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ABSTRACT

The paper develops a sequential migration model and derives a worker's optimal policies for migration and employment. With the worker's simulated reservation wage functions for employment and migration, a stationary equilibrium is defined. In that equilibrium, stationary distributions of employed and unemployed stayers and movers over different states are derived. The analysis of Markov equilibria shows that mainly *unemployed* skilled and unskilled migrants will migrate. I have referred to this unemployed self-selection of skilled and unskilled migrants. Furthermore, in the stationary equilibrium, a trade off between equity and efficiency is derived and represents the adverse effects when a government fosters income increases too much.

Keywords: Sequential Migration, Markov Equilibria, German Reunification
JEL classification: C61, E27, J61

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1 Introduction

Migration theory predicts that when two countries have unequal wage distributions, either skilled or unskilled workers will migrate disproportional. For instance, a destination country with a more spread out wage distribution than a source country attracts skilled workers. These workers migrate, because they can get higher wages in destination than in the source country.

This result is shown in a static model with full employment.[1] Labor markets today, however, have high unemployment. How does the result change when workers can be unemployed and can more than once be employed or unemployed in their life time? How can the possibility of different employment and unemployment phases be considered within the worker's migration decision? My thesis is that workers, thinking about migration, try to calculate life time earnings for two countries and allow for different employment states during their life.

How will a worker do this? A worker tries to calculate expected life time earnings for both countries and both employment states, compares them and decides then to migrate or to stay. That is, the worker's decision to migrate and to accept a job offer does not only depend on the income or (mean) wage and variances—as in the early migration models—but on the worker's reservation wages for migration and for employment. Worker's reservation wages for migration and employment are the wage thresholds, at which the worker is willing to accept a job offer and to migrate to the destination country. They are the outcomes of comparing life time earnings in different employment states and for different countries. Workers choose those which deliver the highest life time earnings. The reservation wages depend on the worker's age and skill, the wage offer drawn from the source or destination country's wage distribution, and on the worker's previous earned income.

But what happens, if a worker has been laid off, does not want to accept a current wage offer or to look for a job in the source country, or her skills depreciate during unemployment? The worker's reservation wages take these endogenous and exogenous changes into account and change as well. This means that the worker faces each period a different environment and therefore she might revise her employment and migration decisions sequentially.

The different decisions about employment and migration imply that the worker can be in one of four situations: either she stays employed or unemployed in the source country or she migrates and is employed or unemployed in the destination country. A worker can

[1] See, for example, Borjas (1987).

thus be an *employed* or *unemployed stayer* or an *employed* or *unemployed mover*.

What do the migration and employment decisions of a single worker entail for an economy as a whole? This can be made clear by defining the aggregate state of the economy for the source country from the worker's perspective. For this, I assume that the worker is a representative worker and that there is a continuum of ex ante identical workers. This supposition allows the derivation of distributions of employed or unemployed stayers and employed or unemployed movers in the source country, starting from the worker's optimal policy functions over employment and migration. With these reservation wage functions, first, *endogenous Markov matrices* are derived, which describe the transition states of the workers. Concretely, transition probabilities are defined over the different states in which workers can be. These stochastic transition probabilities are conditional on the worker's current migration and employment states and depend on her reservation wages. Second, with the stochastic transition functions at hand, invariant distributions for the source economy are simulated. Starting from the different transition states, in which workers can be, the economy converges to a stationary equilibrium. This stationary equilibrium is characterized by an invariant distribution, which shows the fractions of employed or unemployed stayers and movers for the source country. Taking the different characteristics of workers into account, different stationary equilibria for the source country are derived.

I compute and extensively analyze a numerical example. This example is the east-west migration, which occurred after the reunification in Germany. By analyzing the stationary equilibria for the source country, which is east Germany in the example,[2] I find that migrants are essentially *unemployed* self-selected.

Until now, the migration literature demonstrates migrants are positively (or negatively) self-selected.[3] Self-selection means that migrants do not move randomly. Positive self-selection is the migration of skilled workers and follows from the assumption of a more spread out wage distribution in the destination than in the source country. Skilled workers migrate, because they can get higher wages in the destination country. Due to simplicity and deviating from the literature, I call this self-selection of skilled migrants. On the other hand, because of higher average wages in the destination country, negative self-selection is the migration of unskilled workers. Again deviating from the literature, I call this self-selection of unskilled migrants.

Keeping the same assumptions about means and variances of wage distributions, but adding the employment states, I find unemployed workers disproportional migrate. That

[2]Since Germany is reunified, it seems natural to write east and west Germany without capital letters.

[3]See, for example, Borjas (1987) and Chiswick (1999).

is, additional to the result that skilled or unskilled workers migrate, my analysis takes unemployment *and* skills into account. My main finding is the self-selection of unemployed skilled and unemployed unskilled migrants.

My results are supported by empirical studies. Empirical data for Germany show no bias towards a specific skill group.[4] The studies find furthermore that, after reunification, predominantly unemployed workers migrated towards west Germany.

Related with this finding is the illustration of a trade off between efficiency and equity in terms of past incomes, benefits and level of unemployment. That is, if a government concentrates too heavily on the rise in incomes to achieve equal standards of living in two countries and neglects productivity aims, but simultaneously agrees on high benefit payments, high unemployment will result. Interpreting the calibration results, I show that these effects might have been induced by the German government. The equity-efficiency trade off will be determined endogenously. Equity is represented by the level of benefit payments and efficiency by the level of employment. I show that higher benefits cause lower employment.

The next section presents data of the German economy after the reunification. Section 3 describes the environment of the sequential migration model. Section 4 provides a detailed analysis of the worker's decision problems about employment and migration. Section 5 defines the labor market equilibrium for the source economy, and Section 6 characterizes the equilibrium outcomes quantitatively. Section 7 concludes.

2 The German Reunification Process

The model of sequential migration will be applied to the German reunification. The fall of the Berlin Wall and the monetary unification of the two German states in July 1990 were astonishing events, with long-run effects, seldom occurred in modern economies. The opportunity to move from east to west Germany emerged in the late summer of 1989. Until the political reunification in October 1990, the political future of east Germany was uncertain. A large migration began to flow, because of the fear the emigration window might close again. In 1989 and 1990, 400,000 individuals moved yearly or almost 2.5% of the eastern population.[5] That is, the reunification can be interpreted as a mass migration towards the western economy, which is similar to a sudden increase of 26% of their population.

[4] See for example Hunt (2000).

[5] For the development of the east-west migration in the recent years see also Figure 6 in the Appendix.

The huge migration of individuals with the same cultural background has rarely happened before. A decade later, the costs are much more transparent than at the beginning of the reunification. For evaluating them or maybe the benefits, two aspects are important. Firstly, individuals without any capital moved and, secondly, the eastern production stock was totally obsolete. Taking both aspects into consideration, the data indicate the reunification has been extremely expensive. Over the period 1990–2000, total financial transfers from west to east Germany exceeded 750 billion Euros, an amount which corresponds to 4–5% of the annual German GDP or approximately 3,750 Euros per-capita or twice the disposable income of Poland. The largest share, roughly 40–45%, represents social entitlements. Investment subsidies account for 12% and direct investments to the infrastructure for the rest.

Taking this enormous amount of costs into consideration, one can ask, "how much did the east German economy produce by itself to cover the costs?" That is, how efficient was east Germany to finance these transfers by its own means? The data shows real GDP in the new states grew cumulative between 1992 and 2003 by about 45%—mainly due to firing labor in the manufacturing sector—and real GDP per-capita reached nearly 63% of the western level in 2003.[6] On the other hand, per-capita consumption was 82% of that in west Germany in 1999.[7] Thus, transfers increased the standards of living above production, and east Germany produced less of what it consumed at the end of the first decade after reunification.

Opposite to the development of efficiency is the equity part in east Germany. Equity can be characterized by insurance. The insurance motives in the east are the same as in the western welfare state, which has protected east Germany since then. The equity aim was to reach "the same standards of living within ten years after reunification"[8] and can be described by the development of real wages and incomes. Real wages have risen strongly. Between 1991 and 2003 gross compensation per dependent employee rose by approximately 87%, increasing its level relative to the west from 49 to 92%.[9] Rapid wage increases were mainly driven be the attempt to reach fast convergence and were the strongest within the first three years after reunification. Today's wage levels are still dominated by early settlements, but the increases have become slower, due to modest

[6] See also Figure 7 in the Appendix.

[7] See Pohl (2002, p.36).

[8] This aim was often declared by the German government at that time.

[9] See Appendix, Figure 8. Note that this increase was not observed in any of the other transition economies, even in the Czech Republic, whose initial conditions were quite similar to those in east Germany.

collective bargaining agreements and significant wage undercuttings on the individual firm level. These high wage increases were a major factor depressing the development of eastern competitiveness.

The development of income is the second measure for equity. Eastern incomes have converged much more rapidly than output. Transfer and household incomes grew strongly and have largely approached those in the west. Net incomes add up to approximately 75% of the level in the old states. The net income distribution peaks in the same income bracket (between DM 2000 and DM 3000 per month) for east and west Germany.[10] The eastern distribution, however, is more concentrated around lower income groups than the western and less concentrated in the top income range. This reflects a relatively high degree of income equality, which is partly attributable to the benefit system. The composition of household income by source reflects the high transfer dependency of the eastern economy. Public transfers account for 32% of average gross income, 10 percentage points more than in the old states. Between 1993 and 1998 the share of transfers has increased by nearly 3 percentage points.

Employment figures in the new states show the direct correlation to unemployment subsidies. From 1991 to 2003, unemployment increased by 10 percentage points, from 10 to 20%, and remained constant at nearly 29% for both registered and hidden unemployed workers.[11] Employment declined dramatically,[12] and each third person of the working age population received either unemployment benefits or support during the last decade.

Industrial subsidies effectively helped firms to survive, despite the push in labor costs, and unemployment related benefits provided income support to replaced workers. Simultaneously, high and persistent unemployment was cushioned by work provision and training schemes, and early retirement schemes reduced labor force participation. Additionally, the generosity of the social security system is documented by these facts: A worker with children receives 67% of the last net income as unemployment benefits for 180 days up to 960 days, depending on age and contribution history. After this time, she can receive unemployment support for nearly an infinite period of time, which pays currently 53% of the last net income.[13] In September 2001, 44% of the unemployed received

[10] See Appendix, Figure 9.

[11] See Appendix, Figure 7.

[12] See Appendix, Figure 10.

[13] In January 2005, these rules will change dramatically. From this point onwards, unemployed will generally be restricted to receive unemployment benefits for only 365 days; except for the over 55 year old workers, they will receive unemployment benefits for the highest of 548 days. Furthermore, unemployment support will completely vanish, instead unemployed workers will receive a minimum level of social support,

unemployment benefits, and 40% unemployment support. These generous social security systems may have induced wrong incentives.

A state characterized by these high wage and income increases, relative to output, as well as high unemployment increases would not have been sustainable. Without the massive transfers, east Germans would have migrated even stronger towards the western states, creating severe political and social problems there. The result of the extremely high transfers, however, was that west Germans paid higher taxes—a 7.5% solidarity income and corporation surcharge from 1991 to 1997 and a 5.1% increase in the social security contribution—, accepted higher interest rates, experienced unusually large budget deficits of about 3% of GDP on average over the 1991–1997 period, as compared to 1.5% before unification, and a loss in competitiveness in international markets. Interpreting similar data, Canova and Ravn (2000, p.429) conclude further: "The adjustment process seems to be slow and it is unclear how many years it will take unified Germany to catch up with the economic performance of the former West Germany and, indeed, whether this level will ever be attained." Furthermore, they summarize that (p.425) "...the persistence of these effects (meaning investment reductions and decreases in high-skilled hours that result from the initial wage increases) depends on the length of time that it takes for the skill distribution to readjust to the pre-unification situation. Given the typical time needed for migrants to acquire the same distribution of skills as the native population, and the estimated time needed to retrain East Germans, the model predicts a prolonged period of below steady state conditions with depressive effects still active 30–40 years after the reunification."

