6 = 2) + \mu_7 I(age \leq 24) + \\ \mu_8 I(age \leq 30) + \mu_9 I(age \geq 60) + \mu_{10} I(age \geq 70) \end{array} \right]$$

A.2 Psychic Costs in Germany

$$\begin{aligned} \rho_t &= \sum_{k=1}^{4} \left(\rho_k I(type = k) + \rho_{4+k} I(type = k) t + \rho_{8+k} I(type = k) t^2 \right) + \\ &\quad \rho_{13} I(l_t = 0) + \rho_{14} I(l_t = 2) + \rho_{15} age_0 + \rho_{16} age_0^2 \end{aligned}$$

A.3 Bequest Function

$$B(.) = \beta_0 \left[1 - \exp(\sum_{k=1}^{4} \beta_k I(type = k) A_{T+1}) \right]$$

A.4 Employment Transition

Employment transition before one becomes eligible for retirement is modeled as a probit.

$$\begin{aligned} l_t^* &= \alpha_0 + \alpha_1 l_{t-1} + \alpha_2 age_t + \alpha_3 age_t^2 + \alpha_4 I(age_t \geq 60) + \alpha_5 age_0 + \\ &\quad \sum_{z=2}^{5} \alpha_{4+z} I(country = z) + \sum_{k=2}^{4} \alpha_{8+k} I(type = k) + \varepsilon \end{aligned}$$

$$l_t = 1 \left[l_t^* > 0 \right]$$

A.5 Employment Transition with Retirement

I use a multinomial logit model for employment transition when retirement is possible.

$$\begin{aligned} P(l &= j) = \exp(\gamma_{4(j-1)+1} + \gamma_{4(j-1)+2} age_0 + \gamma_{4(j-1)+3} I(l_{t-1} = 0) + \gamma_{4(j-1)+4} age_t) \; / \\ &\left[1 + \sum_{h=1}^{2} \exp(\gamma_{4(h-1)+1} + \gamma_{4(h-1)+2} age_0 + \gamma_{4(h-1)+3} I(l_{t-1} = 0) + \gamma_{4(h-1)+4} age_t) \right] \\ &j = 1, 2 \end{aligned}$$

$$P(l=0) = 1 \,/\, \left[1 + \sum_{j=1}^{2} \exp(\gamma_{4(j-1)+1} + \gamma_{4(j-1)+2} age_0 + \gamma_{4(j-1)+3} I(l_{t-1}=0) + \gamma_{4(j-1)+4} age_t)\right]$$

A.6 Human Capital

$$H_t = \upsilon_1 t + \upsilon_2 t^2 + \upsilon_3 age_0 + \sum_{z=2}^{5} \upsilon_{2+z} I(country = z) + \sum_{k=2}^{4} \upsilon_{6+z} I(type = k)$$

A.7 Distribution of Shocks

$\boldsymbol{\eta}_t = (\eta_t^s, \eta_t^y)$, the vector of contemporaneous shocks to preferences and earnings, have the following joint distribution.

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

A.8 Preferences for Living in the Home Country

The value of living in the home country has four compenents: A baseline country dummy plus the value of accumulated wealth in Germany –where wealth is interacted with purchasing power parity between the source country and Germany–, the value of potential earnings in the home country after return -which is shifted according to the ratio of expected wages in source countries–, and the value of German pension benefits –which is adjusted according to the ratios of purchasing power parities–. Below is given the parametrization, which is explained in detail at the end of this section.

