DISCUSSION PAPER SERIES

IZA DP No. 4899

Source Country Characteristics and Immigrants' Migration Duration and Saving Decisions

Murat G. Kirdar

April 2010

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

Source Country Characteristics and Immigrants' Migration Duration and Saving Decisions

Murat G. Kirdar
Middle East Technical University
and IZA

Discussion Paper No. 4899
April 2010

IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

IZA Discussion Paper No. 4899
April 2010

ABSTRACT

Source Country Characteristics and Immigrants' Migration Duration and Saving Decisions*

This paper examines how immigrants' migration duration and saving decisions in the host country respond to the purchasing power parity (ppp) and the wage ratio between the host and source countries. It is shown that in theory immigrants may stay longer in the host country as a result of an increase in ppp, in particular those with a high willingness to substitute consumption intertemporally. However, the empirical results from immigrants in Germany reveal that optimal migration duration decreases in ppp. Holding individual immigrant characteristics constant, immigrants from poorer source countries have shorter migration duration than immigrants from wealthier source countries. The empirical results also reveal that saving rate increases in ppp.

JEL Classification: F22, J61

Keywords: international migration, immigrant workers

Corresponding author:

Murat G. Kirdar
Department of Economics
Middle East Technical University
Ankara 06531
Turkey
E-mail: kirdar@metu.edu.tr

* I would like to thank Abdurrahman Aydemir and seminar participants at METU, TOBB ETÜ, and Bilkent University, and the participants at the 2008 ESPE conference for their valuable comments.

1 Introduction

The immigration pressure on the developed world has been on the rise. The fraction of immigrants in the population has increased from 9.8 percent in 1990 to 14.2 percent in 2010 in North America, and from 6.9 percent in 1990 to 9.5 percent in 2010 in Europe (United Nations, 2009). Hatton and Williamson (2002) report that gross flows have in fact increased faster than these net flows because return migration has become more common. The level of return migration from several host countries has been quite high. For instance, while about 800,000 migrants entered Germany on average annually between 1962 and 2005, more than 560,000 left (German Federal Statistics Office).[1]

In this paper, the reason that immigrants return to their home countries is the higher purchasing power of savings accumulated in the host country after returning to the home country due to lower prices there.[2] In this case, return migration can be interpreted as a part of optimal life-cycle location decisions because at the time of the in-migration decision immigrants know that it will be optimal for them to return after they accumulate a certain amount of savings (Borjas, 1994). In the savings accumulation model, immigrants make joint migration duration and saving decisions. Two key characteristics of source countries that influence the migration duration and saving decisions of immigrants are purchasing power parity (e.g., if purchasing power parity is 2, while a unit of savings buys one apple in the host country, it buys two apples in the home country) and relative wages between the host and source countries. This paper examines how purchasing power parity (ppp) and relative wages influence immigrants' migration duration and saving choices.

Using a model of joint consumption and migration duration decisions, I first derive comparative statics results on the impact of ppp as well as relative wages on the optimal migration duration and saving decisions of immigrants. Then, in the empirical part of the paper, I test the comparative statics results obtained from the model using a rich longitudinal data set

[1] Jasso and Rosenzweig (1982) report that of the 1971 cohort of immigrants in the U.S., the fraction that returned by 1979 could be as high as fifty percent. Aydemir and Robinson (2006) calculate an out-migration rate of 35 percent by 20 years of residence for working-age male immigrants in Canada.

[2] This motivation for return migration has been used in a number of papers: Djajic, 1988; Dustmann, 1997, 2003; Stark et al., 1997.

on immigrants from various source countries (Turkey, Greece, Italy, and Spain) in Germany. The empirical context is appropriate for testing the hypotheses derived from the savings accumulation model because the empirical literature has provided ample evidence on the savings accumulation motivation for the immigrants originating from these Mediterranean countries in Germany. Kırdar (2009), using the same data set, reports that these immigrants' return realizations in fact respond to the purchasing power parity between Germany and the source countries. If these immigrants are in Germany to save, we would expect their saving rates to be high right after arrival. In fact, Kumcu (1989) finds quite high saving rates for Turkish immigrants in Germany. In addition, examining Turkish return migrants from Germany in Turkey, Dustmann and Kirchkamp (2002) observe that very few are wage earners and most live on their savings.

The findings of this paper within a savings accumulation model has applicability to a much wider context as the empirical literature on migration boasts evidence that immigrants in several parts of the world in fact have a savings accumulation motivation. Yang (2006) shows that return migration of Philippine migrants depends on the exchange rate with the host countries. Massey and Espinosa (1997) find that return migration of Mexican immigrants in the U.S. responds to prices in Mexico.

Understanding how ppp and relative wages influence migration duration and saving choices is important due to a number of reasons. While some immigrants originate from poor countries, other immigrants come from countries with relatively similar characteristics to those of the host country. For instance, are intra-European immigrants from high wage and low ppp countries or immigrants from developing countries with low wage and high ppp more likely to stay longer? A second reason is related to policy instruments used by some source countries in the way of exchange rate premiums, targeted toward migrants only, to attract more savings from them.[3] To assess the impact of this policy, it is important to understand the impact of ppp on not only the saving but also the migration duration decision of immigrants because both decisions determine the level of accumulated savings at the time of return. Another reason is simply to understand the changes in immigrants' behavior in response to changes in the macroeconomic environment. How do migration duration and

[3]For instance, the Turkish government implemented such policies in the past.

savings change if relative wages or the ppp between host and source countries changes as a result of fast economic growth or an economic crisis in the source country? Purchasing power parity fluctuates over time substantially for many source countries. For instance, that between Germany and Turkey increased by 35 percent in the aftermath of the 1994 financial crisis in Turkey.

The simple model I use is an extension of that used by Stark et al. (1997), which examines the theoretical impact of ppp on optimal migration duration also in a framework of joint consumption and migration duration decisions. Using a specific utility function in their analysis, the logarithmic function, Stark et al. find a negative impact of ppp on migration duration. On the other hand, this paper allows for a more general utility function–where there is a parameter governing the willingness to substitute consumption intertemporally–, which yields more general comparative statics results. The key distinguishing feature of this paper from that by Stark et al. is that it also includes an empirical section that tests the hypotheses derived from the model.

An interesting implication of the theoretical model in this paper, not recognized by the previous literature, is that for certain immigrants–those with a high willingness to substitute consumption intertemporally–an increase in ppp can in fact increase the optimal migration duration. However, numerical solutions of the model illustrate that for the range of estimated values of elasticity of intertemporal substitution of consumption in the literature, the impact of ppp on optimal migration duration would be negative. The other contribution of the theoretical part of this paper is that, holding individual-level characteristics constant, immigrants who originate from poorer source countries–high ppp, low relative wage countries–would save more in the host country than immigrants coming from relatively wealthier source countries.[4]

The major contribution of this paper is empirical. The previous empirical literature has established certain causal links between the purchasing power of immigrants and their return migration behavior.[5] Yang (2006) uses exchange rate fluctuations to examine the effect of migrants' purchasing power on the return migration decision of Philippine migrants.

[4]In a similar vein, Galor and Stark (1990) show theoretically that immigrants would save more than the natives as they face lower prices after returning to their home countries.

[5]The impact of relative prices on other decisions of immigrants has also been analyzed in the literature; e.g., Yang (2008) measures the impact of exchange rate variations on immigrants' remittance decisions.

Similarly, Kırdar (2009), employing the same data set used in this study, examines the impact of ppp on return migration realizations using duration analysis methodology. Unlike Yang (2006) and Kırdar (2009), which use data on return migration realizations, this study uses longitudinal information on intended migration durations.[6] This longitudinal information allows me to handle unobserved heterogeneity in immigrants' characteristics using panel data estimation methods, which is not the case in the other two papers. In addition, the scope of this paper is much wider in the way that it also examines the impact of ppp on the saving behavior of immigrants as well as the impact of relative wages between the host and source countries on the migration duration and saving decisions.[7]

The empirical results reveal that the impact of ppp on optimal migration duration is negative and large. For instance, a 10 percent increase in ppp lowers the migration duration of a 30-year-old arriver by 28 percent. The empirical analysis also confirms the negative effect of wage ratio on the optimal migration duration as predicted by the theoretical model; however, this finding is less compelling in terms of statistical significance. Nonetheless, the economic significance is large; e.g., a 10 percentage-points increase in the wage ratio decreases the optimal migration duration of a 35-year-old arriver by 30 percent.

This paper also provides an empirical answer for the first time, in the German context, to an important question posed by Stark et al. (1997): are immigrants from poorer source countries more likely to stay longer in the host country? Stark et al. (1997) claim that immigrants originating from poorer countries may in fact stay shorter in the host country if the impact of a higher ppp in shortening the optimal migration duration dominates the impact of lower relative wages in lengthening the optimal migration duration. This paper shows empirically that this is possible: immigrants facing Turkish ppp and relative wage

[6] The information on optimal migration duration allows me to examine the response of optimal migration duration, rather than the return migration levels within certain periods, as it is in the other two papers, to changes in ppp. Besides, there is both cross-sectional and time variation in ppp in this paper, whereas in Yang (2006) there is only cross-sectional variation.

[7] Dustmann (2003) examines the impact of the wage differential on the optimal migration duration, using the same data set, and finds that optimal migration duration may decrease as the wage differential grows. Dustmann (2003) uses individual level wages to control for the wage differential whereas this paper examines the impact of aggregate expected wage ratio between the host and source countries.

values have a shorter predicted migration duration than immigrants facing the ppp and relative wage values of wealthier EU countries in the sample, when all other characteristics of immigrants are the same.

Finally, this is also the first paper, to the best of my knowledge, that establishes the causal link between ppp and immigrants' saving behavior empirically. It is shown that ppp has a positive impact on the saving rate, which is also large in magnitude; e.g., a 10 percent increase in ppp increases the saving rate of a 20-year-old entrant in his first year of residence in Germany by 22 percent.

The next section describes the theoretical model. Section 3 explains the data set and presents some descriptive statistics. Section 4 covers the estimation method and section 5 presents the empirical results. Section 6 concludes.

2 Model

2.1 Basic Structure

In the optimization problem shown below, τ denotes the remaining worklife and d the duration of residence in the host country. Immigrants preferences depend on consumption in the host country (c_1) and consumption in the home country after return (c_2) according to a per-period utility function, $u(.)$. The utility maximization problem of immigrants is subject to a number of constraints. The first one is a lifetime budget constraint, where p denotes the purchasing power parity between the host and home countries, y_g the real wage rate in the host country, and y_h the real wage rate in the home country. The second one is a minimum consumption constraint: immigrants' consumption in the host country cannot fall below a minimum consumption level, denoted by $c_{\min}$. Finally, duration of residence obviously has to lie between zero and the duration of remaining worklife.

$$\begin{aligned} \max_{d,\ c} \quad & du(c_1) + (\tau - d)u\,(c_2) \\ s.t. \quad & pdc_1 + (\tau - d)c_2 \leq pdy_g + (\tau - d)y_h \\ & y_g \geq c_1 \geq c_{\min}, \quad \tau \geq d \geq 0 \end{aligned} \tag{1}$$

In the above problem, purchasing power parity is taken to be greater than one ($p > 1$) and

the real wage rate in the host country is higher than the real wage rate in the home country ($y_g > y_h$). While the former assumption is required to rationalize the return migration decision, the latter condition is the reason why these foreign workers are in the host country. I choose a constant relative-risk aversion utility function,

$$u(c) = \begin{array}{ll} c^\alpha/\alpha & \alpha < 1,\ \alpha \neq 0 \\ \ln(c) & \alpha = 0 \end{array} \tag{2}$$

because this functional form allows me to examine how the effect of ppp and relative wages on the optimal migration duration and consumption decisions of immigrants vary by the curvature of the utility function (or by immigrants' willingness to substitute consumption intertemporally). The elasticity of intertemporal substitution of consumption is $1/(\alpha - 1)$.

