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Mathias Sinning

Determinants of Savings and Remittances

Empirical Evidence from Immigrants to Germany

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Mathias Sinning*

Determinants of Savings and Remittances – Empirical Evidence from Immigrants to Germany

Abstract
This paper investigates the determinants of migrants' financial transfers to their home country using German data. A double-hurdle model is applied to analyze the determinants of the propensity to send transfers abroad and the amount of transfers. The findings reveal that return intentions positively affect financial transfers of immigrants to their home country. Moreover, while the effect of the household size on migrants' transfers abroad turns out to be significantly negative, remittances are higher if close relatives live in the sending country. Finally, Vuong-tests indicate that the double-hurdle model is the correct specification for the analysis of migrants' savings and remittances rather than the conventional Tobit model usually applied in the literature.

JEL Classification: F22, C34, D12, D91

Keywords: International migration, savings, remittances, double-hurdle model

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1 Introduction

Due to the increasing relevance of international migration, the economic performance of migrants represents an important factor for both the immigration and sending countries. In the receiving countries, the economic situation of the foreign-born population and the economic and societal integration of immigrant minorities into the host-countries' society have become a matter of intense debate among economists and policy makers. At the same time, the economic situation of migrants has become increasingly important for the sending countries because migrants' remittances have grown to the largest source of external funding in many emigration countries.

The economic literature on the performance of immigrants in their host country concentrates predominantly on the analysis of migrants' earnings and employment status (Borjas, 1994; Zimmermann, 2005). Only a few studies have examined the wealth accumulation patterns of immigrants in their home countries (Bauer and Sinning, 2005; Amuedo-Dorantes and Pozo, 2006), although migrants' savings and investment abroad may represent a substantial or even the major part of their overall financial transfers (Brown, 1994). An investigation of such a long-run indicator of economic well-being may be relevant because the capacity of immigrants to accumulate wealth in their home countries does not only reflect their economic performance in the host country but also allows to draw inferences about their future economic situation.

According to the World Bank (2006a), remittances in 2005 have exceeded US$ 233 billion worldwide. Moreover, recorded remittances to developing countries have doubled between 2000 and 2005, indicating a substantial increase in payments of migrants to their families abroad. The traditional development literature has largely focused on the size and potential impact of migrants' remittances (Adams, 1992; Durand et al., 1996). In addition, a sizeable theoretical and empirical literature has revealed that a variety of motives may induce migrants to send remittances to their countries of origin (Lucas and Stark, 1985; Bernheim et al., 1985; Cox, 1987; Cox and Rank, 1992; Cox et al., 1987; Ilahi and Jafarey, 1999; Amuedo-Dorantes and Pozo, 2006).

Despite the increasing importance of the long-run economic situation of migrants and the growing impact of their remittances, only a few studies investigate migrants' savings and remittances jointly. Amuedo-Dorantes and Pozo (2006) analyze both savings and remittances of Mexican immigrants in the US. They demonstrate that immigrants remit a substantial part of their labor earnings for family-provided insurance as well as for self-insurance. Merkle and Zimmermann (1992) examine migrants' savings in Germany and their transfers abroad. They find that return intentions significantly affect migrants' remittances but do not influence their savings behavior. Considering both migrants' savings in the home and host country, Bauer and Sinning (2005) demonstrate that immigrants who intend to stay in Germany only temporarily save significantly more than permanent migrants.

Germany, a major immigration country in the European Union, represents an excellent example for the analysis of the importance of migrants' savings and remittances. Since about 1.5 million immigrants in Germany will reach retirement age within the next 15 years, both savings and return intentions of immigrants may become important factors for the German pension system. Even though the majority of the foreign-born population in Germany does not originate from developing countries, immigrants residing in Germany remit a substantial part of their income. In 2004, remittance flows from Germany amounted to US$ 10.4 billion (World Bank, 2006b). A sizeable part of these transfers consists of savings-related remittances of temporary migrants (Merkle and Zimmermann, 1992; Bauer and Sinning, 2005).

This paper aims at providing empirical evidence on the relative importance of the determinants of migrants' transfers to their home countries, paying particular attention to their return intentions and household composition in the home and host country. In the empirical analysis, which is based on data from the German Socio-Economic Panel (SOEP), different types of transfers will be distinguished, namely savings, payments to family members and other persons abroad as well as transfers that are sent to the home country for other reasons. In addition to the Tobit model, which accounts for the censored nature of the dependent variables, a double-hurdle model will be applied to assess the effects of relevant determinants on the individual decision to send transfers abroad and the amount of transfers.

The paper contributes to the existing literature in several respects. Firstly, empirical evidence on the determinants of migrants' remittances is generated by examining micro-level data from immigrants to Germany. While the major part of the existing literature on remittances mainly concentrates on migrants' transfers to developing countries, the analysis focuses on remittances of migrants' from traditional labor-exporting countries, such as Turkey, Italy and Greece as well as refugees originating from former Yugoslavian countries. Secondly, in addition to migrants' payments to family members in their countries of origin which are typically addressed by the literature on remittances, the analysis of German data allows an explicit consideration of migrants' savings in their home countries as a relevant part of their overall transfers. Finally, a double-hurdle model is applied to account for differences between the stochastic processes that determine the decision of immigrants to remit and the level of remittances. Existing studies have often adopted more restrictive models for binary or censored dependent variables to assess the determinants of migrants' remittances.

The empirical findings reveal that return intentions positively affect financial transfers of immigrants to their home country. Moreover, while the effect of the household size on migrants' transfers abroad turns out to be significantly negative, remittances are higher if close relatives live in the sending country. Women are less likely to send transfers abroad and – given that their payments are positive – also send smaller amounts abroad than comparable men. While the current gross income increases migrants' savings and payments to persons abroad, the variation of past income streams increases the amount of other transfers to the sending countries, indicating that these transfers represent insurance payments to some extent. Finally, Vuong-tests indicate that the double-hurdle model is the correct specification for the analysis of remittances rather than the conventional Tobit model usually applied in the literature.

The paper proceeds as follows. Section 2 gives a short survey of the existing literature on the determinants of migrants' remittances. Section 3 describes the empirical strategy and the data used for the analysis. The estimation results are presented in Section 4. Section 5 concludes.

