

Source Country Characteristics and Immigrants' Migration Duration and Saving Decisions

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Abstract

This paper examines how immigrants' migration duration and saving decisions in the host country respond to changes in purchasing power parity (ppp) as well as in relative wages between the host and source countries. For this purpose, I develop a model of immigrants' joint migration duration and saving decisions and derive comparative static results regarding the impact of ppp and wage ratio on these decisions. An interesting implication of the theoretical model is that immigrants may in fact stay longer in the host country as a result of an increase in ppp, in particular those with a low degree of relative risk aversion. Another notable implication of the model is that as the relative wage level in the home country increases, immigrants' saving rate in the host country also increases. I test the implications of this model using a longitudinal dataset on immigrants in Germany from various source countries and employing panel data estimation methods. Both ppp and the ratio of wage level in the home country to that in the host country have a negative effect on the optimal migration duration. Moreover, optimal migration duration is elastic with respect to both variables. The empirical results also reveal that ppp has a positive effect on saving rates in Germany which is consistent with the implications of the model.

JEL Classification Codes: F22

Keywords: International Migration

1 Introduction

Section 2 presents the theoretical model and its comparative statics implications. The data are explained in section 3 and the estimation method in section 4. The empirical results are presented in section 5. Section 6 concludes.

2 Model

I write a simple model of joint consumption and migration duration decisions. (Similar models are used by). In this model, the return of immigrants to their home countries, despite higher earnings in the home country, are rationalized by the higher purchasing power of savings accumulated in the host country after returning to their home country due to lower prices there.

2.1 Basic Structure

In the optimization problem shown below, τ denotes the remaining worklife and t 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, $u(\cdot)$. 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 can not 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.

$$\begin{aligned} \max_{t, c} \quad & tu(c_1) + (\tau - t)u(c_2) \\ \text{s.t.} \quad & ptc_1 + (\tau - t)c_2 \leq pty_g + (\tau - t)y_h \\ & y_g \geq c_1 \geq c_{\min}, \quad \tau \geq t \geq 0 \end{aligned}$$

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 former condition is the reason to why these foreign workers are in the host country. I choose a constant relative-risk aversion utility function,

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

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

2.2 Characterization of the Solution

First, I characterize the solution to the above problem assuming that the optimal solution is an interior one.¹ (At the end of this section, numerical solutions that also allow for corner solutions are illustrated.) Since the utility function is monotonic, the budget constraint binds. Therefore, I can replace c_2 in the objective function with $\left(y^H + \frac{p.t.[y^G - c_1]}{(\tau - t)}\right)$ and write the first order conditions for an interior optimal point as follows:²

$$u(c_1) + \frac{p.[y^G - c_1].\tau}{\tau - t} u' \left(y^H + \frac{p.t.[y^G - c_1]}{(\tau - t)} \right) = u \left(y^H + \frac{p.t.[y^G - c_1]}{(\tau - t)} \right) \quad (1)$$

$$u'(c_1) - p.u' \left(y^H + \frac{p.t.[y^G - c_1]}{(\tau - t)} \right) = 0 \quad (2)$$

The left-hand-side of equation 1 is the benefit of staying for one more in the host country: the first term is the utility from consumption in the host country for one more period and the second term is the utility from the consumption of added savings (acquired by staying an additional period in the host country) after return to the home country. The right hand side of equation 1 is the loss of utility from consumption for one period in the home

¹Since the objective function is continuous and the constraint set for (t, 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.

²These F.O.C. are both necessary and sufficient. Since the utility function is concave, the objective function is a non-negative summation of concave functions and the constraint set is convex, the first order conditions are sufficient.

country. Equation 2 is the familiar consumption smoothing condition: the marginal utility of consumption is set equal across period after accounting for the price differences in different periods.

When the F.O.C.'s given in equations 1 and 2 are solved for this utility function, the following optimal migration duration and consumption decision rules are found:

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

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

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

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

The optimal migration duration is a function of the decision period, curvature parameter, purchasing power parity, and relative wages. The interesting feature of this function is that it is the ratio of the wages that matter, not their levels. The saving rate, $1 - c^*/y_g$, also depends on the wage ratio, not on the levels of wages. In the consumption smoothing problem of the migrant in different locations, the ratio of the wages determines the fraction of the host country wage that must be saved in order to smooth consumption. For instance, if both host and home country wages were to double, the fraction of the host country wage that must be saved in order to smooth consumption does not change even though the amount of it changes. Since this increased in amount but not in proportion saving levels make the same proportional increase in the host country earnings after return (compared to the baseline case), it takes the same amount of time in the host country to accumulate these savings. However, the fact that we are assuming an interior optimal point is critical here; if the minimum consumption constraint were binding, this result would obviously not hold. When the minimum consumption constraint binds, a higher wage rate in the host country also implies a higher saving ability. This could change the saving rate 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.