2.2 Solution of the Problem

Assuming an interior optimal solution, the optimal migration duration and consumption decision rules can be written as follows[8]: (At the end of this section, numerical solutions that also allow for corner solutions are illustrated.)

$$d^* = \frac{\tau(1-\alpha)p^{\alpha/(\alpha-1)}\,(y_h/y_g) + \tau\,[\alpha p - (y_h/y_g)]}{(1-p^{\alpha/(\alpha-1)})\,[p-(y_h/y_g)]} \tag{3}$$

$$c^* = \frac{\alpha p^{1/(\alpha-1)}\,(py_g - y_h)}{(1-\alpha)(1-p^{\alpha/(\alpha-1)})} \tag{4}$$

The above consumption decision rule gives the following optimal consumption rate.

$$c^*/y_g = \frac{\alpha p^{1/(\alpha-1)}\,[p-(y_h/y_g)]}{(1-\alpha)(1-p^{\alpha/(\alpha-1)})} \tag{5}$$

Both the optimal migration duration, d^*, and the saving rate, $1 - c^*/y_g$, depend on the wage ratio, not on the level of wages. However, the fact that we are assuming an interior optimal point is critical here. When the minimum consumption constraint binds, not only the wage ratio but also the level of wages would matter because in this case a higher wage

[8] Since the objective function is continuous and the constraint set for (d, c) is closed and bounded, there exists an optimal solution to this problem according the Extreme Value Theorem. Moreover, since the objective function is a strictly concave function (it is a non-negative summation of two strictly concave functions) and the constraint set is convex, the solution is unique.

rate in the host country also implies a higher saving ability. This would change the migration duration as well.

2.3 Comparative Statics

Here, I investigate how optimal migration duration and consumption choices respond to changes in purchasing power parity and relative wages.

2.3.1 Relative Wages and Optimal Migration Duration and Consumption Choices

Equations 6 and 7 give the marginals of the optimal migration duration and the optimal consumption rate with respect to the wage ratio, respectively. The results are summarized in Proposition 1.

$$\frac{\partial d^*}{\partial \left(y_h/y_g\right)} = \frac{p\tau\left(\alpha-1\right)}{\left[p-\left(y_h/y_g\right)\right]^2} < 0 \tag{6}$$

$$\frac{\partial (c^*/y_g)}{\partial \left(y_h/y_g\right)} = \frac{-\alpha p^{\frac{1}{\alpha-1}}}{\left(1-\alpha\right)\left(p^{\frac{\alpha}{\alpha-1}}-1\right)} > 0 \tag{7}$$

Proposition 1 *As the ratio of home country wage rate to host country wage rate increases, both the optimal migration duration and the saving rate in the host country decrease.*

2.3.2 Purchasing Power Parity and Optimal Migration Duration and Consumption Choices

The partial derivative of optimal migration duration with respect to purchasing power parity is given in equation 8.

$$\frac{\partial d^*}{\partial p} = \frac{\tau}{\left(\alpha-1\right)\left(y_h-py_g\right)^2\ p\left(p^{\frac{\alpha}{\alpha-1}}-1\right)^2} * \tag{8}$$

$$\left\{-y_g y_h(\alpha-1)^2\left(p^{1/2}-p^{\frac{3\alpha-1}{2(\alpha-1)}}\right)^2 - 2\alpha^2 p^{\frac{2\alpha-1}{\alpha-1}} y_g y_h + p^{\frac{3\alpha-2}{\alpha-1}}\alpha^2 y_g^2 + p^{\frac{\alpha}{\alpha-1}}\alpha^2 y_h^2\right\} \lesseqgtr 0$$

The sign of $\partial d^*/\partial p$ is ambiguous. While the first two terms inside the curly brackets are negative, the last two are positive. The numerical solutions presented later in this section show that depending on the values of the parameters, $\partial d^*/\partial p$ can, in fact, be of either sign.

This finding that a higher ppp implies a longer optimal migration duration in certain cases is a new one. Stark et al. (1997) establish a negative relationship between ppp and optimal migration duration; however, their analysis is based on a specific utility function, the logarithmic function, whereas my analysis allows for a general type of utility function.

Equation 9 displays the partial derivative of optimal consumption in the home country with respect to ppp. The sign of this partial derivative is not immediately obvious from the equation; however, it is shown in the appendix that $\partial c^*/\partial p$ is, in fact, negative.

$$\frac{\partial c^*}{\partial p} = \frac{\alpha\left(y_h - p^{\frac{\alpha}{\alpha-1}} y_h - p\alpha y_g + p^{\frac{\alpha}{\alpha-1}}\alpha y_h\right)}{p^{(\alpha-2)/(\alpha-1)}\left(\alpha-1\right)^2\left(p^{\frac{\alpha}{\alpha-1}}-1\right)^2} < 0 \tag{9}$$

Proposition 2 *The impact of purchasing power parity on optimal migration duration can take either sign whereas the impact of purchasing power parity on saving rate in the host country is always positive.*

Combining the positive effect of a low wage ratio on the saving rate in proposition one and the positive effect of a high ppp on the saving rate in proposition two, we can reach the following conclusion.

Corollary 3 *Holding individual-level characteristics constant, immigrants' from poorer countries –high ppp, low wage ratio–save more in the host country compared to immigrants from relatively wealthier countries.*

Special Case: $y_h = 0$ Next, I investigate how immigrants' optimal migration duration and consumption decisions respond to ppp when they do not intend to work as wage-earners after returning to their home country. This restriction allows drawing more general conclusions regarding the impact of ppp on optimal migration duration. However, it is not a restriction made only for tractability; it has empirical relevance as well. Dustmann and Kirchkamp (2002) report, based on a sample of Turkish return migrants from Germany in Turkey, that less than five percent worked as wage-earners.

When immigrants do not plan to work as wage-earners in their home country after return, the partial derivative of the optimal migration duration decision with respect to ppp is given

in equation 10. Unlike the general case above, the partial derivative of optimal migration duration with respect to ppp is always negative.

$$\frac{\partial d^*}{\partial p} = \frac{\tau p^{\frac{1}{\alpha-1}} \alpha^2}{(\alpha-1)\left(p^{\frac{\alpha}{\alpha-1}} - 1\right)^2} < 0 \tag{10}$$

Proposition 4 *When immigrants do not plan to work as wage-earners after returning to their home country, optimal migration duration decreases in purchasing power parity.*

2.4 Numerical Solutions

In this subsection, I provide numerical solutions to immigrants' joint migration duration and consumption decisions accounting for corner solutions, which are displayed in Table 1. The wage ratio and ppp values in the table are selected to reflect to range of these variables for the source countries in our sample. For the curvature parameter, alpha, a wide range of values are taken with a focus on the range that the previous literature points out. (The findings of this literature and their implications for my model are discussed at the end of this subsection.) In Table 1, the ratio of the real wage rate in the home country to that in the host country is set to 75 percent in the first panel, to 50 percent in the second, and to 25 percent in the third. Each panel displays how optimal consumption and migration duration change as ppp increases for various values of alpha. Whenever the minimum consumption constraint is binding, the optimal migration duration when the minimum consumption constraint is not enforced is also given in parentheses.

As can be seen from Table 1, given a wage ratio, the sign of the impact of ppp on optimal migration duration depends on the curvature parameter of the utility function (alpha). When alpha and the wage rate in the home country are sufficiently high, optimal migration duration increases in ppp at certain ranges of ppp. (These are displayed in bold.) For instance, when the wage rate in the home country is 75 percent of that in the host country and alpha is 0.7 or higher, the optimal migration duration increases in ppp. One could wonder if this arises due to the imposition of the minimum consumption constraint because wherever $\partial d^*/\partial p$ is positive in Table 1, the minimum consumption constraint binds. However, an examination of the optimal migration durations when the minimum consumption constraint is not imposed

reveals that the fact that $\partial d^*/\partial p$ is positive at certain ranges of ppp when alpha is high enough still holds. In fact, it now widens in terms of the range of the wage rate in the home country after return: a positive $\partial d^*/\partial p$ is observed in the second and third panels of Table 1 (where the wage ratio is 0.5 and 0.25, respectively) as well. However, for many other values of alpha and the wage ratio, the effect of ppp on optimal migration duration is negative. This confirms that the interior solution characterization of $\partial d^*/\partial p$ in equation 8, in fact, takes either sign.

The effect of ppp on optimal migration duration is positive only for very high alpha, i.e. when willingness to substitute consumption intertemporally is also high. Using a structural dynamic model of return migration and saving decisions for the same group of immigrants, Kırdar (2004) estimates an alpha parameter around 0.6. This estimate implies a higher willingness to substitute consumption intertemporally compared to typical estimate of alpha in the literature.[9] However, even for this high level of willingness to substitute consumption intertemporally, as can be seen from Table 1, the impact of ppp on optimal migration duration is negative for the full range of wage ratio values for the source countries in our sample.

2.4.1 Interpretation

Here, I provide intuition on the comparative statics findings regarding the effects of ppp and relative wages on optimal migration duration and consumption choices as well as on how these effects are influenced by alpha, the parameter that determines immigrants' willingness to substitute consumption intertemporally.

There are two separate effects of increasing ppp. On one hand, the value of accumulated

[9] Note that alpha that Kırdar (2004) estimates is high compared to the typical value in life-cycle consumption literature, which is around -2 (Hubbard et al., 1994). However, a number of recent empirical papers (Keane and Wolpin, 2001; Imai and Keane, 2004; Sauer, 2004) estimate a much higher alpha parameter, similar to that in Kırdar (2004), and, therefore, a higher willingness to substitute consumption intertemporally. Keane and Wolpin (2001) claim that normally a high level of prudence is needed so that young people do not borrow despite a rising lifetime income; however, when there are borrowing constraints–as it is in their paper as well as in Kırdar (2004)–a high level of prudence may not be needed. In fact, based on experimental studies that estimate risk aversion, Gooree et al. (2003) also estimate alpha around 0.5.

savings after returning to the home country increases; therefore, immigrants want to spend a larger fraction of their worklife in their home country (income effect). On the other hand, the returns to staying longer in Germany and accumulating more savings, i.e. the opportunity cost of return, also increase (substitution effect). According to Table 1, while the substitution effect dominates for immigrants who are very willing to substitute consumption intertemporally, the income effect dominates for the rest. Immigrants who are more willing to substitute consumption intertemporally are, by definition, more patient about saving in the host country in order to enjoy its benefits in the form of high consumption after return. Therefore, the increase in the opportunity cost of return due to a higher ppp is larger for them, which makes it possible for them that migration duration increases in ppp.

