Regional Labor Markets, Network Externalities and Migration: The Case of German Reunification

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I. German Reunification: 15 Years Later

Germany was divided into three parts: West Germany, East Germany, and Berlin. These three parts were united on October 3, 1990. Many forecasts regarding the future of Germany have been made since then, ranging from the enthusiastic to the dour. It is time to take stock of what has happened since.

Among the most skeptical forecasts, Robert J. Barro (1991), in a *Wall Street Journal* opinion piece, warned against too much optimism regarding the speed at which East Germany will catch up to West Germany. He argued that productivity in East Germany will catch up only at "1 ½ to 2-percentage points per year." He argued that this "will create pressures for the German government to speed up the process. There is, however, little ... to suggest that governments can accelerate convergence." He finally stated, that "the flow of migrants will ... decline over time. The annual number of net migrants will fall to a range of 140,000 to 230,000 by the year 2001."

Unfortunately, Barro was right with most of his predictions. Average labor productivity in East Germany (without Berlin) for 2001 to 2003 is approximately two-thirds that of West Germany, with the productivity growth rate differential for 1999 to 2003 at 1.6 percent, in line with, or only slightly better than, Barro's prediction. Fiscal transfers into East Germany have been massive, for a total transfer of nearly one trillion euros from West to East Germany from 1991 to 2003, averaging close to 37 percent of East German GDP, throughout. These transfers may have improved the lives of East Germans, but they do not seem to have accelerated convergence. If anything, the anemic growth of Germany during the last 15 years may be due to these transfers (see Fabio Canova and Morten O. Ravn, 2000 or Hans-Werner Sinn, 2002).

The average net migration rate for 2001 to 2003 of approximately 73,000 (subtracting an average inflow of 134,000 from an average outflow of 207,000) is close to the average of the preceding ten years: only the gross flows are as high as Barro predicted. It seems likely that the large fiscal transfers acted as a "bribe" to the East Germans to stay where they were, keeping them from competing against West Germans for jobs at lower wages, or to lure West Germans to come. But the more discomforting fact here is that migration has not slowed down, which makes matters even worse than Barro predicted. While the population in West Germany is growing, it is shrinking in East Germany. The differential of the population growth rates (excluding Berlin) is 1 percent, whether one calculates it for 1991 to 2004 or for just the last five years of this period.

To investigate the issue of inner-German migration further, I have examined regional data available from the Statistisches Bundesamt. A more detailed presentation of this data, as well as the model below, is in Uhlig (2006). Further investigations of East-West German migration and commuting is presented in Jennifer Hunt (2006) and Nicola Fuchs-Schündeln and Rima Izem (2006).

Data are available on cross-border reallocations for each district or "Kreis" in Germany, each year from 1995 to 2003 and for several age groups. For 2003, detailed population data are available. Whenever the district name contained the word "Stadt," the German word for city, I have categorized it as a city (or a "large city," if the population exceeded 100,000); otherwise it is categorized as countryside, although much of it presumably also serves as extended suburbs. The population splits 80-20 between West

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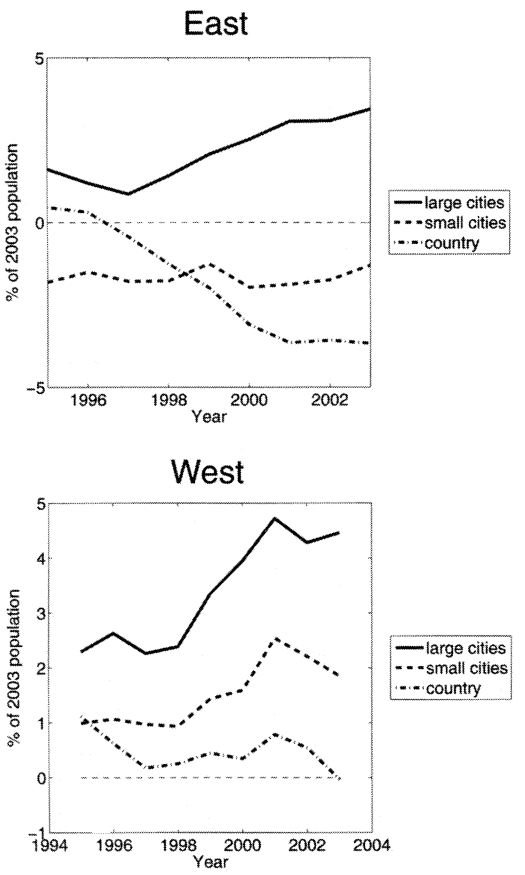

FIGURE 1. MIGRATION PATTERNS OF 18 TO 29-YEAR-OLDS AS A PERCENTAGE OF THE 2003 POPULATION

Germany and East Germany, and 28 percent, 3 percent, and 68 percent, respectively, across large cities, small cities, and countryside.

