Immigrant Participation in Social Assistance Programs: Evidence from German Guestworkers

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The share of immigrants in the German social assistance program exceeds their population share and continues to grow. This study evaluates the causes of this phenomenon and tests for the effects of assimilation, cohort, age at migration, and country of origin on immigrant behavior. It uses panel data and jointly models panel attrition, labor force status, and household social assistance dependence. Assimilation and age at migration increase the probability of social assistance dependence. In addition, the labor force status of the household head has different effects for native and immigrant welfare risks. The correction for unobserved heterogeneities in the estimation substantively affects the results.

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1. Introduction

Since World War II Germany has been an immigration country. With its restrictive naturalization rules the share of foreign nationals in the German population increased from 1.0 percent in 1951 to 8.9 percent in 2002. So far, economic analyses of immigration to Germany focused on its labor market effects. This paper studies the participation of immigrants in the government transfer program providing means-tested social assistance. Immigrants accounted for 22.3 percent of the social assistance recipients in 2002 even though they made up only 8.9 percent of the German population. Social assistance dependence among households headed by foreign-born individuals has exceeded that of the native population for the last two decades.

Similar differences in immigrant and native transfer dependence have been studied in other countries such as the United States (U.S.) and Canada. The literature discusses four aspects of immigration as relevant to welfare dependence: (i) Borjas and Trejo (1991) and Borjas and Hilton (1996) point to the year of immigration, and argue that in the U.S. the probability of immigrant welfare dependence increased, the later the year of immigration (cohort effect). (ii) In a variety of papers Borjas and coauthors as well as Baker and Benjamin (1995) show that immigrants' risk of welfare dependence grows, the longer they have lived in the host country (assimilation effect). (iii) Borjas and Trejo (1993) show the relevance of the country of origin for subsequent social assistance receipt. (iv) Hu (1998) argues that age at migration is crucial for the probability of welfare dependence. In this study I investigate, whether these four effects can be confirmed based on the immigration experience of a European country.

The analysis of immigrant welfare dependence bears considerable policy relevance: first, expenditures on the German welfare program account for 1.5 percent of gross domestic product. Factors affecting transfer programs of this magnitude need to be well understood. Second, since the population share of immigrants continues to rise it is important to learn about differential effects of policy programs for this group. Third, if one subgroup of the population is more dependent on welfare than the population as a whole, the social assistance administration possibly does not meet its obligation to assist these recipients in their return to economic independence. This might suggest reforms of the program administration. Finally, an analysis of the social assistance dependence of immigrants provides an opportunity to evaluate past immigration policies. If the foreign-born are more likely to depend on welfare than natives, and if this is not tolerated politically, one might consider a change in immigration rules to allow entry only for those most likely to remain economically independent or to enforce time limitations on residence permits.

Economists have devoted little attention to the study of welfare dependence in Germany, and even less to that of immigrants. Most similar to this study is a paper by Büchel et al. (1997), which investigates the differences across immigrant groups using cross-sectional data. While the literature on immigrant welfare participation typically applies (repeated) cross-section data,[1] I apply a long-running panel survey: first, the effects of age, years since migration, and immigration year can be determined independently. Second, household-specific unobserved heterogeneities can be controlled for, and third, the macroeconomic situation at particular survey dates loses influence.[2] The estimations correct for potential biases arising from nonrandom panel attrition, endogenous labor force status and unobserved heterogeneity using a semiparametric estimator, which avoids distributional assumptions. This extends the literature in two dimensions. First, survey based analyses of immigrant welfare dependence so far ignored the problem of panel attrition (e.g. Borjas and Hilton 1996). Second, the literature which did account for endogenous survey attrition typically applied estimators which imposed distributional assumptions.[3] The results indicate that the endogeneity and heterogeneity corrections have substantial effects on estimation and simulation results. While cohort and country of origin effects cannot be confirmed, those of assimilation and age at migration appear to be present. The difference in welfare dependence between native and immigrant households is partly due to the fact that the loss of employment more likely leaves immigrants' households under the welfare income thresholds than natives'.

While Riphahn (1998) studies the same topic, the current study offers an analysis which is more sophisticated in several regards: Riphahn (1998) estimated the determinants of social assistance dependence in merely a single equation model without controls for endogenous panel attrition and labor force status. Also the former study applied a parametric probit estimator to control for unobserved heterogeneity at the household level. Finally, the present study generates additional insights regarding the effects of immigrant assimilation, of age at migration, and the year of immigration.

The next section summarizes background information about immigration to Germany

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[1] See Blau 1984, Jensen 1988, Borjas and Trejo 1991 and 1993, Borjas 1995, Baker and Benjamin 1995, Bean et al. 1997. The only exception is Borjas and Hilton 1996, which uses panel data from the Survey of Income and Program Participation.

[2] McDonald and Worswick (1998) show that results based on repeated cross-section surveys are affected by the choice of years.

[3] See Ridder (1990) for the method and Lillard and Panis (1998) for an application.

and the German social assistance program. Section 3 lays out the conceptual framework of the analysis. Section 4 describes the data and discusses the empirical methods. Estimation and simulation results are presented in section 5, before conclusions are drawn in section 6.

2. Institutional and Historical Background on Migration and Welfare in Germany

Immigration to Germany since 1945

The immigration experience of the Federal Republic of Germany can be divided into several phases, during none of which immigrants were selected based on human capital criteria (Schmidt and Zimmermann 1992): in the first five years after World War II West Germany had to absorb about eight million refugees from former German territories in the East. The next phase ended with the construction of the Berlin Wall in 1961, and was characterized by migration from East to West Germany of about 2.6 million individuals. Since the early 1960s through 1973 West Germany recruited workers mostly from Italy, Spain, Greece, Turkey, Portugal, and Yugoslavia, who were referred to as *guestworkers*. They were predominantly employed in manufacturing and construction, typically in low-skill, blue-collar jobs. In the early seventies many guestworkers brought their families to Germany and only few returned to their home countries. By the time the recruitment policy was stopped in 1973, the foreign-born population in West Germany had grown from 0.7 in 1961 to 4.1 million.

The immigration patterns since 1989 have been dominated by inflows of ethnic Germans, asylum seekers, and refugees.[4] The foreign population in West Germany, which does not include ethnic Germans, increased from 4.5 mio at the end of 1988 to 6.9 mio at the end of 1996, and the population share rose from 7.3 to 10.4 percent.

The Social Assistance Program

The social assistance program (*Sozialhilfe*) in Germany consists of two parts: general income support (*Hilfe zum Lebensunterhalt*) and support for special circumstances (*Hilfe in besonderen Lebenslagen*), such as e.g. aid for the handicapped or elderly care. The general income support system aims to guarantee that every resident in Germany, independent of nationality can lead a 'dignified' life based on a socio-culturally determined minimum income

[4] By 1993 about 350,000 refugees from Yugoslavia had entered Germany. In 1989 and 1990 massive flows of annually about 400,000 persons moved from East to West Germany. In addition, inflows of ethnic Germans from Eastern Europe and the republics of the former Soviet Union reached annual levels above 375,000 in 1989 and 1990. In response, an annual quota of 220,000 was installed which was filled each year through 1995. The number of asylum seekers reached a maximum of 440,000 in 1992 upon which their entry was restricted.

level. Every individual with less than this minimum income is supported.

The general income support part of the program offers counseling, financial benefits, and support in kind. Before transfers are made, all incomes of the core family (including other public transfers) and, with some exceptions, property items are considered in a means test. Every welfare recipient is obliged to work as far as possible. The welfare office is supposed to help recipients reintegrate into the labor force. If a welfare recipient refuses to accept employment, benefits can be cut by 25 percent.

Four types of financial benefits are available: standard rate benefits which are paid monthly, one-time payments, premiums on top of the standard rate, and housing benefits. The standard rate benefits are paid as fixed amounts, based on age adjusted household size.[5] The standard rates are determined by state governments to adjust for regional differences in the cost of living. They differ only minimally, and provide no incentives for migration, as e.g. in the U.S. (Borjas 1998). In 2002 the standard rates for household heads amounted to about € 292 in West Germany. In addition to standard rate benefits, expenses for rent and heating are covered, and one-time payments are available for situations of special need. Since certain groups of recipients incur above average expenditures, fixed premiums on top of standard rates are paid, e.g. for disabled persons, and pregnant women.

