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Unemployment Benefits, Risk Aversion, and Migration Incentives

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ABSTRACT

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With reference to the EU enlargement, a framework is derived which allows the study of the effect of unemployment benefits on the migration decision. While benefits simply increase the expected gain for risk neutral individuals, they work as an insurance device for risk averse migrants; the results for the two groups might differ. Thus, the migration decision is reformulated as monetary lottery and a utility function exhibiting constant relative risk aversion is applied. The model suggests increased migration incentives independent of taste and a positive selection of risk neutral individuals. Furthermore, risk averse migrants are likely to be found in countries with more evenly distributed incomes, other things equal. While the calibration of the model shows a significant change in migration incentives, empirical results on aggregate data for South-North migration within the EU are rather ambiguous.

JEL Classification: J60, J61, J65, D81

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1 Preliminaries

In the dawn of one of the most challenging and far-reaching endeavours in European history - the Eastern enlargement of the Union - migration research has gained large prominence in the public and academic debate.[1] More than 100 million people will join the common European Market and are expected to enjoy the same rights as the citizens of current Member States in the years to come. A cornerstone will be the right of free movement of labour within the Union. And, while many think this will increase prosperity and welfare on both sides[2], others stoke the fear of mass immigration and a drain on the public purse.

Germany, as well Austria, have been by far the most popular European destination countries for emigrants in the past; almost 9 per cent of the German population is foreign born. Its geographical location with close boarders to the Central and Eastern European Countries (CEEC)[3] has led to increased anxieties among politicians and parts of the population for a mass influx from the East. An anguished labour market short of high skilled employees combined with an aging population are likely to aggravate the problem even further in the years to come and have caused a serious political dispute about an immigration law for the first time in post-war Germany; a considerable step for a state that, thus far, has always denied to be a classical immigration country. And while the government tries to ease the most acute pressure by ad hoc initiatives (e.g. the German version of the 'green card'), conservative groups warn of the fiscal and cultural consequences of more immigration. They point to the putative fact that most immigration is into the social security system, rather than employment.

As one expects in such circumstances, substantial literature on East-West migration has appeared in recent years. The next section will briefly revise the most influential of these studies. However, at the same time, surprisingly little research has been done on welfare incentives despite its popularity in the public discourse and scientific evidence from the U.S. (see e.g. Borjas , [10]).[4] This paper, therefore, will develop a framework to study the impact of unemployment benefits on labour migration.

The co-ordination of social security systems within the European Union is laid down in Article 51 of the Rome Treaty accompanied by Regulations 1408/71, 574/71 and 1251/70. Above all, they were designed to ensure that persons exercising their right of free movement are not disadvantaged in terms

[1] Two accession groups can be distinguished according to the stage of progress made with regard to the *acquis communautaire.* The first group consists of Poland, the Czech Republic, Hungary, Estonia, Slovenia and Cyprus. The second group includes Latvia, Lithuania, the Slovak Republic, Bulgaria, Romania, Malta and probably in the near future, Turkey.

[2] Despite the complexity of the matter, there have been early attempts to quantify the costs and benefits of the enlargement. Baldwin, *et al.* [2] estimate the net costs of roughly 0.01 per cent of EU15's GDP.

[3] Unless otherwise stated, the term CEEC refers to the group of the 12 potential accession countries.

[4] However, there are some studies on the welfare dependence of immigrants; see e.g. Riphahn [31], Bird *et al.* [8], and Fertig and Schmidt [16].

of social protection. In other words, individuals are allowed to export or claim social security payments, such as unemployment benefits and public pensions, while social assistance schemes, such as housing benefits, minimum income support payments and supplementary pensions, are excluded from the legislation (OECD [30]). However, the general non-discrimination rule for immigrants applies to social assistance as well.

If one believes Todaro's seminal work [34], potential emigrants care about their expected rather than total income. It seems, therefore, a natural step to consider not only working income, but also benefits from phases of unemployment in the destination country. In addition, the model takes into account entitlement legislations, which may delay the accessibility of social security measures and heterogeneities in risk attitudes. As a result, unemployment benefits are not only likely to increase the number of immigrants due to higher expected incomes, but also to change the composition of immigrants. Benefits increase the proportion of risk averse individuals among migrants and helps to select them into countries with relatively evenly distributed incomes, other things equal.

The structure is as follows; section 2 gives a brief review of recent empirical studies on East-West migration in the context of the enlargement; section 3 re-formulates the migration decision in terms of money lotteries using a utility function exhibiting a coefficient of constant relative risk aversion; section 3.1 and 3.2 discuss implications of the framework on quantity and quality of immigrants; section 4 calibrates the model with income and benefit data to show the magnitude of the entitlement effect; eventually, section 5 sets out to establish an empirical link between emigration and welfare benefits applying aggregate data on South-North migration within the EU.

2 Recent Studies[5]

A number of empirical studies have attempted to answer the question of how many immigrants can be expected from candidate countries. The predominant workhorse of these studies is an ad-hoc model such as $m_{i,t} = X_{i,t}\beta + \varepsilon_{i,t}$, where $X_{i,t}$ is a vector of economic variables determining migration and $\varepsilon_{i,t}$ a stochastic term, capturing unobserved variables. The dependent variable, $m_{i,t}$, may be the stock or flow of immigrants or emigrants depending on the particular study.[6] Often, individual and time effects are controlled for.

Bauer and Zimmermann [3], for example, apply data from the South Enlargement of the EU. The emigration rate is explained by the ratio of unemployment rates and the real per capita GDP in home and host country using a log-linear fixed effect panel estimator. Simulated migration rates based on

[5] It is beyond the scope of this paper to revise the broad field of migration theory. However, for an overview of migration literature see Massey, *et al.* [25] and Molho [28].

[6] Only the most recent studies will be discussed in this section. For a broader overview of studies with regard to the EU-Enlargement and migration, up to 1998, see ICMPD/ÖFM [21].

estimates for Greece, Spain, and Portugal for the time period 1985 to 1997 indicate that 2-3 per cent of the population in CEEC (approximately 3 million people) will migrate within the next 10 to 15 years. Given previous experience, it can be expected that two thirds of the potential immigration will occur in Germany.[7] The authors find that the largest migration rates can be expected from countries such as Poland, Romania, and Bulgaria. In Poland, for example, migration rates will rise from 1.3 to 6 per cent, due to free labour mobility in the aftermath of accession. However, the results are very much restricted to differentials in income and unemployment rates, whereas, important cost determinants, such as distance and network effects, have been neglected. In addition, it can not be taken for granted that the situation of the south European countries is easily comparable to conditions in the CEEC. As the authors point out, even though the unemployment rates are fairly close to those found in the three reference countries, the income differences between West and East Europe are much larger; hence, the transferability of the results might be limited.

Sinn, *et al.* [32], address the issue of network effects explicitly by explaining the stock of migrants in the German population, using the difference in income, the output gap in the destination region, the stock of migrants in the previous period and two dummy variables, indicating EU membership and whether the free movement of labour has been established. The estimated coefficients are based on migration data from Greece, Italy, Spain, Turkey, and Portugal for the period 1974 to 1997.[8] Simulating the model with data for the accession countries[9], and assuming a 2 percentage point higher growth in the real per capita GDP than in Germany, suggests, that 3.2 to 4 million people will migrate to Germany within the first 15 years after accession.[10] This is a slightly different prediction compared to the previous study, but it also indicates, once again, that the fantastically high numbers brought up by the media are out of range. However, the question arises again, whether, and to what extent, the estimated coefficients for the southern European countries can be compared to the situation of the transition countries.

Finally, an Error Correction Model (ECM) is applied in a study by the European Integration Consortium [6], which is based on a time- series model borrowed from Hatton [20]. Two features are of importance. First, uncertainty is explicitly incorporated into the migration decision and second, past information is used by potential migrants to form expectations about their future income perspectives. In addition, a long time-series of immigration into Ger-

[7] The following countries have been included in the forecast: Poland, the Czech Republic, Hungary, Slovakia, Slovenia, Romania, and Bulgaria. Base year is 1995.