The data seem to indicate the German government has put more weight on equity than on efficiency. The overemphasize of equity might have contributed to high increases in income and unemployment. Therefore, it might be reasonable to depict the trade off between equity and efficiency by high income and unemployment increases.

In the model, I can replicate this trade off by defining a relationship between unemployment subsidies, previously earned incomes and the level of unemployment. Previously earned incomes will affect unemployment benefits, which will be a driving force for accepting or rejecting a wage offer. These decisions will therefore affect the level of unemployment. Furthermore, by defining the reservation wage for migration, the fraction of stayers and movers will be determined, i.e. those who want to stay in the source country

which amounts to 345 Euro in west and to 331 Euro in east Germany. However, before the social support will be paid, the unemployed has to use up own savings. Only if they are below a certain threshold, the unemployed will receive social support. These new programs are known as "Hartz IV."

or migrate to the destination country.

3 A Search Model for Migration

After the description of the German reunification situation, I extend Ljungqvist and Sargent's (2002) stochastic search model for unemployment to migration. That is, I will study migration from a worker's perspective in a dynamic setting by defining her migration and employment decisions and by taking the implications of welfare benefits on the optimal policy functions for migration and employment into account. Workers can search in the source and the destination country, migrate to the chosen (welfare) country and might be able to choose between employment and unemployment. Ljungqvist and Sargent's model is set up in the spirit of McCall's (1970) search model and extends it to a stochastic framework.

In the early McCall model, at the beginning of each period when a worker is employed, she faces a probability $\lambda \in (0, 1)$ of being laid off, which can lead to unemployment in that period. Furthermore, at the beginning of each period when the worker is unemployed, she may receive a job offer with a constant wage drawn from a time-invariant cumulative distribution function $F(w)$. She can take or leave the offer, with no opportunity to recall rejected offers. Successive draws from F are independent. The worker sets a reservation wage $\overline{w}$ for accepting the wage offer. McCall shows how workers choose the reservation wage by deriving a Bellman equation for the reservation wage $\overline{w}$, above which all wage offers are accepted. The worker's strategy is then to accept all offers above the reservation wage and to reject all those below it. Rejecting a wage offer means the worker stays unemployed, but preserves the opportunity to look for a better job. McCall's search model states how the reservation wage is influenced by the level of unemployment compensation b, the discount factor β, the layoff probability λ and the wage offer distribution F.

Ljungqvist and Sargent (1998, 2002) extend that model by introducing stochastic. Employed, unemployed or laid off workers are heterogeneous with respect to skills and unemployment compensation they might receive. Within their model, they show increased microeconomic turbulence interacts with unemployment benefits to change the equilibrium level of unemployment. Economic turbulence is modeled as the risk of losing skills at a layoff. That is, a worker instantaneously loses some skills when being laid off. Such skill losses reflect that some skills are job specific and others can become quickly obsolete, especially during the restruction of industries. Describing a more turbulent economic environment means workers face larger risks of skill losses at a layoff. Assuming the accu-

mulation of skills during employment, the possibility of a productivity switch on the job is introduced too.

To investigate migration, a worker searches for a job within two countries, which are characterized by different wage distributions. Ljungqvist and Sargent's (2002) model will be extended by assuming different mean wages and variances for the source and the destination country. This replicates the inequality of wage distributions in Germany after the reunification, i.e. east Germany's more equal wage distribution as opposed to the west more unequal ones. Early migration models show wage differentials represent an important incentive to migrate and are the key variable for explaining migration. These static models usually conclude that the number of individuals who consider migration as optimal choices increases with the wage differential (see e.g. Sjaastad 1962). More recently, Borjas (1987) develops a static self-selection model. It describes how a more spread out wage distribution in the destination country leads to the migration of skilled workers. Skilled workers leave the country, because they can earn higher wages in the destination country. While a higher mean of the wage distribution in the destination country induces an outflow of unskilled workers. This idea of differences in the moments of wage distributions as decisive migration incentives will be a driving force here too.

Furthermore, recent empirical studies show immigrants choose to live in the state with the highest welfare benefits (Borjas, 1999). Since immigrants are a self-selected sample of persons who have chosen to bear the fixed costs of the move, it costs them little to select one particular country over another once the costs of moving are incurred. In contrast, the existing differences in welfare benefits across states may not motivate natives to migrate because the benefit differentials might be displaced by fixed migration costs the natives would face. The core of Ljungqvist and Sargent's (1998, 2002) search analysis also focuses on how institutions for compensating unemployment affect the level of unemployment. That is, their studies concentrate on the influence of unemployment benefits on the worker's reservation wage. Beside increased economic turbulence, Ljungqvist and Sargent attribute high European unemployment to wrong incentive effects on labor supply due to generous European unemployment benefits. These latest results show that immigrants and unemployed workers base their decisions on unemployment benefits too when searching for a new job. A sequential migration framework has, therefore, to account for unemployment compensation systems as migration and employment incentives.

Putting these aspects together, the economy is described from the perspective of an individual unemployed worker who will first search for a job within two countries and will afterwards make the decision of staying in the source country or migrating to the

destination country. Because this decision can be made at each period, sequential migration conditional on the employment state is induced. In the stationary equilibrium, the search and migration decisions of workers lead to an endogenous determination of the distribution of stayers and movers who will be employed or unemployed in the source country.

4 The Environment

This type of an incomplete markets model has a large number of ex ante identical but ex post heterogeneous agents who can be employed or unemployed and stay in the source or migrate to the destination country. I study an economy with no aggregate uncertainty and no variation of an aggregate state variable over time, so there is no macroeconomic time series variation.[14] There is, however, much uncertainty at the individual level. The individuals face a version of an infinite horizon search and migration problem and their option is to manage their employment state in the chosen country by accepting or rejecting a job offer and staying or migrating when facing wage shocks. The model uses the previous employment state as a vehicle for insurance. I then describe an economy in which the wage distributions are time-invariant for the average of all households, but the individual worker draws wages from each country's specific wage distribution.

Consider an economy with a continuum of agents of total mass equal to one and with geometrically distributed life spans normalized to the unit interval with births equal deaths. Workers become older and transit with probability $\alpha(a, a')$ to different age classes $a = 1, ..., \overline{a}$. For each age class the transition probabilities sum to one, i.e. $\alpha(a, a) + \alpha(a, a + 1) = 1$ for $a = 1, ..., \overline{a} - 1$ and for the age class of retirement $\overline{a}$ the transition probability is $1 - \alpha(\overline{a}, \overline{a})$. The individual age space is A with $A = \{1, 2, ...\overline{a}\}$ where $\overline{a}$ denotes the maximum age. Note that newborn workers are not entitled to unemployment compensation.

At the beginning of each period t the worker chooses search effort $e_t \geq 0$ to look for a job at home and abroad. Search induces disutility $c(e_t)$, which is increasing in e_t, but may lead to a wage offer. With probability $\pi(e_t)$, $\pi_{e_t} > 0$, the worker draws an offer in $t + 1$. The job offer stems from the country's time-invariant wage distribution

[14] Most of the heterogeneous-agent models have no aggregate variations over time to avoid the curse of dimensionality. The difficulty arises when formulating the household's dynamic programming problem with an aggregate state variable. However, Krusell and Smith (1998) describe a model that has an aggregate state variable.

$F_k(w_k) = \Pr(w_{k,t+1} \leq w_k)$ for $k \in \{o, f\}$, where o is the origin (or source) and f the foreign (or destination) country. The wage distributions differ in their means and variances.[15] For each country, the set of possible wage values is denoted W, $W = \{w_{k,1}, ..., w_{k,l}\}$. With the wage offer at hand, the worker can accept or reject the job offer. Accepting the offer implies the worker will be employed in period $t+1$. Each agent's wage follows a Markov process with stationary transition probability $G(w'_k|w_k) = \Pr(w_{k,t+1} \leq w'_k|w_{k,t} = w_k) > 0$ for each $w_k, w'_k \in W_k$ that is independent of all other agents' current and past wage offers. Rejecting the wage offer means the worker is unemployed in period $t+1$. Furthermore, with probability $(1-\pi(e_t))$ the agent will not receive a wage offer at all and stays unemployed.

Once the worker has quit the job and is unemployed, she can be entitled for social assistance. On the one hand, she will be eligible for benefits $b(I_k)$, if the government's suitable earnings $I_e(I_k)$ are higher than the previous earned wage income, which is the wage w_k times her skill level h. On the other hand, as long as the government's suitable earnings are lower than last earnings $w_k\, h$, no benefits are paid. The entitlement of unemployment compensation leads to the payment of net unemployment benefits in the amount of $(1-\tau)b(I_k)$, where τ is the tax rate, and the benefits depend on the income I_k earned in the previous period.

When the worker was employed previously, she can be laid off with probability $\lambda \in [0, 1]$ and will be unemployed in period t. Laid off workers can qualify for unemployment compensation too, if the foregone earnings fall short of the government's suitable earnings criterion. That is, as long as $w_k h < I_u(I_k)$, the worker is eligible for benefits.

Furthermore, the skills of the worker can stochastically depreciate or accumulate depending on whether she is employed, unemployed or laid off. The skills of an unemployed worker will depreciate from skill level h to h' with probability $\mu_u(h, h')$, where $h, h' \in H$, and for a laid-off worker with probability $\mu_l(h, h')$ in the initial laid-off period and with the probability $\mu_u(h, h')$ afterwards. However, if the worker is employed, she accumulates skills with probability $\mu_e(h, h')$, until she becomes unemployed. Additionally, let T be the fixed migration cost when moving and K the layoff costs when being laid off or having quit the job.

The worker sees her new skill level at the beginning of a period, before deciding to accept a new wage offer,[16] to choose search intensities for both countries, to quit a job

[15] One can point to the importance of the variance of the wage distribution. A high variance is an expression of high risk, but it is also an expression of the opportunity to obtain a wage significant over the mean.

[16] Note that in an aggregate model of migration with more than one type of labor, the effect of im-

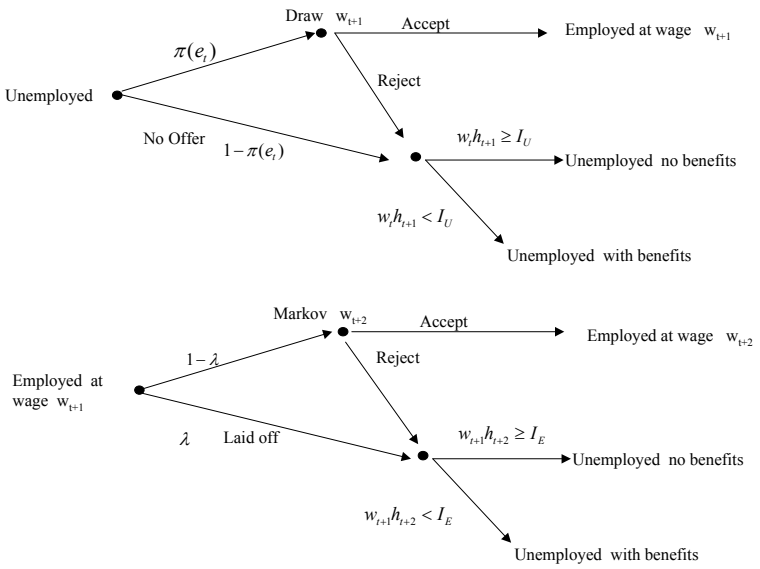

Figure 1: The Worker's Employment Decision Tree.

and to migrate to the destination or stay in the source country. Before the migration decision is made, at the beginning of each period, the employment decision is taken. This time structure for the worker's employment situation is shown in Figure 1. At each point in time, her decision problem is described by an individual state vector $s \in S$ with $s = (a, h, I)$ and S is the individual state space with $S = A \times H \times W$ for $A = \{1, ..., \overline{a}\}$, $H = \{h_1, ..., h_m\}$ and $W = \{w_1, ..., w_l\}$, where $I = wh$. On the basis of this state vector, the worker makes sequential decisions for migration and employment.