Eligibility for social assistance in principle is independent of nationality and only based on residence in Germany. However, the regulations for immigrants differ by immigrant group. Ethnic Germans as well as East Germans arriving in West Germany before unification are treated just like West Germans. Until 1994 asylum seekers received benefits under social assistance regulations. Since then they are funded under a separate law and no longer appear in the social assistance statistics.[6] The social assistance regulations for other immigrants including guestworkers is complicated by the fact that European and German law overlap. Foreign nationals without permanent residence rights in Germany can lose their right to stay or to get their residence permit prolonged if they depend on social assistance. This practice is contrary to European Union (EU) regulations. Even Turkey as a non-EU-member signed the *European Convention on Social and Medical Assistance* based on which its citizens should be treated like citizens of their host countries. Given that German legal practice does not fully respect these

[5] Since 1990 another 50 percent of the standard rate is paid for children under age 7, another 65 percent for children up to age 14, 90 percent for those aged 15 through 18, and 80 percent for adults other than the household head.

[6] The increasing share of refugees and asylum seekers in recent years' welfare population characterizes the situation in a number of countries, among them the U.S. (see Borjas 1995) and Canada (Baker and Benjamin 1995).

regulations, social assistance receipt is connected with a risk of expulsion for those foreign individuals, who are not asylum seekers, refugees, or who do not possess permanent residence rights (Schulte and Trenk-Hinterberger 1986, and Huber 1991).

In 1980 foreign residents made up 8.3 percent of the income support recipients, a fraction that already exceeded their share in the total population of then 7.2 percent. By 1989 the share of foreign income support recipients went up to 23.8 percent and it peaked in 1992 with 34.8 percent, when immigrants made up about ten percent of the population. The numbers came down in 1994 following the new regulations for asylum seekers, and are now at above 20 percent.

3. Conceptual Framework

The literature does not provide a general theoretical framework explaining household transfer receipt. Instead, we can identify two relevant sets of factors: those related to eligibility and those affecting take-up. Eligibility for social assistance in Germany follows if a household's monthly net income is below its administratively defined need and if the need cannot be met out of income or wealth. The determinants of eligibility are a households' need, wealth, and income.

The take-up[7] literature emphasizes the crucial role this issue plays as a determinant of transfer receipt: van Oorschot (1994) summarizes that internationally about 20 percent of the eligible households do not claim available social assistance benefits. Hauser and Kinstler (1995) report non-take-up of up to 25 percent among foreign clients of a German charity and Riphahn (2001) reports more than 50 percent non-take-up based on the 1993 income and expenditure survey (EVS). Non-take-up is typically explained as a consequence of (i) misconceptions and ignorance regarding existing transfer programs and (ii) stigma and application costs (Blundell et al. 1988, Duclos 1995). If stigma and application costs are fixed and independent of the benefit level, we would expect that individuals with high benefit claims and long expected durations of transfer receipt are more likely to take-up social assistance. In contrast, those for whom benefits only marginally exceed the money value of application costs are less likely to take up their assistance payments. This reasoning was confirmed by Blundell et al. (1988),

[7] Only recently the take-up of welfare benefits by immigrants has found attention in the literature. Hu (1998) suggests that average immigrant take-up rates do not differ from native ones, with the exception of above average take-up among elderly immigrants. For Germany Riphahn (1999) showed that the take-up rates of natives and immigrants are not signicantly different after controlling for other factors, while unconditional average take-up rates of immigrants exceed those of natives. Bird et al. (1999) also find that immigrants to Germany are on average more likely to claim their benefits than natives.

Duclos (1995), and for take-up of unemployment benefits in the U.S. by Anderson and Meyer (1997). In addition to benefits, a set of household-specific characteristics are assumed to affect stigma and application costs, and therefore take-up behavior ("physical, psychological, sociological, informational factors affecting the burden of taking up benefits", Duclos 1995).

Typically four factors are considered when modeling transfer receipt: (1) the *structure of a household* indicates need as well as earnings potential. Having more children in a household suggests a higher financial need but it may also increase the opportunity cost of the application procedures and thus decrease the probability of welfare dependence. The more adults are in a household and the higher their human capital, the higher its earnings potential. Generally, households with fewer adults or even single (parent) households are less able to handle income drops.[8]

(2) Next, the *characteristics of the household head* may play a role. The head's earnings potential will be reflected in measures of human capital, health and gender. Also age may matter on several dimensions. First, it might reflect cohort differences in attitudes toward social assistance dependence. Second, older individuals may be more likely to be disabled and with reduced earnings potentials. Finally, a regulation by which inheritors of a deceased welfare recipient can - under certain circumstances - be obliged to repay transfers deters some eligible elderly individuals to claim their benefits. (3) Take-up behavior may depend on the *expected duration* of financial need, since the longer the expected duration of benefit receipt the less relevant are application costs. Therefore we expect a higher propensity of welfare dependence in households where welfare dependence is more likely to be permanent, e.g. if there is a handicapped household head, or one who has already left the labor force (for a similar approach see Baker and Benjamin 1995).[9]

(4) Finally, one would like to control for the *information on the social assistance program* available to the household, which might be reflected in the characteristics of its social networks. Since such measures are hard to obtain, we use the size of the city where the household resides. The anonymity of large cities might reduce stigma effects and their infrastructure reduces application costs.

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[8] Since household need is determined based on household structure, endogenous household formation is not an important issue in the analysis of social assistance dependence for Germany.

[9] Almost all German social assistance studies point to the overriding influence of the labor market status. Riphahn (1999) reviews that literature and shows a strong correlation between unemployment and social assistance dependence at the individual and household, as well as at the regional and time series level.

These determinants of social assistance dependence are potentially relevant for both, the native and the immigrant sample. In order to test for differences in their impacts on both samples' welfare dependence, a full set of interaction terms will be considered in the model. In contrast, different controls are necessary to answer the immigrant-specific questions posed in the introduction. Years since migration is considered as a measure of assimilation, where the expected influence on welfare receipt is not a priori clear: on the one hand one might expect increased transfers as immigrants learn about the program over time, on the other hand immigrants acquire country-specific human capital and should become less likely to depend on public transfers. To control for immigration year effects, at least a trend variable of the immigration year is necessary, and to test for the relevance of age at migration appropriate indicators are considered. Any remaining differences between the two samples' average welfare dependence may be captured by an overall immigrant indicator variable. Alternatively, country of origin indicators can aid in evaluating nationality differences in the remaining propensity to depend on social assistance.[10]

4. Data and Empirical Approach

4.1 The Sample

We use data from the first thirteen annual waves of the German Socioeconomic Panel (GSOEP, 1984-1996), which surveys a representative sample of the German population and an oversample of immigrants from Turkey, Greece, Former Yugoslavia, Spain, and Italy. To clearly identify the nationality of the interviewed household and to maintain the representative character of the data, only those West German households are considered, which have a German household head, and only those immigrant households are considered, which have a household head that is born abroad and from one of the five originally identified countries.

Households were dropped from the sample if they could not be matched to a household head or did not respond to the question on social assistance. Also, observations with missing values on key variables were censored after the last valid observation. In the end we observe 4,595 German and 1,316 immigrant households with valid information on welfare receipt. Pooling over time we obtain 31,917 German and 8,516 immigrant household-year observations, yielding on average 6.8 annual observations per household. The immigrant households in our

[10] Borjas and Trejo (1993) and Bean et al. (1997) found strong source country effects on the variance of welfare recipiency rates across national origin groups. Similar differences by country of origin were found in studies on immigrant earnings and return migration (Schmidt 1994, Bauer and Zimmermann 1997).

data represent guestworkers, who came to Germany since the 1950s. Table 1 describes the distribution of the immigrant sample and some of its social assistance dependence patterns. About one third of the immigrant households is of Turkish nationality, Italian and Yugoslavian households make up one fifth each, and those of Greek and Spanish nationality account for about 12 percent each.

4.2 Descriptive Statistics

Our dependent variable indicates whether any member of a household received social assistance in a given year.[11] Since this information is available only at the household level, households are the unit of analysis. Social assistance receipt among immigrant households in our sample (2.9 percent) exceeds that of German households (2.2 percent), on average by about 24 percent. In order to compare immigrants who entered Germany in different periods, Table 1(a) presents period-specific probabilities of welfare receipt. In contrast to the findings for the U.S. (e.g. Borjas 1995) and Canada (Baker and Benjamin 1995), a trend indicative of a decline in the "quality of immigrants" is not apparent.[12] Table 1(b) describes the patterns of welfare dependence by country of origin: guestworkers from Turkey have the highest dependence probability, and immigrants from former Yugoslavia the lowest.

It is interesting to compare the frequency of welfare dependence for the two subsamples by their characteristics (see Table 2). Among German households welfare dependence is highest and about six times the sample average among single parent households and for households with unemployed heads. In comparison, immigrant single parent households bear a welfare risk of about 2.4 times the sample average. Households with unemployed or out of the labor force heads have above average probabilities of depending on welfare in the immigrant sample, as well. For the more frequently observed household types, i.e. couples without children, and couples with children below age 16, welfare dependence among foreign households clearly exceeds that of their native counterparts. Single person households have strongly increased risks of social assistance dependence in the native sample. Among couples with children the risk of welfare dependence is generally below average. The share of families with children among guestworker

[11] The GSOEP asks about social assistance in four questions, which cover receipt of any social assistance, general income support, one-time benefits, and support in special circumstances. Since we are interested in the phenomenon of general income support, those households were not considered in receipt of social assistance, which indicated only support in special circumstances, or only one-time benefits.