[8] The output gap rather than unemployment rates has been included as the explanatory variable mainly because unemployment rates turned out to be insignificant. Sinn, *et al.* [32] argue, that a high total unemployment rate in a country such as Germany, is mainly due to persistent long-term unemployment which is irrelevant for flexible emigrants.

[9] Only Poland, Romania, the Czech Republic, Hungary, and Slovakia have been considered in the estimation. The base year is 1997.

[10] However, these results are based on purchasing power parities which only apply to long-term migrants rather than commuters. Hence, the authors point out that the actual number of migrants may be even higher.

many has been chosen, covering the post-war period 1967 to 1998. Rather than being confined to the South European trio Spain, Greece, and Portugal, the data set makes use of eighteen countries, including the EU Member States, Norway, Switzerland, the United States, Turkey, and the countries of Former Yugoslavia. The framework allows explanation of the annual change in the ratio of the stock of migrants to the home population. The explanatory variables are the differential in per capita GDP; employment rates in home and host country; the lagged ratio stock of migrants to the home population; institutional variables such as the removal of migration barriers; and, finally, country-specific effects capturing, among other aspects, determinants such as distance and language.

Assuming a 2 per cent convergence rate for the per capita GDP in the CEEC[11] and an accession by 2002, it can be expected that within the next 10 years or so, 1.9 million people will emigrate from the CEEC towards Germany. The model predicts a peak to be reached in 2030, with a stock of 2.5 million migrants. In other words, the share of immigrants from CEEC countries in the German population increases from 0.6 percent in 1998 to 3.5 percent in 2030.[12]

However, aggregated migration studies based on historical data are prone to identification problems, such as invariance over time and applying out-of-sample forecasts, even across space. As Fertig and Schmidt [15] show, the conceptual consequences might be severe. In order to address this issue, the study applies a parsimonious specification of migration rates for German post-war immigration data for 17 countries during the period of 1960 to 1997. Economic and non-economic differences are reflected in country-specific, time-specific and white noise components. Furthermore, Fertig and Schmidt place some emphasis on a core-age group in the region of origin in addition to the standard economic determinants of migration, which have been the sole concern of the studies discussed above. They argue that the existence of a significant number of individuals in the population younger than 40 is a necessary prerequisite for economic differences to have an impact on potential migration. Using this set-up, their predictions for migration from the CEEC-4 into Germany in the period 1998-2017 vary between 300000 and 1.2 million people, depending on the model specification.

Besides the studies discussed above, a different line of research has tried to enhance the understanding of post-accession migration between East and West Europe. In recent years, at least three main surveys have been published, which have attempted to capture migration intentions in the CEEC by interviewing random samples of the population (Fassmann and Hintermann [13], Frejka, *et al.* [17], and IOM [22].[13]). The aim of these studies is to reveal the prevailing

[11] In particular, the CEEC-10 group includes Poland, the Czech Republic, Hungary, Slovakia, Slovenia, Romania, and Bulgaria, Estonia, Latvia, Lithuania.

[12] A similar approach has also been used by Fertig [14]. In contrast to the discussed study, only 17 countries have been used and a period covering 1960 to 1994. The out-of-sample predictions forecast only moderate immigration from the CEEC-10 into Germany reaching from 700000 to 760000 people, depending on the scenario.

[13] The surveys vary greatly in terms of questions, methodology and included countries. Frejka, *et al.* [17] can be considered the most comprehensive study, addressing a wide range of topics, even though it is mainly of descriptive nature. This study is also focusing on households with migration experience and is, therefore, not necessarily comparable to the

microeconomic determinants behind the migration decision, which are, by definition inevitably, lost in the previously outlined aggregate studies on international migration. Some general conclusions may be drawn from this literature.

First, young and reasonably qualified males are much more likely to seek migration, compared to females. This result is consistent with migration theory, where the decision to change location is considered as an investment in human capital (Sjaastad [33]).

Second, as the same studies show, most potential migrants prefer short periods, rather than long-term or permanent migration. Asked for the reasons which hinder emigration, the majority of respondents state existing family and community ties, followed by good job perspectives at home, and the hope of economic and political improvements in the near future [22].

The most important determinants behind the migration decision seem to be living conditions, income differentials, employment probabilities and the general economic situation. Therefore, it appears that the decision to migrate is influenced by both, so called "push" and "pull" effects. This goes partly in line with the empirical results of the studies discussed earlier.

Western Europe, Germany and Austria in particular, have been named as the most likely and desirable host countries mainly for short stays, not least because of their relatively small geographical distance. However, the IOM [22] survey identifies United States, Canada, Australia, and New Zealand as the favourite emigration domiciles.

One important shortcoming of most surveys, however, is the lack of classification according to the degree of migration potential. In contrast, Fassmann and Hintermann [13] distinguish in their study of Poland, the Czech Republic, Slovakia and Hungary, a general migration potential, a likely migration potential, and finally the actual migration potential. While the first group does not rule out migration at some point in the future, the second group has already undertaken concrete steps to prepare migration, such as gathering information or studying the language of the desired destination country. The third group, however, embeds individuals who actually applied for working permits or visas. The survey shows that roughly 700000 people can be classified as having an actual migration potential in the four included countries, which is notably lower than the general migration potential in these countries and the numbers forecasted by above mentioned econometric models.

3 The Framework

Assume an individual residing in home country h has to decide whether to stay or migrate in one of N possible destination countries. Each country, $i \in N$, is characterised by a payoff, w^i, and migration costs C^i. Let w_1^i be working income and w_2^i unemployment benefits. Costs include direct expenses such as traveling

other studies that simply cover a cross section of the entire population regardless previous migration experience.

and moving as well as psychic costs. The payoff in country i is either w_1^i with probability p^i or w_2^i with probability $1-p^i$, where $w_1 > w_2$. Suppose the individual has perfect knowledge about the probability distribution, $F\left(w^i\right)$, which is independent of the payoff in country $j \neq i$. Then, the decision to migrate is similar to the purchase of a lottery ticket with two possible outcomes. In the good state, $s = 1$, the individual becomes employed, in the bad state, $s = 2$, however, the individual faces unemployment. Individuals are T-period lived and homogenous in their skills, i.e. they are randomly chosen to be employed or unemployed. However, they vary in their degree of risk aversion.[14]

For the sake of simplicity, all variables are held constant over T periods except for w_2^i. Assume immigrants do not qualify for benefits upon arrival and any point in the future, unless they have been employed in the previous period. Formally:

$$w_{2,t}^i = \begin{cases} = 0 & for \quad t = 1 \\ = w_2^i > 0 & for \quad t > 1 \quad if \quad work_{t-1} \text{ in } i \\ = 0 & for \quad t > 1 \quad if \quad \text{no } work_{t-1} \text{ in } i \end{cases}$$

Note that whether a person qualifies for benefits is solely determined by the employment probability in the previous period, but independent of earlier stages.[15]

Then, the expected utility is $Eu\left(w_{k,t,s}^i, p^i\right)$ for individual k at time t and country i. Assume that individuals know with certainty their state, s, in the country of origin. Hence, the expected utility at home, $Eu\left(w_{k,s}^h, p^h\right)$, is equal to the actual utility $u\left(w_k^h\right)$.

In a simple net present value approach with risk neutral individuals, entitlements can be expected to simply increase the expected income and, for given costs, make migration more likely to occur. Yet, while this is equally true for risk averse individuals, unemployment benefits have an additional effect; they reduce the risk of migration and act as an insurance devise. Therefore, the results for the two groups may differ. In order to capture the impact on both risk neutral and risk averse individuals a general approach is adopted, encompassing the standard risk neutral case. Hence, a utility function of the common form

$$u\left(a, w\right) = \frac{\left(a + w\right)^{1-\gamma}}{1-\gamma} \tag{1}$$

is applied, where a is a state independent income, w is the gain from the gamble in one particular state (e.g. employment) and γ is the coefficient of relative risk aversion. We assume that $a > 0$ and $\gamma \neq 1$.[16] Utility functions of this

[14] Clearly, making wages exogenously determined is a strong simplification. Alternatively, one might think of a group of individuals exhibiting the same level of skills, but the degree of risk aversion varies among them.

[15] While this is generally true, one might argue that the level of unemployment benefits varies with the length of past employment. However, for the sake of simplicity, w_2^i is either zero or positive and constant over time.