After the characterization of the worker's environment, her functional equations will be defined that describe the sequential search for accepting employment in the source or destination country. Let $V(a, h, w_k, I_k)$ be the value of the optimization problem for the worker with age a, skill level h, wage w_k who was employed and earned income I_k in the previous period and who decides upon a country specific wage offer to quit the job or not. $V_b(a, h, I_k)$ is the value of an optimization problem for an unemployed worker with age a, skill level h, country specific last earnings I_k who is entitled for unemployment compensation. $V_0(a, h)$ is the value for an unemployed worker who is not entitled to unemployment

migration on natives' labor market outcome will usually depend on the assumption of the degree of substitutability between immigrant and native workers. That is, it is usually assumed (and then shown) that immigrants will raise the wages of workers with whom they are complements in production, or they will lower the wages of workers with whon they are gross substitutes. Here, however, differences in skills and their impact on the labor market are determined by the accumulation or depreciation of skills of an individual worker who is employed or unemployed.

compensation. The Bellman equations for this sequential search and migration problem are:

$$\begin{aligned} V(a,h,w_k,I_k) &= \max_{\text{accept,reject}} \{\Omega(a,h,w_k), \\ &\quad D(h,w_k,I_k)V_b(a,h,I_k) - T_k + (1-D(h,w_k,I_k))V_0(a,h) - K\}, \end{aligned} \tag{1}$$

$$\begin{aligned} V_b(a,h,I_k) &= \max_{e_k} \Bigg\{ -c(e_k) + (1-\tau)b(I_k) + \beta \sum_{a'} \alpha(a,a') \sum_{h'} \mu_u(h,h') \\ &\quad [(1-\pi(e_k))V_b(a',h',I_k) + \pi(e_k) * \\ &\quad \left(\int_{w_k < I_u(I_k)/h'} \max_{\text{accept,reject}} \{\Omega(a',h',w_k), V_b(a',h',I_k)\} \, dF_k(w_k) \right. \\ &\quad \left. + \int_{w_k \geq I_u(I_k)/h'} \max_{\text{accept,reject}} \{\Omega(a',h',w_k), V_0(a',h')\} \, dF_k(w_k) \right) \Bigg] \Bigg\}, \end{aligned} \tag{2}$$

$$\begin{aligned} V_0(a,h) &= \max_{e_k} \Bigg\{ -c(e_k) + \beta \sum_{a'} \alpha(a,a') \sum_{h'} \mu_u(h,h') \left[(1-\pi(e_k)) \right. \\ &\quad \left. V_0(a',h') + \pi(e_k) \int \max_{\text{accept,reject}} \{\Omega(a',h',w_k), V_0(a',h')\} \, dF_k(w_k) \right], \end{aligned} \tag{3}$$

where

$$\begin{aligned} \Omega(a,h,w_k) &\equiv (1-\tau)w_k h + \beta \sum_{a'} \alpha(a,a') \left[\lambda \sum_{h'} \mu_l(h,h') V_b(a',h',w_k h) - \lambda(K+T_k) \right. \\ &\quad \left. (1-\lambda) \sum_{h'} \mu_e(h,h') \int V(a',w'_k,h',w_k h) dG(w'_k|w_k) \right], \end{aligned}$$

$$D(h,w_k,I_k) = \begin{cases} 1, & \text{if } \; w_k < I_e(I_k)/h, \\ 0, & \text{if } \; w_k \geq I_e(I_k)/h, \end{cases}$$

$$T_k = \begin{cases} 12, & \text{if } \overline{w}_m(a,h,I_k) \geq \overline{w}_{b,k}(a,h,I_k), \\ 0, & \text{if } \overline{w}_m(a,h,I_k) < \overline{w}_{b,k}(a,h,I_k). \end{cases}$$

For each country $k \in \{o,f\}$, the intertemporal optimization problem (1) – (3) can be solved numerically. This gives functions, firstly, for the optimal search intensity $e^*_{b,k}(a,h,I_k)$ and the reservation wage $\overline{w}_{b,k}(a,h,I_k)$ for an unemployed worker who is eligible for unemployment compensation, secondly, for the optimal search intensity $e^*_{0,k}(a,h)$ and the reservation wage $\overline{w}_{0,k}(a,h)$ for an unemployed worker who is not entitled for unemployment benefits and thirdly, for the optimal search intensity and the reservation wage $\overline{w}_k(a,h,w_k,I_k)$ for an employed worker. The reservation wage function of migration

$\overline{w}_m(a, h, I_k)$ for a worker who decides to stay or migrate will be determined later. The functions $\overline{w}_{0,k} : S \to R$, $\overline{w}_{b,k} : S \to R$ and $\overline{w}_k : S \to R$ are optimal decision rules provided they are measurable, feasible and satisfy the functional equations as optimal value functions [see theorem 9.2 in Stokey and Lucas (1989)].

5 Equilibrium for the Labor Market

This section describes the equilibrium concept and some theorems used to compute equilibria. First, some background for the equilibrium concept is provided. The stationary equilibrium for the labor market will be derived for the source country only, even though workers can look for jobs in two markets. Since workers will be heterogeneous in their individual state vectors, a way of describing the heterogeneity in the economy at a point in time is needed. A probability measure defined on subsets of the individual state space is a natural way of describing this heterogeneity. Let S be the finite set with $\{s_1, ..., s_r\}$ and ψ be a probability measure on $(S, \mathcal{S})$ where $S = A \times H \times W$ and $\mathcal{S}$ is the Borel σ-algebra. Thus, for $S \in \mathcal{S}$, $\psi(S)$ indicates the mass of agents whose individual state vectors lie in S.

The aggregate state of the economy is given by ψ. As ψ changes over time, the wage would be expected to change too. However, the wages and wage distributions are assumed to be constant. For many questions, the dynamics caused by changing distributions of individual state vectors are of interest. For the question at hand, however, I define a more specialized notion of an equilibrium, in which the probability measure ψ remains unchanged over time. An important technical reason for concentrating on stationary equilibria is that methods for characterizing equilibria in general do not exist currently. The paper adopts, therefore, the stationary recursive equilibrium structure described in Stokey and Lucas (1989, p.320f).[17] To define what it means for a probability measure ψ to be stationary over time, a transition function $\mathcal{P}, \mathcal{P} : S \times \mathcal{S} \to [0, 1]$, is needed. Intuitively, $\mathcal{P}(s, S)$ is the probability that an agent with state s will have an individual state vector lying in S in the next period. The following shows how to construct a transition function from the decision rules $\overline{w}_{0,k}(s)$, $\overline{w}_{b,k}(s)$, $\overline{w}_k(s)$ and $\overline{w}_m(s)$ and the transition probabilities $\psi(\overline{w}'(s)|\overline{w}(s))$. The reservation wage function of migration is defined as $\overline{w}_m(s) \equiv \max\{\overline{w}_{b,o}(s), \overline{w}_{b,f}(s)\}$. Equipped with a well-defined transition function $\mathcal{P}$, a probability measure ψ defined on $(S, \mathcal{S})$ is stationary.

[17] See also Ljungqvist and Sargent (2004, chapter 2.2.1).

Definition 1 *A stationary recursive equilibrium for the labor market of this economy are reservation wage functions* $(\overline{w}_{0,k}(s),\ \overline{w}_{b,k}(s),\ \overline{w}_k(s))$ *and distribution functions* $\psi(s)$ *where*

(1) $\overline{w}_{0,k}$, $\overline{w}_{b,k}$, $\overline{w}_k$ *solve the individual's optimization problem (1)–(3);*

(2) *an* n*-dimensional vector* $s \in R^n$ *records the possible values of the state of the system;*

(3) *an* $(n \times 1)$ *vector* ψ_0 *records the probabilities of being in each state* i *at time* 0 *with*

(a) $\psi_{0i}(S) = \Pr[w_0(s) = \overline{w}_i(s)]$,

(b) $\psi_0(S) = \sum_{i=1}^{n} \psi_{0i}(s) = 1$;

(4) *an* $n \times n$ *transition matrix* $\mathcal{P}(s, S)$ *records the probabilities of moving from one value of the state to another in one period;*

(5) $\psi(s)$ *is time-invariant.*

The first condition says agents optimize. The third condition defines the unconditional initial probabilities and the initial probability distribution over the initial state, the fourth condition defines the transition probability matrix, and the fifth says the distribution of agents over states is unchanging. Note that the measure ψ is defined over sets of S. Thus, the definition of stationary equilibria requires individuals never draw wages beyond some fixed wage level to compare them with the endogenously determined reservation wages.

The next method will be used to compute equilibria and, therefore, I restrict the analysis to situations where a worker is eligible for unemployment compensation. The reservation wage functions $\overline{w}_{b,k}(s)$ and $\overline{w}_m(s)$ will remain. With these functions at hand, the partial equilibrium analysis can continue. The first step characterizes situations in which a worker may migrate or stay and will accept a wage offer or remains unemployed. That is, with the reservation wages for employment and migration at hand, $\overline{w}_{b,o}(s)$ and $\overline{w}_m(s)$, respectively, a worker can be in one of the states

$$\psi_{0i}(s) = \begin{cases} F_f(\overline{w}_m(s)) * F_o(\overline{w}_{b,o}(s)), & \overline{w}_m(s) \leq \overline{w}_{b,o}(s), \overline{w}_{b,o}(s) > w_o, \\ [1 - F_f(\overline{w}_m(s))] * F_o(\overline{w}_{b,o}(s)), & \overline{w}_m(s) > \overline{w}_{b,o}(s), \overline{w}_{b,o}(s) > w_o, \\ F_f(\overline{w}_m(s)) * [1 - F_o(\overline{w}_{b,o}(s))], & \overline{w}_m(s) \leq \overline{w}_{b,o}(s), \overline{w}_{b,o}(s) \leq w_o, \\ [1 - F_f(\overline{w}_m(s))] * [1 - F_o(\overline{w}_{b,o}(s))], & \overline{w}_m(s) > \overline{w}_{b,o}(s), \overline{w}_{b,o}(s) \leq w_o. \end{cases} \tag{4}$$

These decision rules define the unconditional probabilities $\psi_{0i}(s)$ at time 0. The unconditional probabilities describe the employment and migration states for $i = 1, ..., 4$ in which a worker can be. $\psi_{01}(s)$, for example, is the probability that the reservation wage of an unemployed worker is higher than the wage offer and is higher than the reservation wage for migration. So the worker stays unemployed in the source country. If the reservation wage is higher than the offered wage and the reservation wage for migration is higher than the first one, the worker will further be unemployed and will migrate to the destination country. That is, with the probability $\psi_{02}(s)$ the worker will be unemployed and will migrate. Therefore, the worker faces four different states characterized by the initial distribution: Firstly, the worker will be unemployed and stays in the source country (stayer), secondly the worker stays unemployed and migrates to the destination country (mover), thirdly she will be employed and stays in the source country (stayer), and fourthly she will be employed and migrates to the destination country (mover). Under these rules, the initial vector $\psi_0(s)$ states the discrete probability $\psi_{0i}(s)$ for each state i. This expresses the next proposition.

Proposition 2 *The initial distribution of states $\psi_0(s)$ is determined by adding up the unconditional probabilities ψ_{0i} for $i = 1, ..., n$ and equals one*

$$\psi_0(s) = \sum_{i=1}^{n} \psi_{0i}(s) = 1,$$

satisfying condition (3b).