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

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

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

2.3.2 Purchasing Power Parity and Optimal Migration Duration and Consumption Choices

Using equations 6 and 7, I also examine how the optimal migration duration and consumption choices respond to changes in purchasing power parity. The partial derivative of optimal migration duration with respect to purchasing power parity is given in equation 8.

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

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

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

This finding that a higher purchasing power parity implies a longer optimal migration duration in certain cases is a new one. Stark et al (.) established a negative relationship between purchasing power parity and optimal migration duration; however, their analysis was based on a specific utility function, the logarithmic function, whereas my analysis allows for a general type of utility functions. In fact, I show in Appendix A that, the partial derivative of optimal migration duration with respect to ppp, given in equation 8 above, is

negative for a logarithmic utility function as Stark et al (.) claimed. However, this is not the case in general.

It is also important to understand the impact of ppp on host country consumption because since immigrants make joint consumption and optimal migration duration decisions, any impact of ppp on host country consumption will have an impact on the optimal migration duration as well. Equation 9 displays the partial derivative of optimal consumption in the home country with respect to purchasing power parity. The sign of this partial derivative is not immediately obvious from the equation; however, it is shown in Appendix B that $\partial c^*/\partial p$ is, in fact, negative.

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

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.*

Galor and Stark (1990) show that the probability of return migration would induce immigrants to save more than the natives; however, they do not examine the relationship between immigrants' saving behavior and purchasing power parity. Here, I show that, ceteris paribus, immigrants' from poorer countries save more in the host country compared to immigrants from relatively wealthier source countries.

Special Case: $y_h = 0$ Next, I investigate how immigrants' optimal migration duration and consumption decisions respond to purchasing power parity when they are not intending to work as wage-earners after returning to their home country. This restriction allows drawing more general conclusions regarding the impact of purchasing power parity on optimal migration duration. However, it is not a restriction made only for tractability; it has empirical justification in many immigration contexts as many immigrants who migrate to the host country to work and accumulate savings are not willing to work as wage-earners in their home country after return. For instance, Dustmann and Kirchkamp (2000) report, based on a sample of Turkish return migrants from Germany in Turkey, less than five percent worked as wage-earners. Massey and .. (.) reports that return migration of Mexican immigrants do not respond to the home country vs. host country wage ratio much.

Here, I focus on the impact of purchasing power parity on optimal migration duration only as the its impact on consumption decision has an unambiguous effect in the general case. In the case that immigrants do not plan to work as wage-earners in their home country after return, the partial derivative of optimal migration duration decision with respect to purchasing power parity is given in equation 10. Unlike the general case above, the partial derivative of optimal migration duration with respect to purchasing power parity is always negative.

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

Proposition 3 *In the case that 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

TABLE 1

In this subsection, I provide numerical solutions to immigrants' joint migration duration and consumption decisions accounting for corner solutions, which is displayed in Table 1. The home country real wage rate is set to 75 percent of host country real wage rate in the first panel, to 50 percent of it in the second panel, and to 25 percent in the third. Each panel displays how optimal consumption and migration duration changes as purchasing power increases for various values of the curvature parameter. Whenever the minimum consumption constraint is binding, the optimal migration duration for an interior solution (minimum consumption constraint not enforced) is also given in paranthesis.

As can be seen from Table 1, the optimal migration duration decreases as purchasing power parity increases in most cases, but not all. In fact, when the curvature parameter and the wage rate in the home country are sufficiently high, optimal migration duration increases with purchasing power parity at certain ranges of ppp. For instance, when the wage rate in the home country is seventy-five percent of that in the host country and the curvature parameter is 0.7 or higher, the optimal migration duration increases with ppp at certain ranges of ppp. One could wonder if this arises due to the imposition of the minimum consumption constraint because wherever $\partial t^*/\partial p$ 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 $\partial t^*/\partial p$ is positive at certain ranges of ppp when the curvature parameter 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 $\partial t^*/\partial p$ is observed in Tables 2 and 3, as well. This confirms that the interior solution characterization of $\partial t^*/\partial p$ in equation 8, in fact, takes either sign.

2.5 Interpretation

TO BE COMPLETED.