While all groups tend to leave East Germany, except for those above 50 years of age, the numbers are particularly large for 18 to 29-year-olds, i.e., the future work force (Figure 1). There is an exodus in particular from small cities and rural East Germany, in contrast to the pattern in West Germany. On average for the last five years of the data, 1.9 percent of the 18 to 29-year-olds left East Germany, excluding Berlin, for Berlin and West Germany, and their migration appears to accelerate rather than slow down. This is not compensated for by middle-aged families with young children. The 30 to 49-year-olds are also leaving on net, albeit at a slower rate. Additionally, the birth rates per female in East Germany from 1991 to 2004 was only about two-thirds of the (already low) birth rate in West Germany, and only slowly catching up. It appears that East Germany is slowly but surely aging and dying, except for a few vibrant core areas and big cities.

Furthermore, the slow convergence of the East to the West should perhaps surprise more than usual. The disparity between East Germany and West Germany is not the result of many years of a gradual drifting apart—as is the case for the regions analyzed by Barro and Xavier Sala-i-Martin (1995). Rather, here are two parts of the same country, one of which has been held back artificially during the postwar years. This is similar to the distinction between choosing or being assigned to a civil service job, studied by Fuchs-Schündeln and Matthias Schündeln (2005) to measure risk aversion. What is needed is a theory consistent with the following stylized facts. There is persistent migration from East Germany to West Germany, in particular by 18 to 29-year-olds. Unemployment in East Germany is higher than in West Germany. Wages are lower in East Germany. Average labor productivity is lower in East Germany. The welfare system provides comparable benefits in East and West Germany to short- and long-term unemployed workers. There have been and continue to be sizeable fiscal transfers from West Germany to East Germany. Legal and educational differences between East Germany and West Germany are minor.

II. A Model of Regional Labor Markets, Network Externalities, and Migration

Surely, market distortions and policy interference in East Germany have been significant (see Dennis J. Snower and Christian Merkl, 2006), and adjustment costs are high (see Michael Burda, 2006). But should we be confident that East Germany would recover quickly, if all these policy distortions were to be removed? The model in this section provides a simple framework to show that this may not be so. It shows that one region (East Germany) can have higher unemployment, lower productivity, and persistent outward migration compared to another region (West Germany), and without any convergence taking place, despite the absence of policy distortions or costs of moving factors of production (while the latter is the main cause

of the slowdown of convergence in Burda, 2006). Workers also do not suddenly become more skilled by moving from East Germany to West Germany. Rather, I argue, agglomeration effects play a key role (see also Masahisa Fujita et al., 1999, Russell W. Cooper, 1999).

A standard labor search model would predict that the initially higher unemployment in East Germany should attract relatively more vacancy creation than in West Germany. Migration would provide an additional valve. Yet something more is needed; I therefore extend the standard labor search model to allow for migration as well as network externalities of production. I closely follow the notation and exposition of Richard Rogerson et al. (forthcoming, sect. 4). I will study only steady-state equilibria with constant shares of each type of worker in the population of the region and, therefore, omit time subscripts, unless necessary. The model is described as a partial equilibrium in the sense that the destination region for migration is not modeled explicitly, but it will be obvious at the end how this could be done.

For the network externalities, consider a match of a worker and a firm. In isolation, production is assumed to be y_m (m for "match"). I assume that it is beneficial for this pair to join a network of enterprises and specialize on some specific task. Thus, as part of a network, the production by this pair is now assumed to be $y_n > y_m$ (n for "network"). Joining a network is probabilistic. I assume that this probability depends on the ratio of nonnetworked firm-worker pairs m_t to networked firm-worker pairs n_t: this turns out to make the model fairly tractable. Thus, let $\nu = \nu(m_t/n_t)$ be the instantaneous probability for a nonnetworked firm-worker match to become part of some network of firms. Division of labor is beneficial to all: so, the larger the networks, the better. There is no rivalry in joining a network. Furthermore, the more networks already present, the larger the chance of an unmatched firm joining one will be. I, therefore, assume that $\nu(\cdot)$ is decreasing. For simplicity, I assume that $\nu = \nu_h > 0$ for $m_t/n_t \leq \psi$ and $0 \leq \nu = \nu_l < \nu_h$ for $m_t/n_t > \psi$ and some value $\psi > 0$, satisfying

$$\nu_l \psi < \lambda < \nu_h \psi \tag{1}$$

where λ is the exogenous job separation rate for (networked) firm-worker matches. I shall write ν, keeping in mind that this can take one of the two values. I will calculate the equilibrium for a "guess" for ν and then determine ν with the equilibrium ratio of m_t to n_t. The emergence and importance of clusters in East Germany has recently been studied and documented in Martin T. Rosenfeld et al. (2004).