$$\begin{aligned}
V^L(\widetilde{S}_t) = & \sum_{country=z} I(z) \left(\frac{1-\delta^{p_{age_t}}}{1-\delta}\right) \pi_{0,z} \\
& + \sum_{country=z} I(z)(\exp(\pi_{1,1}) + \exp(\pi_{1,2}) p_{age_t})(1 - \exp[(\pi_{1,3} + \pi_{1,4} p_{age_t})\,(ppp^z A_t)]) \\
& + \sum_{country=z} I(z) \max\left\{\left(\left(\frac{\hat{w}^z}{\hat{w}^{Turk}}\right)^{\pi_{2,1}} \pi_{2,2} + \left(\frac{\hat{w}^z}{\hat{w}^{Turk}}\right)^{\pi_{2,3}} (\pi_{2,4} age_t + \pi_{2,5} age_t^2)\right), 0\right\} \\
& + \sum_{country=z} I(z) I(t \geq 3) \left(\frac{ppp^z}{ppp^{Turk}}\right)^{\pi_{3,1}} \Delta_{age} \left[\pi_{3,2} \left[1 + \pi_{3,3} I(age_t \geq 64)\right] (1 - \exp(\pi_{3,4} t))\right]
\end{aligned}$$

Above 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. Also,

$$p_{age_t} = (last\_age - age_t)/2$$

is the number of periods left till death and

$$\Delta_{age} = I(age_t \geq 64)\left(\frac{1-\delta^{p_{age_t}}}{1-\delta}\right) + I(age < 64)\delta^{(64-age_t)/2}\left(\frac{1-\delta^{p_{age_t=64}}}{1-\delta}\right)$$

is the discount factor for pension benefits, which an immigrant can start receiving only after age 64.

Note that the variation in the above value according to nationality is limited to three sources: $\pi_{0,z}$ is the baseline country dummy, ppp^z determines the purchasing power in the source country compared to Germany, $\hat{w}^z/\hat{w}^{Turk}$ shifts the value of expected earnings in the source countries according to expected wages in each country when the baseline country is taken as Turkey.

The following is an explanation of the individual 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 compared to Germany. It would depend on source country characteristics like per capita income level, whether the country has a socialist regime, income inequality, political stability and so forth. This dummy also includes the transportation cost of return, which would vary by country of origin according to its distance from Germany. In addition, it accounts for the institutional difference between the EU and non-EU countries in that non-EU immigrants can not engage in repeat migration to Germany after they make a permanent return to their home countries.

2nd line (Value of Accumulated Assets): The value of accumulated wealth varies according to wealth intereacted with ppp in an inverse exponential form. Both parameters of the inverse exponential function varies with the age of the migrant because in his home country a migrant's per period consumption of the wealth he acquired in Germany would depend on the remaining length of his life.

3rd line (Value of Potential Earnings at Home): The present discounted value of immigrants' utility from their earnings in their home country after return would depend on their age at return as well as the country they return. Both the constant term and the slope of the decrease in the discounted value by age varies by $\left(\frac{\hat{w}^z}{\hat{w}^{Turk}}\right)$, which is the ratio of the average earnings level in country z to that in Turkey.

4th line (Value of German Pension Benefits): In order to qualify for German pension benefits, one must have worked for at least 5 years (which is 3 periods in our model). Δ^2_{age} discounts the value to the period an immigrant is making the return decision. $\left(\frac{ppp^z}{ppp^{Turk}}\right)$ accounts for the different purchasing power of German pension benefits in different

source countries. (Turkey is taken as the baseline country.) Pension benefits depend on immigrants' duration of residence in an inverse exponential functional form. (Periods of unemployment are counted toward the contribution period. Since in the model, immigrants are always in the labor market, duration of time in the labor market is equal to duration of residence.)

B 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.

B.1 Classification Errors

B.1.1 Unbiased Classification Error in the Labor Market Outcomes:

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

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 (2001) methodology, I write the classification errors in the following linear form.

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

$$\theta_{1,\neq 1}^l = P(l_{it}^* = 1 | l_{it} \neq 1) = (1 - \widetilde{E})\widehat{P}(l_{it} = 1)) \quad (3)$$

where

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

and $\widetilde{E}$ is a parameter measuring the extent of classification error, which is transformed in the following way in estimation.

$$\widetilde{E} = 1/[1 + \exp(E)]$$

E is estimated along with the other parameters of the model Unbiasedness of the classification errors requires that when equations (2 and 3) are substituted into the equation below, $P(l_{it}^* = i) = P(l_{it} = i)$ holds.