Use willingness to substitute for intuition

Two separate effects of increasing ppp. On one hand, consumption in the home country after return increases. Therefore, immigrants want to spend a larger fraction of their worklife in their home country to take advantage of increased consumption and utility after return. On the other hand, the benefit to staying longer in Germany and accumulating more savings also increases. While the former effect dominates for most immigrants, the second one dominates for immigrants who are less risk averse (more willing to substitute intertemporally) because the extra utility that is gained from additional savings is higher for them. Moreover, there is the indirect effect coming from the change in consumption behavior. A higher purchasing power parity increases savings in the host country. This strengthens the former effect (income effect), immigrants accumulate savings faster and the effect of increased ppp becomes stronger. This indirect effect – which decreases optimal migration duration – is also weaker for immigrants who are less risk averse because first these immigrants already save more as a result of their higher willingness to substitute consumption intertemporally, therefore the room for increase in savings is less; 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.

Why positive effect when home country earnings are higher? As can be seen from equation X, as home country earnings increase, optimal migration duration decreases. As a result, holding alpha fixed, immigrants who face higher earnings after return return earlier and return with lower savings. Since they return with lower savings, the income effect is weaker for them. Moreover, as they face a longer duration of time in their home country after return, the substitution effect – the benefit of extra savings that can be accumulated – is higher for them. Therefore, when the curvature parameter is high enough (risk aversion is low enough), while we observe cases where the impact of ppp on optimal migration duration is positive

when the earnings after return is high, we do not observe a positive impact of ppp on optimal migration duration when the earnings after return is low. In addition, conditional on alpha, the minimum consumption level is more likely to be binding for a given value of ppp when the earnings after return 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

German Socioeconomic Panel (1984-2000).

Longitudinal dataset conducted every year.

Contains an over-sampled group of immigrants.

Sample is restricted to:

Immigrants from Turkey, Greece, Italy and Spain (ex-Yugoslavian immigrants are dropped.)

Households with a male household head who were 18 or older at arrival.

Information on intended migration duration (in number of years) every year. When the intended age of return exceeds 60 (earliest age of retirement), intended migration duration is taken as the time remaining until age 60.

Information on annual saving every year after 1991. This along with household income is used to generate saving rate.

Control variables: age, duration of residence (year of immigration is available), unemployment status

MACRO DATA

Source country and time variation in a number of macroeconomic variables that influence migration duration and saving decisions.

3.1 Descriptive Statistics

TABLE 1

4 Estimation

According to the model, the impact of ppp as well as wage ratio on optimal migration duration varies by the decision horizon (i.e. age at arrival), as can be seen in equations 8 and 6. On the other hand, the impact of ppp and wage ratio on saving rate does not depend

on the decision horizon. However, the model assumes constant wages. In the more general case of age-dependent wages, the impact of ppp and wage ratio on saving behavior would also depend on the age at arrival. Therefore, the empirical specification would have the following form:

$$y_i = \beta_0 + \beta_1 ppp_i + \beta_2 ppp_i age_i + \beta_3 wage_i + \beta_4 wage_i age_i + \beta_5 x_i + u_i \quad (11)$$

where y stands for the two dependent variables – intended migration duration and saving – and x stands for the all time-invariant immigrant characteristics like country of origin, birth cohort, schooling as well as time-invariant characteristics after arrival to Germany like marriage status at arrival, whether the immigrant had children at arrival. Time-variant immigrant characteristics like household income, experience, labor market status, household size, etc are not included in the specification because these variables are endogenous and jointly determined with both migration duration and saving decisions.

Ideally, we would like to observe the dependent variables (intended migration duration and saving) as well as the key control variables (purchasing power parity and wage ratio) at the time of arrival to Germany. In this case, all of the variables in equation 11 would be at the time of arrival. However, the data include information on intended migration duration and saving choices not at arrival but at various years after arrival. Since the effects of ppp and wage ratio would depend on the duration of residence, I also add interaction terms with duration of residence to the specification given in equation 11

$$y_i = \beta_0 + \beta_1 ppp_i + \beta_2 ppp_i age_i + \beta_3 ppp_i res_i + \beta_4 wage_i + \beta_5 wage_i age_i + \beta_6 wage_i res_i + \beta_7 x_i + u_i \quad (12)$$

At the same time, the data have a very nice feature in that repeated intended migration duration and saving choices are given for an individual over time. Therefore, I take the following panel estimation approach: I investigate how optimal migration duration and saving choices respond to changes in ppp and the wage ratio over time. In particular, I use a within-effects estimator. The neat feature of this method is that it eliminates individual level unobserved heterogeneity. For instance, if age-at-arrival were correlated with some unobserved characteristic of immigrants, any finding regarding how the impact of ppp and wage ratio changes by age could be biased.