2 Determinants of migrants' remittances

An extensive literature provides theoretical and empirical evidence on general motives behind migrants' remittances and outlines relevant determinants. Using data from the National Migration Study of Botswana, Lucas and Stark (1985) were the first to note that – in addition to altruism – a variety of motives could play a decisive role in determining remittances. They considered the strategy to secure inheritance and the desire to invest in assets at home as "pure self-interest" and designated the motives behind remittances that were based on implicit contractual agreements between migrant and family as "tempered altruism or enlightened self-interest". These motives could include, for example, repayments for a previous educational investment in the migrant or payments that insure migrants against income losses in the host country.

Several studies have provided evidence in support of these hypotheses. Bernheim et al. (1985) suggest that family members in the sending country may use their possibility of depriving migrants of their rights to inheritance to secure remittances. At the same time, expectations about future bequests may induce migrants to send remittances to their home country. Cox (1987) argues that altruism and exchange (such as repayments of educational costs or the purchase of services) are major motives behind migrants' remittances. Cox and Rank (1992) find empirical patterns for inter-vivos transfers (i.e. transfers between living persons) that are more consistent with exchange than altruism. Ilahi and Jafarey (1999) provide evidence on repayments of loans aimed at financing international migration. Finally, Amuedo-Dorantes and Pozo (2006) demonstrate that migrants do not only send remittances to their home country to insure family members against income losses (Coate and Ravallion, 1993) but also to insure themselves.

Although a sizeable literature has attempted to discriminate between various motivations to remit, empirical evidence on the determinants of migrants' savings in their countries of origin is rather scarce. However, a number of studies has highlighted the relevance of migrants' savings in their home countries. Using data from the 1979 Youth Cohort of the National Longitudinal Surveys, Amuedo-Dorantes and

Pozo (2002) compare migrants' savings in the US to those of comparable natives. They find that immigrants save significantly less than comparable natives and argue that the apparent lower precautionary savings of immigrants may be caused by the fact that immigrants engage in precautionary saving by remitting parts of their income to their countries of origin. Merkle and Zimmermann (1992) investigate migrants' savings in the host country as well as remittances using data from the German Socio-Economic Panel (SOEP). They find that migrants' return intentions significantly affect their remittances but do not influence their savings behavior. Based on these results, they conclude that temporary migrants hold savings mainly in their home countries. Using the same data source, Bauer and Sinning (2005) demonstrate that immigrants who intend to return to their home country save significantly more than permanent migrants if both savings in the home and in the host country are taken into account.

The theoretical and empirical literature on savings and remittances has highlighted a number of variables that may be relevant in explaining migrants' transfer behavior. Galor and Stark (1990) demonstrate that the positive probability of immigrants to return to their home countries positively affect their savings behavior. Return intentions have also been identified as a major determinant of migrants' payments to family members abroad by a number of studies on remittances (see Docquier and Rapoport, 2005 for a review).

Most empirical studies on migrants' remittances have focused on income effects to assess the degree of altruism that may be inferred from the migrants' behavior. The pure altruism hypothesis, which postulates unity of the transfer-income derivative, could be rejected by several studies on transfers in developed and undeveloped economies (Cox, 1987; Cox et al., 1987; Altonji et al., 1997). In addition to income, migrants' transfers are likely to be affected by income uncertainties. Following the literature on risk-diversification within families (Stark, 1991), Dustmann (1997) demonstrates that immigrants may accumulate more precautionary savings than comparable natives if they face high income uncertainties on the labor market of their host country. Amuedo-Dorantes and Pozo (2006) show that income risks may increase migrants' insurance payments to their countries of origin to smooth

future consumption after remigration.

Following the contribution of Lucas and Stark (1985), the literature on the determinants of remittances has also focused on the migrants' family background in the home and host countries. Specifically, empirical studies have shown that the marital status and the household size and composition in the migrants' home and host country are important determinants of remittances (Hodinott, 1994; de la Briere et al., 2002).

In addition to the determinants of migrants' savings and remittances presented above, a number of socio-economic and demographic characteristics may also affect transfers of immigrants to their home country. In particular, age, gender, education and the employment status have proved to be relevant in explaining both migrants' savings and remittances (see, e.g., Cox, 1987; Cox et al., 1987; de la Briere et al., 2002; Merkle and Zimmermann, 1992; Bauer and Sinning, 2005). Moreover, the transfer behavior of immigrants may also be influenced by their migration background. In particular, since the migration process leads immigrants to be a highly selected group of individuals (Borjas, 1987), both savings and remittances may vary substantially across countries of origin. Funkhouser (1995) demonstrates that self-selection of immigrants may have a decisive influence on migrants' remittances. The savings behavior may also be affected by the cultural background of immigrants (Carroll et al., 1994, 1999). Finally, in addition to source country variations, differences between immigration cohorts might exist. Specifically, migrants' remittances typically decline as the duration of residence in the host country increases (DeVoretz and Vadean, 2005), while wealth levels of more established immigrants in their host countries tend to be higher than those of more recent immigration cohorts (Bauer et al., 2007), suggesting that the length of stay in the host country might have positive effects on migrants' savings abroad.

The objective of the following analysis is to generate empirical evidence on the relative importance of the determinants of migrants' financial transfers, taking into account the factors mentioned above. Since these factors may have different effects on the propensity to send transfers abroad and the amount of transfers, a double-hurdle model is applied which allows a separate consideration of the underlying

stochastic processes.

3 Empirical strategy and data

While investigating the determinants of migrants' savings and remittances, the censored nature of the outcome variable has to be taken into account. In particular, it seems likely that a substantial part of the foreign-born population does not send transfers abroad. One way to tackle this problem is to use a Tobit model (Tobin, 1958) which has been applied in previous studies on both savings and remittances (Merkle and Zimmermann, 1992; Rodriguez, 1996; Cox et al., 1987). An important shortcoming of the Tobit model is that zero values are considered as corner solution outcomes although the stochastic process that describes the individual decision to send transfers abroad may differ considerably from the one that governs the decision about the amount of transfers. Specifically, in the context of savings and remittances, the use of the Tobit model implies that an interior solution occurs if the interest rate is sufficiently high or the price of sending transfers abroad is sufficiently low (see also Yen et al., 1997). However, a sizeable part of the immigrant population never sends financial transfers abroad regardless of prices, interest rates and income. Such "non-participation" decisions have to be considered in addition to corner solution outcomes.