In addition, there is the indirect effect resulting from the change in consumption behavior. A higher ppp increases savings in the host country. As a result, immigrants accumulate savings faster and the effect of increased ppp in rising consumption after return (income effect) becomes stronger. This indirect effect, which decreases optimal migration duration, is weaker for immigrants who are more willing to substitute consumption intertemporally because first these immigrants already save more (due to their higher willingness to substitute consumption intertemporally), therefore there is less room for an increase in their savings; second, again due to their already high saving rates, the minimum consumption level binds immediately, therefore it is less likely that their saving behavior will change at all.

Another important fact in Table 1 is that a positive effect of ppp on migration duration is more likely when the home country expected wage rate is higher. As illustrated in the model, as the home country expected wage rate increases, optimal migration duration decreases. Therefore, for a given value of the curvature parameter, immigrants who face higher earnings in their home country return earlier with lower savings. As a result, the income effect resulting from a higher ppp is weaker for them. Moreover, since they face a longer duration of time in their home country after return, the substitution effect is stronger for them. In addition, conditional on the curvature parameter and ppp, the minimum consumption level is more likely to be binding when the expected wage rate in the home country is higher. Therefore, the indirect effect through consumption, which decreases optimal migration duration, is less likely to play a role in this case.

3 Data

The data set used in this study is the German Socioeconomic Panel (GSOEP). This is a longitudinal data set conducted every year since 1984. I use the 1984 to 2000 waves in this study. The nice feature of this data set is that it contains an over-sampled group of immigrants from five different source countries: Turkey, ex-Yugoslavia, Greece, Italy and Spain. I do not include the ex-Yugoslavian immigrants in this study due to the split of the original country into numerous new countries during the time frame of this study. Many of these immigrants entered Germany in the 1960's and 1970's under the bilateral agreements signed by these source country governments with the German government (guestworker recruitment scheme). Since the first wave of the data set is a representative sample of the stock of immigrants from these source countries in Germany in 1984, many of these immigrants had already been in Germany for some time in the initial wave of the study.

The sample is restricted to households with a male household head who was 18 or older at arrival. This age restriction is made because these immigrants must have made the initial immigration decision themselves given the interpretation of return migration as part of optimal life-cycle migration decisions in the underlying model that is tested.

The variable used for measuring immigrants' migration duration is their intended migration duration. In every survey year, immigrants are asked about how long more they are planning to stay in Germany in number of years. This information along with the duration of residence at the time of survey is used to generate the intended migration duration at each survey year. When the intended age of return exceeds 65 (age of retirement), intended migration duration is taken as the time remaining until age 65.[10] Given the longitudinal

[10] In a setting where immigrants return to their home countries to enjoy the higher purchasing power of savings accumulated in the host country, nobody would delay his return after the age of retirement (age 65). Those who return after age 65 must have different motives. Whether an immigrant stays 5 more years or 10 more years after retirement in Germany before returning cannot be explained by ppp or the wage ratio between the countries. On the other hand, for the same immigrant, it is for sure that the values of ppp and wage ratio were such that it was not optimal for him to return until retirement, and this information is used in this study. The sensitivity of the findings to this restriction is tested by taking the intended migration duration until age 70, 75, and 80; i.e. the intended duration of residence until death instead of retirement. The qualitative findings all hold; the quantitative results regarding the effect of ppp are in fact larger.

nature of the data set, this feature allows me to follow the changes in the intended migration duration for a person over time. This is the major reason why I use data on intended migration durations rather than realized values of this variable. Besides, migration duration generated based on return migration realizations would be right-censored.

The data on the other decision variable, saving rate, are generated using the information on annual savings and household income. The survey includes a question on monthly savings, which is converted to annual level. This information on saving behavior is available only after 1991. An important feature of the saving data is that they are censored below at zero because only positive amount of savings are examined in the survey: the survey asks whether immigrants saved any, and if so how much. Therefore, some of the saving values registered as zero could, in fact, be negative.

Age and duration of residence are two important micro-level control variables used in the estimation, which are generated using the information on year of birth and year of arrival in Germany, respectively. A number of other individual-level characteristics are used including nationality, educational attainment (high school and college graduation status), and whether the household head arrived after 1973-the last year of guestworker recruitment.

Macro-level data are also used in the estimation. In fact, the two key variables in this study are macro-level variables. Purchasing power parity and wage ratio exhibit variation over country of origin and calendar year. In calculating the expected wage ratio, adjustments are made for the variation in the aggregate unemployment rate and the replacement rate of the unemployment benefits in the source countries.[11]

3.1 Descriptive Statistics

I first discuss the distribution of age and duration of residence at the time of arrival and in the full sample because these variables will be critical in the identification of the effects of ppp and relative wage variables on the choice variables. Figure 1 displays, in the first panel,

[11] The source for ppp data is OECD (2002a), and the source for data on replacement rates is OECD (2002b).The wage data for the three EU countries in comparison to Germany are taken from the U.S. Bureau of Labor Statistics webpage. The data for Turkey in comparison to Germany are taken from the ILO webpage.

the distribution of the age at arrival for the 828 people in the sample and the age distribution for the 7,754 person-time observations in the full sample. These immigrants are on average quite young at the time of arrival: the median age at arrival is 26 and 95 percent of the immigrants are under the age of 40 at arrival. On the other hand, when we examine the age distribution in the full sample, we see that the median age of immigrants in all observations is much higher at 50 and that in only 15 percent of the observations are immigrants under the age of 40. The first panel of Figure 2 illustrates the duration of residence in the full sample. The median duration of residence in all observations is 20 years. Only in 5 percent of the observations, a duration of residence that is less than 10 years is reported.

The second panel of Figure 2 presents the distribution of intended migration duration. The median intended duration of residence is 33 years. This high value is not a surprise given the similarly high value for the median duration of residence. The more important fact about the distribution of intended migration duration is the fraction of immigrants who report an intention to return back before the age of retirement. Of the 827 people in the sample, only 121 (14.6 percent) consistently report an intention of staying until retirement. For the rest of the people in the sample, we observe variation in the intended migration duration over time.

Figure 3 shows how intended migration duration varies according to the current duration of residence. At arrival, intended migration duration averages at around 10 years. Intended migration duration rises to 30 years at about 15 years of residence, and to 40 years at about 30 years of residence. (In this figure, obviously, the group of people with 15 years of residence are different from the group of people at arrival in that they chose to stay in Germany for 15 years.)

Figure 4 presents the mean saving rate by duration of residence. Saving rate is more volatile over time compared to intended migration duration due to the smaller sample size. One of the most salient features of the saving rate profile is its declining trend. Saving rate is between 10 and 12 percent at 10 to 12 years of residence. However, it drops to a level just above 4 percent between 20 and 25 years of residence, and it roughly stabilizes thereafter. These saving rates are rather low, which seems to contradict the saving accumulation motive

underlying the theoretical model.[12] However, we should also realize that most of these immigrants are low-income workers with limited saving ability. More importantly, we only observe the saving rate after 10 years of residence in Germany. However, the literature is full of evidence of very high saving rates for these immigrants after arrival. For instance, Paine (1974), using a study carried out by the State Planning Organization of Turkey in 1971–when all Turkish guestworkers would be in Germany for less then ten years and most for less than four years–calculates a 36 percent saving rate. Using a similar survey, conducted by the Central Bank of Turkey in 1986, which contains information on immigrants' income and savings according to their duration of residence in Germany, I find a saving rate of 39 percent for Turkish immigrants with less than four years of residence. We could reconcile these findings of the literature as to the high saving rates in the early years after arrival with the relatively much lower saving rates after ten years of residence, reported in this paper as well as in Bauer and Sinning (2005), with a declining saving rate profile over time. In fact, even after ten years of residence, there is evidence for a declining trend.

The mean values for micro-level variables by country of origin as well as for the whole sample can be seen in Table 2. Figure 5 displays the purchasing power parities of the four source countries with Germany from 1984 to 2000. There is substantial variation in levels across source countries: the average ppp, over the 17 years, for Turkish immigrants is roughly twice as much as that for Italian immigrants. The variation in ppp over time in Figure 5 is also significant; in fact, it is remarkable for Turkish immigrants: there were a 35 percent rise in 1994, the year of an economic crisis, and a 34 percent rise in 1986. The expected wage rate in the source countries as a fraction of the wage rate in Germany is illustrated in Figure 6 for the four source countries. There is substantial variation across the source countries. While the expected wage ratio for Turkish immigrants averages at 0.25 over the 17 years, it averages at 0.7 for Italian immigrants. The variation over time is also remarkable. For Italian immigrants, the wage ratio in 1995 was 36 percent lower than the wage ratio in 1990.

[12] Bauer and Sinning (2005) find that immigrants' saving rate is, in fact, lower than that of natives in Germany; however, they also report that the gap vanishes once socio-economic characteristics are accounted for. They also find that saving rate of immigrants who intend to return to their home country is higher.

4 Estimation

This section presents the estimation method used in testing the comparative statics implications of the theoretical model, propositions 1 and 2, regarding the effects of ppp and wage ratio on the optimal migration duration and saving decisions. According to equations 3 and 5, the optimal migration duration, d^*, and the saving rate, s^*, can be written in the following functional forms.

$$d^* = d(\tau, p, y_h/y_g; \alpha) \tag{11}$$

$$s^* = s(p, y_h/y_g; \alpha) \tag{12}$$

I will approximate the functional forms in equations 11 and 12 using linear models in the estimation. According to equation 11, the optimal migration duration depends on the remaining worklife, i.e. age at arrival, in addition to the two key macroeconomic variables and the curvature parameter (which can not be accounted for in the estimation due to its unobserved nature). On the other hand, saving rate depends only on the two macroeconomic variables and the curvature parameter; it does not directly depend on the remaining worklife as can be seen in equation 12. However, in the case that relative wages between the two countries vary by age, the saving rate would also vary by age. Therefore, in the empirical specification, I allow the saving rate to vary by age as well.

According to the theoretical model, the impacts of ppp and wage ratio on optimal migration duration vary by the decision horizon (i.e. age at arrival), as can be seen in equations 8 and 6. On the other hand, the impacts of ppp and wage ratio on the saving rate, given in equations 9 and 7, do not depend on the decision horizon. However, I use a more general specification by allowing the effects of ppp and wage ratio on the saving rate to vary by age as well.[13] Therefore, the empirical specifications for migration duration and saving rate are written in the following form.

$$d_i = \beta_0 + \beta_1 ppp_i + \beta_2 ppp_i age_i + \beta_3 wage_i + \beta_4 wage_i age_i + \beta_5 age_i + u_i \tag{13}$$

$$s_i = \gamma_0 + \gamma_1 ppp_i + \gamma_2 ppp_i age_i + \gamma_3 wage_i + \gamma_4 wage_i age_i + \gamma_5 age_i + v_i \tag{14}$$

[13]The main findings on saving rate are robust to this extra inclusion of age interaction terms.