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

B.1.2 Biased Classification Error in Return Migration

The classification error in return migration has two important properties. 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 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 the classification error is biased. Thus, $P(m_t^* = 1) \neq P(m_t = 1)$.

The following expressions, in which G is the parameter indicating the degree of misreporting, are used.

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

B.2 Measurement Errors

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

B.2.1 Measurement Error in Earnings

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

B.2.2 Measurement Error in Savings

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

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

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

The calculation of the probability of observing the registered spell conditional on the true spell can be categorized into four groups according to which spell ends earlier and whether or not it ends with an exit as follows:

Case 1: The simulated spell ends earlier with an exit.

Data	0	0	0	0	X
Simulated	0	0	0	1	

This has zero probability because since a return took place, this person could not have been in the sample.

$$P(M_i^{obs}|M_{in}^{sim}) = 0$$

Case 2: The data and simulated spell both end with an exit at the same period.

Data	0	0	0	0	1
Simulated	0	0	0	0	1

There are T_1 periods of correct reporting of staying in Germany as well as correct reporting of exit.

$$P(M_i^{obs}|M_{in}^{sim}) = (1 - \theta_{1,0}^m)^{T_1}$$

Note that the probability of correct of reporting of an exit, $\theta_{1,1}^m = 1$.

Case 3: The data spell ends earlier with an exit.

Data	0	0	0	0	1	.	.	.
Simulated	0	0	0	0	0	0	0	0

There are T_1 periods of correct reporting of staying in Germany and $T - T_1$ periods of mismatch (classification error).

$$P(M_i^{obs}|M_{in}^{sim}) = (1 - \theta_{1,0}^m)^{T_1}(\theta_{1,0}^m)^{T-T_1}$$

OR

Data	0	0	0	0	1	.	.	.
Simulated	0	0	0	0	0	0	0	1

There are T_1 periods of correct reporting of staying in Germany and $T - T_1 - 1$ periods of mismatch (classification error).

$$P(M_i^{obs}|M_{in}^{sim}) = (1 - \theta_{1,0}^m)^{T_1}(\theta_{1,0}^m)^{T-T_1-1}$$

Case 4: The data spell ends earlier without an exit.

Data	0	0	0	0	0	.	.
Simulated	0	0	0	0	0	0	X

There are T_1 periods of correct reporting of staying in Germany and $T - T_1$ periods of missing information.

$$P(M_i^{obs}|M_{in}^{sim}) = (1 - \theta_{1,0}^m)^{T_1}$$

B.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, the probability of observing the reported labor market status spell conditional on the simulated spell can be written as follows.

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

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

The savings data in the GSOEP are censored at zero because the savings question is asked only for positive savings. (Since I aggregate the data into two year periods, there are censoring values other than zero as well.) For censored observations, the probability that $A_{t+1} - A_t$ equals the censoring value is written:

$$P((A_{t+1} - A_t)_i^{obs}|(A_{t+1} - A_t)_{in}^{sim}) = \Phi\left(\frac{(A_{t+1} - A_t)_i^{obs} - (A_{t+1} - A_t)_{in}^{sim}}{\sigma_{s,m}}\right)$$

Above Φ is the standard normal cumulative distributive function.

For uncensored observations,

$$P((A_{t+1} - A_t)_i^{obs}|(A_{t+1} - A_t)_{in}^{sim}) = \frac{1}{\sigma_{s,m}}\phi\left(\frac{(A_{t+1} - A_t)_i^{obs} - (A_{t+1} - A_t)_{in}^{sim}}{\sigma_{s,m}}\right)$$

where ϕ is the standard normal density.

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

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

C SUBSISTENCE INCOME

In this section, I explain how subsistence income is calculated using demographic features of immigrants and the German institutional rules. I calculate the probability of being married by age and the mean number of children by age for each nationality. Then, I smooth both the probability of being married and mean number of children profiles using lowess smoothing and use these smoothed values in the following subsistence level income formula:

$$520 * [1 + 0.8(prob\_married) + 0.7(no\_children)]^{31}$$

The results are displayed in the below table.