[16] An alternative assumption may be $a \geq 0$, however, this implies that in case $a = 0$ and $w = 0$, we have to restrict γ to $\gamma < 1$, otherwise $u(0)$ is no longer defined. To avoid such limitation, we assume in what follows that $a > 0$.

form exhibit constant relative risk aversion, i.e. absolute risk aversion that declines with wealth. The coefficient of relative risk aversion is given by $\gamma = -(a+w)\,u''(a,w)/u'(a,w)$. For the special case $\lim_{\gamma\to 1}$, the function collapses to $u(a,w) = \ln(a+w)$.

Given the utility function in (1), certainty equivalents can be derived. The advantage of certainty equivalents is two-fold. First, their magnitude is unaffected by positive affine transformations of the utility function.[17] Second, rather than expressing gains from migration in utility units, employing certainty equivalents re-transforms benefits into monetary units, which are much easier to compare. A certainty equivalent is defined as a certain amount of money that gives the same utility as the gamble, or in other words, the maximum price an individual is willing to pay for the lottery. Given the specification of $u(.)$, this is

$$CE^i_{k,t} = \left[p^i\left(a + w^i_1\right)^{1-\gamma} + \left(1-p^i\right)\left(a + w^i_{2,t}\right)^{1-\gamma}\right]^{1/1-\gamma} - a \tag{2}$$

and

$$CE^h = \left(a + w^h_s\right) - a = w^h_s \tag{3}$$

where equation (3) is a special case of (2) for $p^h = 1$. Obviously, (3) is unaffected by the level of risk aversion and, hence, constant over all individuals. Note that for $\gamma = 0$, (2) is equivalent to a simple expected income approach.

Utilising (2) and (3), the migration decision can be expressed in monetary gains. The expected return and rate of return from migration to country, i, at any point in time are given by

$$\Gamma^i_{k,t} = \left(R^i_{k,t} - CE^h\right) - C^i \tag{4}$$

and

$$\tau^i_{k,t} = \frac{R^i_{k,t} - CE^h}{C^i} \qquad for\ C^i > 0 \tag{5}$$

where $R^i_{k,t}$ is the expected gross return from migration, $\bar{p}CE^i_{k,t}(w^i_1, w^i_{2,t} > 0, .) + (1-\bar{p})CE^i_{k,t}(w^i_1, w^i_{2,t} = 0, .)$, with $\bar{p} = 0$ for $t = 1$ and $\bar{p} = p^i$ for $t > 1$, so that for $t = 1$, $R^i_{k,t} = CE^i_{k,t}(w^i_1, w^i_{2,t} = 0, .)$.

Each country, $i \in N$, is characterised by a sum of returns, $\Gamma^i_k = \sum \Gamma^i_{k,t}$; individuals maximise utility by choosing an optimal destination within their budget:

$$\max_{i\in N} \Gamma^i_k \quad s.t. \quad C^i \leq M \tag{6}$$

[17] Unfortunately, little is known about the actual shape to the utility function. To keep the discussion as general as possible, a measure that is insensitive to transformations is preferred. Certainty equivalents fulfil this property, which will prove to be important once the model is calibrated and different outcomes are compared in the next section.

where M is a budget constraint. Migration will occur if and only if $\Gamma_k^{i^*} > 0$, where i^* the optimal choice. Note that this decision rule does not require $\tau_{k,t}^i > 1$ nor $\tau_{k,t}^i > 0$ for every single period.

The sequence of the model is as follows. At the beginning of each period nature determines the employment state (employment or unemployment) in the country of origin. Then, the individual ranks potential destinations according to their payoffs and applies (6) to decide whether to migrate. In case $\Gamma_k^{i^*} \leq 0$, the individual remains in the country of origin for the remaining $T-1$ periods. If, on the other hand, $\Gamma_k^{i^*} > 0$, the migration fee C^{i^*} is paid and the individual moves to country, i^*. Upon arrival, the employment state is discovered, and host and destination country are exchanged; the decision process starts anew for the remaining $T-1$ periods, taking new information into account where appropriate.[18]

It can be shown that for any point in time[19]

$$\frac{d\Gamma_{k,t}^i}{dw_1^i} > 0, \ \frac{d\Gamma_{k,t}^i}{dw_2^i} > 0, \ \frac{d\Gamma_{k,t}^i}{dw_s^h} < 0, \ \frac{d\Gamma_{k,t}^i}{dp^i} > 0, \ \frac{d\Gamma_{k,t}^i}{dC^i} < 0 \tag{7}$$

Unsurprisingly, individuals prefer countries with high wages and unemployment benefits over destinations with low payoffs, everything else equal. Similarly, returns from migration are higher, the more easily migrants acquire employment. As a matter of course, an increase in income at home decreases the likelihood of migration, other things equal. Finally, higher costs decrease the attractiveness of a destination country.

The return from migration, Γ^i, varies across individuals due to the taste parameter, γ. As can be shown,

$$\frac{dR_{k,t}^i}{d\gamma} < 0, \quad \frac{dCE^h}{d\gamma} = 0 \tag{8}$$

and, hence

$$\frac{d\Gamma_{k,t}^i}{d\gamma} < 0 \tag{9}$$

i.e. the more risk averse individuals, the smaller the return from migration. However, the negative impact of γ is mitigated by an increase in w_2^i, other things equal. Now the different role played by benefits for different levels of risk

[18] If all variables were constant over time, the ranking over one period would be the same as over T periods. However, due to the entitlement effect in later periods, the expected return over at least two periods is required. note that the individual acts only 'step-wise' rational. Future changes in the expected net returns as a results of the change in location are not taken into account (e.g. every move changes the vector of costs due to a new geographic location). Yet, decisions are revised at the beginning of every period knowing for certain the state in h.

Additionally, one might want individuals to behave 'super-rational' and take future revisions due to newly-available information that emerges only after a certain time has been spent in the destination country into account right from the start (McCall and McCall [27]; Berninghaus and Seifert-Vogt [7]).

[19] See Appendix A for the actual derivatives.

aversion becomes evident. While for risk neutral individuals an increase in w_2^i simply improves the stakes of the lottery proportionally, for those risk averse it also reduces the risk from migration and, therefore, exhibits a much stronger impact; the next section discusses some of the consequences.

3.1 Selectivity and Sorting

Independently of unemployment benefits, risk aversion deflates the returns to migration just as a discount rate lowers returns over time. This results in a self-selection of migrants in terms of risk-attitudes. "Individuals with only a low degree of risk aversion will migrate, while individuals with a high degree of risk aversion will stay behind. If it is true that a region's innovative power is influenced by the population's attitude toward risk, this type of selectivity is disadvantageous for regions losing population" (Maier [24])[20]. For any given set of variables, equation (4) is greater for less risk averse individuals. A combination of variables that leaves individual z just indifferent between migrating and staying will trigger migration for individual k given z is the more risk averse, other characteristics equal. Hence:

Proposition 1 *Risk averse individuals are less likely to engage in international migration than risk neutral individuals, other things equal.*

Proof. *The proof follows straight from the negative sign of (8); an increase in the degree of risk aversion will decrease the returns from migration in (4), making it less attractive to migrate for more risk averse individuals, other things equal.* ■

A similar phenomenon of self-selection has been discussed in Chiswick [11] and Borjas [9]. However, here self-selection occurs solely due to differences in taste rather than skill. Yet, whether self-selection in skills and risk aversion work in the same direction is not immediately obvious.[21]

Additionally, risk averse individuals will not only be more reluctant towards migration, they might also choose a different set of countries. Let individual y and k be risk neutral and risk averse, respectively. They have to decide whether to stay in home country h or migrate in one of two possible destination countries, i and j. In county, i, they may purchase a lottery ticket with payoffs w_1^i and w_2^i,

[20] And, by the same argument, might be advantageous for the receiving region.