The theoretical model's predictions are for the time of arrival in Germany and, accordingly, in the above specifications, all variables are written at the time of arrival for each person i. Therefore, ideally we would need data on intended migration duration and saving choices at the time of arrival. However, GSOEP includes information on intended migration duration and saving choices not at arrival but at various years after arrival. Therefore, a time index is introduced, and the key variables of interest are interacted with duration of residence, t_i, which allows the estimation of the effects of the key variables conditional on duration on residence. The resulting specifications are given below in equations 15 and 16. (When duration of residence, t, is zero, equations 15 and 16 reduce to equations 13 and 14, respectively.) These equations are estimated separately. In the estimation, the average values of the last three years are used for ppp and wage ratio variables.

$$\begin{aligned} d_{it} &= \beta_0 + \beta_1 ppp_{it} + \beta_2 ppp_{it} age_{it} + \beta_3 ppp_{it} t_i + \beta_4 wage_{it} + \beta_5 wage_{it} age_{it} \\ &\quad + \beta_6 wage_{it} t_i + \beta_7 age_{it} + \beta_8 age_{it} t_i + \beta_9 t_i + u_i \end{aligned} \tag{15}$$

$$\begin{aligned} s_{it} &= \gamma_0 + \gamma_1 ppp_{it} + \gamma_2 ppp_{it} age_{it} + \gamma_3 ppp_{it} t_i + \gamma_4 wage_{it} + \gamma_5 wage_{it} age_{it} \\ &\quad + \gamma_6 wage_{it} t_i + \gamma_7 age_{it} + \gamma_8 age_{it} t_i + \gamma_9 t_i + v_i \end{aligned} \tag{16}$$

The repeated observations on intended migration duration allows estimation using a fixed-effects OLS estimator. Unobserved heterogeneity could bring about biased estimates in equation 15. For instance, age-at-arrival could be correlated with some unobserved characteristic of immigrants that also has an impact on migration duration, resulting in biased estimates. Using fixed-effects estimation allows elimination of any bias that could be caused by time-invariant unobserved heterogeneity by differencing them out. The specification for this fixed-effects estimation is given in equation 17, where Δx_{it} denotes the difference of x_{it} from the average of x_{it} over time.

Since the savings data are censored below at zero, I use censored regression in the saving rate analysis. A pooled panel data approach is taken here rather than a fixed-effects panel estimation, as it is done for migration duration, because fixed-effects methods using dummy variables for individuals result in convergence failures. (The sample size for saving rate is much smaller compared to that for intended migration duration.) As time-invariant individual characteristics cannot be eliminated in this case, a number of time-invariant individual

characteristics are also included in the regression. These include high school and college graduation status, 1974-1983 cohort status, and country of origin. The final specification for saving rate is given in equation 18, where X_{it} denotes the vector of individual characteristics.

$$\begin{aligned}\Delta d_{it} &= \beta_1 \Delta ppp_{it} + \beta_2 \Delta (ppp_{it} age_{it}) + \beta_3 \Delta \left(ppp_{it} t_i\right) + \beta_4 \Delta wage_{it} \qquad (17)\\ &\quad + \beta_5 \Delta \left(wage_{it} age_{it}\right) + \beta_6 \Delta \left(wage_{it} t_i\right) + \beta_7 \Delta age_i + \beta_8 \Delta \left(age_{it} t_i\right) + \beta_9 \Delta t_i + \Delta u_{it}\\ s_{it} &= \gamma_0 + \gamma_1 ppp_{it} + \gamma_2 ppp_{it} age_{it} + \gamma_3 ppp_{it} t_i + \gamma_4 wage_{it} \qquad (18)\\ &\quad + \gamma_5 wage_{it} age_{it} + \gamma_6 wage_{it} t_i + \gamma_7 age_{it} + \gamma_8 age_{it} t_i + \gamma_9 t_i + X_{it}\Gamma + v_{it}\end{aligned}$$

Since the pooled panel data approach in the saving rate analysis cannot account for unobserved heterogeneity, I also estimate a fixed effects OLS regression using the decision to save as the left-hand-side variable, rather than the saving rate.[14] This allows me to test partially whether the findings in the censored regression for saving rate could be resulting from the effects of unobserved heterogeneity.

I check the robustness of my findings to possible omitted variables that might be correlated with the key variables of interest using additional specifications. A change in ppp could arise from events in Germany as well as the home countries. When the change arises from an event in Germany, it is common to all observations. Moreover, this event in Germany could change other variables that also have an impact on the dependent variable. In this case, if these other variables are not accounted for in the regression, ppp would in part stand for these variables, resulting in an omitted variables bias. For instance, suppose that an economic downturn in Germany brings about a rise in prices, which would change the ppp. This economic downturn could also cause an upsurge in the anti-immigrant sentiment in Germany, which would presumably change immigrants' migration duration and saving choices. However, not accounting for anti-immigrant sentiment, we would mistakenly attribute any change in immigrants' migration duration and saving choices to the change in ppp. For this reason, I add calendar-year dummies to equations 17 and 18 in the second specification. This allows me to capture the impact of ppp and wage ratio through the variation across source

[14] Since the censoring problem in the savings data is quite acute–roughly half of the observations are censored–a fixed-effects OLS estimation on the saving rate would lead to subtantially biased coefficient estimates.

countries within each calendar year.

However, similarly, there may be other time-varying factors in the source countries that are correlated with ppp or wage ratio and that also affect return migration and saving decisions. For instance, economic growth could affect the currency of the home country, and, therefore, ppp as well. At the same time, economic growth in the home country would influence immigrants' return decision. Therefore, not accounting for it could also cause an omitted variable bias. For this reason, in the third specification, I also add controls for the growth rate in the source countries as well as its interactions with age and duration of residence in addition to calendar year dummies to equations 17 and 18.

In all regression analyses in this study, weighted regressions are conducted using the sampling weights provided in the survey. In the analysis of intended migration duration using fixed-effects estimation, sampling weights for 1984 are used because the information comes from the variation in a person's intentions over time. Similarly, in the fixed-effects regression for the decision to save, sampling weights for 1991 are used as the savings data are available only after this year. On the other hand, longitudinal weights are used in the saving rate regression because in this case data from different survey years are pooled.

The macro-level variables used in the estimation do not exhibit variation within country-of-origin groups. Therefore, random disturbances would be correlated within these groups. Moulton (1990) shows that even small levels of correlation could cause significant downward bias in the estimation of standard errors. I address this problem by clustering the standard errors at the level of country of origin, which ensures that variance-covariance matrix is consistent in the presence of correlation within countries. However, Bertrand et al. (2004) and Cameron et al. (2008) report that when the number of clusters is small, even cluster-robust standard errors may lead to downward-biased standard errors.[15] Due to the small number of clusters in my sample, I use a T-distribution rather than a standard normal distribution in forming the significance levels, which is suggested by Cameron et al. as a minimum requirement for dealing with the issue of few clusters.

[15]Bell and McAffrey (2002) find that this bias is larger when variables are relatively constant within clusters. However, as shown in Figures 5 and 6, my aggregate variables exhibit significant variation within clusters.

5 Empirical Results

5.1 Migration Duration

The results of fixed-effects regression of intended migration duration are presented in Table 3 for the three different specifications explained in the previous section. Since the key variables of interest are interacted with both age and duration of residence, the impacts of these variables are presented in Table 4 at selected values of age and zero duration of residence.[16] In other words, their effects are presented at various ages at arrival for conformity with the theoretical model.

As can be seen from Table 4, an increase in ppp lowers the optimal migration duration in Germany. The statistical evidence is strong for most age-at-arrival groups: it is at the 5 percent level for all immigrants who arrive after age 30, and at the 10 percent level for those who arrive between the ages of 24 and 29 according to the first specification.[17] The negative effect of ppp on optimal migration duration is robust to the addition of calendar year dummies as well as the controls for the home country growth rate as can be seen from specifications two and three. Nonetheless, with these additional controls, both the magnitude of the effect of ppp and its statistical significance diminish somewhat. That optimal migration duration decreases in ppp is consistent with the predictions of the theoretical model for the range of values of alpha that has been estimated in the literature.

The magnitude of the effect of ppp on optimal migration duration is large. According to the first specification, for which the statistical evidence is the strongest, a 10 percent increase in ppp lowers the optimal migration duration by 1.34 years for a 30-year-old arriver. Since the predicted migration duration for this immigrant is 4.8 years, when ppp and wage ratio are set at their mean values in the sample, I can claim that a 10 percent increase in ppp

[16] These estimates are calculated as linear combinations of the coefficients of ppp and wage ratio variables with the coefficients of their interactions with age as well as duration of residence, where duration of residence is set at zero and age is set at various values given in the table.

[17] The effects of ppp variable presented in Table 4 for various values of age at arrival are statistically significant despite the fact that the coefficient of ppp variable in Table 3 is not because the coefficient of the ppp variable in Table 3 denotes its effect when both age and duration of residence are set at zero.

lowers the optimal migration duration by roughly 28 percent for this immigrant.[18]

This finding is different from that in Yang (2006), where a higher ppp leads to less return migration. However, the immigrants in that paper are shorter-term migrants on temporary work contracts whereas the immigrants in my sample are longer term immigrants. If there are various types of immigrants with different return migration behavior, the composition of the group of immigrants in my sample would be different from that of Yang. In addition, that the immigrants in Yang's sample have a very high willingness to substitute consumption intertemporally and that they are more likely to be wage-earners after return–in which case the substitution effect could dominate as illustrated in this paper–could explain the different findings. Besides, when immigrants face a steeper rising wage profile over their duration of residence, the substitution effect would be stronger. The wage profile over time in the host country could be different for the immigrants in Yang's sample.

In all three specifications, both the magnitude and statistical significance of the effect of ppp on migration duration are stronger at later ages. For immigrants who plan to stay in Germany throughout their lives, a change in ppp would not make a difference in the migration duration. Since immigrants who are younger at arrival are more likely to stay in Germany throughout their lives (see, e.g., Dustmann [1996]), their optimal migration duration would be less sensitive to changes in ppp. In addition, for immigrants who are older at arrival, the substitution effect–the increase in the value of foregone savings opportunities by returning home when ppp increases–is smaller due to a shorter remaining worklife.

The effect of wage ratio on the optimal migration duration decision has a negative sign as predicted by the theoretical model. This negative effect is statistically significant at the 10 percent level for those who arrive at or after age 32 according to the first specification.

[18]Note that the predicted migration duration at 4.8 years for 30-year-old arrivers is shorter compared to the intended duration residence for new arrivers (with zero duration of residence) in Figure 3. However, the mean age-at-arrival value for those new arrivers in Figure 3 is about 20. For 20-year-old arrivers, the predicted migration duration from specification one is 6.3 years, which is still smaller. The key reason to this discrepancy is that in Figure 3, the data are really sparse for more recent arrivers (at low values of duration of residence). Therefore, the predictions of the model reflect more of the behavior of immigrants with longer duration of residence and match less well with the behavior of more recent arrivers in Figure 3. That the effects of the variables of interest are linear in duration of residence is also important here.

When we add additional controls in specifications two and three, the statistical significance is lost. However, this does not arise from a lower estimate of the coefficient due to a correction of a potential omitted variable bias–the coefficient estimates change little–, but from much less precisely estimated parameters. Despite the relatively low statistical significance, the economic significance of the wage ratio variable is high. A 10 percentage points increase in the wage ratio (e.g. expected wage rate in the source country rises to 50 percent of that in Germany from 40 percent) for a 35-year-old arriver decreases the optimal migration duration by 1.22 years, which implies a 30 percent fall from the predicted level of 4.04 years.