[12] Due to the small number of observations actually receiving social assistance, Table 1(a) does not differentiate by gender of the household head.

households is much higher (66 percent) than in the German sample (40 percent, see figures in parentheses in Table 2). The risk of welfare dependence is high in the more than two generation households, and the "other" category, however, these households make up only small fractions of the samples. The lowest welfare dependence is observed for couples without children.

Having a female instead of a male head of household appears to be correlated with a four times higher risk of welfare dependence among Germans. This effect is not as pronounced in the guestworker sample. Welfare dependence is highest for very young households, it decreases in the middle agegroups, and increases again for household heads around retirement age. Immigrant households with heads above age 54 suffer a much higher risk of welfare dependence than their native counterparts, confirming a pattern pointed out for the U.S. by Hu (1998). The share of welfare recipients in the immigrant out of the labor force population (12.97) exceeds that of natives (4.06) by far. Generally, welfare dependence is lowest when the head of household is full-time employed and highest when the head is unemployed.

The conceptual framework discussed above indicated which explanatory variables should be considered in the social assistance model. For definitions and summary statistics see Table 3. The mean characteristics of natives and immigrants are significantly different at the one percent level for all indicators. Guestworker households are on average larger than those of Germans. Only 11 percent of immigrant households are single person households, compared to about one fourth of German households. Heads of foreign households are somewhat younger, and are less likely to be female or handicapped compared to their native counterparts. Heads of immigrant households have slightly fewer years of education than natives. While about one third of German heads of households are out of the labor force, this holds for only 9 percent of immigrant heads. However, the latter are more than twice as likely to be unemployed than German household heads. Finally, immigrant households are on average more likely to reside in large cities. Most guestworkers had immigrated in their 20s and were surveyed on average about 20 years after immigration.

4.3 Empirical Approach

The objectives of the analysis are to investigate the determinants of the higher welfare dependence of immigrant households compared to native households, and to evaluate the relevance of cohort, assimilation, age at migration, and country of origin effects on welfare dependence. For this purpose a fully interacted model is estimated jointly for both samples, including controls for measures that are specific to the immigrant population. Four

methodological issues must be discussed: the problems of unobserved heterogeneity, of panel attrition, of endogenous labor force status, and of collinear explanatory variables.

The availability of household panel data allows us to control for *unobserved heterogeneity*, an issue not accounted for in studies using cross-section data, which dominate the literature on immigrant welfare dependence. Unobserved heterogeneities are household-specific factors that may influence welfare dependence, but are not measured in the data and thus cannot be controlled for explicitly, such as the sensitivity to welfare stigma, or the unobserved ability and work motivation of household members. To control for the impact of such factors and to improve the efficiency of the estimates, a random effects estimator is applied.

Sample attrition plays an important role in panel data based studies of income poverty and social assistance. The literature on attrition shows that those individuals and households at the tails of the income distribution are particularly likely to drop out of the sample (see e.g. MaCurdy et al. 1998, Lillard et al. 1986). Rendtel (1990) found for the GSOEP that attrition in the early panel years was indeed correlated with the households' socioeconomic status. Table 4 presents the probability of welfare dependence by subsequent interview status. It is readily apparent that welfare dependence in households, which continued to be interviewed (2.31 percent, row 1), is below that of households with item-nonresponse (3.23 percent row 2) or which refused to be interviewed (2.65 percent). This confirms findings of other panel studies that individuals with low incomes have above average attrition probabilities (e.g. Fitzgerald et al. 1998).[13] The last column of Table 3 presents descriptive statistics for the sample of households, which attrited in the next period: the sample of attriters is less likely to have high levels of education, it is more likely to be a female headed or single parent household, and to be unemployed. This suggests that the sample of attriting households is not randomly drawn from the population. In such a situation the estimation results can be biased and inconsistent unless the endogenous selection is controlled for.

Therefore a selection equation is estimated jointly with the social assistance model. This procedure follows Ridder (1990) by assuming that the latent process (A^*) driving sample attrition is determined by characteristics of the household (chh), the interview situation (Int), and by an unobserved household-specific factor (μ), which is weighted by a coefficient (ρ^A):

[13] In addition, regressing the attrition indicator on lagged social assistance receipt and a constant yields a positive significant effect of the social assistance indicator.

$$A^{*}_{i,t} = \beta_1' \, chh_{i,t} + \beta_2' \, Int_{i,t} + \rho^{A} \, \mu_i + \eta^{A}_{i,t}$$

$$A_{i,t} = 1 \text{ if } A^{*}_{i,t} > 0 \qquad (1)$$
$$A_{i,t} = 0 \text{ otherwise.}$$

The β's are coefficients and η^A represents a random error. The attrition indicator $A_{i,t}$ is coded one for households with item-nonresponse, who refused the interview, and who left the country (rows 2-4 in Table 4). Just as in Ridder (1990) the household effect (μ_i) reappears in the social assistance equation. Thereby we control for the possible correlation between the unobservables of the two equations. The endogeneity problem can then be solved by jointly estimating the attrition and social assistance equations, while appropriately controlling for the distribution of the unobserved factor μ_i.

The problem of *endogenous labor force status* arises because we control for the impact of unemployment and the out of the labor force state in the social assistance model. These outcomes are most likely endogenous because similar unobservable determinants, such as ability or motivation to work and earn income, may affect both, the probability of labor force participation and social assistance dependence.[14] As in the case of endogenous panel attrition the problem can be solved by the joint estimation of a labor force status model. That model controls first for individual-specific demographic effects (*demogr*), i.e. age, sex, nationality, and health, second for human capital variables (*hc*) such as years of schooling, vocational degree, and language ability, and third for regional unemployment indicators (*unempl*) such as the unemployment rate, its square and an interaction term for immigrants. The model is estimated as multinomial logit, with employment, unemployment and out-of-the-labor force as alternative states. Let LF represent an indicator of state k occupied by the head of household i in period t:

$$LF_{i,t} = \gamma_{1k}' \, demogr_{i,t} + \gamma_{2k}' \, hc_{i,t} + \gamma_{3k}' \, unempl._{i,t} + \rho^{L}_{k} \, \mu_i + \eta^{L}_{i,t,k} \qquad (2)$$

The γ's are coefficients and η^L represents a random error. Again μ represents household-specific unobserved effects, which may be correlated with those of the attrition and the social assistance models. The equation describing the latent household-specific propensity to claim welfare

[14] Particularly among older workers unobserved characteristics may affect their labor force participation behavior. Once they dropped out of employment, however, their income is not likely to change significantly and social assistance dependence - if it occurs - may be quite durable.

benefits, S^*, can be represented as

$$S_{i,t}^* = \alpha_1' hs_{i,t} + \alpha_2' hh_{i,t} + \alpha_3' dur_{i,t} + \alpha_4' inf_{i,t} + \alpha_5' immi_{i,t} + \rho^S \mu_i + \eta_{i,t}^S$$
$$S_{i,t} = 1 \text{ if } S_{i,t}^* > 0$$
$$S_{i,t} = 0 \text{ otherwise} \qquad (3)$$

where the α's are coefficients, *hs*, *hh*, *dur*, *inf*, and *immi* represent the groups of explanatory variables discussed above for household i in period t,[15] ρ^S is the coefficient weight on the unobserved heterogeneity μ, and η^S represents a random error.

In contrast to Ridder's approach I do not assume a normal distribution of the unobserved component μ. Monte Carlo evaluations of the class of semiparametric estimators indicate that these estimators often dominate incorrectly imposed parametric assumptions on disturbances in terms of bias and mean square error (Mroz and Guilkey 1995). Therefore a discrete factor approximation method is applied. For greater generality and flexibility the unobserved heterogeneity (μ) is represented by three independently distributed and estimated factors μ_k (k=1,2,3), such that

$$\rho^j \mu_i = \rho^j_1 \mu_{1,i} + \rho^j_2 \mu_{2,i} + \rho^j_3 \mu_{3,i} \qquad (4)$$

with j = S, A, LF(k=OLF), and LF(k=unemployed). The coefficients on the labor force status "k=employed" are normalized to zero. It is assumed that after accounting for the three factors μ_k the random errors η are not correlated across equations.