An issue with the savings data is that it is censored below at zero. (Negative savings are not reported.) Therefore, I take a censored regression approach when the dependent variable

is saving rate.

5 Empirical Results

5.1 Migration Duration

The results of fixed-effects regression of intended migration duration are presented in Table 3. 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 for selected values of age and zero duration of residence. 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, there is evidence that an increase in ppp as well as an increase in the wage level in the home country relative to Germany lower the optimal migration duration in Germany. (The evidence for the wage ratio is relatively weak, though, at the 10 percent significance level.) Both findings are consistent with the implications of the theoretical model. However, for the youngest age-at-arrival groups among the immigrants, there exists no evidence for either ppp or the wage ratio influencing the optimal migration duration. Since the implications of the theoretical model are based on the assumption of an interior solution, we could fail to find evidence for these implications for immigrants who arrive at younger ages if corner solutions are more likely to exist for them. For instance, it could be that younger age-at-arrival immigrants are more likely to stay in Germany throughout their lives. In this case, it would be no surprise that their optimal migration duration do not respond to the changes in either ppp or wage ratio. Table 4 also illustrates that there exists no evidence that the growth rate of the home country has an effect on immigrants' optimal migration duration.

The magnitude of the effect of ppp on optimal migration duration is also significant. For instance, according to Table 4, for an immigrant who is 35-years-old at arrival, a 10 percent increase in ppp lowers the optimal migration duration by more than 0.8 years. Since the predicted migration duration for an average immigrant who arrives Germany at age thirty-five is 5.4 years, this means that a 10 percent increase in ppp lowers the optimal migration duration by roughly 15 percent for this immigrant. Similarly, the impact of a change in the wage ratio on optimal migration is strong. Again for an immigrant who is 35-years-old at arrival, a ten percent increase in the wage ratio decreases the optimal migration duration

by more than a year. In other words, for an average immigrant who enters Germany at age thirty-five, a 10 percent increase in wage ratio lowers the optimal migration duration by almost 19 percent.

These findings imply that immigrants from poorer countries may, in fact, stay shorter in the host country if the impact of a higher ppp dominates the impact of a lower wage ratio. To examine whether immigrants from relatively poorer or wealthier countries would stay longer in the host country, predicted migration durations are given for selected values of ppp and wage ratio in Table 5. 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 is the case, the gap diminishes substantially; and, in fact, in certain reasonable cases, immigrants from poorer countries stay shorter. For instance, an immigrant coming from a source country where the wage ratio is 25 percent of that in Germany and the ppp is 2.5 would stay shorter than an immigrant originating from a source country for which the wage ratio is 0.75 and ppp is 1.25.

5.2 Savings

Table 6 presents the censored regression estimation results for saving rates. 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 7 for selected values of age and zero duration of residence (i.e. at arrival to Germany). Before discussing the findings regarding the source country characteristics in Table 7, I will go over the estimates for time-invariant immigrants characteristics in Table 6.

Education has a positive impact on saving rates. (This is statistically significant at the 1 percent level.) This probably arises due to the fact that education is a strong indicator of permanent income of immigrants. It could also be due to the fact that more educated immigrants have different preferences regarding saving.

The dummy for immigrants who arrived Germany after 1973 – after the guestworker programme ended – is negative and statistically significant at the five percent level. This is probably due to the fact that these immigrants are different in terms of their tastes for saving. These immigrants could have different motives in migrating to Germany compared to guestworkers, many of whom went to Germany to accumulate savings before returning to their home countries.

The married-at-arrival dummy has a positive impact on saving rate that is strongly

statistically significant. The fact that these immigrants made the decision to immigrate to Germany despite being married (when the cost of migration is presumably higher) indicates that they are probably different from immigrants who are unmarried at arrival in terms of their willingness to work in a foreign country and save money. Moreover, their marital status at arrival could also mean higher psychic costs of staying in Germany, which would increase their willingness to return as soon as possible, and, therefore, their willingness to save as much as possible.

The dummy for the existence of any children at arrival has negative impact that is statistically significant at the five percent level. This is expected as children would imply a higher marginal utility of consumption. Moreover, these immigrants could be different in terms of their permanent characteristics, in particular their taste for savings, because the fact that these immigrants made the decision to immigrate despite having children indicates that they are probably different in terms of certain permanent characteristics from the rest.