5.1.1 Who would stay longer: immigrants from poorer or relatively wealthier source countries?

The above findings imply that immigrants from poorer countries may, in fact, stay shorter in the host country if the impact of a higher ppp in decreasing migration duration dominates the impact of a lower wage ratio in increasing migration duration. To examine this, predicted migration durations are calculated for selected values of ppp and wage ratio, which are presented in Table 5.[19] Conditional on ppp, as expected from the estimation results, immigrants from poorer countries (lower wage ratio) stay longer. However, when we allow the poorer countries to have a higher ppp, as it actually is, the gap diminishes substantially; and, in fact, in many reasonable cases, immigrants from poorer countries stay shorter. For instance, a 20-year-old immigrant coming from a source country for which the wage ratio is 0.25 and ppp is 2 (wage ratio at ppp is 0.5) would stay shorter, 7.3 years, than an immigrant originating from a wealthier source country for which the wage ratio is 0.5 and ppp is 1.5 (wage ratio at ppp is 0.75), who would stay for 8.0 years. Moreover, as immigrants' age at

[19] The effects of the key variables of interest are identified through the time variation in these variables in the fixed-effects model. However, the intercept term–which is the average of fixed effects–depends on the levels of these key variables as well. Therefore, the predicted values of optimal migration duration are affected by the time variation in the key variables as well as by their levels (cross-sectional variation). Note that the addition of grand means (averages over time and person) of all variables to equation 17 allows the estimation of this intercept term. In addition, the results of a random-effects estimation method, in which the effects of key variables would depend on between as well as within variation, show that the key findings in this section still hold.

arrival increases, that immigrants from poorer countries stay shorter becomes more likely. For instance, for the same two countries in the previous example, a 30-year-old arriver from the wealthier one would stay for 6.8 years, whereas the one from the poorer country would stay for 5.9 years.

Next, I examine the predicted migration durations according to the ppp and wage ratio values for the four source countries in my sample. These are given in Table 6, according to all three specifications used in the estimation, for immigrants who arrive in Germany at ages 20, 30, and 40, separately. The major result is that the predicted migration duration of an immigrant facing Turkish ppp and wage ratio values is shorter than those of immigrants facing ppp and wage ratio values of EU countries for all three age-at-arrival groups. In other words, the shortest intended migration duration occurs when the ppp and wage ratio values are taken for the poorest country in the sample. Moreover, as age-at-arrival increases, this finding becomes even stronger in magnitude.

This finding that the intended migration duration of immigrants facing Turkish values for ppp and wage ratio is shorter may be surprising at first because the literature is full of evidence on the fact that actual return rates of Turkish immigrants are in fact lower. My predictions are based on varying ppp and wage ratio levels holding everything else constant. However, the literature also reports that Turkish immigrants are different in terms of certain individual characteristics that influence return migration decisions.[20]

5.2 Savings

5.2.1 Censored Regression Analysis of Saving Rate

Table 7 presents the censored regression estimation results for saving rates.[21] Due to the age and duration of residence interaction terms of the key variables, their impacts on the saving rate are presented separately in Table 8 at selected values of age and zero duration of residence (i.e. at arrival in Germany).

Purchasing power parity has a positive impact on the saving rate, as implied by the theoretical model. While the statistical significance is at the 10 percent level for all age

[20] See, for instance, Kırdar (2009).

[21] Interpretation of censored regression estimates are similar that of OLS estimates.

groups in specification one, it is much stronger in specifications two and, especially, three. With regard to the impact of wage ratio on the saving rate, however, there is no statistically significant evidence.[22]

The magnitude of the effect of ppp on saving rate is large. According to specification three, for which the statistical significance is the highest for all age groups, a 10 percent rise in ppp increases the saving rate of a 20-year-old arriver in his first year of residence by 5.1 percentage points. Given the fact that the predicted saving rate in the first year of residence for this immigrant–when all other variables are set to mean values–is 23.1 percent, a 10 percent rise in ppp brings about a 22 percent increase in the saving rate. The magnitude of the impact of ppp on saving rate for immigrants arriving at later ages is even larger. A 10 percent increase in ppp rises the saving rate by 26 percent in his first year of residence for a 30-year-old arriver (5.4 percentage points increase from a predicted saving rate of 21.1 percent) and by 30 percent in his first year of residence for a 40-year-old arriver (5.7 percentage points increase from a predicted saving rate of 19.2 percent).

The predicted saving rates during the first year of residence at 23.1 percent for a 20-year-old arrriver, at 21.1 percent for a 30-year-old arriver, and at 19.2 percent for a 40-year-old arrriver are much higher than the mean saving rate given in Table 2. However, the saving rate given in Table 2 is the average of saving rates at various duration of residence values, whose distribution is shown in Figure 2, whereas the predicted saving rates are at the time of arrival. In fact, Kırdar (2004) estimates a downward-sloping saving profile for the same group of immigrants in Germany, which is consistent with the finding here that predicted saving rates at the time of arrival are much higher.

5.2.2 Fixed-Effects OLS Regression Analysis of the Decision to Save

Next, I concentrate on the binary decision to save, ignoring the level of savings when the decision is to save, because this allows me to estimate a fixed-effects model (unlike the case

[22] In a fixed-effects OLS estimation that does not account for censoring, the standard errors of the key variables of interest, compared to those in the censored regression model without fixed effects, are in fact noticeably smaller in specifications one and two and very similar in specification three; however, the coefficient estimates are much smaller (as expected when censoring is not accounted for).

for saving rate). The fixed-effects OLS estimation results for this decision are given in Table 9 and the effects of ppp and wage ratio on this decision at the time of arrival for selected values of age-at-arrival are presented in Table 10, for the three specifications.

According to the first specification, there is statistically significant evidence that immigrants who are 30-years-old or older at arrival are in fact more likely to save when ppp is higher, which supports the finding in the previous subsection. A 10 percent rise in ppp increases the probability of saving by 3.4 percentage points for 30-year-old arrivers, and by 6.1 percentage points for 40-year-old arrivers. As we add year dummies in specification two, standard errors grow substantially and, therefore, any claim to statistical significance is lost. There is no statistical evidence on the effect of wage ratio on the saving decision, as it was for the saving rate in the previous subsection.

6 Conclusions

This paper examines the impact of purchasing power parity and relative wages between the host and source countries on immigrants' migration duration and saving decisions by first developing a simple theoretical framework that allows for heterogeneity among immigrants according to their willingness to substitute consumption intertemporally and then testing the comparative statics implications of this framework using a longitudinal data set on immigrants in Germany from four different source countries.

The theoretical model predicts that a higher ppp can in fact increase the optimal migration duration under certain conditions. In particular, this is the case for immigrants who would earn relatively high wages in their home country after return and whose willingness to substitute consumption intertemporally is high. However, for the values of the elasticity of intertemporal substitution of consumption uncovered by the previous literature, the simulation results of the theoretical model reveal that the effect of ppp on migration duration would be negative. In the special case that immigrants do not work as wage earners after returning to the home country, optimal migration duration decreases in ppp for all values of the parameters. Another important implication of the theoretical model is that immigrants originating from poorer source countries would save more in the host country than

immigrants coming from relatively wealthier source countries.

The empirical analysis reveals that ppp has a negative impact on optimal migration duration. The magnitude of this impact is also large; e.g., a 10 percent increase in ppp lowers the predicted migration duration at the time of arrival by roughly 28 percent for an immigrant who arrives in Germany at the age of 30. The magnitude of this impact is even larger for immigrants who arrive at later ages. This paper also provides suggestive but not compelling empirical evidence, due to relatively low statistical significance, that the optimal migration duration decreases as the expected wage rate in the home country increases relative to that in the host country, which is consistent with the implication of the theoretical model on this matter.

These empirical findings also imply that immigrants from poorer countries may, in fact, stay shorter in the host country. For instance, the estimates reveal that an immigrant coming from a source country where the expected wage rate is 25 percent of that in Germany and the ppp is 2 (wage ratio at ppp is 0.5) would stay shorter than immigrant originating from a country for which the wage rate is 50 percent of that in Germany and the ppp is 1.5 (wage ratio at ppp is 0.75). To be more specific, an immigrant facing Turkish ppp and relative wages would stay shorter in Germany than an immigrant facing ppp and wage ratio values of the wealthier three EU countries in the sample, regardless of age-at-arrival.

The empirical analysis also confirms the positive impact of ppp on saving rate, as implied by the theoretical model, for all age-at-arrival groups. For instance, a 10 percent rise in ppp increases the saving rate by 22 percent in the first year of residence for a 20-year-old arriver. This finding implies that exchange rate premium policies implemented by source country governments would encourage these immigrants to save more. However, since this policy would at the same time shorten the optimal migration duration, the amount of accumulated savings that would return to the home countries along with the migrants could in fact fall.

An important issue is obviously the transferability of the empirical findings of this paper to other geographical settings at different times. The empirical results of this paper are for temporary migrants who are in the host country to accumulate savings. This type of migration has been prominent historically, in particular the large guestworker recruitment schemes in Europe after the World War II, in a period of rapid economic expansion. Similar

temporary labor migration policies have been used in the Gulf countries, which drew massive migration from other Middle Eastern and Asian countries in a period of rising oil revenues. Similar temporary-worker programs have also been proposed in the U.S.. Birdsall et al. (2005) outline how such temporary migration could help both the developing and developed countries. Therefore, the type of migration on which the empirical results of this paper are based on is still important and likely to stay that way, in particular in periods of economic expansions in developed countries.

References

[1] Aydemir, A., Robinson, C., 2008. "Global Labor Markets, Return and Onward Migration", *Canadian Journal of Economics* 41(4), 1285-1311.

[2] Bauer, Thomas and Mathias Sinning, 2005. "The Savings Behavior of Temporary and Permanent Migrants in Germany", IZA Discussion Paper No:1632.

[3] Bell, Robert, and Daniel McCaffrey, "Bias Reduction for Standard Errors for Linear Regressions with Multi-Stage Samples," RAND Working Paper, 2002.

[4] Bertrand, M., Duflo E. and S. Mullainathan, 2004. "How Much Should We Trust Differences-in-Differences Estimates?", *Quarterly Journal of Economics* 119, 249-275.

[5] Birdsall, N., Rodrik, D. and A. Subramanian, 2005. "How to Help Poor Countries", *Foreign Affairs* 84:4, 136-152.

[6] Borjas, G.J. and B. Bratsberg, 1996. "Who Leaves? The Outmigration of the Foreign-born", *Review of Economics and Statistics* 78, 165-176.

[7] Cameron, C., Gelbach J. and D. Miller, 2008. "Bootstrap-Based Improvements for Inference with Clustered Errors", *Review of Economics and Statistics* 90(3), 414-427.

[8] Djajic, S., 1989. "Migrants in a Guest-Worker System: A Utility Maximizing Approach", *Journal of Development Economics* 31, 327-339.

[9] Dustmann, C. 1996. "Return Migration: the European Experience", *Economic Policy* 22, 215-250.

[10] Dustmann, C. 1997. "Return Migration, Uncertainty and Precautionary Savings", *Journal of Development Economics* 52, 295-316

[11] Dustmann, C., 2003. "Return Migration, Wage Differentials, and Optimal Migration Duration", *European Economic Review* 47, 353-369.

[12] Dustmann, C., Kirchkamp, O., 2002. "The Optimal Migration Duration and Activity Choice after Re-migration", *Journal of Development Economics* 67, 351-372.

[13] Galor O. and O. Stark., 1990. "Migrants' Savings, the Probability of Return Migration and Migrants' Performance", *International Economic Review*, 31, 463-467.