In prior estimations a framework was tested which considered factor μ_1 in each of the three equations, factor μ_2 only in the attrition and social assistance equation, and factor μ_3 only in the labor force status and social assistance equations. The rationale was that there may be some elements of household-specific unobservables (μ_1) that are relevant in each of the equations. But there may be separate correlation patterns between the unobservables in the attrition equation and social assistance model (μ_2), as well as between those of the labor force status model and the social assistance model (μ_3). However, in the end the implied restrictions of zero factor loadings ρ_2 in the labor force status equation and of ρ_3 in the attrition equation

[15] *hs* stands for the effects of the household structure, *hh* represents variables describing the household head, *dur* contains indicators of welfare spell duration, *inf* summarizes indicators of the household information status and *immi* are immigrant-specific variables.

were rejected by the data. Therefore in the final model each of the three factors appears in each of the three equations. Whereas the values of the factors μ_k are constant across the three equations, the factor loadings ρ are estimated separately for each equation and capture the existing correlation patterns.

The individual contribution to the likelihood function is now:

$$
\begin{aligned}
L_i(\mu_{1,i},\mu_{2,i},\mu_{3,i}) = \prod_t & \Pr(A_{i,t} = 1 \mid \mu_{1,i},\mu_{2,i},\mu_{3,i})^{d_{Ai}} \cdot \Pr(A_{i,t} = 0 \mid \mu_{1,i},\mu_{2,i},\mu_{3,i})^{1-d_{Ai}} \cdot \\
& \Pr(LF_{i,t} = k \mid \mu_{1,i},\mu_{2,i},\mu_{3,i})^{d_{ki}} \cdot \\
& \Pr(S_{i,t} = 1 \mid \mu_{1,i},\mu_{2,i},\mu_{3,i})^{d_{Si}} \cdot \Pr(S_{i,t} = 0 \mid \mu_{1,i},\mu_{2,i},\mu_{3,i})^{1-d_{Si}}
\end{aligned} \tag{5}
$$

$$
\begin{array}{lll}
d_{Ai} = 1 \text{ if } A_{i,t} = 1 & d_{ki} = 1 \text{ if } LF_{i,t} = k & d_{Si} = 1 \text{ if } S_{i,t} = 1 \\
d_{Ai} = 0 \text{ if } A_{i,t} = 0 & d_{ki} = 0 \text{ if } LF_{i,t} \neq k & d_{Si} = 0 \text{ if } S_{i,t} = 0
\end{array}
$$

where the first row represents a logit model for attrition, row two stands for the labor force participation model, and row three contains the social assistance model. After integrating out over the distribution of the random error components, the likelihood function is maximized over α, β, γ, and the parameters of the unobserved heterogeneity distribution (for further detail on the estimation procedure, see Appendix 1).

Clearly, identification is an important issue in this type of procedure. The statistical model is identified, first, through the functional form of the nonlinear logit type regression equations for the social assistance and attrition models, and the multinomial logit form of the labor force status equation.

Second, exclusion restrictions specify variables that significantly affect the attrition and labor force status but not the social assistance outcomes. In the case of the attrition equation one variable describes whether the household is observed for the first time in that year, another indicates whether the household changed interviewers. A number of studies using data of the GSOEP as well as the Survey of Income and Program Participation (SIPP) found that these measures significantly predict panel attrition (Rendtel 1995, Pannenberg 1997, Zabel 1998). In the labor force model the regional unemployment rate in a linear, squared, and interacted version are added because aggregate unemployment may directly affect individual unemployment risk but not necessarily contemporaneous social assistance dependence (Riphahn 2001). Also, more detailed human capital indicators such as language speaking ability, vocational degree, and categories of years of schooling are considered, because these yield causal effects on labor

market success but need not be direct determinants of social assistance dependence.

Third, a number of identifying assumptions was imposed on the error variance-covariance matrix (see Appendix 1). Finally, the *collinearity* between the age, years since migration, immigration year, the time trend, and age at migration measures for the immigrant sample must be addressed.[16] Due to the panel nature of the data, all effects of interest can be evaluated, once two restrictions are imposed: first, it is assumed that the time trend effect on the probability of social assistance dependence does not differ for the native and guestworker subsamples. Second, preliminary tests yielded that the effect of age on the social assistance outcome does not differ significantly for the two subsamples either. Therefore the age effect is estimated jointly for both samples, such that now identification of the relevant effects is secured. Additionally, the age at migration variable enters the model in a categorical representation to strengthen identification.

5. Estimation and Simulation Results

Estimation results on the social assistance model are presented in Tables 5 and 6, Appendix 2 contains the results for the attrition and labor force participation equations, and for the heterogeneity terms. The results presented in Table 5 were obtained without controlling for endogenous panel attrition, labor force participation, and unobserved heterogeneity. In preliminary estimations the effect of other variables was tested, however, since they did not yield statistically significant effects the measures were omitted in the final specification for parsimony.[17]

A separate model was estimated adding four country of origin variables to the overall "immigrant" indicator with Turkish nationality as the reference group. The joint effect of these indicators did not significantly improve the explanatory power of the model.[18] Therefore it appears that country of origin differences are not important in guestworker welfare dependence, after controlling for other explanatory variables.

A comparison of the results in Table 5 with those obtained after heterogeneity and

[16] The effects are related by the following two equations: (1) years since migration + age at migration = age, and (2) immigration year + years since migration = time trend.

[17] The measures included the average age of household members, and the language ability of the head.

[18] The likelihood value improved from 28,833.1 to 28,830.4. The test statistics of 5.26 remains below the critical value of 14.9 at 4 degrees of freedom.

endogeneity controls were considered (cf. Table 6) yields a number of important differences: for example, the coefficient of the household head's age becomes statistically significant and changes its sign, the coefficient of the indicator for female household heads doubles in magnitude, and the effects of having a handicapped household head lose statistical significance. In addition, the endogeneity controls yield a highly significant improvement of the model fit.[19] Almost all parameters estimated as factor loadings (ρ), to calculate the factors (μ_k) or to determine the probability weights (PW) are statistically highly significant. Therefore the considered controls are important additions to the model in terms of both substance and statistical fit.

To help evaluate the effect of the observable characteristics on the probability of social assistance dependence across subsamples, Table 7 presents simulated effects of changes in the explanatory variables for both subsamples. It presents both, the results of simulations based on estimates with and without controls for unobserved heterogeneities, endogenous panel attrition, and labor force status. These are based on the results presented in Tables 5 and 6, and are generated using the full dataset for each subsample.

Immigrant-specific Effects

The simulation result on the effect of the *immigration year* confirms the evidence in Table 1(a), that the immigration cohort does not seem to affect social assistance dependence. The coefficient is not significantly different from zero, and the variable has basically no impact on the probability of observing a household receiving transfers. Thus, the conclusion from the U.S. literature as to the declining "quality" of immigrants over time cannot be confirmed for the case of guestworker immigration to Germany.

The effect of *age at migration* was estimated using five categorical variables, the reference groups being below age 25. The results indicate that immigrants who entered the country after age 30 have a significantly higher risk of subsequent welfare dependence. The simulated social assistance probabilities exceed those of "young migrants" by at least 77 and up to 800 percent for individuals who enter after age 44. This confirms the results of Hu (1998), and shows that younger migrants have better chances of reaching economic independence, than those who enter after their prime working years.

The *assimilation effect* can be derived from the quadratic years since migration term. The

[19] The critical value at the 1 percent level is 53.7 (d.f. = 27), the test statistic takes on a value of 10,242.

two coefficients are jointly significant at the one percent level and suggest positive assimilation effects. Compared to an individual who spent five years in Germany, those who entered 25 or 35 years ago have a 122 and 308 percent higher probability of social assistance dependence (see bottom lines of Table 7), respectively. Thus for any guestworker, the probability of social assistance dependence increases with the duration of stay. This confirms the assimilation effect found for the U.S. (e.g. Borjas and Trejo 1991, or Borjas and Hilton 1996).[20]

Other Household Effects

The other effects presented in Table 7 agree with the hypotheses discussed in section 3: among the *household structure* effects we observe that native households with many young children run a higher risk of welfare dependence. Apparently childrens' effect on financial need is more influential than the heightened opportunity cost of going through the application procedures when there are children to care for. This confirms the effect of children on social assistance receipt found by Baker and Benjamin (1995) for Canada. Having a first child increases the chances of welfare dependence by 73 percent for native and by only 15 percent for immigrant households suggesting a closer correlation of the welfare risk with the number of offspring for German than for guestworker households.

Also, as hypothesized above, having more adults in the household reduces the probability of social assistance dependence for immigrant households. Here we find a large difference in simulation results between the models with and without endogeneity controls: without endogeneity controls an additional adult in a guestworker household is predicted to reduce social assistance dependence by three percent, once controls are in place, the effect increases to minus 19 percent. The positive effect for the native sample is surprising. It might reflect the oddities of the small group of more than two generation households, which have an above average welfare risk (see Table 2) or it might reflect that grown up children are more likely to remain in the parent household if they are not able to earn their own living. Given the well established earnings correlation across generations (e.g. Solon 1992) this rationalizes higher welfare dependence in households with more adults. The average level of education of adult household members has the expected significant negative effect for native and a positive effect on the welfare dependence of immigrant households, which is difficult to rationalize. Both

[20] Preliminary estimations without endogeneity controls yielded that the conclusions on the effects of assimilation, immigration cohort, country of origin, and age at migration in a model including additional immigrant interaction effects do not differ from those in a model which excludes these interactions.

predicted probabilities differ strongly when based on the results in Table 5 vs. Table 6.