[21] It is debatable whether the level of risk aversion and skill are positively correlated. Risk averse individuals are more reluctant to investments. This might also include investments into education and training. However, most of the basic education is compulsory and only rarely a decision-variable for the individuals. This, however, does not necessarily apply for higher education or the choice of occupation. Hence, whether the kind of self-selection described in this model reinforces or counteracts self-selection due to differences in skills remains an empirical question. Recall that skills are held constant in the framework.

while country j offers a ticket with payoffs w_1^j and w_2^j. Now, each country can be described by its mean and standard deviation of payoffs $\left[\mu^{i,j}, \sigma^{i,j}\right]$. Assume that the only difference between country i and j is their standard deviation and in particular that $\sigma^i < \sigma^j$; hence, $w_1^i < w_1^j$ and $w_2^i > w_2^j$. Then, individual k will migrate to country i, while individual y is just indifferent between the two host countries; sorting occurs.

Proposition 2 *Risk averse individuals will strictly prefer country i over j, if and only if (a) $\frac{\sigma^i}{\sigma^j} < 1$ and (b) $\Gamma_k^i > \Gamma_k^j$, other things being equal.*

Proof. (a) Assume a mean preserving change in the payoffs w_1 and w_2 such that the standard deviation, σ, is reduced for a given lottery. By definition, this does not alter the expected return from the lottery for a risk neutral individual. In contrast, suppose a concave utility function for risk averse individuals such as $u(.) = \frac{(a+w)^{1-\gamma}}{1-\gamma}$. It is well established that $\frac{du}{dw} > 0$ and $\frac{d^2u}{dw^2} < 0$, i.e. the utility exhibits decreasing returns in w. Then, an increase in w_2 is valued more than the loss in w_1, for $w_1 > w_2$; therefore, $\Gamma_{k,t}^i > \Gamma_{k,t}^j$ for any point in time. (b) Recall that $w_2 = 0$ and $w_1^i < w_1^j$in $t = 1$; then, migration to i occurs whenever the gain from a less risky lottery in all $T-1$ periods outweighs the loss in $t = 1$. This is more likely the smaller $w_1^j - w_1^i$ and the larger T. ■

At least two conclusions can be drawn. First, to trigger migration for risk averse individuals, higher payoffs are required than for risk neutral ones, other things equal. If it is true that the uncertainty about payoffs abroad is greater in early stages of emigration, one would expect to find less risk averse individuals among the first to migrate. However, information about earning possibilities will increase over time, reducing the risk of migration. Additionally, following the network theory (Massey and Espana [26]; Levy and Wadycki [23]; Bauer and Zimmermann [4]) a high stock of immigrants in a particular destination country is likely to reduce costs of migration for succeeding generations. Both, decreasing costs and reduced uncertainty increases the expected gains from migration and, hence, the proportion of risk averse individuals among emigrants. However, unemployment benefits work in a similar way and will increase the proportion of risk averse individuals among migrants right from the start.

Second, for given income levels, risk averse individuals are more likely to be found in countries with higher unemployment benefits as a proportion of working income. Hence, countries offering relatively generous benefits will not only attract more, but different kinds of immigrants; reversing Maier's argument this might be disadvantageous for the receiving countries. From an allocative point of view, this may also be sub-optimal, because migration does not take place into the country with the highest income differential, but the one delivering the highest expected payoff from the individuals point of view.

Clearly, the results above can be equally derived for risk loving individuals. By definition, they will select themselves into countries exhibiting a high degree

of income volatility because risk increases their utility. Hence, the results are simply the opposite of the ones derived for risk averse individuals.

Furthermore, one might want to ease the restrictive assumption on exogenous wages by allowing them to be a positive monotonic function of skills. Note that this will merely shift the lottery depending on the level of skills but does not alter the results on self-selection and sorting due to the proportionality of unemployment benefits. Thus, one may construct a situation in which a high-skilled high risk averse individual is left with the same expected payoff as a low-skilled, low risk averse one. Alternatively, employment probabilities may be a function of skills. However, it is not obvious how this functional form looks like a priori and, therefore, how it, if at all, will change the above results.[22]

3.2 Two Period Case

In the following, the case $T = 2$ and $N = 1$ is discussed to illustrate the intertemporal effect of entitlements on the migration decision. For simplicity, costs are assumed to be zero. Three different return-constellations can be distinguished. First, assume equation (4) is positive for t. Then, it can be shown that

$$\begin{aligned} 2CE^h < CE^i_{k,t}\left(w^i_{2,t} = 0, .\right) \\ + \left[p^i CE^i_{k,t+1}\left(w^i_{2,t+1} > 0, .\right) + \left(1 - p^i\right) CE^i_{k,t+1}\left(w^i_{2,t+1} = 0, .\right)\right] \end{aligned}$$

where $CE^h < CE^i$ in t. Recall that $\frac{d\Gamma^i_{k,t}}{dw^i_2} > 0$; hence, if migration is beneficial for $w^i_{2,t+1} = 0$, it is certainly so for $w^i_{2,t+1} > 0$ and individuals favour moving over staying in the sending region. Entitlements do not alter this result, however, they increase the expected return over the two periods.

Second, using the same line of argument, it can be shown that for (4) being negative in t migration will still occur if, and only if

$$\begin{aligned} 2CE^h < CE^i_{k,t}\left(w^i_{2,t} = 0, .\right) \\ + \left[p^i CE^i_{k,t+1}\left(w^i_{2,t+1} > 0, .\right) + \left(1 - p^i\right) CE^i_{k,t+1}\left(w^i_{2,t+1} = 0, .\right)\right] \end{aligned}$$

where $CE^h > CE^i$ in t. This always holds true for $CE^h - R^i_{k,t1} < R^i_{k,t+1} - CE^h$, where $R^i_{k,t}$ is defined as above. Migration occurs, therefore, because the gain in the expected return in the second period outweighs the loss in t. Note that the better stakes result solely from the entitlement effect, i.e. it is assumed that migrants qualify for unemployment benefits abroad in $t + 1$. Yet, this only applies for those migrants who find employment in period t. Hence, on average migrants can expect to benefit from $w^i_2 > 0$ with probability p^i. With probability $\left(1 - p^i\right)$, however, they fail to find a job. If the described strategy is superior to staying in the sending country for both periods, migration will occur even for initially negative payoffs. Here, entitlements alter the result

[22] Think of an example where low skill seasonal workers exhibit high employment probabilities, while their white collar counterparts face poor job opportunities for certain occupations.

significantly and trigger migration where otherwise no such decision would have been made. As a matter of fact, this trade-off is an increasing function of T, other things equal.

Finally, if (4) is negative in t and $t+1$, the optimal strategy is obviously to stay home in both periods.

In summary, the introduction of unemployment benefits may result in a trade-off. Individuals might trade initial losses for higher future payoffs. Host countries, which seemed unfavourable in terms of expected benefits become potential target countries when access to the social security system is granted; the entitlement effect is, therefore, not necessarily lost when legal aspects are accounted for. However, it remains an empirical question whether it is strong enough to outweigh initial loses. The next section seeks to answer this question by calculating actual certainty equivalents for East-West migration.

4 Calibrating the Model

Does the inclusion of unemployment benefits significantly alter migration incentives compared to frameworks which neglect such parameter? One way to answer this question is by testing the model with actual data and see whether incentives are changed. Table 1 reports data on hourly earnings of manual workers in industry in 1996 and 1999 for Poland, the Czech Republic, Hungary, Germany, and France. The upper part contains the data in purchasing power parities (PPPs) while the lower part displays the same data in actual US Dollar exchange rates. The third and fourth columns express hourly wages as a gap towards Germany and France, respectively. For each country, the net income position of a single unemployed individual in the initial phase of unemployment is given in the upper right hand column (OECD [29]).

Even though the income gap has become smaller over the years by all standards, wages in the CEEC still remain significantly lower. This is especially visible when wages are expressed in actual exchange rates. But even when PPPs are used, which is the more relevant measure for long-term emigrants, wages in Germany are up to five times higher; the picture is slightly different for the case of France. In contrast, differences in the net-income position are not that clear-cut. France pays by far the highest benefits as percentage of working income, followed by Hungary and Germany; unemployed in Poland are the worst-off.[23]

Calibration of the above model requires information on levels of risk aversion and employment probabilities. Unfortunately, little is known as to what extent potential migrants are risk averse. A number of empirical studies have appeared in recent years, attempting to determine risk aversion using both experimental

[23] Note that Poland is paying a flat rate to its unemployed which amounts to 38 per cent for an 'Average Production Worker' (see OECD [29]). In other words, low-skilled and high-skilled individuals in Poland receive the same absolute benefits and the replacement rates for low skilled individuals might be, therefore, much higher than for example in Germany.

economics and consumption and investment data (see e.g. [1], [5], [18] and [12]). These studies suggest estimated coefficients of risk aversion between 2 and 7. In the following, results for γ between -3 and 7 are reported in order to cover risk loving individuals as well. Recall that for $\gamma = 0$ results are comparable to the case of risk neutrality.