A model that may be applied if the participation decision and the level of the dependent variable are determined by different stochastic processes is the double-hurdle model which represents a generalization of the Tobit model. The double-hurdle model extends the Tobit model by allowing for a separate *first hurdle* that reflects the (binary) participation decision. Assuming that the error terms of the stochastic processes of level and participation decisions are uncorrelated leads to the independent double-hurdle model, while the dependent double-hurdle model accounts for the possible correlation between the two error terms. As a result of the presence of continuous observations on the dependent variable, exclusion restrictions are not required for a separate identification of the stochastic processes of the independent double-hurdle model (Blundell and Meghir, 1987). To derive the

double-hurdle model with independent error terms, consider latent participation d^* and level y^* as linear functions of the first-hurdle regressor $\mathbf{x}_1$ and the second-hurdle regressor $\mathbf{x}_2$:

$$d^* = \mathbf{x}_1'\beta_1 + \varepsilon_1,$$
$$y^* = \mathbf{x}_2'\beta_2 + \varepsilon_2,$$

with error terms $\varepsilon_1 \sim N(0,1)$ and $\varepsilon_2 \sim N(0,\sigma^2)$. β_1 and β_2 are the parameter vectors to be estimated. Since the double-hurdle model is based on the assumption that the error terms are normally distributed, the inverse hyperbolic sine (IHS) transformation (Burbidge et al., 1988) of the observed dependent variable is frequently applied (Yen and Jones, 1997). The IHS transformation is given by

$$\begin{aligned} T(y) &= \log(\gamma y + (\gamma^2 y^2 + 1)^{1/2})/\gamma \\ &= \sinh^{-1}(\gamma y)/\gamma, \end{aligned}$$

where γ represents an additional model parameter. The IHS transformation approximates $\log(y)$ for large values of y. In the empirical analysis, it is assumed that $\gamma = 1$. The IHS double-hurdle model may be written as

$$\begin{aligned} T(y) &= \mathbf{x}_2'\beta_2 + \varepsilon_2 \text{ if } \mathbf{x}_1'\beta_1 + \varepsilon_1 > 0 \text{ and } \mathbf{x}_2'\beta_2 + \varepsilon_2 > 0 \\ &= 0 \text{ otherwise.} \end{aligned}$$

The likelihood function of the independent IHS double-hurdle model is

$$L = \prod_{i\in\Omega_0}\{1 - \Phi(\mathbf{x}_1'\beta_1)\Phi(\frac{\mathbf{x}_2'\beta_2}{\sigma})\}\prod_{i\in\Omega_1}\{\frac{1}{\sqrt{1+\gamma^2 y^2}}\Phi(\mathbf{x}_1'\beta_1)\frac{1}{\sigma}\phi[\frac{T(y)-\mathbf{x}_2'\beta_2}{\sigma}]\},$$

where $\Omega_0 = \{i|y_i = 0\}, \Omega_0 = \{i|y_i \neq 0\}$ and $\Omega_0 \cup \Omega_1 = \{1, 2, ..., N\}$. When $\gamma = 0$, the likelihood function reduces to that of the independent double-hurdle model (Cragg, 1971; Blundell and Meghir, 1987).

The elasticities of the IHS double-hurdle model are given by the derivation of the unconditional mean with respect to the explanatory variables. The unconditional mean of y consists of the probability of y being uncensored and the conditional mean of y:

$$E(y) = P(y > 0)E(y|y > 0),$$

where

$$P(y > 0) = \Phi(\mathbf{x}_1'\beta_1)\Phi(\frac{\mathbf{x}_2'\beta_2}{\sigma})$$

and

$$E(y|y > 0) = \Phi(\frac{\mathbf{x}_2'\beta_2}{\sigma})^{-1} \int_0^\infty \frac{y}{\sigma\sqrt{1+\gamma^2 y^2}} \phi[\frac{T(y) - \mathbf{x}_2'\beta_2}{\sigma}]dy.$$

The standard errors for the elasticities may be derived using mathematical approximation (Fuller, 1987).

In the following empirical analysis, data from the German Socio-Economic Panel (SOEP) is utilized.[1] The SOEP is a representative longitudinal study including German and immigrant households residing in the old and new German states which started in 1984. In 2005, more than 20,000 persons in about 12,000 households were sampled. The panel contains information about socioeconomic and demographic characteristics, household composition, occupational biographies, etc. The empirical analysis is restricted to immigrants between 18 and 64 years who are not registered unemployed. Immigrants are defined as foreign-born persons who immigrated to Germany since 1948. Due to the small number of observations, the sample does not include ethnic migrants from Central and Eastern Europe who received German citizenship after immigration. Since less than two percent of the migrant population in the sample lives in East Germany, the analysis concentrates on immigrants residing in West Germany. Moreover, the year 1984 is not considered in the regression analysis because lag variables have to be generated for some of the explanatory variables of the model.

The SOEP contains detailed information about transfers of foreigners to their home country between 1984 and 1995. Immigrants were asked initially whether they sent any financial transfers to their home country. This information could be used to construct an indicator variable that differentiates between "participants" and

[1]The data used in this paper were extracted from the GSOEP Database provided by the DIW Berlin (http://www.diw.de/GSOEP) using the Add-On package PanelWhiz v1.0 (Oct 2006) for Stata(R). PanelWhiz was written by Dr. John P. Haisken-DeNew (john@panelwhiz.eu). The PanelWhiz generated DO file to retrieve the GSOEP data used here and any Panelwhiz Plugins are available upon request. Any data or computational errors in this paper are my own. Haisken-DeNew and Hahn (2006) describe PanelWhiz in detail.

"non-participants". Additionally, the amount of three different types of transfers may be observed, namely savings for later, support for the family and transfers for other reasons. After 1995, only the amount of transfers to persons abroad is available. Therefore, the analysis is limited to the examination of this rather general outcome measure between 1996 and 2005. Since participation and level decisions were again surveyed separately, a dummy variable indicating whether immigrants sent remittances abroad could also be constructed for the sample period 1996-2005.