Even though we observed a higher propensity of social assistance receipt for German single person households (cf. Table 2), the estimated single person effect is not statistically significant. The variable 'single parent household' has a large and statistically significant coefficient. It more than doubles the risk of depending on social assistance for both samples, confirming a pattern found by Baker and Benjamin (1995) for a Canadian sample.

The estimated effect of the *household head*'s age is statistically significant and in preliminary estimations even a third order polynomial continued to add to the goodness of fit. Preliminary results also showed that the effect of age did not differ across the two subsamples, which justified restricting the coefficients for immigrants to zero. The simulations yield a moderate decrease in the risk of welfare receipt for an aging household. Similar to the results of Borjas (1995) and Baker and Benjamin (1995), having a female head of household significantly increases the risk of welfare dependence (plus 160 percent for the German - this effect doubled after unobserved heterogeneity was considered - and plus 14 percent for the immigrant sample). More schooling for the household head reduces the welfare risks as expected, even though the coefficients are imprecisely estimated.

The effects of the *expected duration* of welfare dependence confirm our hypotheses: households who are unlikely to improve their income situation in the near future, such as those with handicapped or not employed heads are more likely to receive social assistance payments, where only the effect of a handicap is not statistically significant. The simulated probabilities declined substantially when the model with endogeneity controls was applied. The effects of labor force status are large for both samples. The welfare risk for immigrant households goes up by a factor six if the household head is unemployed or out of the labor force. For native households the risk about doubles. The interaction terms for immigrants indicate highly significant differences in the labor force status effects for the two subsamples. The difference in native and immigrant susceptibility to welfare risk is likely due to the earnings dependence of unemployment benefits: those who had higher pre-unemployment earnings receive higher unemployment benefits. Thus, if earnings and benefits for average guestworkers are lower than for average natives, households of the former might have to depend on additional social assistance payments more frequently in response to the loss of employment.

Finally, the citysize variable was considered to approximate the stigma and *information effects* which might lead to higher welfare dependence in larger cities. Indeed, living in a small town is correlated with lower and living in a large city with higher welfare dependence. The

effects are significantly stronger for the immigrant than for the native sample.

The Role of the Social Assistance Administration

The study was motivated in part by the question whether the social assistance administration meets its obligation to equally assist all recipients in their return to economic independence. This question can be addressed by comparing the probability of social assistance dependence for both subsamples after conditioning on the determinants of eligibility and take-up. If the model adequately captures these systematic factors, any remaining difference in average social assistance dependence reflects at least in part the effect of agency behavior. If the residual welfare dependence of immigrants is higher than that of natives, this might indicate that conditional on eligibility and take-up, natives receive more support, e.g. through better counseling. In order to test for this effect, the model was reestimated omitting all immigrant-specific variables and interaction effects. The results are presented in Table 8 and show that conditional on other variables, immigrants are no longer more likely than native households to receive social assistance.[21] Therefore we find no evidence that the social assistance administration fails to meet its responsibility towards immigrants.

6. Conclusions

In view of the steadily increasing share of immigrants among social assistance recipients in Germany, this study investigates the determinants of immigrant versus native welfare dependence, and evaluates the relevance of cohort, assimilation, age at migration, and country of origin effects for social assistance dependence. The analysis is based on a panel of 4,595 German and 1,316 guestworker households with annual measures of social assistance dependence. The immigrant households represent guestworkers which entered Germany since the 1950s from Turkey, Italy, Yugoslavia, Spain, and Greece. The probability of welfare dependence among these households exceeds that of native households by more than 24 percent. The empirical approach is to estimate logit models of social assistance receipt jointly for the native and immigrant samples, controlling for unobserved heterogeneity, for potentially endogenous panel attrition, and labor force status. These types of controls are new to the

[21] Only by omitting other immigrant-specific variables can the coefficient of the immigrant indicator be interpreted as the conditional average immigrant effect. In order to test whether the original results of Table 6 show an effect in the same direction, the direction of the immigrant-specific effects and interaction terms was evaluated jointly at the mean of immigrant characteristics. The result indicates that the probability of social assistance dependence for immigrants after conditioning on other variables is below that of natives, confirming the results of Table 8.

literature on immigrant transfer program participation. The procedure controlling for the effects of panel attrition generalizes existing approaches by avoiding the imposition of distributional assumptions in the correlation structure. The endogeneity and heterogeneity controls significantly improve the fit of the estimated models and have substantial impacts on coefficient estimates and simulation results.

The findings of U.S. studies of immigrant welfare dependence were confirmed with respect to the importance of assimilation effects, i.e. the longer an individual lives in the destination country, the more likely the person is to receive social assistance. Also, advanced age at migration causes large differences in the predicted probability of welfare dependence among migrants to Germany. No confirmation could be found for cohort effects, by which immigrants who entered more recently tend to have higher risks of welfare dependence, nor for country of origin differences.

Among the explanatory factors household size, labor force status, and city size yield significantly different effects on the probability of social assistance dependence for the native and the guestworker samples. The most influential determinants of immigrant social assistance dependence are labor force status and an advanced age at immigration. It appears that labor force status - and unemployment in particular - is the key determinant of overall welfare dependence, and of the difference in social assistance receipt between the native and immigrant subsamples. Given their overall weaker economic situation, it seems plausible that the income drop following unemployment yields graver consequences for the economic independence of immigrants than of natives.[22]

Several policy conclusions can be drawn from the analysis: first, given that age at migration has such a sizeable impact on the risk of subsequent social assistance dependence, it appears to be a powerful lever to use in immigration regulation, if high welfare dependence is a political concern. Second, the fact that a sizeable share of former immigrants depends on social assistance, indicates that the immigration policy at the time of their entry did not sufficiently consider migrants' labor market qualifications. This is confirmed in the results showing that unemployment and human capital are important determinants of the risk of social assistance dependence. Third, given institutionalized and legally mandated hiring discrimination in

[22] The German unemployment insurance provides earnings replacement as a fixed percentage of prior net labor incomes in a general and in an additional means-tested scheme. If an individual with high prior earnings loses employment this person receives higher unemployment benefits than an individual with low prior earnings. Therefore the latter person may in addition to unemployment benefits become eligible for social assistance, whereas the former does not.

Germany,[23] it seems worthwhile to carefully evaluate the impact of these regulations on the labor market success of immigrants. Fourth, we find no evidence that the social assistance administration renders services of lower quality to the immigrant as compared to the native population.

[23] Based on a legal stipulation, employment offices can offer a job to a foreign worker only if no suitable native worker is available, a regulation which does not equally apply to all immigrants ("Inländerprimat").

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Table 1(a) Distribution of Sample and Welfare Dependence by Immigration Year

Immigration Period	Share in Household Sample (in %)	Share of Social Assistance Recipients (in %)
before 1960	2.17	9.60
1960-64	18.20	2.58
1965-69	26.14	3.42
1970-74	37.08	2.53
1975-79	10.04	2.02
1980-84	4.19	2.54
after 1984	2.17	4.21
Total	100.00	2.91

Note: Column two is calculated using one observation per household, while the others average across all household-year observations. Figures in parentheses are based on fewer than 30 observations.

(b) Average Immigration Year and Welfare Dependence by Citizenship

Citizenship	Share in Household Sample (in %)	Average Immigration Year	Average Social Assistance Dependence Rate (in %)
Greece	12.61	1956	2.22
Spain	12.01	1967	2.21
Italy	20.74	1968	2.36
Ex-Yugoslavia	21.12	1964	1.99
Turkey	33.51	1972	4.37
Total	100.00	1967	2.91

Note: Share in the household sample and average immigration year are calculated using only one observation per household (N=1,316), average social assistance dependence is based on all household-year observations (N=8,516).

Source: Own calculations based on GSOEP.