[14] Goeree, J.K., C.A. Holt, and R.P. Thomas, 2003. "Risk Averse Behavior in Generalized Matching Pennies Games," *Games and Economic Behavior* 45, 97-113.

[15] Hatton, T. and J. Williamson, 2002. "What Fundamentals Drive World Migration?", Center for Economic Policy Research, Discussion Paper No:458.

[16] Hubbard, G.R., Skinner, J. and S.P. Zeldes, 1994. "The Importance of Precautionary Motives in Explaining Individual and Aggregate Saving", *Carnegie-Rochester Conference Series in Public Policy*, 40, 59-125.

[17] Imai, S. and Michael P. Keane, 2004. "Intertemporal Labor Supply and Human Capital Accumulation," *International Economic Review* 45(2), 601-641.

[18] International Labor Organization, LABORSTA Database of Labour Statistics, Labour Cost in Manufacturing, http://laborsta.ilo.org/.

[19] Jasso, G., Rosenzweig, M., 1982. "Estimating the Emigration Rates of Legal Immigrants Using Administrative and Survey Data: The 1971 Cohort of Immigrants to the United States", *Demography* 19, 279-290.

[20] Massey, Douglas and Kristin Espinosa, 1997. "What's Driving Mexico-U.S. Migration? A Theoretical, Empirical, and Policy Analysis", *American Journal of Sociology*, 102, 939-999.

[21] Keane M.P. and K.I. Wolpin, 2001. "The Effect of Parental Transfers and Borrowing Constraints on Educational Attainment," *International Economic Review* 42, 1051-1104.

[22] Kırdar, Murat, 2004. "An Estimable Dynamic Model of Return Migration and Savings", Ph.D. Dissertation, U. of Pennsylvania.

[23] Kırdar, Murat, 2009. "Labor Market Outcomes, Savings Accumulation, and Return Migration", *Labour Economics* 16(4), 418-428.

[24] Kumcu, E.M., 1989. "The Savings Behavior of Migrant Workers: Turkish Workers in W. Germany", *Journal of Development Economics* 30, 273-286.

[25] Moulton, Brent, 1990. "An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Units", *Review of Economics and Statistics* 72(2), 334-38.

[26] Organization for Economic Development and Cooperation (OECD), 2002a. OECD Indicators, Benefits and Wages.

[27] Organization for Economic Development and Cooperation (OECD), 2002b. OECD Indicators, PPP.

[28] Paine, Suzanne. *Exporting Workers: the Turkish Case.* Cambridge: Cambridge, 1974.

[29] Sauer, Robert M., 2004. "Educational Financing and Lifetime Earnings", *Review of Economic Studies* 71(4), 1189-1216.

[30] Stark, O., Helmenstein, C. and Y. Yegerov., 1997 "Migrants' Savings, Purchasing Power Parity, and the Optimal Duration of Migration", *International Tax and Public Finance*, 4, 307-324.

[31] Türkiye Cumhuriyeti Merkez Bankası. *Yurt Dışındaki Vatandaşlarımızın Tasarruf Eğilimleri Araştırması.* Ankara, 1986.

[32] United Nations, Department of Economic and Social Affairs, Population Division (2009). Trends in International Migrant Stock: The 2008 Revision.

[33] U.S. Department of Labor, Bureau of Labor Statistics. International Comparisons of Hourly Compensation Costs for Production Workers in Manufacturing, Supplementary Tables.

[34] World Development Indicators, http://devdata.worldbank.org/wdi2005/Section6_1.htm

[35] Yang, Dean, 2006. "Why do Migrants Return to Poor Countries? Evidence from Philippine Migrants' Responses to Exchange Rate Shocks" *Review of Economics and Statistics 88(4), 715-735.*

[36] Yang, Dean, 2008. "International Migration, Remittances and Household Investment: Evidence from Phillippine Migrants' Exchange Rate Shocks" *Economic Journal 118, 591-630.*

Table 1: Numerical Solutions to Immigrants' Joint Consumption and Migration Duration Decisions

wage ratio = 0.75															
	ppp=1.5			*ppp=1.75*			*ppp=2*			*ppp=2.5*			*ppp=3*		
	c	t		c	t		c	t		c	t		c	t	
alpha = 0.9	0.50	**35.35**	**(32.96)**	0.50	**35.52**	**(33.24)**	0.50	**35.64**	**(33.67)**	0.50	**35.77**	**(34.30)**	0.50	**35.85**	**(34.67)**
alpha = 0.7	0.74	33.77		0.50	**29.47**	(29.41)	0.50	**29.60**	(27.73)	0.50	**29.71**	(26.60)	0.50	**29.73**	(26.34)
alpha = 0.6	0.90	36.67		0.65	30.25		0.51	27.53		0.50	27.37	(25.27)	0.50	27.36	(24.39)
alpha = 0.5	1.00	40.00		0.76	31.67		0.63	28.00		0.50	25.35	(24.76)	0.50	25.30	(23.33)
alpha = 0.1	1.00	40.00		0.99	39.35		0.87	32.36		0.73	25.89		0.64	22.81	
alpha = -1	1.00	40.00		1.00	40.00		1.00	40.00		0.95	34.55		0.89	27.97	
wage ratio = 0.5															
	ppp=1.5			*ppp=1.75*			*ppp=2*			*ppp=2.5*			*ppp=3*		
	c	t		c	t		c	t		c	t		c	t	
alpha = 0.9	0.50	36.73	(34.96)	0.50	36.67	**(34.64)**	0.50	36.62	**(34.74)**	0.50	36.54	**(35.01)**	0.50	36.49	**(35.20)**
alpha = 0.7	0.99	39.77		0.62	33.61		0.50	31.77	(30.93)	0.50	31.44	(28.74)	0.50	31.19	(27.94)
alpha = 0.6	1.00	40.00		0.81	35.85		0.62	31.79		0.50	29.46	(28.13)	0.50	29.12	(26.52)
alpha = 0.5	1.00	40.00		0.95	38.67		0.75	33.33		0.53	28.33		0.50	27.32	(26.00)
alpha = 0.1	1.00	40.00		1.00	40.00		1.00	40.00		0.83	32.32		0.71	27.61	
alpha = -1	1.00	40.00		1.00	40.00		1.00	40.00		1.00	40.00		0.99	38.64	
wage ratio = 0.25															
	ppp=1.5			*ppp=1.75*			*ppp=2*			*ppp=2.5*			*ppp=3*		
	c	t		c	t		c	t		c	t		c	t	
alpha = 0.9	0.50	37.46	(36.16)	0.50	37.34	(35.57)	0.50	37.23	**(35.50)**	0.50	37.07	**(35.57)**	0.50	36.95	**(35.64)**
alpha = 0.7	1.00	40.00		0.74	36.41		0.51	33.22		0.50	32.66	(30.41)	0.50	32.28	(29.25)
alpha = 0.6	1.00	40.00		0.98	39.58		0.72	34.84		0.50	30.93	(30.35)	0.50	30.43	(28.27)
alpha = 0.5	1.00	40.00		1.00	40.00		0.88	37.14		0.60	31.11		0.50	28.83	(28.18)
alpha = 0.1	1.00	40.00		1.00	40.00		1.00	40.00		0.93	37.32		0.78	31.54	
alpha = -1	1.00	40.00		1.00	40.00		1.00	40.00		1.00	40.00		1.00	40.00	

Notes : c denotes consumption, t denotes migration duration. Values inside the parantheses are optimal migration durations when the minimum consumption constraint is not enforced. Duration of residence is given in bold when it increases in ppp. Wage ratio and ppp values are selected according to the actual values for the source countries in the empirical section. The values of alpha focus on the range that is uncovered by the previous literature.

Table 2: Table of Means for Micro Variables

	Turkish	Greek	Italian	Spanish	Total
Intended Duration of Residence	32.12	32.69	35.72	35.94	33.35
Saving Rate (%)	5.14	8.09	5.36	11.53	5.83
Current Duration of Residence	20.77	22.82	23.08	24.59	21.82
Age	48.17	49.39	47.38	49.70	48.21
High School Graduate	0.16	0.26	0.18	0.12	0.18
College Graduate	0.03	0.15	0.02	0.06	0.05
Cohort 1974-1983	0.18	0.13	0.25	0.02	0.18
Number of People	312	156	212	148	828
Number of Obs in Panel	3,137	1,468	1,997	1,152	7,754

Table 3: Fixed-Effects OLS Estimates for Intended Migration Duration

Dependent Variable: Intented Migration Duration			
	Specification 1	Specification 2	Specification 3
Log(PPP)	-8.271	-2.724	-0.481
	[9.158]	[7.587]	[6.093]
Log(PPP) * Age	-0.171	-0.223	-0.254
	[0.188]	[0.176]	[0.136]
Log(PPP) * Dur. of Res.	0.643*	0.632	0.652
	[0.230]	[0.292]	[0.281]
Wage Ratio	-8.719	-7.335	-5.187
	[7.667]	[9.769]	[10.944]
Wage Ratio * Age	-0.099	-0.113	-0.172
	[0.086]	[0.107]	[0.126]
Wage Ratio * Dur. of Res.	0.376	0.594	0.668
	[0.252]	[0.450]	[0.376]
Dur. of Residence	2.312**	2.229**	2.321**
	[0.508]	[0.599]	[0.617]
Age * Dur. of Residence	-0.029**	-0.028**	-0.029**
	[0.006]	[0.007]	[0.007]
Home Country Growth Rate			1.149
			[0.996]
Home Country Growth Rate * Age			-0.022
			[0.021]
Home Country Growth Rate * Dur. Of Res.			0.001
			[0.012]
Year Dummies	No	Yes	Yes
Observations	6782	6782	6782
Number of persnr	820	820	820
R-squared	0.232	0.238	0.239

Robust standard errors in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%
Standard errors are adjusted for clustering at the level of country of origin.
Macro variables are three-year moving averages.

Table 4: Impacts of PPP and Wage Ratio on Intended Migration Duration at Arrival

	Effect of Log(PPP)					
	Specification 1		Specification 2		Specification 3	
Age at Arrival	Coeff	SE	Coeff	SE	Coeff	SE
20	-11.696	5.699	-7.182	4.333	-5.564	4.004
25	-12.553	4.905 *	-8.296	3.598	-6.835	3.614
30	-13.410	4.172 **	-9.410	2.944 **	-8.105	3.319 *
35	-14.266	3.538 **	-10.525	2.438 **	-9.376	3.146 *
40	-15.123	3.065 **	-11.639	2.182 **	-10.647	3.114 **
45	-15.979	2.836 **	-12.753	2.265 **	-11.918	3.228 **

	Effect of Wage Ratio					
	Specification 1		Specification 2		Specification 3	
Age at Arrival	Coeff	SE	Coeff	SE	Coeff	SE
20	-10.691	5.960	-9.604	7.807	-8.621	8.551
25	-11.184	5.534	-10.172	7.332	-9.480	7.964
30	-11.677	5.108	-10.739	6.866	-10.339	7.384
35	-12.170	4.683 *	-11.306	6.410	-11.197	6.813
40	-12.663	4.259 *	-11.873	5.967	-12.056	6.253
45	-13.156	3.837 **	-12.441	5.540	-12.914	5.707

A T(3) distribution is used in forming the significance levels.
*** significant at 1 percent level, ** at 5 percent level, * at 10 percent level.