Following Todaro [34], the probability of employment, p, is simply approximated by the employment rate; here, $p^{Germany}$ and p^{France} are assumed to be 0.8.[24] Furthermore, the state independent income, a, is set to unity for the sake of convenience. Individuals in the sending countries are assumed to be employed.

As table 2 and 3 show, migration pays off for risk neutral and risk loving individuals even in the absence of unemployment benefits, neglecting costs. In contrast, emigration is not favourable for risk averse individuals with $\gamma \geq 3$. Note that all entries in the tables are certainty equivalents, i.e. monetary units, derived from the above framework. Costs have been neglected for the time being; in other words, certainty equivalents can be regarded as the maximum cost that can occur to make an individual just indifferent between staying and moving.[25].

Making unemployment benefits available, however, significantly alters the outcomes. Tables 4 and 5 summarise the results and show the percentage change in certainty equivalents, compared to the previous example. Regardless of taste, emigration is desirable. At the same time, risk averse individuals benefit the most from entitlements; while their risk loving and risk neutral counterparts have incentives to migrate even without welfare benefits, for risk averse individuals, unemployment insurance makes a crucial difference.

Thus, predictions on the composition of risk attitudes among emigrants are confirmed; the less risk averse a person, the more likely is emigration due to higher payoffs for given costs.

Finally, assume individuals are two-period lived and benefits in the destination country can not be claimed in the first period. However, if the individual migrates in t, they may qualify for benefits in $t+1$ with probability p^i. As shown in the previous section 3.2, in some cases migration in t may be observed even for negative payoffs if, and only if, future expected returns outweigh the initial loss due to entitlements. Tables 6 and 7 show certainty equivalents for a two-period horizon. Trading future gains for present loses does in fact pay when wages are calculated in actual exchange rates, rather purchasing power parities. But even for PPPs entitlements take effect; while it does not pay to migrate for Poles characterised by $\gamma \geq 3$, despite a higher expected payoff in $t+1$, it pays for Hungarians (except for very risk averse emigrants towards France). Recall that

[24] Using average wages, it seems certainly resaonable to approximate employment probabilities by the employment rate. However, once disaggregated data is used, it seems desirable to take into account heterogeneities in the likelihood of finding a job. The use of conditional probabilities following a simple Markovian process should be considered. These state-dependent probabilities can be quite different from average employment rates (see, e.g., Góra and Lehmann [19])

[25] Note that payoffs are per hour and therefore, costs must be expressed in the same unit.

in the absence of unemployment benefits, no such incentive exists and migration would have been ruled out.

Note that budget constraints have been neglected due to the zero cost assumption. Therefore, Germany is clearly the most attractive destination country. Yet, controlling for costs and budget constraints it might be equally rational to migrate to France rather than Germany.

5 Empirical Evidence

Welfare benefits, such as unemployment insurance, significantly alter migration incentives as shown in the previous section. Yet, more importantly it is whether this actually translates into higher emigration rates.

Ideally, one would like to test the above hypotheses with micro-level data in order to capture and control for individual characteristics, such as taste and skill. Unfortunately, very little data are available which is mainly a consequence of at least two conceptual problems. First, tastes, in contrast to skills, are increasingly difficult to measure, a problem that is not only confined to migration studies. Second, micro-data on migration is either collected before departure or ex post in the host country. As a result, tracing individuals across boarders becomes virtually impossible.

Alternatively, marco-data has often been used, as shown in the above discussion of the relevant literature. Data on aggregate variables such as GDP and immigration rates are more readily available. The price, however, is a loss of clearness. Recall that the framework in previous sections was solely concerned with speculative, income enhancing labour emigration.[26] Yet, highly aggregated data reflects far more migration forms, such as contracted emigration, family reunification and refugees, to name but a few. The manifold forms might not be traced back to the same underlying determinants and violate the assumed homogeneity among migrants; effects overlap or counteract each other on the micro-level. As a consequence, severe identification problems might arise (see e.g. Fertig and Schmidt [15]). Thus, estimated coefficients are likely to show only net effects, and have to be treated with caution.

Despite these limitations, and in the absence of alternatives, aggregate data have been applied to test for welfare effects in South-North migration within the European Union. The data covers the period 1990-1999 and is taken from EUROSTAT (New Cronos) and the World Bank (World Development Indicators). Explained is the emigration rate, i.e. the number of emigrants in a specific period divided by the population in the previous period. The sending countries are Greece, Spain and Portugal; the host countries are the remaining EU-12 Member States.

Coefficients of five explanatory variables have been estimated: the ratio of real GDP per capita and the ratio of the unemployment rate in sending and re-

[26] In contrast to speculative migration, Molho [28] distinguishes contracted migration which takes place after a job has been found in the destination region.

ceiving country, respectively; the stock of immigrants in the destination country as share of the population in the country of origin; the ratio of unemployment benefits per unemployed in sending and receiving country; and finally, the ratio of social protection expenditure as share of GDP in sending and receiving country. If appropriated, variables have been calculated in Purchasing Power Parities (PPP) rather than actual exchange rates according to OECD data to ensure comparative price levels.[27] All exogenous variables are lagged by one period to avoid endogeneity problems.

Table 8 summarises the raw data. The number of observations varies between 329 on the unemployment benefit ratios and 234 on the migration stock. Note that there is surprisingly little variation in the emigration rates but substantial differences in the unemployment and benefit ratios. Both the highest and the lowest emigration rate is found in Portugal (towards Germany and Finland, respectively). The migration stock amounts for 0.254 per cent of the sending population, on average, and reaches remarkable 3.4 per cent for Greek immigrants in Germany. While unemployment benefits vary quite heavily, social protection expenditures, which encompass the former, do not.

Given the small number of occasions (maximal 9) and the relatively large number of subjects (maximal 32) from a well-defined set of countries (all EU states) a panel rather than pooled time-series approach seemed most appropriate. Subjects in the sample are 'one-of-a-kind' and should not be viewed as a random draw from an underlying population. Furthermore, in the particular context of international migration, several unobservable characteristics are likely to influence the migration decision such as culture and taste. However, these characteristics are not independent of the explanatory variables. Hence, a log-linear fixed-effects model has been chosen:

$$\ln y_{i,t} = c + \beta \ln X_{i,t-1} + \varepsilon_{i,t} \tag{10}$$

where $\ln y_{i,t}$ is the demeaned log emigration rate, $\ln X_{i,t-1}$ a vector of demeaned log explanatory variables defined as above, c, an overall constant, and $\varepsilon_{i,t}$, a vector of demeaned error terms, capturing everything that has not been controlled for.[28]

In addition, $t-2$ time dummies have been included in all models to control for macro-economic shocks and other common effects such as changes in the European Union legislation.

Table 9 reports the results. A couple of specification tests have been applied. In all seven models the test for unobserved heterogeneity (Breusch-Pagan Test) clearly favours a panal over a pooled OLS approach. In order to account for possible heterogeneity, robust standard errors have been reported; however, the differences are small if compared to the non-robust ones, and there is no change in terms of significance. Furthermore, the Hausman specification test indicates

[27] The implicit assumption is, therefore, that the relevant group of migrants spend a substantial amount of time in the host country rather than commutes.

[28] Note that $y_{i,t}$ and $X_{i,t}$ are demeaned by subtracting the within mean of y_i and X_i, respectively, and then adding the grand average of y and X. This explains the overall constant term in (10).

that, in most cases, unobserved country-specific effects should be treated as fixed parameters rather than random effects.