Proof. Add up all $\psi_{0i}(s)$, $i = 1, ..., n$, in (4). ■

To each state i belongs an unconditional probability $\psi_{0i}(s)$, which shows the mass of individuals of a certain age, skill level and previous earnings who stay in the source or want to move to the destination country and are unemployed or employed. For example, the unconditional probability ψ_{01} describes the fraction of unemployed stayers at time 0, and ψ_{03} represents the proportion of employed movers. The perspective taken here is that for the source country.

Due to the finite structure, the model arrange the initial distribution and other things so that the distribution of agents over individual state variables (S) remains constant over time even though the state of the individual household is an endogenously determined stochastic processes. That is, only the Markovian wage process changes endogenously according to the worker's intertemporal maximization problem. The other state variables of the model, age and skill, change according to exogenous Markov chains and are not

determined by the worker's decision problem over employment and migration and are, therefore, kept constant.

In the second step, I define on the Markov chain $\mathcal{P}(s,S)$ the transition probabilities on S and show their structure. Here, the Markov chain takes into account exogenous and endogenous probabilities of the worker's intertemporal maximization problem, which are not in the initial distribution, but maintains their structure. That is, the exogenous firing probability λ or the job offer probability $\pi(e_f^*(s))$ as well as the endogenous unconditional probabilities of migration and employment, $(1-F_f(\overline{w}_m(s)))$ and $(1-F_o(\overline{w}_{b,o}(s)))$, respectively, enter the Markov chain.[18]

Proposition 3 *Let $\mathcal{P}_{ij} = \mathcal{P}(s_i, \{s_j\})$ be the conditional probability of being currently in state i and move to state j in the next period, then the transition probabilities on the states are*

$$\mathcal{P}_{ij,o} = \Pr[w_{t+1}(s) = \overline{w}_j(s) | w_t(s) = \overline{w}_i(s)] =$$

$$\begin{pmatrix} F_m[\pi F_o + (1-\pi)] & (1-F_m)[\pi F_o + (1-\pi)] & F_m\pi(1-F_o) & (1-F_m)\pi(1-F_o) \\ \gamma[\pi F_f + (1-\pi)] & (1-\gamma)[\pi F_f + (1-\pi)] & \gamma\pi(1-F_f) & (1-\gamma)\pi(1-F_f) \\ F_m[\lambda + (1-\lambda)F_o] & (1-F_m)[\lambda + (1-\lambda)F_o] & F_m(1-\lambda)(1-F_o) & (1-F_m)(1-\lambda)(1-F_o) \\ \gamma[\lambda + (1-\lambda)F_f] & (1-\gamma)[\lambda + (1-\lambda)F_f] & \gamma(1-\lambda)(1-F_f) & (1-\gamma)(1-\lambda)(1-F_f) \end{pmatrix}$$

with $F_m \equiv F_f(\overline{w}_m(s))$, $F_o \equiv F_o(\overline{w}_{b,o}(s))$, $F_f \equiv F_f(\overline{w}_{b,f}(s))$ and $\pi \equiv \pi(e_f^*(s))$.

Proof. Since $\mathcal{P}_{ij} \geq 0$ and $\sum_{j=1}^{n} \mathcal{P}_{ij} = 1$ for $i = 1, ..., n$, $\mathcal{P}$ is an $n \times n$ Markov matrix. ■

Consider one-step transitions. If the current state is s_i, the probability distribution over next period's state is given by the ith row of $\mathcal{P}$, $\mathcal{P}_{i\cdot} = (\mathcal{P}_{i1}, ..., \mathcal{P}_{i4})$. For instance, if the worker's current state is $i = 1$, i.e. according to decision rule (4) the worker is currently unemployed and stays in the source country represented by $\psi_{01}(s)$, then the distribution over next period's state is given by the first row. That is, conditional on being unemployed in the source country this period, $\mathcal{P}_{11,o}$ is the probability the agent

[18] Huggett (1997) also takes into account that exogenous or endogenous variables can enter the transition matrix and not necessarily the initial and the invariant distribution, $\lambda_{j+1}(B) = T_{j\theta}\lambda_j(B) \equiv \int_{\mathcal{B}} \pi_{j\theta}(z, \{z' : (y(x,j;\theta), z') \in B\}) d\lambda_j$, $\forall B \in \mathcal{B}$, where the mapping $T_{j\theta}$ is directly defined in terms of a decision rule and an exogenous Markov shock process. The distribution of agents over states is then denoted as λ, whereas θ denotes a parameter entering the agent's preferences and/or Markovian process.

will be unemployed and stays in the source country in the next period too. Similarly, in the next period, the worker can stay in the source country and can be employed, being depicted by $\mathcal{P}_{13,o}$, and $\mathcal{P}_{14,o}$ is the transition probability the agent will migrate and will be employed in the destination country. So the subscript i shows the current state, being defined in (4), and j the transitional probability for the next period's state. Another example is the third row, $i = 3$, which means the worker is employed and stays in the source country and, e.g., $\mathcal{P}_{32,o}$ reflects then the transition probability of being unemployed and migrating to the destination country in the next period.

Furthermore, the stochastic matrix also entails situations when the worker stays currently in the destination country and might return to the source country in a period ahead. That is, the second and fourth row describe the probability distribution over next period's state conditional on the worker's current stay in the destination country. Because I do not analyze return migration, however, the probabilities of staying in the destination country γ or migrating back to the source country $(1 - \gamma)$ in the next period are taken as exogenous. The reason is a technical one and is shown in Proposition 4 to make the matrix invertible.

With the transition function $\mathcal{P}(s, S)$ at hand, it is possible to derive the invariant distribution, $\psi(s)$, in the third step.

Proposition 4 *If ψ satisfies*

$$(I - \mathcal{P}')\psi = 0, \tag{5}$$

then the equilibrium is stationary and characterized by an invariant distribution function $\psi(s)$.

Proof. (5) determines ψ as an eigenvector associated with a unit eigenvalue of $\mathcal{P}'$. That is, the fact that $\mathcal{P}$ is a stochastic matrix, i.e., it has nonnegative elements and satisfies $\sum_j P_{ij} = 1$ for all i, guarantees that $\mathcal{P}$ has at least one unit eigenvalue, and that there is at least one eigenvector that satisfies equation (5). ■

6 Numerical Application for the reunified Germany

6.1 Calibration

Since the migration decision will be analyzed from the perspective of an east German worker, the source country is represented by east and the destination country by west

Germany. The model has been calibrated using the following parameters for both countries.[19] The employed worker can be laid off with probability $\lambda = 0.006$. Layoff costs are constant $K = 5$, and migration costs depend on the worker's decision to migrate or to stay. If she migrates, the migration costs are $T_f = 12$ and otherwise $T_o = 0$. The discount factor is $\beta = 0.95$. The probability of returning from the destination to the source country $(1 - \gamma)$ is taken to be 0.05, a value similar to empirical studies.[20]

Wages

The exogenous wage distributions $F_j(w_j)$, $j \in \{o, f\}$, are Gaussian distributions with mean 0.5 and variance 0.01 for the source country and with mean 0.7 and variance 0.02 for the destination country. These parameter values replicate, on the one hand, the more equal wage distribution in east Germany, as opposed to the more unequal one in the west,[21] and, on the other hand, the high eastern wage increases, which have reached in 2003 approximately 75% of the western level. These huge wage rises were driven by wage bargaining outcomes between managers of former state-owned firms and representatives of western unions, none of whom had real productivity concerns.

In the model, wages are assumed to follow a Markov process. The wage of an employed worker stays with probability 0.98 the same, and with probability 0.02 it will be higher.

Due to equity aims of the German government, wages increased dramatically in the east in 1991–1995, and productivity concerns did hardly exist. The wage increases had nearly no economic reasoning, i.e. east production felt dramatically in the early years. Wages, however, increased.

The wage rises would justify to work with changing wage distributions in the model. Assuming invariant wage distributions, however, might not to be too unrealistic. Support for invariant wage distributions is given by empirical studies, finding mixed results of the impact of migration on wages.[22] For example, some studies find migration responses

[19] For some similar parameter values, see also Ljungqvist and Sargent (1998).

[20] For example, Hunt (2000) shows that 3% of east Germans who migrated to the west return to the east each year on average.

[21] See Appendix, Figure 9.

[22] See for example Friedberg (2001) who studies the implications of mass migration on the Israeli labor market and finds that the Russian immigration did not depress the wages of native Israelis, instead it may have raised them. On the other hand, Akerlof et al. (1991) estimated that if 4% of the east German labor force would migrate to the west, wages would have been be depressed on average by 3.15%. In their simulation study for Germany, Canova and Ravn (2000) simulated that a 1% flow of migrants from east Germany may cause a drop in low-skilled wages of only 0.5%, which is close to zero. That is, there is no unique impact of migration on wages.

include the mobility of the native-born population as well as the mobility of capital and the mobility of intermediate and final goods and services. These responses imply price equalization, which otherwise would have been precluded by observing a relationship between migration and wages in cross-section data.[23] Moreover, if skill differences are widely spread over the whole population, a rise in the immigrant population will have no effect on the structure of wages. On the other hand, however, if the inflows of migrants lead to a rise in the relative share of a particular skill group, the relative wage of that group should fall.[24] Thus, it is not clear whether migration rises or depresses wages.[25] Assuming invariant wage distributions, therefore, seems to be the most plausible way.[26]

Skills

The workers' skills can change according to five skill levels, which are evenly divided within the interval $h \in [1.0, 1.4]$. The skills of an employed worker remain the same with probability 0.95 and with probability 0.05 the worker accumulates skills and moves to the next higher skill level.

Comparing the sequential search approach to a general equilibrium model, in the latter approach, high-skilled agents would typically be treated to be more productive than low-skilled agents and would accumulate real or human capital. When a worker migrates to another country, it is usually argued that the human capital of immigrants depreciates upon emigration because of productivity differences in human capital or differences in language skills.[27] As empirical evidence for Germany shows, however, human capital was not country-specific at the time of the reunification. For 1992 to 1997, according to the OECD (2001, Table 26), the average qualification structure of east-west migrants is similar to the average qualification structure of the population in the old states: 18% of the migrants were less educated, as compared to 26% in the old states, 70% had a medium education, as compared to 62%, and 12% were highly educated, as compared to 12%. These figures indicate no specific reason for the depreciation of human capital due

[23] See Chiswick (1993).

[24] See Card, DiNardo (2000).

[25] So factor price equalization in wages by labor mobility is empirically not confirmed.

[26] See also existing wage differentials along the U.S.-Mexican border. Chiswick and Hatton (2002) argue that location specific investments in human capital largely account for the persistent substantial difference in wages for workers of the same skill level on different sides of the U.S.-Mexican border. These location-specific human capital investments include investments in the labor market, language and culture of the origin, and "investments" (relationships) with family, friends and community.

[27] Some studies show poor language skills result in reduced wages. For example, Trejo (1997) finds among Mexican immigrants to the US, those suffer wage losses who lack English language abilities.

to migration.

In the model, human capital will depreciate when a worker is laid off. When laid off, she remains with probability 0.95 temporarily in the same skill group, and with probability 0.05 her skills depreciate and she migrates to the next lower skill group. During unemployment, the worker's skills stay the same with probability 0.9, but skills depreciate twice as fast as they were accumulated, i.e. the skill depreciation probability is 0.1.

The worker's disutility of searching a job c as well as the probability of receiving a wage offer π depend positively on the search effort, i.e.

$$\begin{aligned} c(e_k) &= 0.25\ e_k \\ \pi(e_k) &= 0.5\ e_k^{0.3}. \end{aligned}$$

Insurance System of the Government

The government's aim is to redistribute income to individuals, via taxes and transfers, to insure workers against income fluctuations. According to German insurance practice, an unemployed fulfilling certain requirements receives 60% of the last net income as unemployment benefits. This value is also used for the calibration of the model's replacement ratio

$$b(I_k) = 0.6\ I_k.$$

To distinguish between unemployed workers receiving benefits and those without, the government has a suitable earnings criterion. An unemployed worker who quits the job or has been laid off might be entitled to unemployment compensation, when her last income is below 75% of the government's suitable earnings, $I_e(I_k) = I_u(I_k) = 0.75\ I_k$. Unemployment benefits will terminate, if the unemployed worker does not accept a job offer associated with earnings greater or equal to 75% of previous earnings. The generated 25 last income levels fall into the interval $I_k \in [0, 1.5]$.