TABLE C.1: SUBSISTENCE INCOME BY AGE AND ORIGIN

Age	Turkish	Yugoslavian	Greek	Italian	Spanish
18	14,080	14,465	12,480	12,851	13,298
20	16,747	15,734	13,430	14,429	14,823
22	19,451	17,451	15,286	16,615	16,514
24	22,091	19,267	17,229	18,906	18,211
26	24,613	21,054	19,196	21,145	19,916
28	26,988	22,801	21,100	23,216	21,554
30	29,152	24,440	22,910	25,071	23,071
32	30,970	25,866	24,571	26,668	24,429
34	32,346	27,023	26,034	27,928	25,596
36	33,247	27,863	27,213	28,775	26,519
38	33,679	28,320	28,029	29,176	27,147
40	33,667	28,380	28,452	29,128	27,428
42	33,220	28,076	28,504	28,678	27,344
44	32,434	27,451	28,226	27,919	26,968
46	31,450	26,592	27,663	26,964	26,382
48	30,324	25,628	26,912	25,898	25,662
50	29,122	24,703	26,109	24,797	24,895
52	27,956	23,893	25,409	23,750	24,156
54	26,915	23,155	24,918	22,842	23,494
56	26,043	22,463	24,675	22,120	22,939
58	25,309	21,832	24,644	21,598	22,545
60	24,590	21,238	24,652	21,251	22,346
62	23,862	20,625	24,577	21,043	22,266
64	23,168	19,938	24,387	20,962	22,239
66	22,478	19,135	24,101	21,002	22,232
68	21,748	18,199	23,717	21,155	22,246
70		17,053	23,224	21,414	22,300
72			22,722	21,758	22,385
74			22,464	22,159	22,451

[31] Children, in fact, receive 50 to 90 percent of the baseline amount depending on their age. We average this as 70 percent.

D PARAMETER ESTIMATES

Marginal Utility Parameters

μ_1	μ_2	μ_3	μ_4	μ_5	μ_6	μ_7	μ_8	μ_9	μ_{10}
4.115	4.546	5.289	5.349	−0.0877	−0.1372	−0.323	−0.086	0.0126	0.0865
(0.189)	(0.130)	(0.371)	(0.328)	(0.0047)	(0.0071)	(0.879)	(0.013)	(0.0027)	(0.0085)

Psychic Cost Parameters

ρ_1	ρ_2	ρ_3	ρ_4	ρ_5	ρ_6	ρ_7	ρ_8
5,671	4,157	3,250	6,989	−380.4	−12.05	−176.9	−351.9
(110.3)	(112.8)	(670.7)	(59.13)	(19.42)	(3.648)	(17.49)	(21.27)

ρ_9	ρ_{10}	ρ_{11}	ρ_{12}	ρ_{13}	ρ_{14}	ρ_{15}	ρ_{16}
3.172	−0.177	−1.035	6.704	−46.06	634.9	−2.417	−0.1589
(1.373)	(0.284)	(6.009)	(0.480)	(36.60)	(104.8)	(1.1343)	(0.0396)

Bequest Function Parameters

β_1	β_2	β_3	β_4	β_5^c	β_6^b	β_7^c	β_8^b
11.378	10.369	11.011	9.252	−0.00425	−0.0292	−0.00207	−0.00158
(0.1138)	(0.0717)	(0.2259)	(15.069)	(0.000429)	(0.0456)	(0.000184)	(0.3955)

Value Home Parameters

π_{01}	π_{02}	π_{03}	π_{04}	π_{05}	π_{11}	π_{12}	π_{13}^c	π_{14}^d
−1,861	−2,377	916.6	587.6	608.4	9.420	8.049	−0.0114	0.0381
(160.4)	(263.3)	(36.76)	(152.8)	(75.07)	(0.108)	(0.034)	(0.00023)	(0.00116)

π_{21}^f	π_{22}^c	π_{23}	π_{24}	π_{25}	π_{31}^f	π_{32}	π_{33}	π_{34}
−1.067	−0.0145	16,586	−248.0	−8.765	0.0283	614.8	6.356	−0.1087
(0.6168)	(41.95)	(1,137)	(130.6)	(4.276)	(0.1598)	(89.92)	(0.817)	(0.0223)