As can be seen from the F-statistics, the individual effects parameter are jointly significantly different from zero for all specifications; the explained variance ranges from 12 to 38 per cent. Models (I) to (III) can be regarded as 'classical' specifications. Recall that all right-hand-side variables, but the migration stock, are defined as ratios between sending and receiving country. Hence, one would expect the per capita income differential to have a negative impact on the emigration rate for values smaller than unity. By the same argument, the unemployment ratio should positively alter the migration decision for values greater than unity. Finally, a higher stock of immigrants from previous periods will increase the number of emigrants.

The results suggest that the theory actually fits the data. Given the log-linear set-up, coefficients can be read as elasticities. Unity changes in the explanatory variables translate into less than unity changes in the emigration rate. Once unemployment ratios and the stock of pervious immigrants are controlled for, income and the number of previous immigrants exhibiting similar coefficients, but are insignificant. In contrast, host countries with relatively low unemployment rates attract more immigrants; a robust and significant result for all seven models. Thus, total income differentials become less important if one takes into consideration expected income and network effects, just as the theory predicts.

The most general implication that arises from the framework in previous sections suggests a positive link between emigration and the level of unemployment benefits, independent of taste. Hence, controlling for the ratio of unemployment benefits per unemployed in sending and receiving country, one would expect a negative coefficient due to the log-linear transformation.

Yet, the results are rather ambiguous. While in the parsimonious estimation, (IV), the impact is indeed negative, once the stock of immigrants is included, the coefficient switches sign, but preserves its magnitude. In contrast, specifications (VI) and (VII) show that social protection expenditures, a broader measure of welfare benefits which also encompass unemployment benefits, strongly and significantly impact on the emigration rate; the coefficient is even greater than unity.

There are several possible explanations for the results on unemployment benefits and social protection expenditures. Note that unemployment benefits concern only a fraction of individuals, most likely long-term labour immigrants. Additionally, the impact is greatest for risk averse individuals among this group. Yet, due to the lack of appropriate data, their number remains unknown and, as mentioned above, aggregate data assumes away all kinds of self-selection. Additionally, the stock of previous immigrants can be expected to proxy for informal unemployment insurance through friends and family; therefore a smaller coefficient on unemployment benefits. Hence, it is not overly surprising to not find a strong empirical correlation at this level of aggregation.

On the other hand, the strong impact of social protection expenditures on the emigration rate is most likely a consequence of the broader definition of the

variable; it covers the majority of welfare benefits from child protection to pensions and concerns, therefore, a relatively larger group of emigrants compared to unemployment benefits.

Finally, note that the Hausman statistic is raised significantly once the migration stock is controlled for; thus, unobserved heterogeneity affects mainly the information channel between sending and receiving country. It is hardly surprising that unobserved effects, such as language and culture, are more likely to be correlated with previous immigration than with economic variables; this result concurs with (Vogler and Rotte [35]).

6 Concluding Remarks

The impending EU enlargement towards Eastern Europe has nourished fears of significant population movements resulting in even higher unemployment rates and 'welfare shopping' on the expense of already tight public purses. Thus, a framework has been derived to study the effect of unemployment benefits on the migration decision.

Unsurprisingly, unemployment benefits increase the expected income for potential migrants, regardless of taste and skill. As a consequence, countries offering relatively high benefits can be expected to attract more labour migration. This result remains valid even when the legal design is accounted for.

Second, unemployment benefits affect the composition of migrants once one allows for heterogeneities in taste. The more risk averse individuals, the smaller the probability of migration. For risk loving and risk neutral individuals, on the other hand, even small differences in incomes are sufficient to trigger migration; they will be, therefore, among the first to migrate. Unemployment benefits decrease the volatility of expected payoffs abroad and increase the share of risk averse individuals among immigrants. Whether this is of any disadvantage for the host country depends on the correlation between risk attitudes and other characteristics, such as skills, and remains an empirical issue.

Third, risk averse individuals might choose destination countries with relatively evenly distributed incomes among employed and unemployed, other things equal. Intuitively, this is the case, because risk averse migrants value an increase in unemployment benefits more, than an equally-sized decrease in working income. Consequantly, countries that would not attract immigrants in the absence of unemployment benefits due to smaller working incomes, might do so once benefits are accounted for. However, they will mainly be targeted by risk averse individuals.

Fourth, the results from the calibration show that when unemployment benefits are not instantaneously available, they take effect even over a time horizon of two periods.

In the absence of suitable micro-data, empirical results on welfare effects in South-North migration are ambiguous. While the relative level of unemployment benefits does not affect the migration decision on the aggregate level, social

protection expenditures do so significantly. However, it is believed that this underlines the demerits of aggregate data rather than suffices to dismiss the theoretical model.

Finally, some policy implications can be derived. The availability of unemployment benefits increases migration incentives for labour emigrants. However, benefits are conditional on previous employment which ensures that immigration for the sole purpose of 'welfare shopping' is impeded. Labour market incentives and, more importantly, disincentives resulting from unemployment benefits are, therefore, not fundamentally different for immigrants, compared to natives.

A more severe problem might arise from the compositional effect of welfare benefits; they encourage more risk averse individuals to migrate which may cause allocative inefficiencies.

Note that the results derived in this paper are confined to unemployment benefits and do not equally apply to other welfare benefits. As the empirical results suggest, broader welfare measures, such as social protection expenditures, exhibit a significant impact on the emigration rate.

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Country	*Purchasing Power Parities*						*Net Income Position*
	Hourly Wages		Gap to Germany		Gap to France		
	1999	*1996*	*1999*	*1996*	*1999*	*1996*	
Poland	6.42	3.02	2.32	4.60	1.62	2.87	38%
Czech Republic	5.11	4.22	2.91	3.30	2.04	2.06	50%
Hungary	4.54	2.76	3.28	5.04	2.30	3.14	62%
Germany	14.88	13.91	**1.00**	**1.00**	0.70	0.62	60%
France*	10.43	8.67	1.43	1.61	**1.00**	**1.00**	70%
	Current Exchange Rates (US Dollars)						
	Hourly Wages		Gap to Germany		Gap to France		
	1999	*1996*	*1999*	*1996*	*1999*	*1996*	
Poland	2.96	1.39	4.24	8.42	2.99	5.29	-
Czech Republic	1.85	1.53	6.76	7.66	4.78	4.81	-
Hungary	1.79	1.09	7.00	10.77	4.95	6.77	-
Germany	12.53	11.71	**1.00**	**1.00**	0.71	0.63	-
France*	8.86	7.36	1.41	1.59	**1.00**	**1.00**	**-**

Table 1: Wage comparison of hourly earnings of manual workers in industry. Data is taken from the EUROSTAT New Cronos database; * numbers refer to 1998. Purchasing Power Parities and actual exchange rates are taken from the OECD Main Economic Indicator database and refer to 2001. The net income position refers to a single unemployed person in the initial phase of unemployment.

Level of risk aversion	*Sending/ Receiving*	*Czech Republic*	*Hungary*	*Poland*
-3	Germany	8.909	9.481	7.598
	France	*4.847*	*5.872*	*5.091*
0	Germany	6.794	7.366	5.483
	France	*3.381*	*4.406*	*3.625*
0.4	Germany	5.720	6.291	4.409
	France	*2.693*	*3.718*	*2.937*
1	Germany	3.024	3.595	1.713
	France	*1.059*	*2.083*	*1.302*
3	Germany	-3.894	-3.322	-5.205
	France	*-3.760*	*-2.736*	*-3.517*
7	Germany	-4.805	-4.233	-6.116
	France	*-4.655*	*-3.631*	*-4.412*

Table 2: Certainty equivalents for varying levels of risk aversion where no unemployment benefits are available (in PPPs).

Level of risk aversion	*Sending/ Receiving*	*Czech Republic*	*Hungary*	*Poland*
-3	Germany	9.944	10.009	8.839
	France	*6.523*	*6.771*	*6.149*
0	Germany	8.172	8.236	7.067
	France	*5.286*	*5.534*	*4.912*
0.4	Germany	7.304	7.369	6.199
	France	*4.729*	*4.976*	*4.354*
1	Germany	5.183	5.248	4.078
	France	*3.438*	*3.685*	*3.064*
3	Germany	-0.642	-0.577	-1.747
	France	*-0.608*	*-0.361*	*-0.983*
7	Germany	-1.546	-1.482	-2.651
	France	*-1.492*	*-1.244*	*-1.866*

Table 3: Certainty equivalents for varying levels of risk aversion where no unemployment benefits are available (in actual exchange rates).