Table 5: Predicted Intended Migration Durations at Arrival according to Purchasing Power Parity and Wage Ratio

	PPP					
	1.25	*1.5*	*1.75*	*2*	*2.25*	*2.5*
Age at arrival = 20						
Wage Ratio = 0.75	7.44	5.31				
Wage Ratio = 0.5	10.12	7.99	6.17	4.61		
Wage Ratio = 0.25	12.79	10.66	8.85	7.29	5.91	4.68
Age at arrival = 30						
Wage Ratio = 0.75	6.32	3.88				
Wage Ratio = 0.5	9.24	6.80	4.73	2.94		
Wage Ratio = 0.25	12.16	9.72	7.64	5.86	4.28	2.87
Age at arrival = 40						
Wage Ratio = 0.75	5.20	2.45				
Wage Ratio = 0.5	8.37	5.61	3.27	1.26		
Wage Ratio = 0.25	11.53	8.78	6.44	4.42	2.64	1.05

Notes: Estimates are based on the parameters in specification 1 in Table 3. Duration of residence is set at zero. All other variables are set at their mean values.

Table 6: Predicted Intended Migration Durations according to Actual Values of PPP and Wage Ratios for the Four Source Countries in the Sample

	Specification 1			Specification 2			Specification 3		
	Age at Arrival			Age at Arrival			Age at Arrival		
	20	30	40	20	30	40	20	30	40
Turkish	5.19	3.45	1.71	6.70	4.50	2.29	7.85	4.63	1.40
Greek	9.29	8.18	7.08	8.65	7.20	5.75	7.87	5.91	3.95
Italian	8.70	7.73	6.76	7.15	5.96	4.77	7.16	5.04	2.93
Spanish	10.07	9.17	8.27	8.84	7.73	6.61	9.13	7.08	5.04

Notes: Estimates are based on the parameters in Table 3. Duration of residence is set at zero and all other variables are set at their mean values. In specification 3, source country growth rate is set at the country specific mean value and interacted with age accordingly.

Table 7: Censored Regression Estimates for Saving Rate

Dependent Variable: Saving Rate			
	Specification 1	Specification 2	Specification 3
Log(PPP)	0.245	0.334***	0.453***
	[0.155]	[0.089]	[0.138]
Log(PPP) * Age	0.003	0.005	0.003
	[0.004]	[0.004]	[0.003]
Log(PPP) * Dur. of Res.	-0.019***	-0.026***	-0.024***
	[0.004]	[0.006]	[0.004]
Wage Ratio	0.368	0.333	0.466
	[0.379]	[0.269]	[0.341]
Wage Ratio * Age	-0.004	0.000	-0.001
	[0.005]	[0.005]	[0.006]
Wage Ratio * Dur. of Res.	-0.008	-0.021**	-0.022***
	[0.007]	[0.011]	[0.008]
Dur. of Residence	-0.006	0.009	0.011
	[0.014]	[0.017]	[0.014]
Age	-0.004	-0.006*	-0.007
	[0.004]	[0.003]	[0.005]
Age * Dur. of Residence	0.000*	0.000	0.000
	[0.000]	[0.000]	[0.000]
High School Graduate	0.006	0.003	0.004
	[0.028]	[0.026]	[0.027]
College Graduate	0.058***	0.059***	0.056***
	[0.018]	[0.019]	[0.020]
1974-83 Arrival Cohort	-0.081**	-0.066	-0.068
	[0.035]	[0.043]	[0.043]
Greek	0.038***	0.056*	0.060**
	[0.008]	[0.030]	[0.028]
Italian	-0.027	0.079*	0.075*
	[0.033]	[0.042]	[0.043]
Spanish	0.069***	0.133***	0.144***
	[0.009]	[0.037]	[0.026]
Home Country Growth Rate			-0.04
			[0.040]
Home Country Growth Rate * Age			0.001
			[0.001]
Home Country Growth Rate * Dur. Of Res.			-0.002***
			[0.001]
Year Dummies	No	Yes	Yes
Observations	2418	2418	2418

The dependent variable is censored below at zero.
Robust standard errors in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%
Standard errors are adjusted for clustering at the level of country of origin.
Macro variables are moving averages of the last three years.

Table 8: Impacts of PPP and Wage Ratio on Saving Rate at Arrival

	Effect of Log(PPP)								
	Specification 1			Specification 2			Specification 3		
Age at Arrival	Coeff	SE		Coeff	SE		Coeff	SE	
20	0.297	0.112	*	0.435	0.109	**	0.509	0.113	**
25	0.311	0.108	*	0.460	0.123	**	0.523	0.113	***
30	0.324	0.107	*	0.486	0.138	**	0.537	0.115	***
35	0.337	0.110	*	0.511	0.155	**	0.551	0.120	***
40	0.350	0.115	*	0.536	0.173	*	0.565	0.127	**
45	0.363	0.124	*	0.562	0.191	*	0.579	0.135	**

	Effect of Wage Ratio					
	Specification 1		Specification 2		Specification 3	
Age at Arrival	Coeff	SE	Coeff	SE	Coeff	SE
20	0.295	0.318	0.327	0.255	0.442	0.263
25	0.277	0.307	0.325	0.258	0.435	0.249
30	0.259	0.298	0.323	0.262	0.429	0.239
35	0.241	0.291	0.322	0.268	0.423	0.234
40	0.223	0.286	0.320	0.277	0.417	0.232
45	0.205	0.285	0.319	0.287	0.411	0.235

These estimates are linear combinations of the estimators in censored regression presented in Table 7.
A T(3) distribution is used in forming the significance levels.
*** significant at 1 percent level, ** at 5 percent level, * at 10 percent level.

Table 9: Fixed-Effects OLS Estimates for the Decision to Save

Dependent Variable: Positive Savings or Not ({0,1})			
	Specification 1	Specification 2	Specification 3
Log(PPP)	-0.471**	-0.015	-0.023
	[0.136]	[0.683]	[0.752]
Log(PPP) * Age	0.027***	0.028***	0.043***
	[0.004]	[0.004]	[0.006]
Log(PPP) * Dur. of Res.	-0.040*	-0.052	-0.078
	[0.014]	[0.027]	[0.036]
Wage Ratio	-1.771	-1.284	-1.256
	[1.373]	[1.860]	[2.179]
Wage Ratio * Age	0.071***	0.069**	0.092**
	[0.011]	[0.016]	[0.020]
Wage Ratio * Dur. of Res.	-0.084	-0.102	-0.143
	[0.036]	[0.059]	[0.068]
Dur. of Residence	-0.095**	-0.073	-0.055
	[0.026]	[0.044]	[0.057]
Age * Dur. of Residence	0.001**	0.001**	0.001**
	[0.000]	[0.000]	[0.000]
Home Country Growth Rate			-0.149**
			[0.043]
Home Country Growth Rate * Age			0.005*
			[0.002]
Home Country Growth Rate * Dur. Of Res.			-0.005
			[0.003]
Year Dummies	No	Yes	Yes
Observations	2423	2423	2423
Number of persnr	403	403	403
R-squared	0.045	0.049	0.056

Robust standard errors in brackets; * significant at 10%; ** significant at 5%; *** significant at 1%
Standard errors are adjusted for clustering at the level of country of origin.
Macro variables are moving averages of the last three years.

Table 10: Impacts of PPP and Wage Ratio on the Decision to Save

	Effect of Log(PPP)							
	Specification 1			Specification 2			Specification 3	
Age at Arrival	Coeff	SE		Coeff	SE		Coeff	SE
20	0.069	0.130		0.554	0.755		0.841	0.844
25	0.204	0.136		0.696	0.774		1.057	0.868
30	0.339	0.145	*	0.838	0.792		1.273	0.893
35	0.475	0.155	*	0.980	0.811		1.489	0.918
40	0.610	0.168	**	1.122	0.830		1.705	0.944
45	0.745	0.182	**	1.264	0.848		1.921	0.970

	Effect of Wage Ratio							
	Specification 1			Specification 2			Specification 3	
Age at Arrival	Coeff	SE		Coeff	SE		Coeff	SE
20	-0.345	1.147		0.105	1.552		0.575	1.786
25	0.011	1.090		0.452	1.475		1.033	1.688
30	0.368	1.034		0.799	1.400		1.490	1.590
35	0.724	0.978		1.146	1.324		1.948	1.492
40	1.081	0.922		1.493	1.250		2.406	1.395
45	1.437	0.865		1.840	1.176		2.863	1.299

These estimates are linear combinations of the estimators in fixed-effects OLS regression presented in Table 9.
A T(3) distribution is used in forming the significance levels.
*** significant at 1 percent level, ** at 5 percent level, * at 10 percent level.