Table 2 Observed Probability of Welfare Dependence (in percent)

	All Households	Native Hh.	Immigrant Hh.
Total	2.39	2.25	2.91
Type of household			
Single Person	2.67	2.69	2.51
	(21.69)	(24.48)	(11.24)
Couple no children	.99	.77	2.58
	(25.40)	(28.30)	(14.54)
Single Parent	12.50	13.48	7.09
	(4.77)	(5.11)	(3.48)
Couple, children under 16	1.91	1.72	2.35
	(25.55)	(22.61)	(36.51)
Couple, children over 16	1.77	.94	4.50
	(12.71)	(12.35)	(14.09)
Couple, children above and below 16	1.75	1.66	1.88
	(7.62)	(5.47)	(15.64)
More than 2 generations	3.03	2.56	3.47
	(1.63)	(0.98)	(4.05)
Other	10.08	8.60	18.92
	(0.64)	(0.69)	(0.44)
Head of Household			
Male	1.48	1.06	2.74
	(76.62)	(73.06)	(89.98)
Female	5.36	5.45	4.45
	(23.38)	(26.94)	(10.02)
Age < 25	6.55	6,90	5.26
	(2.87)	(2.86)	(2.90)
Age 25 - 39	2.64	2.86	1.72
	(30.12)	(30.52)	(28.62)
Age 40 - 54	1.77	1.58	2.20
	(32.83)	(28.77)	(48.06)
Age > 54	2.41	1.90	5.92
	(34.18)	(37.86)	(20.42)
Employment Status of Head of Household			
Full-time	.61	.65	.49
	(65.16)	(60.86)	(81.24)
Part-time	3.01	3.14	1.32
	(2.63)	(3.10)	(0.89)
Out of the Labor Force	4.73	4.06	12.97
	(26.21)	(30.73)	(9.32)
Unemployed	13.88	12.66	15.89
	(4.47)	(3.52)	(8.06)
Number of Household Observations	40,433	31,917	8,516

Note: Figures present unweighted shares of households with given characteristic receiving social assistance. In parentheses fraction of households with given characteristic in the subsample.

Table 3 Descriptive Statistics

	Nonattriting			Attriting
	All Households	**Native**	**Immigrant**	**All Households**
Household receives welfare (0/1)	.024	.022	.029	--
	(.153)	(.148)	(.168)	
Number of children under 16 in household	.647	.525	1.105	.530
	(.978)	(.878)	(1.179)	(.908)
Number of adults in household	2.099	2.007	2.443	2.016
	(.931)	(.863)	(1.081)	(.932)
Avg. years of schooling of adult hh. members	11.103	11.439	9.843	10.960
	(2.353)	(2.338)	(1.948)	(2.390)
Household type: One person (0/1)	.217	.245	.112	.229
	(.412)	(.430)	(.316)	(.420)
Househ. type: Single parent with child(ren) (0/1)	.048	.051	.035	.058
	(.213)	(.220)	(.183)	(.233)
Head of household: Age / 10	4.762	4.865	4.378	4.614
	(1.584)	(1.676)	(1.096)	(1.726)
Head of household: Female (0/1)	.234	.269	.100	.284
	(.423)	(.444)	(.300)	(.451)
Head of household: Years of schooling	11.164	11.515	9.853	10.999
	(2.441)	(2.411)	(2.081)	(2.460)
Head of household: Handicapped (0/1)	.214	.228	.159	.193
	(.410)	(.420)	(.366)	(.394)
Head of household: Out of the labor force (0/1)	.262	.307	.093	.259
	(.440)	(.461)	(.291)	(.438)
Head of household: Unemployed (0/1)	.045	.035	.081	.050
	(.207)	(.184)	(.272)	(.218)
City with less than 20,000 inhabitants (0/1)	.121	.136	.065	.111
	(.326)	(.342)	(.246)	(.314)
City with more than 100,000 inhabitants (0/1)	.375	.367	.406	.392
	(.484)	(.482)	(.491)	(.488)
Years since migration	4.085	0	19.393	4.231
	(8.380)	(0)	(6.042)	(8.310)
Immigration year / 1000	.459	.056	1.968	.480
	(.832)	(.327)	(.057)	(.845)
Time trend / 100	19.890	19.890	19.887	19.878
	(.035)	(.035)	(.034)	(.036)
Age at Migration: 25-29 (0/1)	.050	0	.236	.058
	(.217)	(0)	(.425)	(.234)
Age at Migration: 30-34 (0/1)	.035	0	.165	.037
	(.183)	(0)	(.371)	(.188)
Age at Migration: 35-39 (0/1)	.020	0	.096	.023
	(.140)	(0)	(.294)	(.150)
Age at Migration: 40-44 (0/1)	.009	0	.042	.015
	(.094)	(0)	(.201)	(.121)
Age at Migration: > 44 (0/1)	.003	0	.014	.019
	(.055)	(0)	(.118)	(.138)
Number of Household Observations	40,433	31,917	8,516	4,791

Note: 1. Presented are sample means with standard deviations in parentheses.
2. Since welfare receipt is coded based on survey in subsequent year, no information is available for attriting households.
3. Tests of the equality of variable means yielded that all variables are significantly different at the one percent levels for the nonattriting native and immigrant households.

Table 4 Probability of Welfare Dependence by Subsequent Interview Status (in percent)

	Subsequent Interview Status	**All Households**	**Native**	**Immigrant**
1	Interview realized	2.31 (85.51)	2.17 (85.61)	2.84 (85.12)
2	Censored due to item-nonresponse	3.23 (2.53)	3.25 (2.60)	3.12 (2.25)
3	Household refused interview	2.65 (4.39)	2.48 (4.17)	3.15 (5.23)
4	Household moved abroad	2.42 (0.41)	0.00 (0.07)	2.80 (1.68)
5	Household died / household dissolved	5.29 (0.51)	4.88 (0.64)	33.33 (0.04)
6	Household not found	20.00 (0.04)	25.00 (0.03)	14.29 (0.08)
7	Status unknown since last interview year (t=1995)	2.58 (6.61)	2.41 (6.88)	3.35 (5.60)
8	Overall	2.39 (100.0)	2.25 (100.0)	2.91 (100.0)
9	Number of observations	40,433	31,917	8,516

Note: In parentheses fraction of all households (independent of welfare receipt) in category.

Table 5 Estimation Results: Interacted Model Estimated without Endogeneity Controls

	Main Effects		Immigrant Interactions	
	Estimated Coefficient	Standard Error	Estimated Coefficient	Standard Error
Household Structure				
No. of children under 16 in household	.549 **	.050	-.372 **	.085
No. of adults in household	.145 *	.094	-.179 **	.117
Avg. schooling of adult hh. members	-.370 **	.085	.441 **	.146
Household type: One person	.783	.180	-.543	.331
Household type: Single parent	1.593 **	.151	-.547	.381
Characteristics of Household Head				
Head of household: Age / 10	.078	.626	-	-
Head of household: Age squared / 100	-.101	.129	-	-
Head of household: Age cubed / 1000	.007	.008	-	-
Head of household: Female	.676 **	.115	-1.245	.299
Head of household: Years of schooling	.009	.082	-.045	.138
Expected Duration of Welfare Receipt				
Head of household: Handicapped	.508 **	.098	-.327 ▫	.199
Head of household: Out of the labor force	2.483 **	.132	1.103 **	.243
Head of household: Unemployed	1.864 **	.123	1.373 **	.259
Indicators of Informational Status				
City with less than 20,000 inhabitants	-.728 **	.166	-.829	.815
City with more than 100,000 inhabitants	.206 **	.088	.272	.181
Immigrant-specific Variables				
Immigrant	-	-	-4.699 **	.858
Years Since Migration	-	-	.076	.053
Years Since Migration squared / 100	-	-	-.052	.129
Immigration Year / 1000	-	-	-.234	.154
Age at Migration: 25-29	-	-	.433	.226
Age at Migration: 30-34	-	-	.288	.255
Age at Migration: 35-39	-	-	.470 ▫	.274
Age at Migration: 40-44	-	-	1.130 **	.342
Age at Migration: > 44	-	-	2.541 **	.346
Time Trend / 100	-1.532	1.072	-	-
Constant	29.088	21.346	-	-
Log Likelihood (Number of Parameters)	-33,954.893 (90)			
Number of Nonattrited Household-Year Obs.	40,433			

Note: **, *, ▫ indicate statistical significance at the 1, 5 and 10 percent significance level, respectively.