Comparing the German insurance policy with that to other former central planned economies, Schrettl (1992) suggests the distinguishing feature in the east German transition process was the validity of the same high insurance level for east Germany. Right after unification, these high insurance levels were justified by fears of even larger mass migration towards the west, which could have resulted in political and social turmoils there. These political fears did not only motivate high levels of financial transfers, but also large-scale provisions of active labor market programs. Over the 1991–1996 period, public transfers to the eastern states reached approximately $100 billion per year. This

corresponds to 4–5% of the annual west German GDP, which is about 35% of the local GDP), or to a yearly transfer of nearly $4000 per capita. Of these transfers social insurance related payments accounted for about 45%.[28]

The tax rule used by the government has to be specified as well. Taxes are supposed to be proportional to the worker's net income with a non-progressive tax rate of $\tau = 0.3$. Thus, an employed worker receives an after tax income of $(1-\tau)wh$ and an unemployed worker of $(1-\tau)b(I_k)$. Due to simplicity, the marginal tax rate is kept constant for all skill levels.

Governments insure workers from any kind of employment fluctuations by choosing taxes and transfers that are proportional to the income. Most theoretical studies assume a government is forced to balance its budget on a period-by-period basis. The German government, however, used intertemporal borrowing to finance the transfers. For 1991–1997, this borrowing scheme implied unusually large budget deficits of about 3% of GDP on average in west Germany, as compared to 1.5% before unification. To replicate this spending behavior, the model allows for intertemporal borrowing too.

Ages

To capture the age effects on migration, workers can transit through four age groups: The probability of staying in the youngest age group is 0.9985 and 0.992 for the second and the third group. With a probability of 0.992 the worker remains in the oldest group.

6.2 Simulation Results

This section characterizes the calibration results of the optimal search intensities a domestic worker is choosing when searching for a job in the destination country. After the search intensities have been shown, the calibrated relations, on the one hand, between the reservation wages for migration and previous earnings and, on the other hand, between the reservation wages for migration and skills are discussed. The reservation wage for migration is the wage that leads to migration if the foreign wage offer is higher than that reservation wage. Due to simplicity reasons, only the development of the reservation wage for migration $\overline{w}_m(s)$ will be shown.

Optimal search intensities of for workers when searching in the destination country

When looking for a job in the foreign country, the search intensities chosen by workers vary dramatically. These variations reflect the influence of various skills and incomes on

[28] See Canova and Ravn (2000).

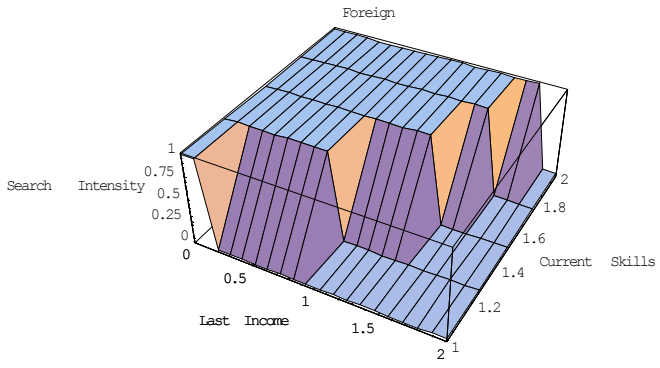

Figure 2: Search Intensity of Domestic Workers in the Foreign Country.

search intensities. As Figure 2 shows the search intensities depend negatively on previous earnings and positively on skills. Migrants with low last earnings have the highest search intensities. This holds for all skill levels, i.e. low and high skilled workers search very intensively for a new job, when past incomes were very low. However, rising incomes lead, via the influence of unemployment compensation, to decreasing search intensities. An increase in previous incomes induces a rapid reduction in search intensities. Especially low skilled workers with middle or high past incomes reduce their search intensities, due to high benefits. That is, low skilled workers with high last incomes receive high benefits, which are hard to come by. By rejecting to put any effort into the job search, these migrants neither look in the destination nor in the source country for a job, instead they choose to be unemployed. On the other hand, high skilled workers search very intensively, even though they have high previous earnings too and receive high benefits. The reason is high skilled workers do care about their jobs and do not rest on high benefits and choose, therefore, high search intensities.

In the German migration case, there might have been several reasons for east migrants with middle and high last incomes to choose low search intensities. The first is the immediate transfer of western social security rules to the east. With the political union, east workers received instantaneously the same level of unemployment support. This could have triggered low search intensities. A second reason might be the one-to-one convertibility of the former east Mark into the German Mark (DM). The monetary union was established before the political union and without any productivity considerations.

At that time, its aim was to reduce social and migrational pressure, which could have otherwise created harsh political and organizational problems in the west too. High east savings and incomes might have been generated, in the former GDR, without any skill or qualification considerations. They could have been the result just because of a long-run affiliation to a former state company. After the reunification, however, they were the basis for the amount of unemployment benefits. Thus, due to an overvaluation of the eastern Mark, high savings and earnings as well as unemployment benefits were generated and could have induced low search intensities of eastern workers.

Furthermore, high past incomes might have triggered severe damaging budget effects as well. Since immigrants with high previous earnings and very low search intensities are not willing to find employment, they do not pay taxes, do not contribute to the social security system and receive high unemployment support instead. Hence, fiscal budgets are heavily charged. This burden increases net fiscal deficits and is even more harmful, since subsequent costs of retirement, for which new migrants are eligible, are not taken into account. That is, due to wrong incentives, 'rich' immigrants may have contributed dramatically to rising deficits in the early years after reunification.[29]

Coming back to pure theoretical considerations of the analysis of search incentives, another intertemporal aspect of the model becomes apparent. Workers would choose low search intensities for all subsequent periods, if the worker's human capital did not depreciate during unemployment. Last incomes are defined as the current wage times the worker's previous skill level. Due to the depreciation of skills over time, after a while, it might be optimal to increase the search intensity. A higher search intensity will lead to a higher probability of getting a job offer. Therefore, the intertemporal link of earned incomes and skill depreciation might lead to higher subsequent search intensities and to employment. In static migration models, this link is missing.

These effects characterize the influence of earned incomes and skills on search intensities, but say nothing about their effects on the migrant's reservation wage and on the interplay between a migrant's reservation wage and a wage offer. By comparing both, the worker decides to stay in the source country or to migrate to the destination country and to accept or reject the job offer. Before characterizing the stationary equilibrium, the influence of previous period's incomes and skills on the reservation wage for migration will be discussed.

[29] Contrary to these arguments, Storesletten (2000) discusses that (selective) immigration should be able to mitigate fiscal burdens, which are associated with the aging of the baby boom generation, and might serve as an alternative to tax hikes or spending cuts for financing future fiscal deficits.

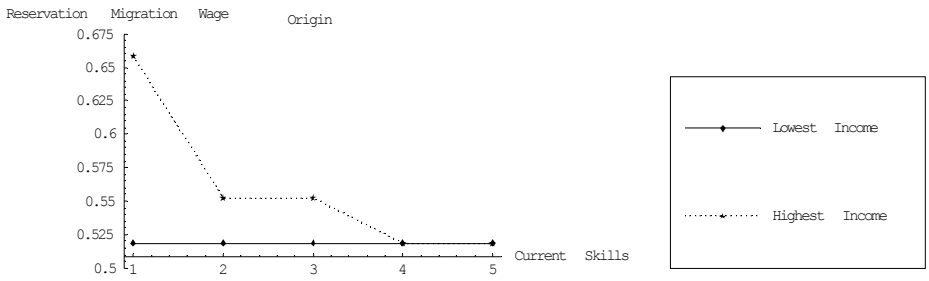

Figure 3: Reservation Migration Wage and Skills.

Reservation wage for migration and skills

Figure 3 shows the relation between the reservation wage for migration and skills for two given income levels. Here, the effect of high benefits on the worker's reservation wage of migration become obvious. Even though workers belong to the same, for example, low skill group, they choose significant different reservation wages for migration. This is the result of different past income levels that lead to distinctive employment and migration decisions. If a worker with a low previous income is regarded, the reservation wage for migration is constant in skills. Low earnings induce low reservation migration wages, which remain low, and are constant in skills. Due to low previous earnings, these workers do not receive high benefits and are willing to accept low wages. On the other hand, the reservation wage for migration for a worker with a high previous income is not constant in skills, instead it depends negatively on skills. It is higher, the higher the earned income and the less educated the worker. A worker without any skills, but with a high previous income, has the highest reservation migration wage! This worker searches for high wage offers in both countries to maintain the high income level from the previous period. Because low skilled workers did not accumulate any skills previously, they do not fear skill depreciation, when getting no wage offer at all, and skill depreciation is no punishment for them. However, the more educated a worker is, the greater the fear of skill depreciation during unemployment and the lower the reservation wage for migration.

Reservation migration earnings and last incomes

Figure 4 shows the effects of previous earnings on the reservation *earnings* for migration for different skills. The reservation earnings for migration are defined as the

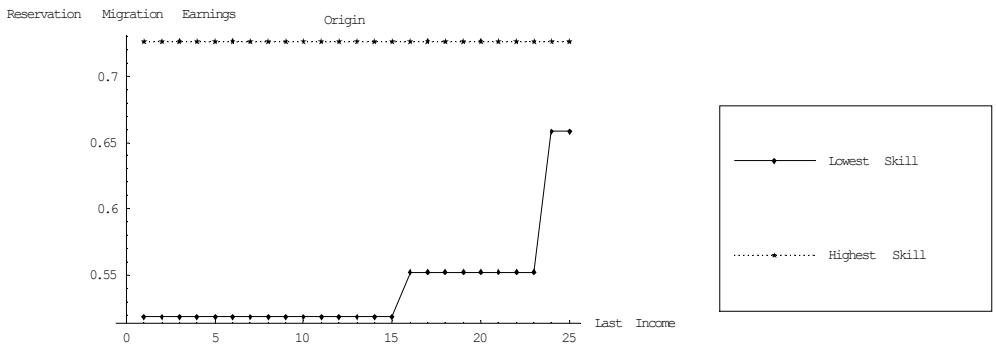

Figure 4: Reservation earnings for migration and last incomes.

migrant's reservation wage times the worker's current skill level and represent the income threshold the migrant expects to earn at least in the destination country. Above the threshold, the worker is willing to accept a wage offer and to leave the country. High and low skilled workers have different reservation earnings when making migration decisions. To analyze the structure of thresholds for different skills, the comparison of reservation migration earnings shows the thresholds for high skilled are much higher and constant in last incomes. The high threshold is the reward a high skilled worker expects from skill accumulation. The constant relation, however, points to the fear of skill depreciation. For low skilled migrants, on the other hand, the reservation migration earnings are very low and constant in low previous earnings, but increasing in the high and middle income ranges. That is, a low skilled worker with a low migration earning threshold is willing to accept low foreign wage offers, but when previous incomes were high, the threshold increases steeply, and this prevents accepting a job offer—even though the worker is low skilled.

Next, the influence of different last incomes on the reservation migration earnings for low and high skilled workers and their connection to wealth constraints will be discussed. Low skilled workers with low previous earnings might have large incentives to emigrate, but those who possibly have the most to gain may simply be too poor to finance the move. They might face wealth constraints. Higher previous incomes can relax the wealth constraints and provide resources to finance migration. Therefore, low skilled workers with high previous earnings might not be wealth constrained and can migrate.