In the empirical analysis, a number of socio-economic and demographic characteristics are considered as explanatory variables of migrants' transfers to the home country. These variables include a squared function of age, the household gross income, the number of years of education and indicator variables for the migrants' employment status, gender and the attendance of school in Germany. Moreover, the variance of the average income of the last five years is used as a proxy variable for income risk. In general, it may be expected that migrants facing greater income risk are more likely to send transfers abroad and transfer more than migrants facing less income risk (Amuedo-Dorantes and Pozo, 2006).

In addition to these characteristics, the set of explanatory variables includes information about the household composition, such as the household size, the marital status and the presence of children in the household. Unfortunately, the SOEP does not contain information about the household size of immigrants in their home country. Instead, dummy variables indicating whether the spouse or children of the respondent live abroad are included into the regression equation. In order to avoid causality problems, lag variables are used for some of the explanatory variables in the regression model.

Since all kinds of transfers may be observed for both temporary and permanent migrants, differences between the two groups are taken into account in the empirical analysis. In particular, the SOEP provides information on the intentions of immigrants to stay in Germany. This information is used to generate a dummy variable for return intentions. Finally, differences between immigration cohorts and immigrants originating from different source countries are considered by including the number of years since migration and a set of source country indicators into

the model. The sample is restricted to immigrants from OECD member countries and former Yugoslavian countries. Source country indicators were generated for immigrants from major traditional labor-exporting countries, namely Turkey, Italy and Greece as well as for immigrants from former Yugoslavia.[2] After excluding all observations with missing values on one of the variables used in the analysis, the panel data set contains 12,732 person-year-observations of 2,189 individuals for the period 1985-1995 and 8,849 person-year-observations of 1,860 persons for the period 1996-2005.

The descriptive statistics presented in Table 1 reveal that the proportion of immigrants who save abroad in the period from 1985 to 1995 is 4.5%, while 7.5% of the foreign-born population sends transfers to their home country for other reasons. Moreover, the share of immigrants who send payments to family members in their countries of origin amounts to 24.0%, indicating that these payments are relatively more important if compared to savings and other transfers abroad. While immigrants save on average about 16 Euros per month in their home country, the average amount of savings of persons reporting positive values is about 355 Euros (10.3% of the household gross income), suggesting that savings abroad seem to be highly relevant for a part of the foreign-born population. On average, immigrants remit about 19 Euros per month to their home country for other reasons. Given that these transfers are positive, more than 250 Euros (7.9% of gross income) are sent abroad for other reasons. The unconditional amount of migrants' payments to family members abroad is about 56 Euros, the conditional amount is about 234 Euros (8.7% of gross income). 13.1% of the foreign-born individuals report to send remittances abroad between 1996 and 2005. While the average amount of remittances is about 23 Euros, migrants send more than 170 Euros (6.8% of gross income) to their home country given that their remittances are positive. Overall, the proportion of migrants reporting to send financial transfers abroad is 31.8% in the period from 1985 to 1995. Given the information about migrants' payments to persons abroad after 1995, the corresponding share amounts to 15.0%.

[2] A detailed description of the definition of variables used in the analysis is given in the Appendix.

The mean values presented in the bottom part of Table 1 expose that some of the explanatory variables have changed considerably between the sample periods 1985-1995 and 1996-2005. In particular, the share of immigrants originating from countries other than Turkey, Italy, Greece and former Yugoslavia has increased to 26.0% in the sample period after 1995. In addition to the changing nationality mix within the foreign-born population in Germany (see Bauer et al., 2005 for details), a substantial part of these differences may be attributed to a change in the sample design. In 1994 and 1995, two additional sub-samples of immigrant households were appended to the SOEP (Frick and Haisken-DeNew, 2005). As a consequence of these changes, return intentions have declined over time. Particularly, while the majority of the guest-worker generation observed before 1996 (64.3%) wishes to remain in Germany temporarily, only 39.3% of the foreign-born population surveyed between 1996 and 2005 plans to return to the country of origin.

4 Results

This section presents the IHS Tobit and IHS double-hurdle estimates of migrants' savings and remittances. The estimates of savings and other transfers of the sample period 1985-1995 are presented in Section 4.1. Section 4.2 includes the corresponding results for payments to family members and other persons residing abroad, using the available information of the periods 1985-1995 and 1996-2005.

In addition to the double-hurdle model with independent error terms, a dependent double-hurdle model was estimated. Wald tests were performed to test the dependency of the stochastic processes of the double-hurdle model. The test results reveal that participation and level equations are independent for all types of transfers observed between 1985 and 1995. The corresponding estimates of the correlation coefficients of the dependent double-hurdle models confirm these findings. For the dependent double-hurdle model of the period after 1995, convergence could not be achieved. Consequently, the following tables include the estimates of the independent rather than those of the dependent double-hurdle model.

To investigate whether the independent IHS double-hurdle model is more appro-

priate in modeling migrants' transfers abroad than the IHS Tobit model, the test procedure proposed by Vuong (1989) was applied (see also Yen, 2005). In all cases, the results of the Vuong-tests indicate that the double-hurdle model represents a more suitable way of modeling migrants' financial transfers than the Tobit model.[3]

4.1 Savings and other transfers

Tables 2 and 3 include the estimates of IHS Tobit and independent IHS double-hurdle models, using information about migrants' savings and other transfers abroad as dependent variables. The marginal effects of these models denote the size and direction of the impact of the explanatory variables on the savings level. In particular, the (semi-)elasticities of the double-hurdle model, which were evaluated at the respective means of the independent variables, indicate the effect of a change in one of the explanatory variables on the unconditional mean of the dependent variable.[4] Moreover, the coefficients of the participation and level equations of the double-hurdle model denote the influence of the explanatory variables on the probability to send transfers abroad and the (conditional) monthly amount of transfers, respectively.

The estimates in Tables 2 and 3 provide evidence for an inverted U-shaped transfer-age profile which is consistent with the implications of the inter-temporal consumption model (see, e.g., Amuedo-Dorantes and Pozo, 2006). The findings also reveal that immigrant women are on average less likely to send savings or other transfers abroad and – given that their transfers are positive – send significantly less to their home country than average men. This result is in line with the literature on the labor market activity of immigrants which finds that foreign-born women are economically less active than comparable foreign-born men (Basilio et al., 2007).