The impacts of ppp, wage ratio, and source country growth rate are given in Table 7. There is some evidence that purchasing power parity has a positive impact on saving rates. This evidence is statistically significant at the ten percent level for immigrants who are relatively older at arrival whereas statistical significance goes down for immigrants who are younger at arrival. The positive impact of ppp on the saving rate is consistent with the corresponding implication of the theoretical model.

Even though the statistical significance of the impact of ppp on saving rate is relatively weak, its economic significance is quite strong. For instance, for an immigrant who is forty-years-old at arrival, a 10 percent increase in ppp increases the saving rate by 5.4 percent. (The average predicted value of saving rate is -5.52 percent with a standard deviation of 0.051.)

While the impact of wage ratio on the saving rate is positive, as implied by the theoretical model, this is statistically insignificant. There exists no evidence at all for an effect of the home country growth rate on the saving rate.

6 Conclusions

TO BE COMPLETED.

References

- [1] Borjas, G.J. and B. Bratsberg. "Who Leaves? The Outmigration of the Foreign-born", *Review of Economics and Statistics* 78, 165-176. (1996)
- [2] Dustmann, C., 2003. "Return Migration, Wage Differentials, and Optimal Migration Duration",. *European Economic Review* 47, 353-369.
- [3] Dustmann, C., Kirchkamp, O., 2002. The Optimal Migration Duration and Activity Choice after Re-migration. *Journal of Development Economics* 67, 351-372.
- [4] Galor O. and O. Stark. "Migrants' Savings, the Probability of Return Migration and Migrants' Performance", *International Economic Review*, 31, 463-467. (1990)
- [5] International Labor Organization. LABORSTA - database of labor statistics. <http://laborsta.ilo.org/>
- [6] Massey, Douglas and Kristin Espinosa. "What's Driving Mexico-U.S. Migration? A Theoretical, Empirical, and Policy Analysis", *American Journal of Sociology*, 102, 939-999. (1997).
- [7] Organization for Economic Development and Cooperation (OECD), 2002. OECD Indicators, Benefits and Wages.
- [8] Organization for Economic Development and Cooperation (OECD), 2002. OECD Indicators, PPP.
- [9] Stark, O., Helmenstein, C. and Y. Yegerov. "Migrants' Savings, Purchasing Power Parity, and the Optimal Duration of Migration", *International Tax and Public Finance*, 4, 307-324 (1997).
- [10] U.S. Department of Labor, Bureau of Labor Statistics. International Comparisons of Hourly Compensation Costs for Production Workers in Manufacturing, Supplementary Tables.

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
<i>alpha</i> = 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)
<i>alpha</i> = 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)
<i>alpha</i> = 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)
<i>alpha</i> = 0.1	1.00	40.00	0.99	39.35	0.87	32.36	0.73	25.89	0.64	22.81
<i>alpha</i> = -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
<i>alpha</i> = 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)
<i>alpha</i> = 0.5	1.00	40.00	0.95	38.67	0.75	33.33	0.53	28.33	0.50	27.32 (26.00)
<i>alpha</i> = 0.1	1.00	40.00	1.00	40.00	1.00	40.00	0.83	32.32	0.71	27.61
<i>alpha</i> = -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
<i>alpha</i> = 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)
<i>alpha</i> = 0.5	1.00	40.00	1.00	40.00	0.88	37.14	0.60	31.11	0.50	28.83 (28.18)
<i>alpha</i> = 0.1	1.00	40.00	1.00	40.00	1.00	40.00	0.93	37.32	0.78	31.54
<i>alpha</i> = -1	1.00	40.00	1.00	40.00	1.00	40.00	1.00	40.00	1.00	40.00

Values inside paranthesis are optimal migration durations when the minimum consumption constraint is not enforced.