Table 6 Estimation Results: Interacted Model Estimated with Endogeneity Controls

	Main Effects		Immigrant Interactions	
	Estimated Coefficient	Standard Error	Estimated Coefficient	Standard Error
Household Structure				
No. of children under 16 in household	.796 **	.106	-.595 **	.161
No. of adults in household	.212 *	.133	-.426 **	.180
Avg. schooling of adult hh. members	-.262 ▫	.136	.527 *	.231
Household type: One person	.310	.290	.140	.613
Household type: Single parent	1.417 **	.282	-.328	.717
Characteristics of Household Head				
Head of household: Age / 10	-2.369 *	1.095	-	-
Head of household: Age squared / 100	.339	.225	-	-
Head of household: Age cubed / 1000	-.016 *	.014	-	-
Head of household: Female	1.336 **	.219	-1.169	.582
Head of household: Years of schooling	-.153	.137	-.226	.223
Expected Duration of Welfare Receipt				
Head of household: Handicapped	.166	.153	-.047	.303
Head of household: Out of the labor force	1.215 **	.204	1.634 **	.370
Head of household: Unemployed	1.431 **	.216	1.314 **	.362
Indicators of Informational Status				
City with less than 20,000 inhabitants	-.965 **	.284	-1.757 ▫	.999
City with more than 100,000 inhabitants	.152	.183	1.456 **	.373
Immigrant-specific Variables				
Immigrant	-	-	-4.177 **	1.586
Years Since Migration	-	-	.063	.094
Years Since Migration squared / 100	-	-	.064	.230
Immigration Year / 1000	-	-	-.267	.246
Age at Migration: 25-29	-	-	.658	.511
Age at Migration: 30-34	-	-	.894 *	.461
Age at Migration: 35-39	-	-	.886 ▫	.528
Age at Migration: 40-44	-	-	1.557 **	.595
Age at Migration: > 44	-	-	3.391 **	.594
Time Trend / 100	-1.259	1.769	-	-
Constant	28.093	34.868	-	-
Rho 1	-.847 **	.761	-	-
Rho 2	7.968 **	.598	-	-
Rho 3	-7.935 **	.543	-	-
Log Likelihood (Number of Parameters)	-28,833.069 (117)			
Number of Nonattrited Household-Year Obs.	40,433			

Table 7 Simulation Results: Interacted Model with Endogeneity Controls
Difference in Simulated Probability in Percent of Baseline Probability

Simulated Effect:	With Endogeneity Controls		Without Endogeneity Controls	
	Native Hholds	Immigrant Hholds	Native Hholds	Immigrant Hholds
Household Structure				
No. of children under 16 in household (1 vs. 0)	.73 **	.15 **	.59 **	.16 **
No. of adults in household (2 vs. 1)	.17 *	-.19 **	.13 *	-.03 **
Avg. schooling of adult hh. members (14 vs. 9)	-1.44 □	1.57 *	-3.48 **	.39 **
Household type: One person (1 vs. 0)	.27	.42	.99	.25
Household type: Single parent (1 vs. 0)	1.94 **	1.32	3.52	1.69
Characteristics of Household Head				
Head of household: Age (60 vs. 30)	-.88 *	-.84	-1.53	-1.15
Head of household: Female (1 vs. 0)	1.60 **	.14	.82 **	-.46
Head of household: Years of schooling (14 vs. 9)	-.71	-1.26	.04	-.17
Expected Duration of Welfare Receipt				
Head of household: Handicapped (1 vs. 0)	.14	.10	.58 **	.19 □
Head of household: Out of the labor force (1 vs.0)	1.33 **	6.70 **	3.78 **	18.30 **
Head of household: Unemployed (1 vs. 0)	1.97 **	6.20 **	9.23 **	25.19 **
Indicators of Informational Status				
City with less than 20,000 inhabitants (1 vs. 0)	-.65 **	-1.59 □	-.58 **	-.96
City with more than 100,000 inhabitants (1 vs. 0)	.13	1.94 **	.21 **	.50
Immigrant-specific Variables				
Immigration Year (1980 vs. 1960)	-	-.004	-	-.005
Age at migration: 25-29 vs. < 25	-	.52	-	.42
Age at migration: 30-34 vs. < 25	-	.77 *	-	.26
Age at migration: 35-39 vs. < 25	-	.77 □	-	.46 □
Age at migration: 40-44 vs. < 25	-	1.69 **	-	1.59 **
Age at migration: > 44 vs. < 25	-	8.00 **	-	8.10 **
Years since migration: 15 vs. 5	-	.38 **	-	.41 **
Years since migration: 25 vs. 5	-	1.22 **	-	1.02 **
Years since migration: 35 vs. 5	-	3.08 **	-	1.82 **

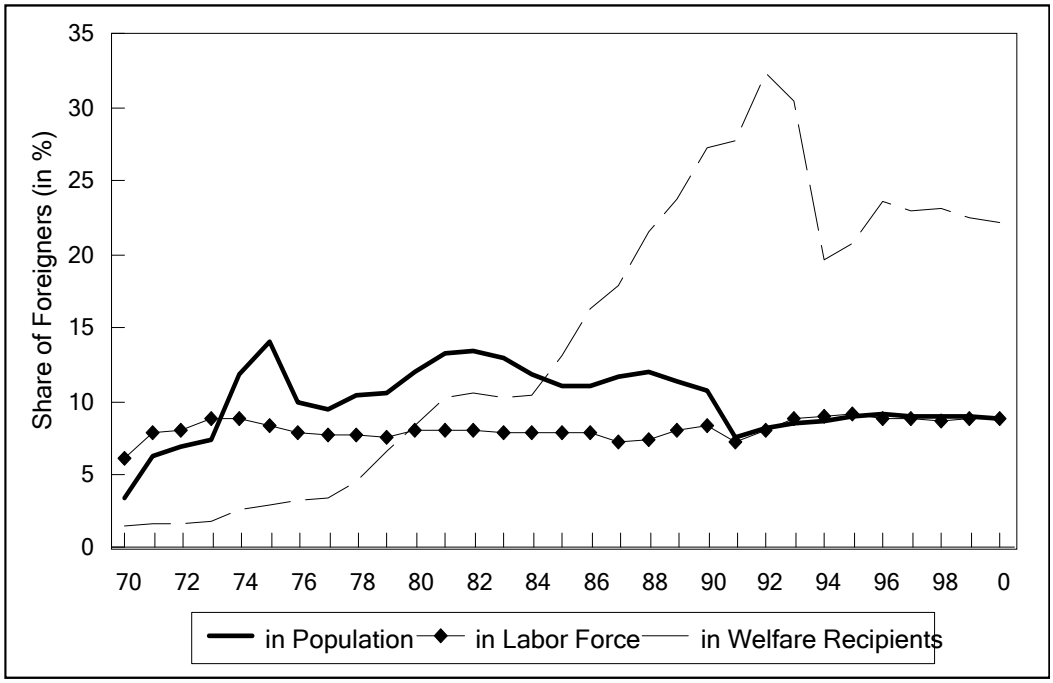
Note: The columns present the difference of two simulated probabilities of welfare dependence relative to the baseline prediction for the full dataset without changes. The values are calculated using all observations and the coefficient estimates as in Table 6 for the first and in Table 5 for the latter columns. The probabilities in the endogeneity corrected scenario obtain after integrating out over the unobserved heterogeneity distribution. The effect of dichotomous variables (D) was calculated for values 1 vs. 0 (i.e. [Pr(S=1|D=1) – Pr(S=1|D=0)] / Pr(S=1), where S indicates social assistance dependence), for continuous variables the compared values are presented in column 1, approximating one standard deviation above and below the variable mean. The asterisks indicate statistical significance of the underlying coefficient estimates as presented in Tables 5 and 6.

Table 8 Estimation Results: Model with Endogeneity Controls but no Interactions

	Main Effects	
	Estimated Coefficient	Standard Error
Household Structure		
No. of children under 16 in household	.419 **	.064
No. of adults in household	.089	.081
Avg. schooling of adult hh. members	-.211 *	.102
Household type: One person	.206	.227
Household type: Single parent	1.752 **	.227
Characteristics of Household Head		
Head of household: Age / 10	-1.521 *	1.085
Head of household: Age squared / 100	.173	.222
Head of household: Age cubed / 1000	-.006	.014
Head of household: Female	.375 **	.191
Head of household: Years of schooling	-.122	.098
Expected Duration of Welfare Receipt		
Head of household: Handicapped	.175	.125
Head of household: Out of the labor force	1.700 **	.175
Head of household: Unemployed	1.763 **	.171
Indicators of Informational Status		
City with less than 20,000 inhabitants	-1.400 **	.320
City with more than 100,000 inhabitants	.102	.137
Immigrant-specific Variables		
Immigrant	-.261	.166
Time Trend / 100	-1.545	1.541
Constant	-36.044	30.600
Rho 1	-2.850 **	.317
Rho 2	11.988 **	1.447
Rho 3	2.144 **	.589
Log Likelihood (Number of Parameters)	-29,021.482 (91)	
Number of Nonattrited Household-Year Obs.	40,433	

Note: **, * indicate statistical significance at the 1, and 5 percent significance level, respectively.

Figure 1 Share of Immigrants in Population, Labor Force and Welfare Recipients



Source: Population: Statistisches Bundesamt, Fachserie 1 Reihe 2, various years,
Labor Force: Statistisches Bundesamt, Fachserie 1, Reihe 4.1.1, various years,
Welfare Recipients: Statistisches Bundesamt, Fachserie 13, Reihe 2, various years.