Income positively affects migrants' savings, while the income effect on other transfers abroad is insignificant. However, the double-hurdle estimates show that income volatility increases the amount of migrants' other transfers abroad, indicating

[3] All test results and the corresponding estimates are available from the author upon request.

[4] The elasticities are not strictly defined for binary explanatory variables. The reported values are actually changes in the dependent variable in response to the change in the binary variable from zero to one.

that these transfers represent insurance payments to some extent (see Amuedo-Dorantes and Pozo, 2006). The income elasticity of the double-hurdle model reveals that an income increase of 1% raises savings by 0.08%. Even after controlling for income, the employment status has an additional effect on migrants' savings and other transfers. While the length of education does not affect savings but reduces the amount of other transfers abroad, immigrants exhibit higher savings if they attended school in Germany.

The household size in Germany negatively determines savings abroad, while the household size effect on other transfers abroad is insignificant. The marginal effects of the double-hurdle model reveal that average married immigrants accumulate about 10% more wealth in their home country and send about 17% more transfers abroad than average single immigrants. The presence of children in the household does not influence savings and other transfers abroad. Moreover, immigrants whose spouse or children have remained in the country of origin do not save or send significantly more transfers abroad for other reasons than comparable immigrants whose closest relatives reside in Germany. This result implies that migrants' transfers which are sent abroad for other reasons do not seem to be intended for consumption of family members in the home country.

The marginal effects of the double-hurdle models reveal that temporary migrants save on average 16.7% more and send 20.6% more other transfers to their home country than permanent migrants. This effect is attributable to the fact that migrants, who intent to return to their home country, are more likely to save or send other transfers abroad than migrants who intent to stay in Germany permanently. Given that migrants' transfers to their home country are positive, the effect of return intentions on the amount of savings and other transfers is not significant.

The effects of the years since migration reveal that the duration of residence in Germany appears to be a weak predictor of migrants' savings and other transfers. Finally, the marginal effects of the source country indicators in the double-hurdle model reveal that saving disparities across countries are insignificant, while source country differences with respect to other transfers seem to exist. Specifically, while Italian and Greek immigrants have a lower propensity to send transfers abroad, the

savings level of Turkish immigrants is significantly higher than that of immigrants originating from other source countries.

4.2 Transfers to persons abroad

Tables 4 and 5 contain the estimates of IHS Tobit and independent IHS double-hurdle models, using information about payments to family members surveyed between 1985 and 1995 as well as payments to persons abroad surveyed between 1996 and 2005 as dependent variables. Similar to the estimates presented in Section 4.1, an inverted U-shaped transfer-age profile is also observed for migrants' payments to persons in the home country. In addition, immigrant women send significantly less transfers to persons abroad than comparable men. The income elasticities of the double-hurdle model, which range between 0.07% and 0.13%, indicate that the pure altruism hypothesis of migrants' payments to persons abroad may be rejected (Altonji et al., 1997). Moreover, the variation of past income streams does not affect migrants' payments to persons abroad, while employment effects are significantly positive.

While the length of education appears to play a minor role in explaining remittances, migrants' payments to family members are significantly lower if they attended school in Germany. Household size effects on migrants' payments to persons abroad are significantly negative, suggesting that migrants residing in relatively large households do not have the financial capacity to remit sizeable amounts to their home country. In contrast, married immigrants send larger amounts of remittances to persons abroad than singles. The presence of children in the household has no additional effect on migrants' payments abroad. Instead, remittances are substantially higher if close relatives live in the country of origin. According to the double-hurdle model, remittances observed between 1985 and 1995 increase by about 130% if the migrants' spouse or the children reside in the sending country. Between 1996 and 2005, a similar effect may be observed for migrants whose spouse lives abroad, while the corresponding effect of children residing in the home country is insignificant.

The coefficients and marginal effects of return intentions suggest that temporary migrants are more likely to remit and remit a higher amount to persons abroad

than permanent migrants. The marginal effects of return intentions on migrants' payments to persons abroad are somewhat larger than the corresponding effects on savings and other transfers. While temporary migrants surveyed between 1985 and 1995 remit on average 32.6% more than permanent migrants, remittances of temporary migrants are 23.8% higher than those of average permanent migrants in the period 1996-2005. Moreover, in contrast to the Tobit model, the estimates of the double-hurdle model reveal that the number of years since migration do not have a significant influence on migrants' transfers to family members abroad. For the sample period after 1995, the effect of the duration of residence is insignificant in both the Tobit and the double-hurdle model. Finally, the marginal effects of the source country indicators exhibit that immigrants originating from Italy remit less, while immigrants from Turkey, Greece and former Yugoslavia remit more to their countries of origin than immigrants from other source regions.

5 Conclusions

This paper provides empirical evidence on the relative importance of the determinants of migrants' transfers to their country of origin, paying particular attention to return intentions and migrants' household composition in the home and host country. In the empirical analysis, which is based on data from the German Socio-Economic Panel (SOEP), the determinants of different types of transfers (savings, payments to persons abroad and other transfers) are being investigated. In addition to the Tobit model, which accounts for the censored nature of the dependent variables, a dependent double-hurdle model is applied to assess the effects of different determinants on both the migrants' propensity to send transfers abroad and the amount of transfers.

The empirical analysis reveals that savings in the home country are highly relevant for a relatively small group of immigrants (4.5%), while a relatively large part of the immigrant population (13.1%-24.0%) sends payments to persons in the sending countries. Moreover, migrants' return intentions have a significant influence on all types of payments abroad. The household size turns out to have a significantly neg-

ative impact on migrants' transfers, indicating that migrants residing in relatively large households do not seem to have the financial capacity to send high amounts to their home country. Women are less likely to send transfers abroad and – given that their payments are positive – also send smaller amounts abroad than comparable men. The estimates also suggest that both the propensity to remit and the level of remittances are significantly higher if close relatives live in the country of origin. Furthermore, the relatively small income elasticities of migrants' transfers suggest that the pure altruism hypothesis, which postulates unity of the transfer-income derivative, can be rejected. While the current gross income increases migrants' savings and payments to persons abroad, the variation of past income streams increases the amount of other transfers to the sending countries, indicating that these transfers represent insurance payments to some extent. Finally, Vuong-tests suggest that the double-hurdle model represents the correct specification for the analysis of migrants' savings and remittances rather than the conventional Tobit model usually applied in the literature.