Table 4: Certainty equivalents for varying levels of risk aversion where unemployment benefits are available; percentage changes refer to results without benefits (in PPPs).

Level of risk aversion	*Sending/ Receiving*	*Czech Republic*		*Hungary*		*Poland*	
		CE	%Δ	*CE*	%Δ	*CE*	%Δ
-3	Germany	9.051	0.016	9.622	0.015	7.740	0.019
	France	*5.031*	*0.038*	*6.055*	*0.031*	*5.274*	*0.036*
0	Germany	8.580	0.263	9.152	0.242	7.269	0.326
	France	*4.841*	*0.432*	*5.866*	*0.331*	*5.085*	*0.403*
0.4	Germany	8.492	0.485	9.064	0.441	7.181	0.629
	France	*4.810*	*0.786*	*5.834*	*0.569*	*5.053*	*0.721*
1	Germany	8.347	1.761	8.918	1.481	7.036	3.108
	France	*4.759*	*3.494*	*5.783*	*1.776*	*5.002*	*2.841*
3	Germany	7.756	11.650	8.328	11.650	6.445	11.650
	France	*4.563*	*8.323*	*5.587*	*8.323*	*4.806*	*8.323*
7	Germany	6.417	11.222	6.989	11.222	5.106	11.222
	France	*4.087*	*8.743*	*5.112*	*8.743*	*4.331*	*8.743*

Table 5: Certainty equivalents for varying levels of risk aversion where unemployment benefits are available; percentage changes refer to results without benefits (in actual exchange rates).

Level of risk aversion	*Sending/ Receiving*	*Czech Republic*		*Hungary*		*Poland*	
		CE	$\%\Delta$	*CE*	$\%\Delta$	*CE*	$\%\Delta$
-3	Germany	10.068	0.012	10.133	0.012	8.963	0.014
	France	*6.684*	*0.025*	*6.932*	*0.024*	*6.310*	*0.026*
0	Germany	9.676	0.184	9.740	0.183	8.571	0.213
	France	*6.526*	*0.235*	*6.774*	*0.224*	*6.152*	*0.252*
0.4	Germany	9.603	0.315	9.667	0.312	8.498	0.371
	France	*6.500*	*0.375*	*6.747*	*0.356*	*6.125*	*0.407*
1	Germany	9.482	0.829	9.547	0.819	8.378	1.054
	France	*6.457*	*0.878*	*6.705*	*0.819*	*6.083*	*0.986*
3	Germany	8.994	9.636	9.059	9.636	7.889	9.636
	France	*6.294*	*6.903*	*6.542*	*6.903*	*5.920*	*6.903*
7	Germany	7.882	9.428	7.946	9.428	6.777	9.428
	France	*5.899*	*7.391*	*6.147*	*7.391*	*5.525*	*7.391*

Level of risk aversion	*Sending/ Receiving*	*Czech Republic*	*Hungary*	*Poland*
-3	Germany	0.141	0.141	0.141
	France	*0.183*	*0.183*	*0.183*
0	Germany	1.786	1.786	1.786
	France	*1.460*	*1.460*	*1.460*
0.4	Germany	2.772	2.772	2.772
	France	*2.116*	*2.116*	*2.116*
1	Germany	5.323	5.323	5.323
	France	*3.700*	*3.700*	*3.700*
3	Germany	**1.532**	**2.675**	**-1.090**
	France	***-0.862***	***1.187***	***-0.375***
7	Germany	**-0.632**	**0.511**	**-3.254**
	France	***-2.317***	***-0.268***	***-1.830***

Table 6: Certainty equivalents in the two period model; bold numbers refer to cases where no migration would have been occurred in the one period model without entitlements. Positive numbers indicate a trade-off possibility over two periods (in PPPs)).

Level of risk aversion	*Sending/ Receiving*	*Czech Republic*	*Hungary*	*Poland*
-3	Germany	0.124	0.124	0.124
	France	0.162	0.162	0.162
0	Germany	1.504	1.504	1.504
	France	1.240	1.240	1.240
0.4	Germany	2.299	2.299	2.299
	France	1.771	1.771	1.771
1	Germany	4.299	4.299	4.299
	France	3.020	3.020	3.020
3	Germany	**6.425**	**6.554**	**4.215**
	France	**4.305**	**4.801**	**3.557**
7	Germany	**4.450**	**4.579**	**2.240**
	France	**2.929**	**3.424**	**2.181**

Table 7: Certainty equivalents in the two period model; bold numbers refer to cases where no migration would have been occurred in the one period model without entitlements. Positive numbers indicate a trade-off possibility over two periods (in actual exchange rates)).

Variable	N	Mean	Std. Div.	Min	Max
Emigration Rate	264	.0002095	.0005513	.0000004	.003241
Per capita GDP Ratio	326	.6609072	.1533097	.35697	1.30491
Unemployment Ratio	350	1.760459	1.631766	.27097	10.8666
Migration Stock	234	.0025439	.0065608	.000005	.034541
Unemployment Benefits Ratio	329	1.161439	1.570007	.04666	8.60
Social Protection Expenditures Ratio	319	.8055028	.1715973	.52715	1.72276

Table 8: Descriptive statistic covering the EU15 countries in the period 1990-1999. Ratios refer to the respective value in the sending divided by the value in the host country.

Dependent Variable: Emigration Rate							
Model	*(I)*	*(II)*	*(III)*	*(IV)*	*(V)*	*(VI)*	*(VII)*
Constant	-10.89**	-10.83**	-10.60**	-10.79**	-10.19**	-11.31**	-9.18**
	(.381)	(.377)	(1.86)	(.177)	(2.11)	(.268)	(1.73)
Per Capita GDP Ratio	-.715**	-.433	-.220	-.627	-.527	-.241	.094
	(.351)	(.373)	(.324)	(.446)	(.443)	(.361)	(.300)
Unemployment Ratio		.237**	.293**	.248*	.307**	.481**	.648**
		(.098)	(.092)	(.093)	(.089)	(.116)	(.111)
Migration Stock			.030		.027		.261
			(.244)		(.271)		(.229)
Unemployment. Benefits Ratio				**-.026**	**.099**		
				(.179)	(.193)		
Social Protection Expenditures Ratio						**-1.92****	**-2.63****
						(.594)	(.523)
R-square	0.1227	0.1416	0.1858	0.1446	0.1924	0.2137	0.3660
F-Statistic α_i*=0*	202.30	203.78	22.81	167.79	21.20	197.55	28.37
	(31,184)	*(31,181)*	*(27,137)*	*(31,175)*	*(27,131)*	*(31,175)*	*(27,131)*
Breusch-Pagan Test χ^2	759.53	771.12	263.03	706.56	228.36	694.36	232.83
Hausman Test χ^2	0.05 *(9)*	1.24 *(10)*	43.76 *(11)*	11.23 *(11)*	45.01 *(12)*	21.68 *(11)*	145.53 *(12)*
N (Groups)	223 (32)	223 (32)	176 (28)	218 (32)	171 (28)	218 (32)	171 (28)

Table 9: Regression results for the emigration rate in Greece, Spain and Portugal towards the northern European Member States. Fixed effects model with time dummies. Standard errors in parentheses; ** indicates significance at the 5 per cent level; * indicates significance at 10 per cent level. Degrees of Freedom for diagnostic statistics are in parentheses.