Type Probability Function

κ_1	κ_2	κ_3	κ_4	κ_5	κ_6	κ_7	κ_8	κ_9
3.097	0.00313	0.0541	−0.9073	−1.235	−4.921	−2.138	−0.0497	0.0433
(0.651)	(0.0519)	(0.0711)	(0.7089)	(0.9981)	(1.077)	(1.057)	(0.1064)	(0.1258)

κ_{10}	κ_{11}	κ_{12}	κ_{13}	κ_{14}	κ_{15}	κ_{16}	κ_{17}	κ_{18}
2.061	0.0284	0.0606	−0.1134	−2.049	−2.647	−3.852	−0.00015	−0.00133
(0.774)	(0.0537)	(0.0771)	(0.7310)	(1.346)	(1.272)	(1.976)	(0.1140)	(0.1502)

κ_{19}	κ_{20}	κ_{21}	κ_{22}	κ_{23}	κ_{24}	κ_{25}	κ_{26}	κ_{27}
0.6315	−0.0031	−0.0400	−0.0319	2.141	1.924	1.977	−0.0033	−0.00012
(1.242)	(0.0726)	(0.0861)	(0.8882)	(1.327)	(1.336)	(1.365)	(0.1734)	(0.1862)

Labor Market Transition After Age 60

γ_1	γ_2	γ_3	γ_4	γ_5	γ_6	γ_7	γ_8
18.024	−0.0530	−43.010	−0.2156	−5.3138	−0.1460	−0.2913	0.1899
(0.413)	(0.0072)	(30.491)	(0.0069)	(0.6059)	(0.0159)	(0.2571)	(0.0066)

Employment Transition

α_1	α_2	α_3	α_4^b	α_5	α_6
−1.1635	4.6915	0.1535	−0.4025	0.0215	0.0472
(0.0321)	(0.0591)	(0.0012)	(0.00058)	(0.0277)	(0.0013)

α_7	α_8	α_9	α_{10}	α_{11}	α_{12}	α_{13}
0.3308	1.6521	2.1306	2.0876	−0.0784	0.2432	−1.3867
(0.0832)	(0.1146)	(0.1140)	(0.1574)	(0.0231)	(0.0489)	(0.1162)

Human Capital

υ_1^b	υ_2^c	υ_3^b	υ_4	υ_5	υ_6	υ_7	υ_8	υ_9	υ_{10}
0.086	−0.0013	−0.1022	0.0366	0.175	0.160	0.227	−0.253	−0.0176	−0.904
(0.010)	(0.0011)	(0.0043)	(0.0057)	(0.018)	(0.018)	(0.021)	(0.015)	(0.0022)	(0.023)

Classification and Measurement Errors

E	F	G	$\sigma_{y,m}$	$\sigma_{s,m,0}$	$\sigma_{s,m,1}$
−9.6717	−0.1115	−2.8648	0.5661	9,551	0.0805
(5.5092)	(680.9)	(0.1805)	(0.0068)	(351.3)	(0.0178)

Other Parameters

δ	r	λ	p^e	σ_y^2	σ_s^2	σ_{sy}
0.98068	0.01634	0.6339	11.633	1.3850	0.001035	0.01061
(0.000731)	(0.000638)	(0.00323)	(0.0139)	(0.0279)	(0.000974)	(0.00113)

NOTES: a - Parameter multiplied by 10.

b - Parameter multiplied by 100.

c - Parameter multiplied by 1000.

d - Parameter multiplied by 100,000.

e - Parameter in the model is defined as exponential transformation of this.

f - Parameter in the model is defined as logistic tranformation of this.