Appendix

Table: Definition of variables

Variable	Description
Savings abroad	Average monthly amount of savings abroad (in real 2000 Euro, 1985-1995).
Other transfers abroad	Average monthly amount of transfers abroad for other reasons (in real 2000 Euro, 1985-1995).
Payments to family members abroad	Average monthly amount of payments to family members abroad (in real 2000 Euro, 1985-1995).
Payments to persons abroad	Average monthly amount of payments to persons abroad (in real 2000 Euro, 1996-2005).
Sent financial transfers abroad	1985-1995: 1 if respondent reports to have sent financial transfers abroad last year; 0 otherwise. 1996-2005: 1 if respondent reports to have sent payments to persons abroad last year; 0 otherwise.
Age	Age of respondent in years.
Female	1 if respondent is female; 0 otherwise.
Income	Household gross income (in real 2000 Euro).
Variance of past income	Variance of household gross income over the last 5 years.
Employed	1 if respondent is full- or part-time employed; 0 otherwise.
Years of education	Education of respondent in years.
Attended school in Germany	1 if respondent attended school in Germany; 0 otherwise.
Household size	Number of persons in household.
Married	1 if respondent is married; 0 otherwise.
Children below 5 years in household	1 if children below 5 years in household; 0 otherwise.
Children 5-15 years in household	1 if children between 5 and 15 years in household; 0 otherwise.
Spouse lives abroad	1 if spouse of respondent lives abroad; 0 otherwise.
Children live abroad	1 if children of respondent live abroad; 0 otherwise.
Intended return migration	1 if immigrant wishes to return to the country of origin; 0 otherwise.
Years since migration	Duration of German residence in years.
Country of origin: Turkey	1 if respondent originates from Turkey; 0 otherwise.
Country of origin: Italy	1 if respondent originates from Italy; 0 otherwise.
Country of origin: Greece	1 if respondent originates from Greece; 0 otherwise.
Country of origin: Ex-Yugoslavia	1 if respondent originates from former Yugoslavia; 0 otherwise.
Country of origin: Other	1 if respondent originates from other OECD member country (reference category); 0 otherwise.

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Tables

Table 1: Descriptive statistics

	1985-1995		1996-2005	
Variable	Mean	Standard Deviation	Mean	Standard Deviation
Savings and remittances				
Proportion of migrants saving abroad	0.045	0.004		
Savings abroad	16.07	1.84		
Savings abroad if > 0	354.87	29.31		
Proportion of migrants sending other transfers abroad	0.075	0.005		
Other transfers abroad	18.97	1.55		
Other transfers abroad if > 0	252.20	12.62		
Proportion of migrants sending remittances to family members	0.240	0.011		
Payments to family members	56.34	4.80		
Payments to family members if > 0	234.36	13.67		
Proportion of migrants sending remittances to persons abroad			0.131	0.012
Payments to persons abroad			22.87	3.12
Payments to persons abroad if > 0			174.11	16.44
Proportion of migrants sending financial transfers abroad	0.318	0.012	0.150	0.013
Explanatory variables				
Socio-economic characteristics				
Age	40.209	0.343	42.965	0.436
Female	0.446	0.010	0.501	0.013
Income	3180.88	66.648	3262.01	85.565
ln(Variance of past income)	12.121	0.056	12.370	0.081
Years of education	9.239	0.074	10.346	0.118
Attended school in Germany	0.200	0.012	0.242	0.016
Employed	0.733	0.011	0.640	0.015
Household composition				
Household size	3.756	0.075	3.564	0.083
Married	0.782	0.013	0.812	0.014
Children <5 years in household	0.228	0.015	0.166	0.015
Children 5-15 in household	0.301	0.015	0.286	0.020
Spouse lives abroad	0.056	0.008	0.016	0.005
Children live abroad	0.083	0.008	0.039	0.008
Migration background				
Intended return migration	0.643	0.015	0.393	0.019
Years since migration	18.688	0.237	22.743	0.430
Country of origin: Turkey	0.474	0.025	0.377	0.026
Country of origin: Italy	0.174	0.016	0.111	0.014
Country of origin: Greece	0.093	0.010	0.059	0.014
Country of origin: Ex-Yugoslavia	0.208	0.018	0.193	0.020
Country of origin: Other	0.051	0.007	0.260	0.024
N	12732		8849	

Table 2: Estimation of IHS Tobit and independent IHS double-hurdle model: Savings abroad – 1985-1991, 1993 and 1995