Table 2: Descriptive Statistics

	<i>Turkish</i>	<i>Greek</i>	<i>Italian</i>	<i>Spanish</i>	<i>Total</i>
<i>Micro Sample</i>					
Number of people	304	151	202	136	793
Number of obs in panel	2,506	1,077	1,584	885	6,052
Intended Duration of Residence	28.27 (6.92)	29.12 (7.34)	31.44 (8.76)	32.09 (6.60)	29.42 (7.63)
Current Duration of Residence	19.53 (6.30)	22.11 (7.09)	21.87 (8.09)	23.56 (6.03)	20.70 (7.05)
Age	47.59 (8.41)	49.69 (8.86)	47.14 (10.76)	49.98 (9.18)	47.875 (9.39)
Unemployed	0.142 (0.358)	0.062 (0.251)	0.073 (0.270)	0.045 (0.229)	0.109 (0.303)
Household Income (DM, 1998)	51,409 (24,723)	57,465 (29,679)	52,592 (25,500)	54,995 (24,305)	52,665 (26,000)
<i>Macroeconomic Variables</i>					
PPP	2.40 (0.36)	1.59 (0.14)	1.18 (0.12)	1.29 (0.10)	1.62 (0.52)
Wage Ratio	0.25 (0.07)	0.33 (0.03)	0.70 (0.11)	0.47 (0.04)	0.44 (0.19)
Home Country Growth Rate	4.47 (4.52)	2.03 (1.96)	2.22 (1.26)	3.22 (1.73)	2.98 (2.80)
German Growth Rate					2.52 (1.46)

Standard errors in paranthesis

Table 3: Fixed-Effects Estimates for Intended Migration Duration

<i>Dependent Variable: Intended Migration Duration</i>				
<i>Independent Variables</i>	<i>Specification 1</i>		<i>Specification 2</i>	
	<i>Coeff</i>	<i>SE</i>	<i>Coeff</i>	<i>SE</i>
Log(PPP)	-4.513	8.395	-3.871	8.401
Log(PPP) * Age	-0.104	0.204	-0.096	0.203
Log(PPP) * Dur. of Res.	0.413	0.224 *	0.362	0.226
Wage Ratio	-6.044	11.278	-5.688	11.277
Wage Ratio * Age	-0.120	0.281	-0.106	0.281
Wage Ratio * Dur. of Res.	0.567	0.348	0.504	0.350
Home Country Growth Rate	-0.375	0.279	-0.351	0.278
Home Country Growth Rate * Age	0.009	0.006	0.008	0.006
Home Country Growth Rate * Dur. Of Res.	-0.005	0.007	-0.004	0.007
Dur. of Residence	2.235	0.355 ***	2.528	0.402 ***
Age * Dur. of Residence	-0.027	0.003 ***	-0.028	0.004 ***
Household Income			0.010	0.006 *
Labor Market Experience			-0.216	0.089 **
Unemployed			-0.151	0.359
Number of obs	6786		6786	
Number of groups	823		823	
F(26,5937)	29.74			
F(29,5934)			27.57	
p-value	0.000		0.000	

The specifications also include year dummies.

Household income is divided by 1,000.

*** significant at 1 percent level, ** significant at 5 percent level, * significant at 10 percent level.

Table 4: Impacts of PPP, Wage Ratio, and Home Country Growth Rate on Intended Migration Duration at Arrival

<i>Age</i>	<i>PPP</i>		<i>Wage Ratio</i>		<i>Home Country Growth Rate</i>	
	<i>Coeff</i>	<i>SE</i>	<i>Coeff</i>	<i>SE</i>	<i>Coeff</i>	<i>SE</i>
20	-6.60	5.25	-8.44	7.10	-0.19	0.19
25	-7.12	4.69	-9.04	6.42	-0.15	0.17
30	-7.64	4.31 *	-9.64	5.98	-0.10	0.16
35	-8.16	4.14 **	-10.24	5.86 *	-0.06	0.15
40	-8.68	4.23 **	-10.84	6.08 *	-0.01	0.15
45	-9.20	4.54 **	-11.44	6.59 *	0.03	0.15
50	-9.72	5.04 *	-12.04	7.34	0.08	0.16

*** significant at 1 percent level, ** significant at 5 percent level, * significant at 10 percent level.

Estimates are based on specification 1 in Table 3.

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

	<i>PPP</i>	1.25	1.5	2	2.5
<i>Age at arrival = 20</i>					
<i>Wage Ratio = 0.75</i>		6.11	4.91	3.01	1.54
<i>Wage Ratio = 0.5</i>		8.22	7.02	5.12	3.65
<i>Wage Ratio = 0.25</i>		10.33	9.13	7.23	5.76
<i>Age at arrival = 30</i>					
<i>Wage Ratio = 0.75</i>		5.25	3.86	1.66	-0.04
<i>Wage Ratio = 0.5</i>		7.66	6.27	4.07	2.37
<i>Wage Ratio = 0.25</i>		10.07	8.68	6.48	4.78
<i>Age at arrival = 40</i>					
<i>Wage Ratio = 0.75</i>		4.39	2.81	0.31	-1.63
<i>Wage Ratio = 0.5</i>		7.10	5.52	3.02	1.08
<i>Wage Ratio = 0.25</i>		9.81	8.23	5.73	3.79

Duration of residence is set at zero.