Applying the idea of wealth constraints skilled and unskilled east workers might have

faced when migrated to the west, empirical studies show the reunification imposed nearly no wealth constraints at all. This becomes apparent when the qualification structure of the east-west migrants with vocational or higher education is regarded. According to the OECD (2001), the share of low skilled workers who migrated is nearly the same as that of high skilled workers. Between 1992 and 1997, 17.6% of low skilled and 12% of high skilled worker migrated. Kempe (2001) shows both fractions remained relatively close together at 17.1% and 25% for low and high skilled migrants, respectively, in 1997–1999.[30] Since the high and low skilled proportions did not change dramatically over time, neither of them faced severe wealth constraints.

Reservation migration earnings for skills and last incomes

Figure 5 summarizes the discussion of reservation migration earnings, current skills and last incomes for unemployed who might stay or migrate. For given low skills, there is a positive relationship between the reservation earnings for migration and last incomes. The higher previous incomes, the higher the reservation migration earnings. For high skilled workers, the link between the reservation earnings for migration and last incomes is positive too, but on a higher level. High skilled workers have higher reservation earnings for migration, which are slightly increasing in incomes, due to the fear of skill depreciation. These forces reflect again the influence of skill accumulation and depreciation on the reservation earnings for migration. Low skilled workers with high earned incomes put more weight on searching for high paid jobs to maintain high living standards than on employment. Quite in contrast is the behavior of high skilled workers. They search for employment and try to avoid unemployment. To achieve this, the reservation migration earnings are constant in last incomes and increase only slightly with additional skills. This increases the probability of getting and accepting a job offer.

[30] In contrast to the result of missing wealth constraints in the German mass migration case is the mass migration from the former Soviet Union to Israel, where Israel experienced a huge inflow of Russian migrants since 1989. Nearly one million Russian immigrants came to Israel, increasing the population by 12 percent in the first half of the 1990s. Friedberg (2001) argues that the Russian immigrants were highly educated and had excellent experiences in high skilled jobs. By regarding Friedberg's argument of non-immigration of low-skilled migrants and following the above developed arguments, it can be concluded that the wealth constraints for low skilled workers must have been extremely large and must have prevented low skill immigration to Israel. A further interesting point worth mentioning is that even though Israel experienced a huge increase in (high skilled) immigration, the aggregate native rate of return to education increased. This shows further that the effect of immigration on wages is far from being clear cut, and Friedberg tries to explain it by social increasing returns in human capital.

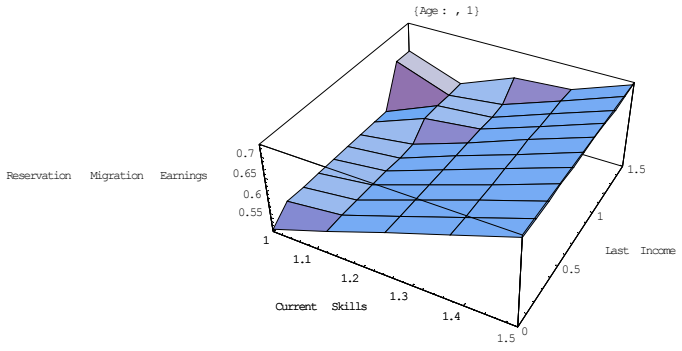

Figure 5: Reservation Migration Earnings for Skills and Earned Incomes.

6.3 Results for the Stationary Steady State

In this chapter I show the source economy has a stationary distribution and converges to that from any initial distribution. The idea is that the stationary probability distribution of states is the model's prediction about its long-run behavior. That is, convergence of an endogenous stochastic process means convergence of the sequence of probability measures $\{\psi_t\}$, given ψ_0. The analogue of a stationary state is a limiting probability measure. These theoretical results derived in Section 5 will now be calibrated.

In the next examples, the probability distribution $\mathcal{P}$ over the state s converges to the stationary distribution $\psi(s)$ for all initial probability measures ψ_0. Therefore, I will neglect to report the initial distribution. A vector with this property is called an invariant distribution. Each row of the limit matrix is an invariant distribution, ψ.

In the first state, the source country is populated by young and unskilled workers with low previous earnings, i.e. $a = 1, h = 1, I = 1$ and $s = \{a_1, h_1, I_1\}$. The calibrated transition matrix $\mathcal{P}(a_1, h_1, I_1)$ is then

$$\mathcal{P}(a_1, h_1, I_1) = \begin{pmatrix} .06 & .54 & .04 & .36 \\ .52 & .03 & .43 & .02 \\ .02 & .19 & .08 & .71 \\ .10 & .01 & .85 & .04 \end{pmatrix}$$

and the stationary distribution is

$$\psi(a_1, h_1, I_1) = [.13 \quad .15 \quad .39 \quad .33].$$

In this state, when the population is young and unskilled with previously low earnings, the stationary equilibrium for the source country is characterized by these population fractions: 13% of the workers will be unemployed and want to stay in the source country. I call them unemployed stayers. 15% of the population will migrate to the destination country and might, most likely, be unemployed there. They are called unemployed movers. 39% of the population will stay and might be employed in the source country (employed stayers), and the remaining fraction of employed movers is 33%.

In the next state, the invariant distribution for a population who is young and unskilled with high previous earnings will be considered. The transition matrix is

$$\mathcal{P}(a_1, h_1, I_{25}) = \begin{pmatrix} .36 & .58 & .02 & .04 \\ .88 & .05 & .07 & .01 \\ .19 & .30 & .19 & .31 \\ .37 & .02 & .58 & .03 \end{pmatrix},$$

and the stationary distribution is

$$\psi(a_1, h_1, I_{25}) = [.52 \quad .35 \quad .08 \quad .05].$$

If the population of the source country is characterized by this population, then 52% are unemployed stayers, 35% are unemployed movers, 8% are employed stayers and 5% are employed movers.

In the third case, the workers are qualified with previous high earnings. The transition matrix is

$$\mathcal{P}(a_1, h_3, I_{25}) = \begin{pmatrix} .14 & .80 & .01 & .05 \\ .85 & .04 & .10 & .01 \\ .07 & .42 & .08 & .43 \\ .15 & .01 & .80 & .04 \end{pmatrix}$$

and the stationary distribution is

$$\psi(a_1, h_3, I_{25}) = [.41 \quad .39 \quad .12 \quad .08].$$

Finally, when the workers are young and high skilled with high previous incomes, the transition matrix is

$$\mathcal{P}(a_1, h_5, I_{25}) = \begin{pmatrix} .09 & .84 & .01 & .06 \\ .84 & .04 & .11 & .01 \\ .05 & .44 & .05 & .46 \\ .10 & .01 & .85 & .04 \end{pmatrix}$$

and the invariant distribution is

$$\psi(a_1, h_5, I_{25}) = [.38 \quad .40 \quad .13 \quad .09].$$

Using these results, the next propositions can be derived.

Proposition 5 *For unskilled workers with low or high income, an increase in past earnings leads to (i) decreasing employment and increasing unemployment rates for stayers and movers (benefit effect). (ii) Unskilled workers with high or low previous earnings are unemployed self-selected.*

Proof. See the calibrated invariant distributions, $\psi(a_1, h_1, I_2) = [.30 \quad .30 \quad .21 \quad .19]$ and $\psi(a_1, h_1, I_{25}) = [.52 \quad .35 \quad .08 \quad .05]$. ■

For the interpretation of this proposition, the reservation wages for accepting a job offer and the reservation wages for migration as well as the optimal search intensities have to be taken into account. The reservation wages determine endogenously the transition probabilities of the stochastic matrix $\mathcal{P}$ and the state probabilities of the stationary distribution function ψ. Figure 5 shows the reservation migration earnings for unskilled workers are increasing in previously earned incomes. Unskilled workers with the highest last incomes have very high reservation wages to accept job offers and very high reservation migration earnings to move to another country. The effect of the positive relationship between reservation migration earnings and previously earned incomes appears in the invariant distribution functions too and implies high unemployment rates for this group. With 52 and 35%, the proportions for unemployed stayers and unemployed movers are the highest in $\psi(a_1, h_1, I_{25})$. Whereas, with only 8 and 5%, the employment proportions for stayers and movers are the lowest. Once again, the reason for the extremely high unemployment rates are high benefit payments based on high incomes. High previous earnings lead to very high reservation wages. Workers, receiving high benefits, try to avoid to search for a job at all. For them, it is optimal to choose very low search intensities, $e^*(a_1, h_1, I_{25}) = 0$ (see Figure 2).

Contrary to these proportions are the employment rates for unskilled workers with low last incomes characterized by $\psi(a_1, h_1, I_2)$. Of these workers, 21 and 19% are employed stayers and employed movers, and 30% as well as 30% are unemployed stayers and unemployed movers, respectively.

Even though the same age and skill group is compared in both states, workers with low past earnings have much higher employment rates than workers with high earnings. This is because of lower reservation wages and nearly no benefits at all. Increases in

past incomes lead to reductions in employment and higher unemployment. Since higher unemployment is induced by low search intensities and high benefits, I call this the *benefit effect*.

Beside the benefit effect, which acts on the employment rates, there is self-selection of migrants. Self-selection is determined by picking the highest migration rates for employed and unemployed movers from the invariant distribution function. For unskilled unemployed workers of both income groups, the migration rates are the highest with 30 and 35%. Since unskilled migrants will most likely be unemployed in the destination country, I define this as *unemployed* self-selection of unskilled movers.

Proposition 6 *For skilled workers, the rise in past incomes leads to (i) decreasing employment and increasing unemployment rates for stayers and movers (benefit effect). (ii) Skilled workers with low earnings are employed self-selected; (iii) whereas skilled workers with high incomes are unemployed self-selected.*

Proof. See the calibrated invariant distributions for $\psi(a_1, h_5, I_1) = [.13 \quad .15 \quad .39 \quad .34]$ and $\psi(a_1, h_5, I_{25}) = [.38 \quad .40 \quad .13 \quad .09]$. ■

Here the benefit effect occurs again: For skilled workers, the increase in earnings generates decreasing employment and increasing unemployment for stayers and movers. This effect is based on high benefits due to high previous earnings. The unemployment proportions increase from 13 to 38% for stayers and from 15 to 40% for migrants. The employment rates decrease from 39 to 13% for stayers and from 34 to 9% for movers. Thus, as previously earned incomes increase, the benefit effect occurs for skilled workers.

Skilled workers with low incomes have high employment rates, because of high search intensities, $e^*(a_1, h_5, I_1) = 1$, and low reservation wages for employment and for migration (see Figures 2 and 3). That is, due to low past earnings, it is optimal for these workers to choose high search intensities and low reservation wages. Firms are therefore willing to hire them and the employment shares for stayers and movers are high.

For skilled workers, self-selection becomes obvious by picking the highest migration rates for employed and unemployed movers. Skilled workers with low previous incomes have the highest rate of employed movers. 34% of skilled workers will migrate to the destination country and will be employed there. I call them *employed* self-selected. The employed self-selection is opposite to the unemployed self-selection of skilled workers with high previous incomes. 40% of skilled workers with high previous incomes want to migrate, but will be unemployed in the destination country. They do belong to the skilled workers in the source country, but because of high previous earned incomes, which induce high

reservation wages, they will be unemployed in the destination country. These skilled migrants are *unemployed* self-selected.

Proposition 7 *For workers with low previous incomes, the accumulation of skills leads to (i) increasing employment and decreasing unemployment rates for stayers and movers (skill effect). (ii) For workers with low previous incomes, a special type of self-selection cannot be determined.*

Proof. See and compare the above calibrated results for the invariant distributions of $\psi(a_1, h_1, I_2) = [.30\ .30\ .21\ .19]$ and $\psi(a_1, h_5, I_2) = [.13\ .15\ .39\ .34]$. ■

The effect of skill accumulation can be observed by comparing the employment rates for stayers and movers. They increase from 21 to 39% and from 19 to 34%, respectively. The unemployment rates decrease from 30 to 13% for stayers and from 30 to 15% for movers. The reduction in unemployment and the increase in employment reflects the pure effect of the accumulation of skills (*skill effect*).