	Tobit				**Double-Hurdle**					
					Participation		**Level**		**Elasticity**	
	Coefficient	t-value	Marginal Effect	t-value	Coefficient	t-value	Coefficient	t-value	Marginal effect	t-value
Age	0.330	0.76	0.010	0.76	0.047	2.12	0.079	1.81	0.024	2.35
$\text{Age}^2 \times 10^3$	-1.830	-0.35	-	-	-0.408	-1.55	-0.756	-1.57	-	-
Female	-4.166	-4.77	-0.123	-4.73	-0.375	-7.02	-0.198	-1.93	-0.177	-6.87
ln(Income)	2.478	2.41	0.075	2.45	0.162	2.18	0.217	2.16	0.082	2.34
ln(Variance of past income)	0.129	0.60	0.003	0.60	-0.001	-0.03	0.017	0.65	0.001	0.06
Employed	5.401	4.52	0.133	5.47	0.433	5.69	0.004	0.02	0.170	6.60
Years of education	-0.362	-1.43	-0.010	-1.47	-0.018	-1.18	0.001	0.02	-0.008	-1.15
Attended school in Germany	3.675	2.37	0.139	1.86	0.202	2.06	0.370	2.08	0.120	2.03
Household size	-0.952	-2.70	-0.028	-2.69	-0.058	-1.93	-0.085	-2.47	-0.030	-2.17
Married	2.630	1.70	0.069	2.00	0.254	2.32	-0.228	-1.31	0.097	2.44
Children < 5 years in household	2.390	1.89	0.082	1.64	0.124	1.39	0.282	1.86	0.072	1.51
Children 5-15 years in household	2.320	2.03	0.077	1.79	0.077	0.93	0.138	1.10	0.041	1.02
Spouse lives $\text{abroad}_{(t-1)}$	-0.756	-0.31	-0.021	-0.33	-0.095	-0.54	-0.012	-0.05	-0.041	-0.59
Children live $\text{abroad}_{(t-1)}$	1.442	1.27	0.048	1.14	0.131	1.49	-0.093	-0.74	0.063	1.27
Intended return $\text{migration}_{(t-1)}$	4.185	4.60	0.114	4.71	0.401	6.45	0.024	0.20	0.167	6.99
Years since migration	0.478	1.60	0.014	1.60	0.015	0.72	-0.049	-1.00	0.005	0.55
$\text{Years since migration}^2 \times 10^3$	-11.521	-1.38	-	-	-0.470	-0.81	1.332	1.06	-	-
Country of origin: Turkey	-2.541	-1.66	-0.076	-1.66	-0.149	-1.34	0.425	2.34	-0.052	-1.06
Country of origin: Italy	-4.467	-2.39	-0.104	-3.20	-0.288	-2.29	0.192	1.00	-0.109	-2.51
Country of origin: Greece	-5.670	-3.50	-0.113	-4.97	-0.245	-2.20	0.230	1.17	-0.091	-2.35
Country of origin: Ex-Yugoslavia	-3.976	-2.64	-0.098	-3.10	-0.157	-1.42	0.339	1.91	-0.057	-1.26
Constant	-59.556	-4.91	-	-	-4.685	-6.43	2.201	1.97	-	-

Notes: Number of observations: 12,732. Weighted IHS Tobit and weighted IHS double-hurdle using weights provided by the SOEP. Standard errors are adjusted in order to take repeated observations of households into account. The regression further includes year dummies. Vuong-test of unweighted independent IHS double-hurdle model vs. unweighted IHS Tobit model: z=22.84, Prob>z = 0.0000.

Table 3: Estimation of IHS Tobit and independent IHS double-hurdle model: Other transfers abroad – 1985-1991, 1993 and 1995

	Tobit				**Double-Hurdle**					
					Participation		**Level**		**Elasticity**	
	Coefficient	t-value	Marginal Effect	t-value	Coefficient	t-value	Coefficient	t-value	Marginal effect	t-value
Age	-0.003	-0.01	-0.001	-0.01	0.029	1.61	0.026	0.77	0.022	1.68
$\text{Age}^2 \times 10^3$	0.732	0.21	-	-	-0.316	-1.44	-0.233	-0.57	-	-
Female	-3.212	-4.78	-0.197	-4.54	-0.302	-6.88	-0.312	-3.85	-0.225	-7.20
ln(Income)	1.301	1.70	0.081	1.71	0.058	1.17	0.005	0.09	0.041	1.17
ln(Variance of past income)	0.296	1.46	0.018	1.47	0.014	1.14	0.049	2.28	0.013	1.49
Employed	4.535	4.73	0.239	5.76	0.422	6.71	0.357	2.17	0.270	8.26
Years of education	0.145	0.81	0.009	0.81	0.024	1.87	-0.076	-3.22	0.011	1.33
Attended school in Germany	1.862	1.72	0.130	1.56	0.114	1.43	0.064	0.46	0.087	1.41
Household size	-0.539	-1.83	-0.033	-1.83	0.003	0.16	-0.043	-1.80	-0.001	-0.01
Married	2.601	2.47	0.143	2.85	0.255	3.37	0.221	1.95	0.168	3.95
Children < 5 years in household	0.929	0.80	0.061	0.77	-0.028	-0.31	0.079	0.67	-0.014	-0.24
Children 5-15 years in household	0.395	0.42	0.025	0.42	-0.042	-0.56	0.053	0.53	-0.026	-0.50
Spouse lives $\text{abroad}_{(t-1)}$	-0.834	-0.47	-0.048	-0.51	-0.044	-0.34	-0.164	-0.80	-0.039	-0.49
Children live $\text{abroad}_{(t-1)}$	0.314	0.30	0.020	0.29	-0.029	-0.36	0.132	0.98	-0.012	-0.22
Intended return $\text{migration}_{(t-1)}$	3.419	4.77	0.196	5.03	0.316	6.26	0.057	0.69	0.206	6.66
Years since migration	0.521	1.95	0.032	1.95	0.005	0.29	0.026	0.65	0.005	0.43
$\text{Years since migration}^2 \times 10^3$	-13.783	-1.99	-	-	-0.146	-0.31	-0.588	-0.59	-	-
Country of origin: Turkey	-1.626	-1.29	-0.101	-1.30	-0.049	-0.50	0.099	0.60	-0.028	-0.42
Country of origin: Italy	-2.679	-1.99	-0.144	-2.35	-0.136	-1.30	-0.251	-1.44	-0.101	-1.65
Country of origin: Greece	-3.256	-2.39	-0.161	-3.05	-0.226	-2.12	0.092	0.54	-0.134	-2.29
Country of origin: Ex-Yugoslavia	-1.970	-1.49	-0.111	-1.66	0.099	0.97	0.291	1.79	0.092	1.15
Constant	-39.821	-5.22	-	-	-3.681	-6.96	4.111	5.00	-	-

Notes: See notes to Table 2. Vuong-test of unweighted independent IHS double-hurdle model vs. unweighted IHS Tobit model: z=27.29, Prob>z = 0.0000.