Predictions are based on specification 1 in Table 3.

Table 6: Censored Regression Estimates for Saving Rate

<i>Dependent Variable: Saving Rate</i>		
<i>Independent Variables</i>	<i>Coeff</i>	<i>SE</i>
Log(PPP)	0.099	0.407
Log(PPP) * Age	0.011	0.008
Log(PPP) * Dur. of Res.	-0.033	0.010 ***
Wage Ratio	0.182	0.630
Wage Ratio * Age	0.007	0.015
Wage Ratio * Dur. of Res.	-0.032	0.018 *
Home Country Growth Rate	-0.102	0.016
Home Country Growth Rate * Age	0.004	0.004
Home Country Growth Rate * Dur. Of Res.	-0.005	0.005
Dur. of Residence	0.028	0.013 **
Age	-0.011	0.011
Years of Schooling	0.011	0.003 ***
1974-83 Cohort	-0.072	0.036 **
Married at Arrival	0.051	0.017 ***
Children at Arrival	-0.052	0.023 **
Greek	0.017	0.117
Italian	0.036	0.097
Spanish	0.087	0.131
Number of obs	2422	
F(26,2396)	4.02	
p-value	0.000	

The dependent variable is censored below at zero.

The specifications also include year dummies.

Home country growth rate is divided by 10.

Significance: *** at 1 percent level; ** at 5 percent level; * at 10 percent level.

Table 7: Impacts of PPP, Wage Ratio, and Home Country Growth Rate on Saving Rate at Arrival

<i>Age</i>	<i>Log(PPP)</i>		<i>Wage Ratio</i>		<i>Home Country Growth Rate</i>	
	<i>Coeff</i>	<i>SE</i>	<i>Coeff</i>	<i>SE</i>	<i>Coeff</i>	<i>SE</i>
20	0.321	0.333	0.330	0.473	-0.011	0.012
25	0.376	0.325	0.367	0.455	-0.009	0.010
30	0.432	0.321	0.404	0.449	-0.007	0.008
35	0.487	0.323	0.441	0.456	-0.005	0.006
40	0.542	0.329 *	0.478	0.473	-0.002	0.005
45	0.598	0.340 *	0.516	0.501	0.000	0.004
50	0.653	0.355 *	0.553	0.537	0.002	0.003

*** significant at 1 percent level, ** significant at 5 percent level, * significant at 10 percent level.

A Impact of PPP on Optimal Migration Duration for a Logarithmic Utility Function

Here, I show that the partial impact of ppp on optimal migration duration, given in equation 8, is always negative when the utility function is of logarithmic form. The CRRA utility function is in fact a logarithmic function as alpha converges to zero. Therefore, I take the limit of equation 8 as alpha goes to zero to find the partial impact of ppp on migration duration for a logarithmic utility function.