Self-selection will again be determined by picking the highest migration rates for unskilled and skilled workers. This shows that, for workers with low previous earnings, 30% of unskilled unemployed workers and 34% of skilled employed workers will migrate. Due to these opposite results in migration rates, an unique direction for migration and, therefore, a certain type of self-selection cannot be determined.

Proposition 8 *The accumulation of skills for workers with high previous incomes induces (i) a skill effect for stayers, i.e. increasing employment and decreasing unemployment rates, (ii) higher employment rates for movers and (iii) unemployed self-selection for skilled migrants!*

Proof. See $\psi(a_1, h_1, I_{25}) = [.52\ \ .35\ \ .08\ \ .05]$, $\psi(a_1, h_3, I_{25}) = [.41\ \ .39\ \ .11\ \ .08]$ and $\psi(a_1, h_5, I_{25}) = [.38\ \ .40\ \ .13\ \ .09]$. ■

The astonishing result here is the unemployed self-selection of skilled migrants. Despite the accumulation of skills, the benefit effect induced by high previous incomes outweighs the skill (accumulation) effect. That is, for movers with high previous incomes, the unemployment rates increase from 35 to 40%, even though they become much more skilled! This shows the strength of benefits and their negative influence on search intensities, $e^*(a_1, h_1, I_{25}) = e^*(a_1, h_3, I_{25}) = e^*(a_1, h_5, I_{25}) = 0$, and on the reservation wages. The eligibility for benefits induces unemployed self-selection for skilled migrants. This means, although skilled workers will migrate, they are most likely unemployed. I call this phenomenon unemployed self-selection of skilled migrants.

To make the importance of this result clear, it should be considered with Borjas' self-selection result. Borjas (1987) concludes skilled workers move, when the destination country—here west Germany—has a more spread out wage distribution than the source country—here east Germany—, because they can get higher wages. My analysis, however, shows this result has to be modified, if previously earned incomes are taken into account. The introduction of benefits and the possibility of different employment states leads to unemployed self-selection of skilled migrants. That is, self-selection in my model not only takes the skill level and different variances of wage distributions, as in Borjas, into consideration, but also the employment states of migrants. If the employment states are added, skilled migrants are unemployed self-selected—instead of just being skilled (or positively) self-selected as in Borjas. This result is shown in Propositions 6 (iii) and 8 (iii).

After this comprehensive analysis, the main results are summarized as follows: First, the rise in past earnings induce via higher benefits higher unemployment. This effect holds for all skill types and is called the benefit effect. Higher past incomes lead via higher benefits to lower employment and higher unemployment rates.

According to Borjas (1999), unemployment benefits conditional on previous earnings are likely to increase the number of immigrants, who would otherwise not have migrated, and have magnetic effects. The calibrations seem to confirm this conjecture: The higher last earnings, the higher the benefits and the higher the migration rates for unemployed workers. Although early empirical studies of immigrant participation in welfare for the U.S. concluded that immigrant households had a lower probability of receiving public assistance, more recent empirical studies have shown that this conclusion no longer holds — immigrant households are now more likely to receive welfare than native households.[31] For the east-west migration in Germany this argument is neutral, because with the political reunification, east Germany had immediately the same institutional and legal system as west Germany and, therefore, unemployed migrants received the same benefit levels.

Secondly, the accumulation of skills reduces unemployment and increase employment. This skill effect holds for stayers and movers with low incomes as well as for stayers with high incomes. As the calibrations show, for given low last incomes, skilled workers have

[31] For the U.S., Borjas and Hilton (1996) report that when both cash and non cash benefits are included in the definition of welfare, approximately 21 per cent of immigrant households received assistance in the 1990s, as compared to only 14 per cent of native households. Furthermore, Borjas' (1999) data illustrate for the U.S. that less-skilled immigrants and immigrant welfare recipients are much more concentrated in high-benefit states than immigrants who do not receive welfare.

high employment rates, and they move disproportionately. The empirical literature confirms the skill effect of higher employment rates for skilled than for unskilled migrants.[32]

Thirdly, for given low last incomes, the accumulation of skills increases the migration rates for employed migrants. Borjas (1987) calls the rise in migration rates for skilled workers positive self-selection.[33] In my model, however, the migration rates increase only for employed skilled migrants. Thus, the result confirms partly Borjas conclusion, but adds the employment part, and is called employed self-selection of skilled migrants.

Fourthly, for given high last incomes, the accumulation of skills leads to rising migration rates but this time for unemployed workers. The accumulation of skills generates higher rates of skilled unemployed movers! That is, because of their high reservation wages and low search intensities, skilled migrants are unemployed in the destination country. I refer this as unemployed self-selection of skilled migrants. One can also say that the skill effect, which increases employment rates, will be outweighed by the benefit effect, which decreases employment rates. However this will be described, for given high earned incomes, the accumulation of skills will lead to higher unemployment of skilled movers.

Fifthly, using these findings, it is not possible to determine a single skill group of workers, who will predominantly move. Both, unskilled and skilled workers will move in relatively high proportions—at around 30% or higher—to the destination country and will, most likely, be unemployed there; as they were in the source country. Therefore, mainly unemployed migrants, either skilled or unskilled, move.

These results are derived by calibrating the model with German wage data. Empirical studies, using traditional regressions, seem to support my findings. Hunt (2000), for example, provides regressions for Germany, based on individual panel data for 1991–1997, and shows workers, being unemployed in the 1990s in east Germany, were more likely to emigrate. Furthermore, she finds that laid-off workers are twice as likely to emigrate compared to employed workers, which is also in line with the above results. Lastly, her empirical evidence seem to support the conjecture of the impossibility to determined uniquely whether high skilled or low skilled are more likely to move. Her regressions show that east-west migrants are mainly unskilled, if the unskilled are classified as having only general schooling. Adding further variables, however, like sex, age and distance dummies, implies an individual with university degree, i.e. a skilled worker, is more likely to move

[32] For example, Pekkala and Tervo (2002) show evidence for Finland that migration by itself does not increase the probabilities of employment, whereas a better education and ability on the part of migrants does.

[33] Here the positive self-selection is called self-selection of skilled migrants.

to the west. These empirical results strengthen further the difficulty to determine pure skilled or unskilled self-selection, but are in accordance with the self-selection of mainly unemployed migrants.

7 Conclusion

In this contribution, I have developed a sequential migration model that represents the intertemporal decisions of an individual worker about employment and migration states, when both states are due to stochastic shocks to the worker's wages and skills. The shocks can lead to revisions of her reservation wages for employment and migration and thus to a new evaluation of the states.

The different decisions about employment and migration imply that the worker can be in one of four situations: either she stays employed or unemployed in the source country or she migrates and is employed or unemployed in the destination country. A worker can thus be an employed or unemployed stayer or an employed or unemployed mover.

In the stationary equilibrium, four types of workers can be identified. The population fractions of employed and unemployed stayers and of employed and unemployed movers are determined and are supplementary differentiated by ages, skills and last earnings. Analyzing the invariant distributions for these different states shows two distinctive effects, a benefit and a skill effect. The first is induced by the rise in past incomes and the latter by the accumulation of skills. The two in opposite directions working effects imply a trade off between equity and efficiency an economy faces. On the one hand, the benefit (or equity) effect illustrates the reduction in employment and the increase in unemployment when previous incomes increase. It works mainly through the link between previous earnings and unemployment benefits. The higher previous incomes, the higher benefits, and the lower the worker's search intensities. Lower search intensities lead to higher unemployment. The benefit effect is generated by a generous social security system, whose level is set by the government.

On the other hand, the skill effect reflects efficiency and acts less surprisingly when previous incomes are low. In this case, the accumulation of skills stimulates employment and reduces unemployment. For migrants with high previous incomes, however, the benefit effect outweighs the skill effect. That is, for migrants with high past incomes, the unemployment rates increase, in spite of the worker's accumulation of skills.

If the benefit effect were missing, the skill (or efficiency) effect would increase employment. I.e., the accumulation of skills would rise employment and decreases unemployment

and, therefore, the economy would be more efficient. When the benefit effect is taken into consideration, however, employment and thus efficiency decreases and unemployment as well as equity increases. This shows the trade off between efficiency and equity. Unemployment, in this case, is primarily caused by the power of the benefits.

Furthermore, I exemplified the rise in previous earnings and/or the accumulation of skills lead to unemployed self-selection of skilled and unskilled migrants. Rising previous incomes generate higher migration rates for unskilled unemployed workers with low or high previous earnings, indicating unemployed self-selection of unskilled migrants. Furthermore, skilled workers with high last incomes are unemployed self-selected too. Empirical studies for the reunified Germany seem to support the unemployed self-selection of skilled and unskilled migrants.

References

Akerlof, George A., Andrew Rose, Janet Yellen and Helga Hessenius (1991), "East Germany In From The Cold: The Economic Aftermath of Currency Union," *Brookings Papers on Economic Activity* 1: 187.

Borjas, George J. (1999), "Immigration and Welfare Magnets," *Journal of Labor Economics* 17: 607-637.

Borjas, George J. (1987), "Self-Selection and the Earnings of Immigrants," *American Economic Review* 77: 531-553.

Borjas, George J. and Lynette Hilton (1996), "Immigration and the Welfare State: Immigrant Participation in Means-Tested Entitlement Programs," *Quarterly Journal of Economics* 111: 575-604.

Canova, Fabio and Morten O. Ravn (2000), "The Macroeconomic Effects of German Unification: Real Adjustments and the Welfare State," *Review of Economic Dynamics* 3: 423-460.

Card, David and John E. DiNardo (2000), "Do Immigrant Inflows Lead To Native Outflows?," *American Economic Review* 90: 360-367.

Chiswick, Barry R. (1999), "Are Immigrants Favorably Self-Selected?," *American Economic Review* 89: 181-185.

Chiswick, Barry R. (1993), "Review of Immigration and the Work Force: Economic Consequences for the United States and Source Areas by George J. Borjas and Richard Freeman," *Journal of Economic Literature* 31: 910-911.

Chiswick, Barry R. and Timothy J. Hatton (2002), "International Migration and the Integration of Labor Markets," IZA Working Paper No. 559.

Friedberg, Rachel (2001), "The Impact of Mass Migration on the Israeli Labor Market," *Quarterly Journal of Economics* 116: 1373-1408.

Huggett, Mark (1997), "The One-Sector Growth Model with Idiosyncratic Shocks: Steady States and Dynamics," *Journal of Monetary Economics* 39: 385-403.

Hunt, Jennifer (2000), "Why Do People Still Live in East Germany?," NBER Working Paper 7564.

Kempe, Wolfram (2001), "Neuer Trend in der Bildungsstruktur der Ost-West-Wanderung?," IWH, *Wirtschaft im Wandel* 9: 205-10.

Krusell, Per and Anthony Smith (1998), "Income and Wealth Heterogeneity in the Macroeconomy," *Journal of Political Economy* 106: 867-896.

Ljungqvist, Lars and Thomas J. Sargent (2004), "Recursive Macroeconomic Theory," 2nd edition (online version).

Ljungqvist, Lars and Thomas J. Sargent (2002), "The European Employment Experience," CEPR Discussion Paper No. 3543.

Ljungqvist, Lars and Thomas J. Sargent (1998), "The European Unemployment Dilemma," *Journal of Political Economy* 106: 514-550.

McCall, John J. (1970), "Economics of Information and Job Search," *Quarterly Journal of Economics* 84: 113-126.

OECD (2001), Economic Surveys Germany, Paris.

Pekkala, Sari and Hannu Tervo (2002), "Unemployment and Migration: Does Moving Help?", *Scandinavian Journal of Economics* 104: 621-639.

Pohl, Rüdiger (2002), "Ostdeutschland im 12. Jahr nach der Vereinigung," in "Das Parlament. Aus Politik und Zeitgeschichte," Bundeszentrale für Politische Bildung, B 37-38.

Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (2003), "Staatsfinanzen Konsolidieren, Steuersystem Reformieren," Jahresgutachten 2003/04.

Schrettl, Wolfram (1992), "Transition with Insurance: German Unification Reconsidered," *Oxford Review of Economic Policy* 8: 144-55.

Sjaastad, Larry A. (1962), "The Costs and Returns of Human Migration," *Journal of Political Economy* 70: 80-93.

Stokey, Nancy L. and Robert E. Lucas (with Edward Prescott) (1989), "Recursive Methods in Economic Dynamics", Harvard University Press, Cambridge.

Storesletten, Kjetil (2000), "Sustaining Fiscal Policy Through Immigration," *Journal of Political Economy* 108: 300-324.

Trejo, Stephen (1997), "Why Do Mexican Americans Earn Low Wages?," *Journal of Political Economy* 105: 1235-1268.

Volkswirtschaftliche Gesamtrechnung der Länder (2003), Länderergebnisse.

Appendix

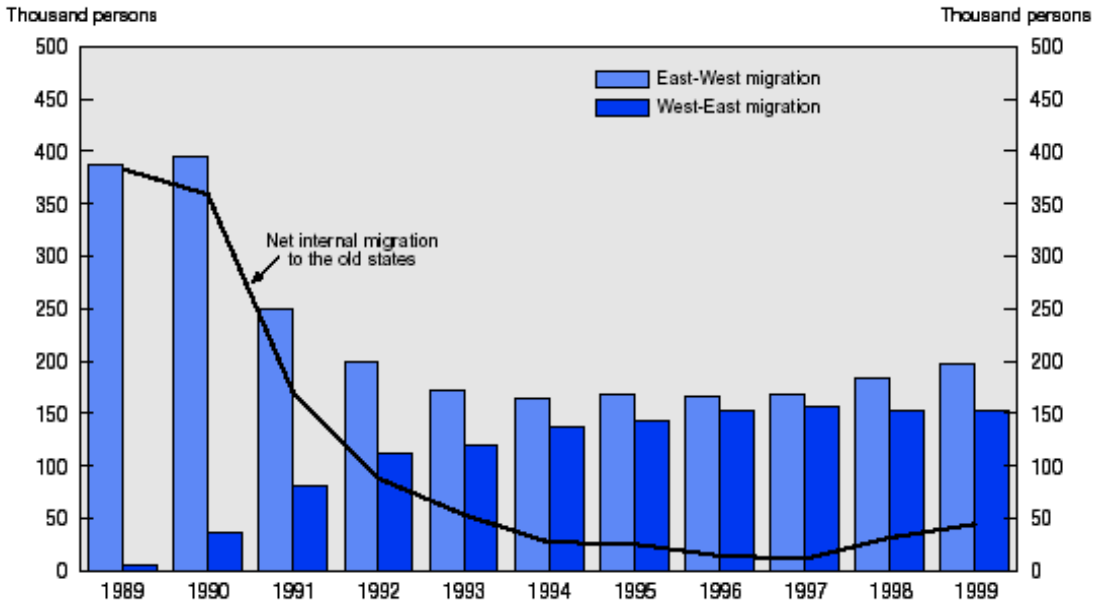

Figure 6: Intra-German migration. Source: OECD (2001), Fig. 29.

Per Cent[a]

	Real GDP Growth[1]		Registered Unemployment[2]		"Hidden" Unemployment[3]	
Year	East	West	East	West	East	West
1990	-15.6	5.7	n.a.	7.2	n.a.	1.3
1991	-22.7	4.6	10.2	6.3	19.3	1.7
1992	7.7	1.7	14.4	6.4	18.4	2.0
1993	11.9	-2.6	15.4	8.0	15.1	2.3
1994	11.4	1.4	15.7	9.0	12.4	2.0
1995	4.5	1.4	14.8	9.1	11.4	2.1
1996	3.2	0.6	16.6	9.9	9.7	2.4
1997	1.6	1.5	19.1	10.8	8.0	2.1
1998	0.4	2.3	19.2	10.3	n.a.	n.a.
1999	2.6	2.1	18.7	9.6	11.8	3.2
2000	1.4	3.1	18.5	8.4	10.1	3.1
2001	-0.2	1.1	18.8	8.0	9.3	3.1
2002	0.1	0.2	19.2	8.5	8.7	3.2
2003	0.2	-0.1	20.0	9.2	7.2	3.2

a Berlin is included with eastern Germany for GDP measures after 1990, but split into east and west for the unemployment measures.

1 Source: OECD Economic Surveys Germany (2001) and Arbeitskreis "Volkswirtschaftliche Gesamtrechnung der Länder".

2 Source: OECD Economic Surveys Germany (2001), Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (2003).

3 "Hidden" Unemployment consists of Short-time workers, Subsidised Jobs, Retraining Courses, Early retirement programs. Source: OECD (2001), Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (2003).

Figure 7: Real GDP Growth, Unemployment, and Hidden Unemployment in East and West Germany, 1990–2003.

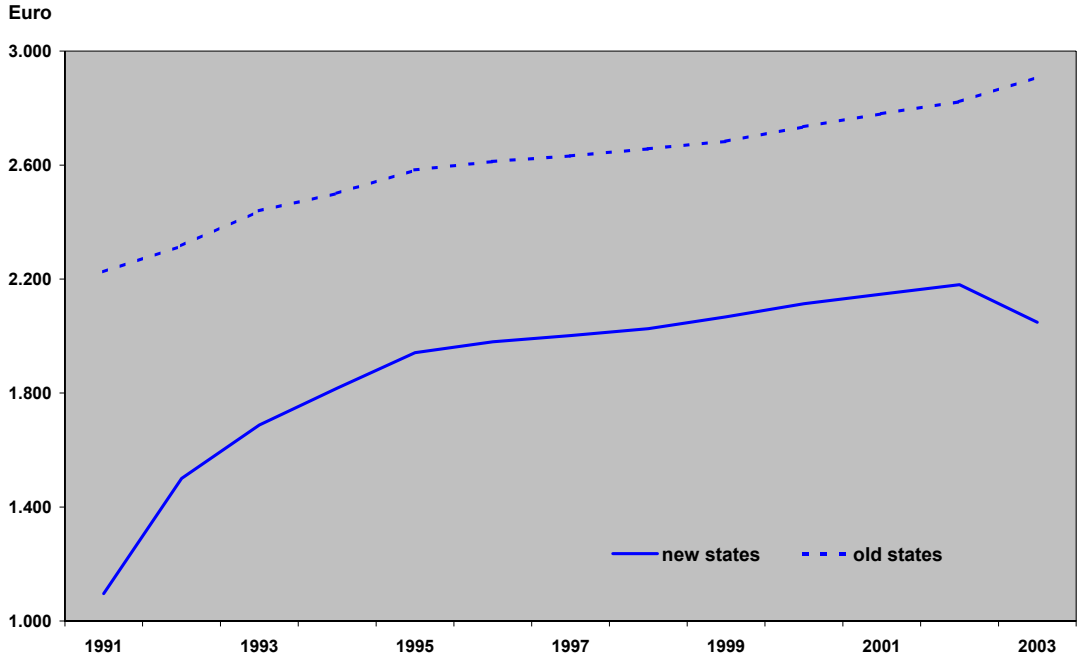

Figure 8: Compensation Per Employee Per Month in Old and New States. Source: OECD (2001), Fig. 19a, und Volkswirtschaftliche Gesamtrechnung der Länder (2003).

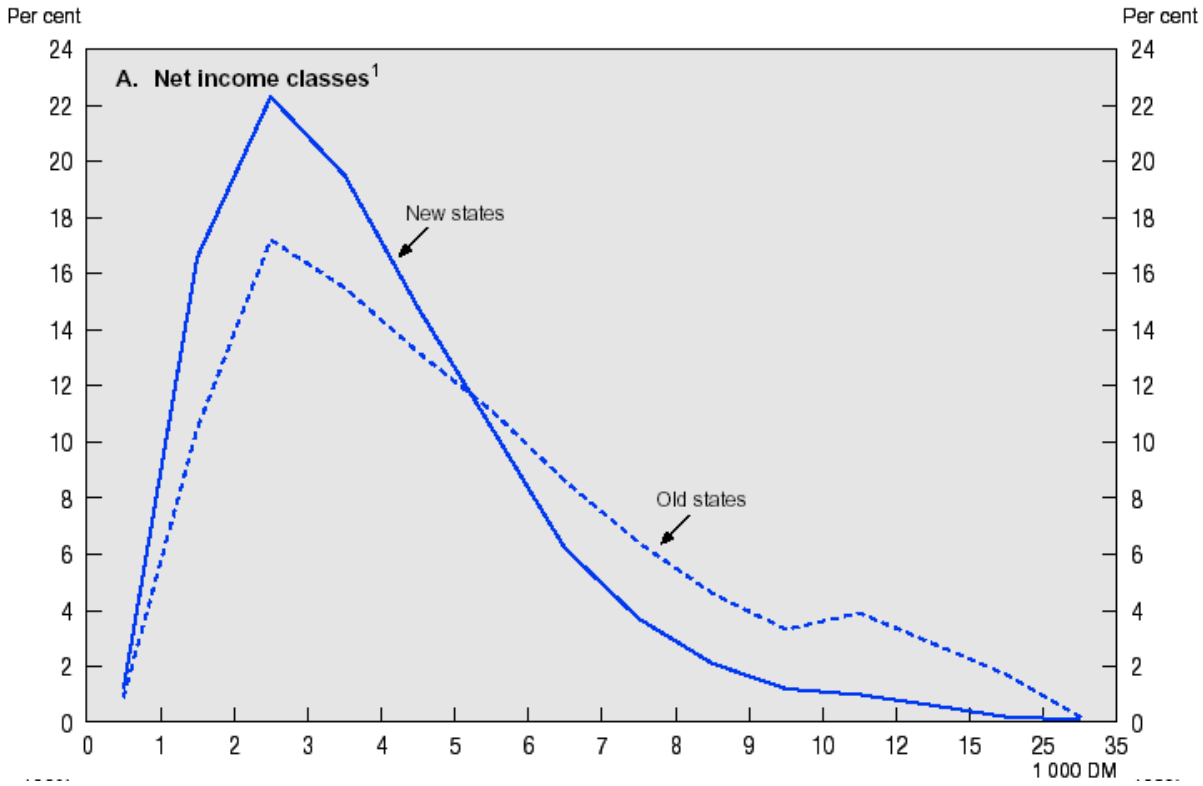

Figure 9: Income Distribution of Households in the 1990s. Source: OECD (2001), Fig. 22.

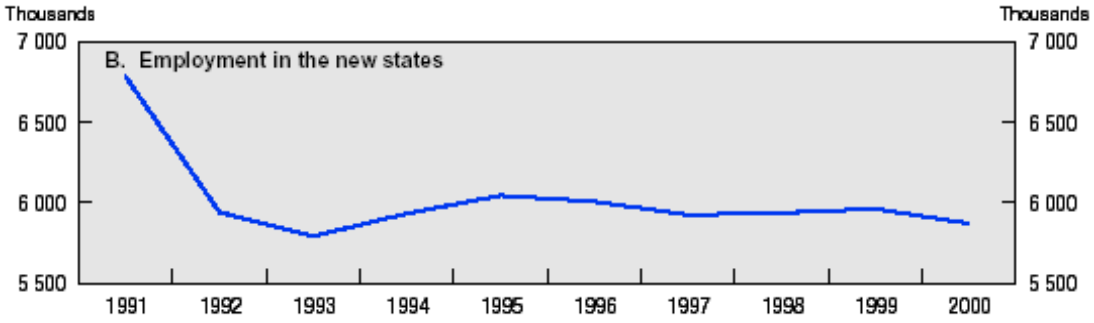

Figure 10: Employment in the New States. Source: OECD (2001), Fig. 18.