A Formal Derivatives

Derivative 1 *Changes in the payoffs*

Two cases need to be distinguished, depending on whether or not unemployment benefits are available in the host country. Assume $w_2^i = 0$, then

$$\frac{dCE^i(w_1^i, .)}{dw_1^i} = \left[\frac{p}{(a+w_1)^\gamma}\left(p\,(a+w_1)^{1-\gamma} + (1-p)\,a^{1-\gamma}\right)^{\frac{1}{1-\gamma}-1}\right] > 0 \tag{11}$$

which is clearly positive (the subindices, k and t, will subsequently be neglected). Now, assume $w_2^i > 0$, i.e. unemployment benefits are available. Then, a change in w_1^i and w_2^i in the host country gives

$$\frac{dCE^i(w_1^i, w_2^i, .)}{dw_1^i} = \left[\frac{p^i}{\left(a+w_1^i\right)^\gamma}\left(p^i\left(a+w_1^i\right)^{1-\gamma} + \left(1-p^i\right)\left(a+w_2^i\right)^{1-\gamma}\right)^{\frac{1}{1-\gamma}-1}\right] > 0 \tag{12}$$

and

$$\frac{dCE^i(w_1^i, w_2^i, .)}{dw_2^i} = \left[\frac{\left(1-p^i\right)}{\left(a+w_2^i\right)^\gamma}\left(p^i\left(a+w_1^i\right)^{1-\gamma} + \left(1-p^i\right)\left(a+w_2^i\right)^{1-\gamma}\right)^{\frac{1}{1-\gamma}-1}\right] > 0 \tag{13}$$

which are both positive. Similarly, a change in the payoff, w_s^h, in the sending country gives

$$\frac{dCE^h}{dw_s^h} = 1 \tag{14}$$

As can easily be checked, from (11), (12), (13) and (14) follows

$$\frac{d\Gamma^i}{dw_1^i} > 0, \ \frac{d\Gamma^i}{dw_2^i} > 0 \tag{15}$$

and

$$\frac{d\Gamma^i}{dw_s^h} < 0 \tag{16}$$

Derivative 2 *Changes in the employment probabilities*

Again, two cases can be distinguished:

$$\frac{dCE^i(w_1^i,.)}{dp^i} = \left[\begin{array}{c} \frac{1}{1-\gamma}\left(\left(a+w_1\right)^{1-\gamma} - a^{1-\gamma}\right) \\ \left(p\left(a+w_1\right)^{1-\gamma} + \left(1-p\right)a^{1-\gamma}\right)^{\frac{1}{1-\gamma}-1} \end{array} \right] > 0 \tag{17}$$

$$\frac{dCE^i(w_1^i,w_2^i.)}{dp^i} = \left[\begin{array}{c} \frac{1}{1-\gamma}\left(\left(a+w_1^i\right)^{1-\gamma} - \left(a+w_2^i\right)^{1-\gamma}\right) \\ \left(p^i\left(a+w_1^i\right)^{1-\gamma} + \left(1-p^i\right)\left(a+w_2^i\right)^{1-\gamma}\right)^{\frac{1}{1-\gamma}-1} \end{array} \right] > 0 \tag{18}$$

Given $w_1^i > w_2^i$ and positive values of w, a, (17) and (18) is positive and, therefore[29]

$$\frac{d\Gamma^i}{dp^i} > 0 \tag{19}$$

Derivative 3 *Changes in the coefficient of risk aversion γ on certainty equivalents*

$$\frac{dCE^i(w_1^i,.)}{d\gamma} =$$
$$\left[\begin{array}{c} \frac{1}{(1-\gamma)^2}\left(\ln\left(p^i\left(a+w_1\right)^{1-\gamma} + \left(1-p^i\right)a^{1-\gamma}\right)\right) \\ \left(p^i\left(a+w_1\right)^{1-\gamma} + \left(1-p^i\right)a^{1-\gamma}\right)^{\frac{1}{1-\gamma}} \\ +\frac{1}{1-\gamma}\left(-p^i\left(\ln\left(a+w_1\right)\right)\left(a+w_1\right)^{1-\gamma} - \left(\ln a\right)\left(1-p^i\right)a^{1-\gamma}\right) \\ \left(p^i\left(a+w_1\right)^{1-\gamma} + \left(1-p^i\right)a^{1-\gamma}\right)^{\frac{1}{1-\gamma}-1} \end{array} \right] \leq 0 \tag{20}$$

and

$$\frac{dCE^i(w_1^i,w_2^i.)}{d\gamma} =$$
$$\left[\begin{array}{c} \frac{1}{(1-\gamma)^2}\left(\ln\left(p^i\left(a+w_1\right)^{1-\gamma} + \left(1-p^i\right)\left(a+w_2\right)^{1-\gamma}\right)\right) \\ \left(p^i\left(a+w_1\right)^{1-\gamma} + \left(1-p^i\right)\left(a+w_2\right)^{1-\gamma}\right)^{\frac{1}{1-\gamma}} \\ +\frac{1}{1-\gamma}\left(p^i\left(a+w_1\right)^{1-\gamma} + \left(1-p^i\right)\left(a+w_2\right)^{1-\gamma}\right)^{\frac{1}{1-\gamma}-1} \\ \left(-p^i\left(\ln\left(a+w_1\right)\right)\left(a+w_1\right)^{1-\gamma} - \left(\ln\left(a+w_2\right)\right)\left(1-p^i\right)\left(a+w_2\right)^{1-\gamma}\right) \end{array} \right] \leq 0 \tag{21}$$

[29] It is rather straightforward that a change in p^i on R^i is positive as well; the result is not reported.

Given the non-linearity of (20) and (21), an analytical solution is increasingly difficult. Therefore, given the parameter restrictions in the framework, i.e. positive payoffs, $w_1^i, w_1^h, w_2^i, w_2^h$, a positive state independent income, a, employment probabilities $0 \leq p^i, p^h \leq 1$, and a coefficient of relative risk aversion $-\infty > \gamma > \infty \cap \gamma \neq 1$, it can be shown numerically that (20) and (21) hold. It can also be shown that for $\lim_{\gamma \to \infty} \frac{dCE^i}{d\gamma} = 0$. Simplifying (21) leads to the expression

$$\frac{\psi\alpha + \psi\beta}{(1-\gamma)} \leq \delta\alpha + \varphi\beta \tag{22}$$

where

$$\psi = \ln\left(p\left(a+w_1\right)^{1-\gamma} + (1-p)\left(a+w_2\right)^{1-\gamma}\right) \tag{23}$$

$$\delta = \ln\left(a+w_1\right) \tag{24}$$

$$\varphi = \ln\left(a+w_2\right) \tag{25}$$

$$\alpha = p\left(a+w_1\right)^{1-\gamma} \tag{26}$$

$$\beta = (1-p)\left(a+w_2\right)^{1-\gamma} \tag{27}$$

As can be easily seen, the $\lim_{\gamma \to \infty}$ for (26) and (27) is zero. Therefore, the $\lim_{\gamma \to \infty}$ for the right-hand-side of (22) is also equal to zero. Similarly, the numerator of the ride-hand-side (22) is zero in the limit.

Therefore, the total effect on Γ^i is negative, given that CE^h is unaffected by changes in the degree of risk aversion.

Derivative 4 *Changes in the independent income, a*

$$\frac{dCE^i(w_1^i, .)}{da} = \begin{bmatrix} \frac{1}{1-\gamma}\left(\frac{p}{(a+w_1)^\gamma}(1-\gamma) + \frac{1}{a^\gamma}(1-p)(1-\gamma)\right) \\ \left(p\left(a+w_1\right)^{1-\gamma} + (1-p)\,a^{1-\gamma}\right)^{\frac{1}{1-\gamma}-1} - 1 \end{bmatrix} > 0 \tag{28}$$

$$\frac{dCE^i(w_1^i, w_2^i.)}{da} = \begin{bmatrix} \frac{1}{1-\gamma}\left(p^i\frac{1-\gamma}{\left(a+w_1^i\right)^\gamma} + \frac{1-\gamma}{\left(a+w_2^i\right)^\gamma}\left(1-p^i\right)\right) \\ \left(p^i\left(a+w_1^i\right)^{1-\gamma} + \left(1-p^i\right)\left(a+w_2^i\right)^{1-\gamma}\right)^{\frac{1}{1-\gamma}-1} - 1 \end{bmatrix} > 0 \tag{29}$$

Numerically, it can be shown that (28) and (29) are positive given the parameter restrictions above and, therefore[30]

$$\frac{d\Gamma^i}{da} > 0 \tag{30}$$

[30] However, recall that changes in the state independent income are of minor interest for this paper and are mainly reported for the sake of completeness.

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