Table 4: Estimation of IHS Tobit and independent IHS double-hurdle model: Payments to family members – 1985-1991, 1993 and 1995

	Tobit				**Double-Hurdle**					
					Participation		**Level**		**Elasticity**	
	Coefficient	t-value	Marginal Effect	t-value	Coefficient	t-value	Coefficient	t-value	Marginal effect	t-value
Age	0.670	4.31	0.137	4.10	0.136	7.20	0.027	1.06	0.176	7.02
$\text{Age}^2 \times 10^3$	-7.073	-4.02	-	-	-1.477	-6.79	-0.198	-0.67	-	-
Female	-3.336	-8.00	-0.667	-7.70	-0.537	-11.34	-0.347	-6.53	-0.720	-11.72
ln(Income)	0.933	2.99	0.191	2.99	0.073	2.02	0.239	4.27	0.130	2.63
ln(Variance of past income)	-0.085	-0.98	-0.017	-0.98	-0.015	-1.28	-0.014	-1.16	-0.021	-1.41
Employed	3.683	6.76	0.631	8.18	0.596	9.83	0.066	0.72	0.663	11.23
Years of education	0.015	0.13	0.003	0.13	-0.001	-0.13	0.019	1.17	0.001	0.03
Attended school in Germany	-1.658	-2.02	-0.304	-2.27	-0.220	-2.32	-0.204	-1.78	-0.289	-2.69
Household size	-0.493	-3.20	-0.101	-3.16	-0.064	-2.63	-0.074	-2.84	-0.093	-2.85
Married	-0.641	-1.01	-0.137	-0.97	-0.112	-1.48	-0.084	-1.14	-0.161	-1.53
Children < 5 years in household	0.052	0.09	0.010	0.09	0.048	0.61	-0.082	-0.88	0.048	0.47
Children 5-15 years in household	-0.179	-0.39	-0.036	-0.40	-0.075	-1.13	-0.097	-1.30	-0.108	-1.27
Spouse lives $\text{abroad}_{(t-1)}$	2.461	3.13	0.642	2.55	0.718	6.20	0.371	4.27	1.335	5.25
Children live $\text{abroad}_{(t-1)}$	3.231	7.18	0.882	5.77	0.706	9.79	0.355	6.57	1.267	8.30
Intended return $\text{migration}_{(t-1)}$	1.520	4.65	0.296	4.75	0.254	5.65	0.130	2.35	0.326	6.02
Years since migration	0.467	3.07	0.096	3.13	0.027	1.41	0.015	0.64	0.036	1.49
Years $\text{since migration}^2 \times 10^3$	-12.23	-3.18	-	-	-0.853	-1.71	-0.459	-0.72	-	-
Country of origin: Turkey	3.935	4.85	0.842	4.42	0.526	4.93	-0.232	-2.03	0.670	4.32
Country of origin: Italy	-0.447	-0.45	-0.088	-0.47	-0.221	-1.87	0.098	0.77	-0.249	-1.86
Country of origin: Greece	2.884	3.16	0.766	2.52	0.486	4.28	0.065	0.52	0.741	3.75
Country of origin: Ex-Yugoslavia	4.159	5.09	1.121	3.96	0.584	5.41	-0.126	-1.13	0.836	4.56
Constant	-31.839	-7.75	-	-	-4.678	-10.07	3.158	4.83	-	-

Notes: See notes to Table 2. Vuong-test of unweighted independent IHS double-hurdle model vs. unweighted IHS Tobit model: z=49.53, Prob>z = 0.0000.

Table 5: Estimation of IHS Tobit and independent IHS double-hurdle model: Payments to persons abroad – 1996-2005

	Tobit				**Double-Hurdle**					
					Participation		**Level**		**Elasticity**	
	Coefficient	t-value	Marginal Effect	t-value	Coefficient	t-value	Coefficient	t-value	Marginal effect	t-value
Age	0.720	2.87	0.074	2.71	0.079	3.30	0.083	1.79	0.078	3.54
Age$^2 \times 10^3$	-8.042	-2.93	-	-	-0.880	-3.22	-0.838	-1.68	-	-
Female	-1.607	-2.69	-0.166	-2.47	-0.202	-3.72	-0.135	-1.81	-0.192	-3.90
ln(Income)	0.466	1.44	0.048	1.44	0.073	2.38	0.079	1.37	0.072	2.46
ln(Variance of past income)	-0.281	-1.89	-0.029	-1.79	-0.006	-0.43	0.017	0.82	-0.003	-0.29
Employed	3.035	4.39	0.288	4.36	0.319	4.73	0.325	3.32	0.292	5.47
Years of education	0.147	1.16	0.015	1.17	0.006	0.46	0.002	0.09	0.005	0.49
Attended school in Germany	0.112	0.08	0.011	0.08	-0.105	-1.14	-0.081	-0.54	-0.097	-1.22
Household size	-1.341	-3.94	-0.138	-3.89	-0.131	-4.42	-0.085	-2.10	-0.124	-4.51
Married	2.525	2.44	0.220	2.76	0.271	2.65	0.280	1.96	0.233	3.28
Children < 5 years in household	1.285	1.03	0.146	0.95	-0.021	-0.19	0.062	0.38	-0.013	-0.13
Children 5-15 years in household	1.436	1.43	0.159	1.30	-0.018	-0.19	-0.173	-1.40	-0.032	-0.40
Spouse lives abroad$_{(t-1)}$	2.866	1.72	0.401	1.31	0.748	3.66	0.661	2.42	1.176	2.96
Children live abroad$_{(t-1)}$	3.078	1.85	0.435	1.40	0.204	1.54	0.091	0.60	0.216	1.44
Intended return migration$_{(t-1)}$	1.469	2.20	0.157	2.26	0.232	4.00	0.249	2.88	0.238	4.14
Years since migration	0.076	0.46	0.007	0.46	0.005	0.37	-0.003	-0.15	0.004	0.34
Years since migration$^2 \times 10^3$	-2.220	-0.64	-	-	-0.266	-0.80	0.046	0.08	-	-
Country of origin: Turkey	4.438	3.66	0.530	3.24	0.377	2.99	0.110	0.53	0.367	2.79
Country of origin: Italy	-2.391	-1.47	-0.201	-1.78	-0.659	-4.11	-0.068	-0.25	-0.438	-5.30
Country of origin: Greece	3.184	2.61	0.448	2.13	0.170	0.99	0.031	0.13	0.168	0.88
Country of origin: Ex-Yugoslavia	6.587	5.81	1.083	4.28	0.751	5.84	0.059	0.30	0.880	4.60
Constant	-29.315	-5.01	-	-	-3.637	-6.52	2.007	1.93	-	-

Notes: See notes to Table 2. Number of observations: 8,849. Vuong-test of unweighted independent IHS double-hurdle model vs. unweighted IHS Tobit model: z=31.17, Prob>z = 0.0000.