Figure 1: Distribution of Age at Arrival and Age in the Full Sample

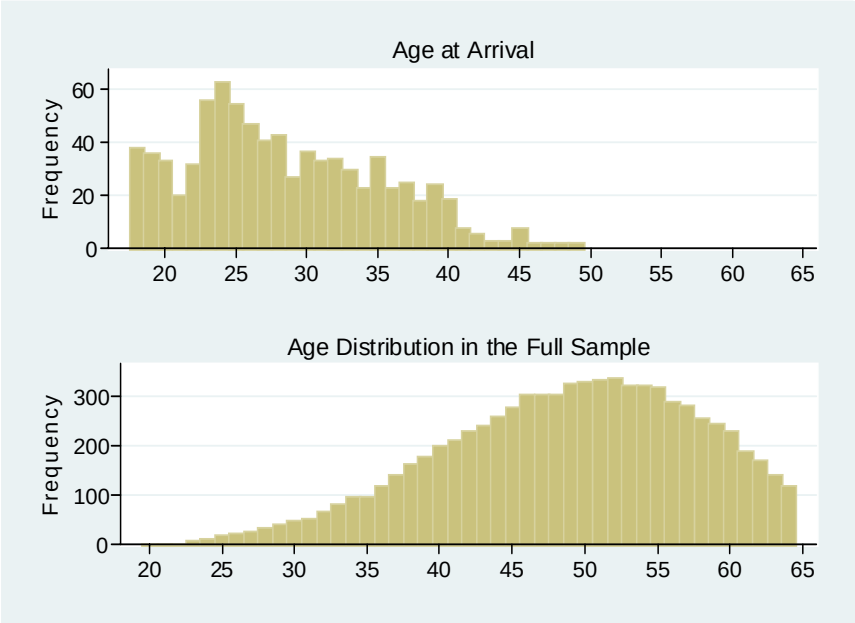


Figure 2: Distribution of Current and Intended Duration of Residences

Figure 3: Mean Intended Duration of Residence by Current Duration of Residence

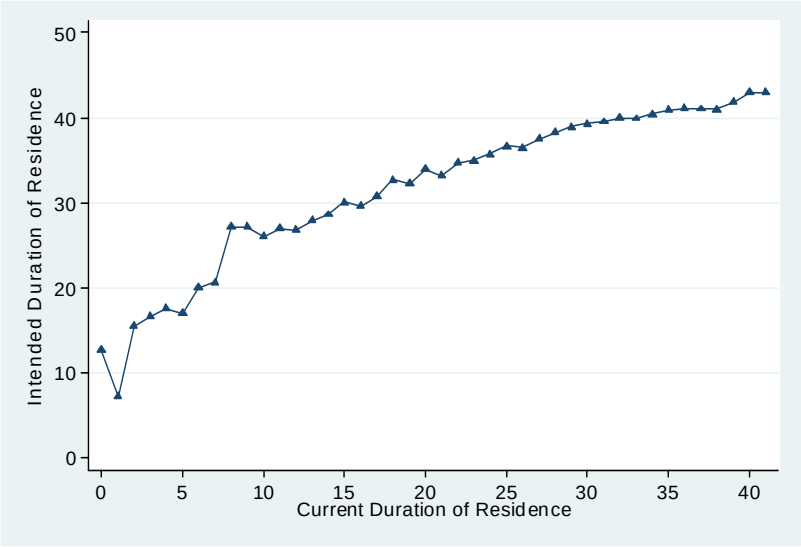


Figure 4: Mean Saving Rate by Duration of Residence

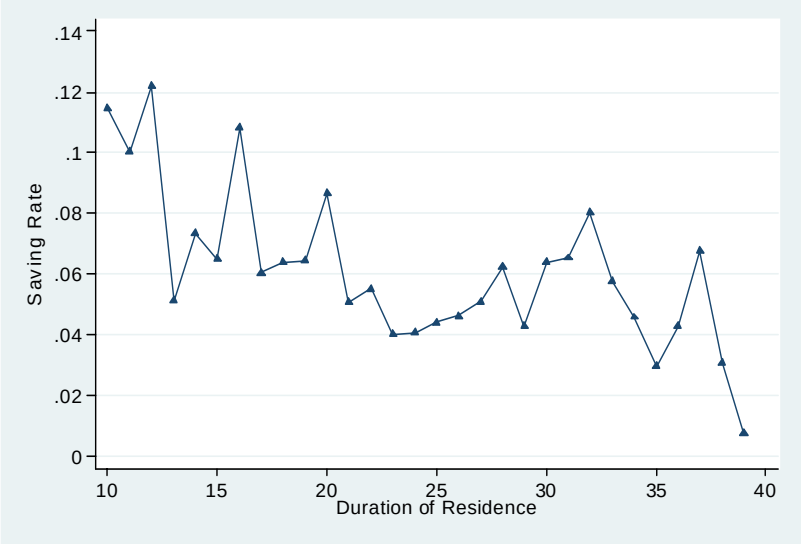


Figure 5: Purchasing Power Parity of Source Countries with Germany

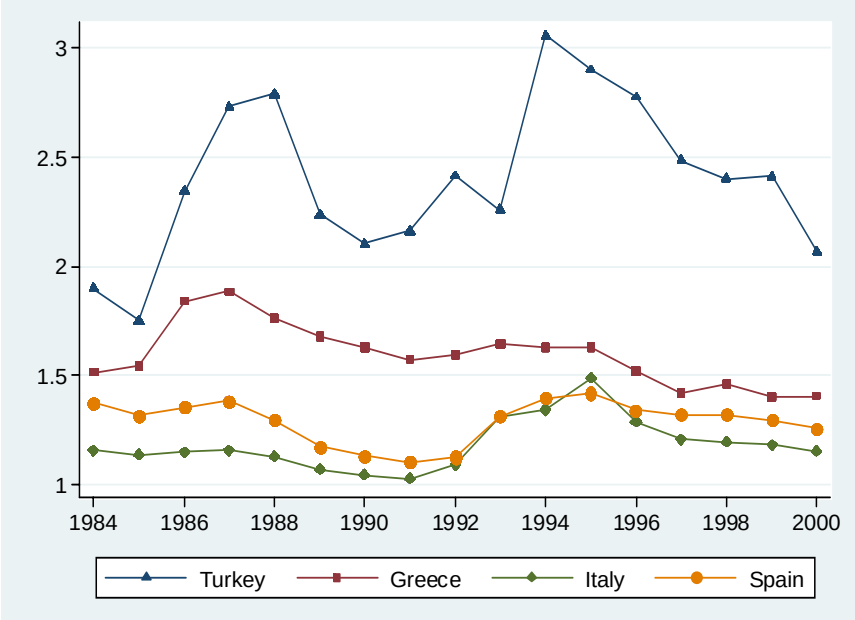
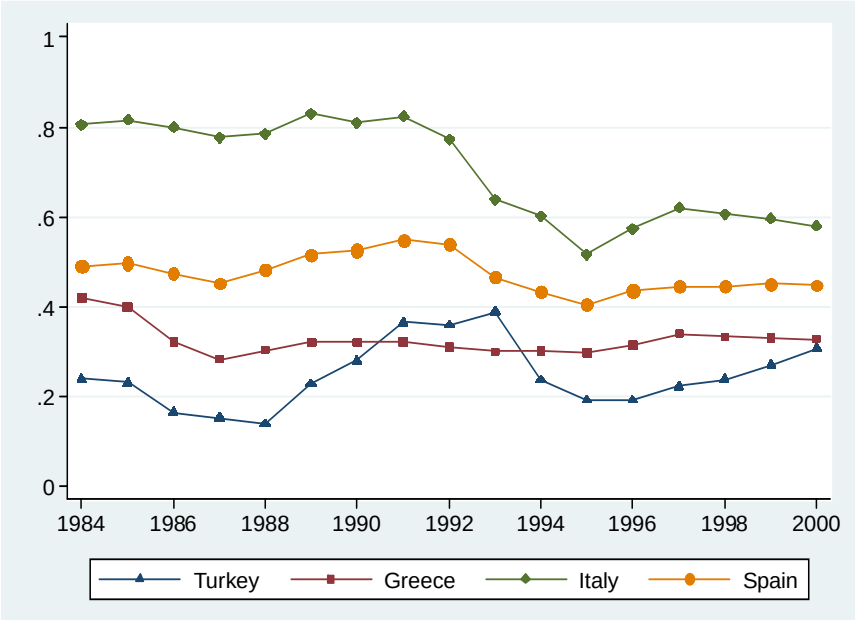


Figure 6: Source Country Expected Wage Rate as a Ratio of German Wage Rate (In Manufacturing)



A Impact of PPP on Consumption

The partial derivative of optimal host country consumption with respect to ppp was given in equation 9 as follows:

$$\frac{\partial c^*}{\partial p} = \frac{\alpha}{p^{(\alpha-2)/(\alpha-1)}\left(\alpha-1\right)^2\left(p^{\frac{\alpha}{\alpha-1}}-1\right)^2}\left(y_h - p^{\frac{\alpha}{\alpha-1}}y_h - p\alpha y_g + p^{\frac{\alpha}{\alpha-1}}\alpha y_h\right) \tag{19}$$

Here, I will show that $\partial c^*/\partial p < 0$. This will be done separately for positive alpha, negative alpha, and alpha equal to zero.

a) $\alpha > 0$

Since the term in the denominator is always positive, I need to show that

$\left(y_h - p^{\frac{\alpha}{\alpha-1}}y_h - p\alpha y_g + p^{\frac{\alpha}{\alpha-1}}\alpha y_h\right) < 0$. Since $y_g > y_h$ and α and p are positive numbers, the below first inequality follows

$$\begin{aligned} y_h - p^{\frac{\alpha}{\alpha-1}}y_h - p\alpha y_g + p^{\frac{\alpha}{\alpha-1}}\alpha y_h &< y_h - p^{\frac{\alpha}{\alpha-1}}y_h - p\alpha y_h + p^{\frac{\alpha}{\alpha-1}}\alpha y_h \\ &= y_h\left[1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha-1)\right] \end{aligned} \tag{20}$$

Since y_h is non-negative, I need to show that $1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha-1)$ is non-positive. For this purpose, I examine the maximum value that this term can take.

$$\frac{\partial}{\partial p}\left(1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha-1)\right) = \alpha\left(p^{\frac{1}{\alpha-1}} - 1\right) \leq 0$$

because $p^{\frac{1}{\alpha-1}} \leq 1$ as $\frac{1}{\alpha-1} < 0$. This implies that $1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha-1)$ is a decreasing function of p. When p is equal to 1, $1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha-1) = 1 - \alpha + (\alpha-1) = 0$. Since p is greater than 1, $\left[1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha-1)\right]$ is always non-positive, which implies that $y_h\left[1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha-1)\right]$ is always non-positive. From inequality 20, it follows that $y_h - p^{\frac{\alpha}{\alpha-1}}y_h - p\alpha y_g + p^{\frac{\alpha}{\alpha-1}}\alpha y_h$ is negative.

b) $\alpha < 0$

The proof is very similar in this case. Since the denominator in equation 19 is positive, I need to show that $\left(y_h - p^{\frac{\alpha}{\alpha-1}}y_h - p\alpha y_g + p^{\frac{\alpha}{\alpha-1}}\alpha y_h\right) > 0$.

Since $y_g > y_h$, $p > 0$, and $\alpha < 0$, I can claim that

$$\begin{aligned} y_h - p^{\frac{\alpha}{\alpha-1}}y_h - p\alpha y_g + p^{\frac{\alpha}{\alpha-1}}\alpha y_h &> y_h - p^{\frac{\alpha}{\alpha-1}}y_h - p\alpha y_h + p^{\frac{\alpha}{\alpha-1}}\alpha y_h \\ &= y_h\left[1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha-1)\right] \end{aligned} \tag{21}$$

Here, I will show that $\left[1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha-1)\right]$ is non-negative. For this purpose, I examine the minimum value it attains.

$$\frac{\partial}{\partial p}\left(1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha-1)\right) = \alpha\left(p^{\frac{1}{\alpha-1}} - 1\right) \geq 0$$

because α is negative and $\left(p^{\frac{1}{\alpha-1}}-1\right)$ is a non-positive number ($p^{\frac{1}{\alpha-1}}$ is less than 1 as $\frac{1}{\alpha-1}$ is a negative number). This means that $\left[1-\alpha p+p^{\frac{\alpha}{\alpha-1}}(\alpha-1)\right]$ is an increasing function of p. In fact, when p is equal to 1, $1-\alpha p+p^{\frac{\alpha}{\alpha-1}}(\alpha-1)=1-\alpha+(\alpha-1)=0$. Therefore, since p is greater than 1, $\left[1-\alpha p+p^{\frac{\alpha}{\alpha-1}}(\alpha-1)\right]$ is always non-negative. This implies that $y_h\left[1-\alpha p+p^{\frac{\alpha}{\alpha-1}}(\alpha-1)\right]$ is always non-negative. From this, I can conclude that $\left(y_h-p^{\frac{\alpha}{\alpha-1}}y_h-p\alpha y_g+p^{\frac{\alpha}{\alpha-1}}\alpha y_h\right)>0$ according to inequality 21.

c) $\alpha=0$

$$\begin{aligned}\lim_{\alpha\to 0} \quad & \frac{\alpha}{p^{(\alpha-2)/(\alpha-1)}(\alpha-1)^2\left(p^{\frac{\alpha}{\alpha-1}}-1\right)^2}\left(y_h-p^{\frac{\alpha}{\alpha-1}}y_h-p\alpha y_g+p^{\frac{\alpha}{\alpha-1}}\alpha y_h\right)\\ = \quad & \frac{1}{p^2\ln^2 p}\left(y_h-py_g+y_h\ln p\right)=\frac{1}{p^2\ln^2 p}\left(y_h(1+\ln p)-py_g\right)\end{aligned}$$

Since $1+\ln p\le p$, and $y_h<y_g$, it follows that $y_h(1+\ln p)-py_g<0$. Therefore, $\partial c^*/\partial p<0$ when alpha is equal to zero.