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Appendix 1

The Estimation Procedure

The individual contribution to the likelihood function was derived as

$$L_i(\mu_{1,i},\mu_{2,i},\mu_{3,i}) = \prod_t \Pr(A_{i,t} = 1 \mid \mu_{1,i},\mu_{2,i},\mu_{3,i})^{d_{Ai}} \cdot \Pr(A_{i,t} = 0 \mid \mu_{1,i},\mu_{2,i},\mu_{3,i})^{1-d_{Ai}} \cdot$$

$$\Pr(LF_{i,t} = k \mid \mu_{1,i},\mu_{2,i},\mu_{3,i})^{d_{ki}} \cdot$$

$$\Pr(S_{i,t} = 1 \mid \mu_{1,i},\mu_{2,i},\mu_{3,i})^{d_{Si}} \cdot \Pr(S_{i,t} = 0 \mid \mu_{1,i},\mu_{2,i},\mu_{3,i})^{1-d_{Si}} \qquad (5)$$

$$d_{Ai} = 1 \text{ if } A_{i,t} = 1 \qquad d_{ki} = 1 \text{ if } LF_{i,t} = k \qquad d_{Si} = 1 \text{ if } S_{i,t} = 1$$
$$d_{Ai} = 0 \text{ if } A_{i,t} = 0 \qquad d_{ki} = 0 \text{ if } LF_{i,t} \neq k \qquad d_{Si} = 0 \text{ if } S_{i,t} = 0$$

The three random error components μ_1, μ_2, and μ_3 are assumed to follow discrete distributions along the lines described by Heckman and Singer (1984). After integrating out over these distributions and adding over all individuals (i=1, ..., N) we obtain the following log-likelihood function

$$\log L = \sum_{i=1}^{N} \log \sum_{k=1}^{K} \sum_{\ell=1}^{L} \sum_{m=1}^{M} PW_k\, PW_\ell\, PW_m\, L_i(\mu_{1k,i}, \mu_{2\ell,i}, \mu_{3m,i})$$

PW_k, PW_ℓ, and PW_m represent the probability weights assigned to the k^{th}, ℓ^{th}, and m^{th} masspoint of the distribution of the three components. The masspoints, as well as the probability weights characterizing these three distributions are estimated jointly with the attrition, labor force participation, and social assistance equations. The total numbers of K, L, and M masspoints describe the distributions, and are determined by sequential estimations with increasing numbers of masspoints. The appropriate number of masspoints is considered to be reached when additional ones do not continue to improve the function value further (judged by the Akaike Information Criterion). Appendix 2(c) provides the results of the estimation which could not be improved upon further.

Identification Restrictions on the Heterogeneity Distributions

All three equations contain the heterogeneity components μ_1, μ_2 and μ_3. Since each of the equations has an intercept term, only K-2, L-2, and M-2 masspoints of the heterogeneity distributions are identified. The first and last masspoints of each distribution are set to zero and one, respectively, and the probability weights for both heterogeneity factors are specified as multinomial logit.

Appendix 2 (a)
Estimation Results on Attrition Equation

	Mean (Std. Dev.)	Estimated with Specific. in Table 5		Estimated with Specific. in Table 6	
		Coeff. Estimate	Standard Error	Coeff. Estimate	Standard Error
Dependent Variable: Household Attrited	.106 (.308)				
Characteristics of Household and Household Head					
Age / 10	4.747 (1.601)	-.070	.061	.051	.071
Age squared / 100	25.093 (16.428)	-.004	.006	-.015 *	.007
Female	.239 (.427)	.132 **	.040	.124 **	.046
Years of Schooling	11.148 (2.444)	.006	.006	.010	.008
Full- or Part-time Employed	.668 (.471)	-.465 **	.039	-1.000 **	.067
Foreign Nationality	.217 (.453)	.491 **	.039	.586 **	.048
Single Household	.218 (.413)	-.358 **	.049	-.371 **	.054
No. Household Members	2.721 (1.449)	-.130 **	.015	-.133 **	.018
Characteristics of Interview					
New household (2)	.172 (.377)	1.013 **	.039	.760 **	.059
Changed Interviewer (2)	.164 (.370)	.685 **	.038	.665 **	.040
Time Trend / 1000	1.989 (.004)	-4.970 **	.523	-3.751 **	.645
Constant	-	97.021 **	10.420	74.495 **	12.787
Rho 1	-	-	-	-2.700 **	.203
Rho 2	-	-	-	.338 **	.156
Rho 3	-	-	-	.584 **	.176
Number of Observations	45.224				
Log Likelihood (No. of Parameters)	-	-33,954.89 (90)		-28,833.01 (117)	

Note: (1) **, * indicate statistical significance at the 1 and 5 percent significance level, respectively.
(2) *New household* indicates households in the period when they are observed for the first time. *Interviewer change* is coded one, if the survey household was interviewed by a different individual compared to the preceding period.

Appendix 2(b)

Estimation Results on Labor Force Participation Equation (Corresponding to Table 6)

	Probability: Out of the Labor Force			Probability: Unemployment		
	Mean (Std.D.)	Coeff. Estimate	Standard Error	Mean (Std.D.)	Coeff. Estimate	Standard Error
Demographic Indicators						
Age / 10	6.35 (1.61)	-9.547 **	.303	4.38 (1.25)	-3.039 **	.326
Age squared / 100	42.9 (17.8)	1.292 **	.035	20.7 (10.7)	.393 **	.038
Age * Immigrant / 10	.38 (1.41)	-2.322 **	.701	(1.76) (2.36)	-2.036 **	.615
Age sq. * Immigr. / 100	2.13 (8.53)	.256 **	.079	8.67 (12.7)	.252 **	.071
Female	.43 (.50)	2.763 **	.140	.22 (.42)	.665 **	.134
Health Satisfaction	5.73 (2.67)	-.158 **	.015	6.05 (2.73)	-.108 **	.015
Human Capital Indicators						
Schooling < 10 years	.27 (.44)	.939 **	.269	.30 (.46)	1.643 **	.257
Schooling 10 years	.37 (.48)	.861 **	.202	.41 (.49)	1.223 **	.214
Schooling 11 years	.18 (.38)	.846 **	.221	.11 (.31)	.674 **	.234
Schooling 12-14 years	.13 (.33)	2.413 **	.198	.13 (.33)	.828 **	.233
No vocat. Training	.32 (.47)	1.223 **	.173	.43 (.49)	.270 ¤	.156
Poor German Speaking	.05 (.22)	.339 ¤	.190	.24 (.43)	.243 ¤	.147
Unemployment Indicators						
Regional Unemployment	8.31 (2.47)	.483 **	.097	8.81 (2.44)	.363 **	.099
Reg. Unempl. squared	75.1 (42.5)	-.023 **	.006	83.7 (43.3)	-.010 ¤	.005
Reg. Unempl. * Immigr	.60 (2.21)	.089 ¤	.046	3.16 (4.36)	.008	.038
Year / 100	19.89 (.04)	11.21 **	1.144	19.89 (.04)	3.142 **	1.122
Years since Migration / 10	1.63 (6.08)	-.030	.022	7.76 (10.7)	.046 **	.018
Immigration Year / 1000	.21 (.61)	.438 **	.176	.80 (.97)	.513 **	.176
Immigrant	.07 (.26)	2.261	1.480	.38 (.49)	2.137	1.329
Constant	-	-223.6 **	22.67	-	-85.27 **	22.33
Rho 1	-	20.20 **	1.061	-	25.14 **	2.263
Rho 2	-	-5.107 **	.383	-	3.655 **	.472
Rho 3	-	-8.719 **	.336	-	-3.040 **	.442

Note: **, *, ¤ indicate statistical significance at the 1, 5 and 10 percent level, respectively.

Appendix 2(c)

Estimation Results on Unobserved Heterogeneity (Corresponding to Table 6)

For each of the three heterogeneity components four masspoints were considered. With the exception of the first and last masspoints, which were set to zero and one, they were calculated as:

$$\text{masspoint} = \frac{\exp(\gamma)}{1 + \exp(\gamma)}.$$

The probability weights for each heterogeneity component were calculated as

$$\text{Prob.Weight}_j = \frac{\exp(\theta_j)}{1 + \sum_{r=1}^{3} \exp(\theta_r)}$$

where the probability weight for j=4 equals 1 minus the other three probability weights. The following results obtained:

	Component 1		Component 2		Component 3	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
γ_1	.87	.09	-.49	.12	.69	.12
γ_2	2.00	.11	.68	.10	-.46	.08
θ_1	.98	.21	1.21	.18	-.08	.23
θ_2	.75	.22	.33	.23	-1.51	.27
θ_3	2.42	.20	1.83	.21	2.69	.24
	Prob. Weight	Masspoint	Prob. Weight	Masspoint	Prob. Weight	Masspoint
1	.12	.00	.21	.00	.03	.00
2	.34	.70	.45	.38	.34	.67
3	.42	.88	.29	.66	.19	.39
4	.12	1.00	.05	1.00	.44	1.00