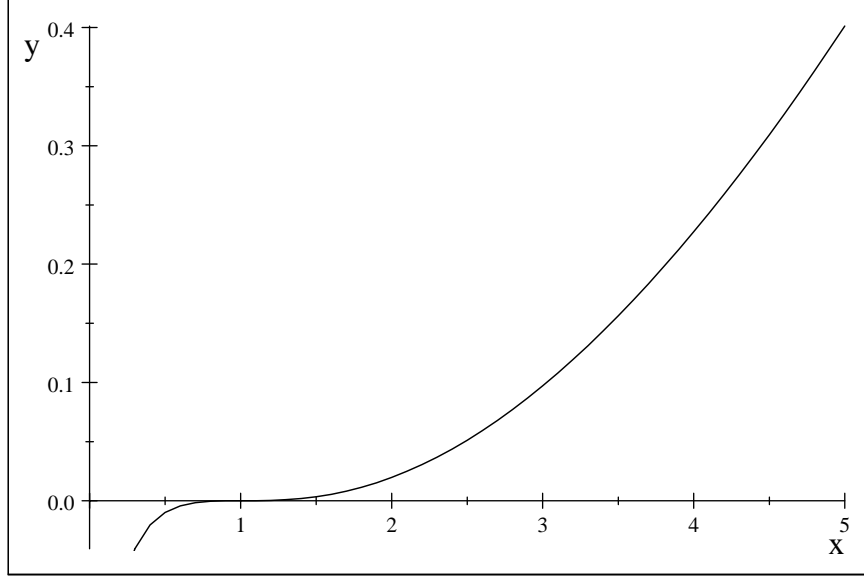
$$\begin{aligned}
& \lim_{\alpha \rightarrow 0} \frac{\tau \left(-y_g y_h (\alpha - 1)^2 \left(p^{1/2} - p^{\frac{3\alpha-1}{2(\alpha-1)}} \right)^2 - 2\alpha^2 p^{\frac{2\alpha-1}{\alpha-1}} y_g y_h + p^{\frac{3\alpha-2}{\alpha-1}} \alpha^2 y_g^2 + p^{\frac{\alpha}{\alpha-1}} \alpha^2 y_h^2 \right)}{(\alpha - 1) (y_h - p y_g)^2 p \left(p^{\frac{\alpha}{\alpha-1}} - 1 \right)^2} \\
&= -\frac{1}{p} \frac{\tau}{(\ln^2 p) (y_h - p y_g)^2} (p^2 y_g^2 - p y_g y_h \ln^2 p - 2p y_g y_h + y_h^2) \\
&= -\frac{1}{p} \frac{\tau}{(\ln^2 p) (y_h - p y_g)^2} ((p y_g - y_h)^2 - p y_g y_h \ln^2 p) \\
&= -\frac{1}{p} \frac{\tau}{(\ln^2 p) (y_h - p y_g)^2} (p y_g - y_h + \sqrt{p y_g y_h} \ln p) (p y_g - y_h - \sqrt{p y_g y_h} \ln p)
\end{aligned}$$

Note that $(p y_g - y_h + \sqrt{p y_g y_h} \ln p)$ is a positive number as $y_g > y_h$ and $p \geq 1$. I need to show that $(p y_g - y_h - \sqrt{p y_g y_h} \ln p)$ is also positive to conclude that the above term has a negative sign.

$$\begin{aligned}
p y_g - y_h - \sqrt{p y_g y_h} \ln p &\geq p y_g - y_g - y_g \sqrt{p} \ln p \\
&= y_g (p - 1 - \sqrt{p} \ln p)
\end{aligned}$$

where the first inequality follows because $y_g > y_h$.

$$p - 1 - \sqrt{p} \ln(p)$$



B Impact of PPP on Consumption

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

$$\frac{\partial c^*}{\partial p} = \frac{\alpha}{p^{(\alpha-2)/(\alpha-1)} (\alpha-1)^2 \left(p^{\frac{\alpha}{\alpha-1}} - 1\right)^2} \left(y_h - p^{\frac{\alpha}{\alpha-1}} y_h - p\alpha y_g + p^{\frac{\alpha}{\alpha-1}} \alpha y_h\right) \quad (13)$$

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

$$\begin{aligned} y_h - p^{\frac{\alpha}{\alpha-1}} y_h - p\alpha y_g + p^{\frac{\alpha}{\alpha-1}} \alpha y_h &< y_h - p^{\frac{\alpha}{\alpha-1}} y_h - p\alpha y_h + p^{\frac{\alpha}{\alpha-1}} \alpha y_h \\ &= y_h \left[1 - \alpha p + p^{\frac{\alpha}{\alpha-1}} (\alpha - 1)\right] \end{aligned} \quad (14)$$

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 ; therefore, it attains its maximum value for the lowest value of p , which is 1. When p is equal to 1,

$$1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha - 1) = 1 - \alpha + (\alpha - 1) = 0$$

Thus, the highest value that $\left[1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha - 1) \right]$ attains is zero, which implies that $y_h \left[1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha - 1) \right]$ is always non-positive. From inequality 14, 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 13 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

$$\begin{aligned} y_h - p^{\frac{\alpha}{\alpha-1}}y_h - p\alpha y_g + p^{\frac{\alpha}{\alpha-1}}\alpha y_h &> y_h - p^{\frac{\alpha}{\alpha-1}}y_h - p\alpha y_h + p^{\frac{\alpha}{\alpha-1}}\alpha y_h \\ &= y_h \left[1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha - 1) \right] \end{aligned} \quad (15)$$

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 and the minimum value it attains is at $p=1$. In fact, when p is equal to 1,

$$1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha - 1) = 1 - \alpha + (\alpha - 1) = 0$$

Therefore, the minimum value $\left[1 - \alpha p + p^{\frac{\alpha}{\alpha-1}}(\alpha - 1)\right]$ attains is zero. 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 15.

c) $\alpha = 0$

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

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