For the migration part, I assume that agents have the option of moving from the region under consideration to some other outside region. Agents experience a disutility $\kappa > 0$ from moving, expressed in wage-equivalent units. I assume that a new disutility level κ' is drawn i.i.d. from some distribution $F(\kappa)$ at the rate ϕ. Let U be the value to an unemployed worker in the region under consideration ("East Germany") and let $\bar{U}$ be the value to an unemployed worker in the destination region ("West Germany"). Upon receiving a new draw of the disutility κ, the worker will move, if and only if $U \leq \bar{U} - \kappa$. Let κ^* be value, for which equality is achieved. I shall ignore the immigration term, and approximate it per $\iota = 0$, for simplicity.

The other features are standard and are taken from Rogerson et al. (forthcoming, sect. 4), modified to allow for nonnetworked as well as networked matches. I assume that workers can be unemployed or produce in a match. While unemployed, workers receive benefits, b. Firms can post vacancies at a flow cost rk per unit of time of posting the vacancy. There is free entry to posting vacancies. Let u be the mass of unemployed workers and v the mass of vacancies. Matching between vacant positions and workers happens according to a constant returns-to-scale matching function. I write $\alpha_w = \alpha_w(v/u)$ for the rate at which unemployed workers find a job and $\alpha_e = \alpha_e(v/u) = \alpha_w(v/u)/(v/u)$ for the rate at which vacancies are filled, with $\alpha_w(\cdot)$ increasing and $\alpha_e(\cdot)$ decreasing in their argument.

In a match, continuous bargaining assures that the worker receives a share $0 < \theta < 1$ of the joint remaining surplus from production, which I denote with S_m for matched but not yet networked firm-worker pairs, and S_n for networked firm-worker pairs. I assume that there is an exogenous separation rate λ, regardless of whether the match is networked or

not. I assume that workers and firms discount the future at rate r.

A. *Analysis and Results*

The value of being unemployed is given by

$$rU = \tilde{b} + \alpha_w \theta S_m \tag{2}$$

where

$$\tilde{b} = b + \phi \int_0^{\kappa^*} F(\kappa)\, d\kappa$$

increases the standard unemployment compensation b to $\tilde{b}$ by the "option value" of moving to the outside region. It depends on U via the migration threshold $\kappa^* = \bar{U} - U$.

As in equation (43) of Rogerson et al. (forthcoming), it can be shown that the firm and worker matching rates α_e and α_w satisfy

$$\frac{r + \lambda + \alpha_w \theta}{(1 - \theta)\alpha_e} = \frac{\tilde{y} - \tilde{b}}{k} \tag{3}$$

where

$$\tilde{y} = \tilde{y}(\nu) = y_m + \frac{\nu}{r + \lambda + \nu}(y_n - y_m) \tag{4}$$

is an average of the labor productivities. Given ν, equation (3) amounts to a fixed-point problem in κ^*. One can show that there is a unique fixed point as a continuous function of ϕ for ϕ near zero.

Equation (3) shows that a lower networking rate ν and a larger migration rate $\phi F(\kappa^*)$ both have the effect of discouraging job creation. In particular, and counterintuitively, the option to migrate increases rather than decreases unemployment. This is so because the option to migrate makes workers more demanding, since they additionally have the option to wait for a good opportunity to move.

For moderate parameters, only unemployed workers find it beneficial to move. The population then decreases forever at the constant rate $\dot{\pi}_t/\pi_t = -\phi F(\kappa_t^*)\tilde{u}$, where $\tilde{u}$ is the (constant-in-the-steady-state) unemployment rate $\tilde{u} = u/\pi$. The equilibrium ratio of m_t to n_t needs to satisfy

$$\nu \frac{m_t}{n_t} = \lambda - \phi F(\kappa^*)\tilde{u}. \tag{5}$$

With (1), the calculated equilibrium is consistent with both $\nu = \nu_l$ and $\nu = \nu_h$, and the step function assumed above for $\nu = \nu(m_t/n_t)$, provided ϕ or $F(\kappa^*)$ is sufficiently small.

There are, therefore, two equilibria. The "highly networked" equilibrium, which I call W ("West Germany"), is the equilibrium in which $\nu = \nu_h$, unemployment is low, and average labor productivity $\tilde{y}(\nu)$ is high. In a full general equilibrium, this equilibrium ought to characterize the destination region, thus fixing $\bar{U}$. The "weakly networked" equilibrium, which I call E ("East Germany"), features $\nu = \nu_l$, high unemployment, and persistent emigration. The two equilibria balance two offsetting forces. The relatively higher unemployment in equilibrium E attracts more vacancy creation than in equilibrium W. The surplus from production is lower in the E equilibrium, however, due to the lower networking rate, discouraging vacancy creation. Interestingly, for large enough values of ϕ, the equilibrium E disappears. Likewise, the highly networked equilibrium W may disappear with a high rate of immigration due to overloading the capacity of existing networks to integrate new members.

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