E MODEL FIT OF EXOGENOUS TRANSITIONS

FIGURE E.1 : EMPLOYMENT PROBABILITY

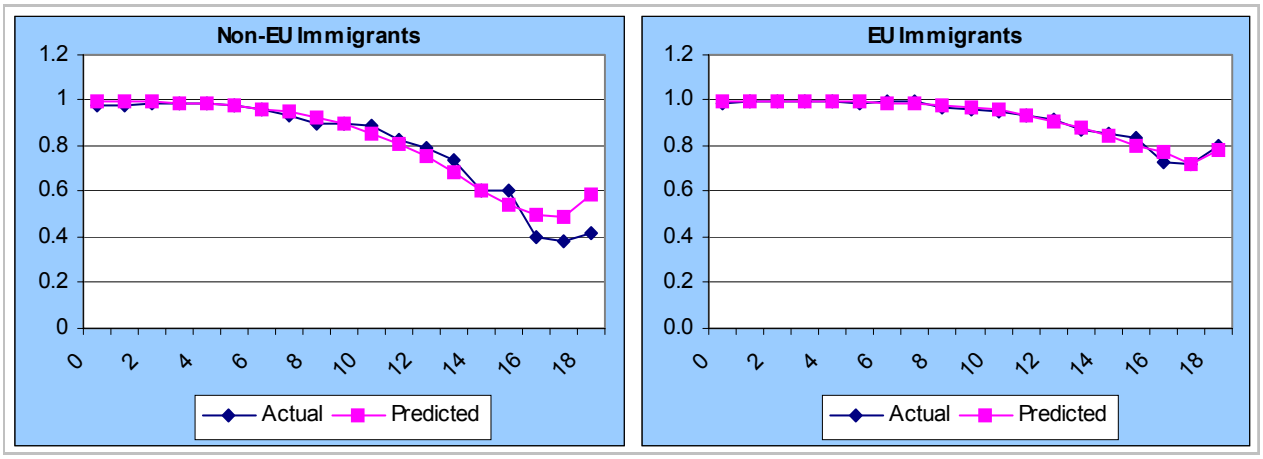


FIGURE E.2 : MEAN INCOME

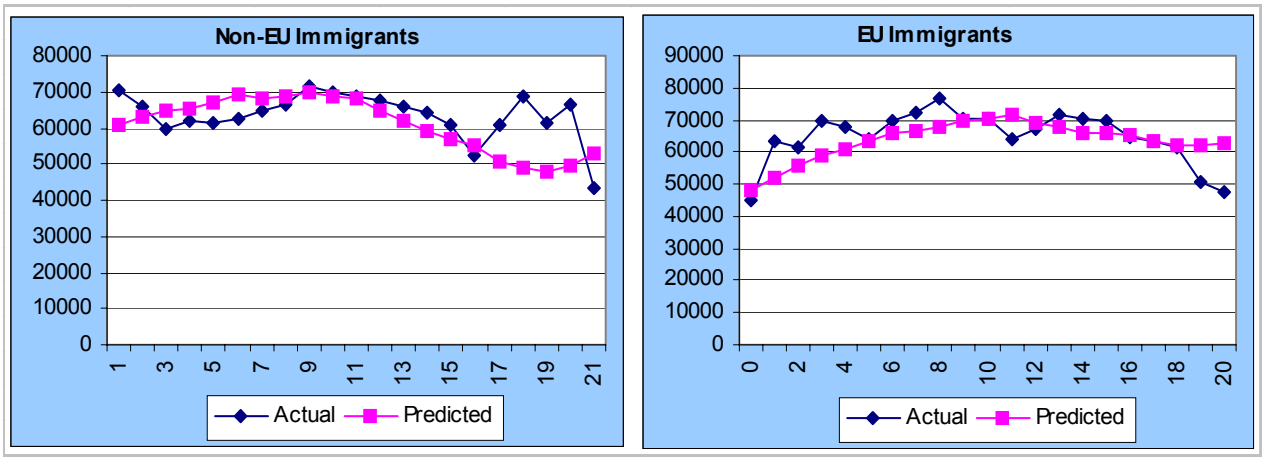


TABLE E.1: PERCENT RETIRED FOR ALL IMMIGRANTS

Age	60	62	64	66	68
Actual	0.374	0.517	0.637	0.918	0.947
Predicted	0.411	0.681	0.849	0.938	0.983