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Regional Disparities in West German Unemployment

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Abstract

There are wide and persistent disparities between regional unemployment rates in West Germany. Furthermore, the regions with high unemployment tend to be those with low regional wages. This distribution of local labour market conditions induces net migration into the advantaged regions. But if there is a skill bias within the group of migrants, internal migration will not work as an interregional adjustment mechanism but rather perpetuate regional imbalances. If only skilled workers are mobile, migration results in a circular process of regional divergence that benefits unskilled workers in the destination region and hurts those in the sending region. The extremity of this "vicious cycle" depends on the degree of imperfection in the labour market for unskilled workers.

1. Introduction

In Germany there are wide disparities between regional unemployment rates, especially between the East and West. But also within West Germany regional labour market differences are evident. For example, in 1999 the unemployment rate in Bremen was 15,6%, whereas in the district of Oberbayern only 5,9% of the labour force were unemployed.

These regional disparities have been very persistent over the last decades and the ranking of single regions with respect to the local unemployment rate has been remarkably stable[1]. What is especially puzzling in the West German case, is the corresponding regional wage structure. Regional wage dispersion is low in West Germany due to a high coverage rate of union bargaining that mostly is contracted at the sectoral level without regional differentiation[2]. But if there is regional dispersion in effective earnings, it tends to be the case that low-unemployment regions reveal high regional earnings and vice versa. To apply the example from above, the effective gross wages and salaries per manufacturing working hour in Bremen were 67,70 DM in 1999, but 101,30 DM in Oberbayern.

But if such a spatial structure is observable, should not internal migration then work as an equilibrating force that over time eliminates these regional imbalances? There is clear evidence that migration goes in the right direction, into the advantaged regions. But whether this will help as an adjustment mechanism, depends on what type of labour is actually migrating. If labour were homogenous, we should in fact expect that regional differences should slowly but steadily vanish. But if migration takes the form of a "brain drain" of productive, human capital-intensive workers, the process of labour migration does not cure, but rather worsen the regional imbalances.

Selective labour migration can trigger a circular process of local divergence, of booming regions where human capital tends to pool together and other regions that fall apart economically. In other words: it would foster regional concentration of economic activity that contributes to the understanding of West Germany´s spatial structure of unemployment and effective wages.

This logic of regional divergence and "vicious cycles" has recently gained considerable attention in the field of New Economic Geography[3]. There typically at the core of agglomeration is an interplay of increasing returns leading to monopolistic competition combined with some pecuniary external effect like the endogenous market size.

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[1] See OECD (2000) for an extensive descriptive presentation of the data.
[2] See Büttner (1999), p.106 ff. and OECD (2000).
[3] see for example Fujita/Krugman/Venables (1999); Krugman (1991)

The approach taken in this paper is different. The idea of regional concentration here is specifically applied to the labour market and the logic behind does not arise from increasing returns. Instead - to keep matters as illustrative and simple as possible - the phenomenon and the intensity of regional pooling is based on three factors: imperfections in the labour market, the skill bias in internal migration and one pecuniary external effect that is rarely explicitly used in the literature, the mutually beneficial interplay between different input factors of production in a standard neoclassical production function. The one good-model presents a nation consisting of two regions with identical constant returns technology and two factors of production, human capital and unskilled labour. Human capital is mobile across regions and gets paid a market wage. Unskilled labour is regionally immobile and subject to a union minimum wage. In two versions of the model both the typical case of a nationally uniform union wage and the case of regional differentiation within union contracts are considered. In response to an asymmetric technological shock in on region, the model induces migration of human capital into the expected direction. The unskilled workers in the advantaged locality benefit from this immigration of human capital through job creation and wage increases of effective earnings over contracted wages. This in turn again benefits the skilled workers and induces an upward spiral for one region, a downward one for the other. But depending on the degree of imperfection in the labour market for unskilled workers, this circular process might not lead to complete pooling. In equilibrium the model reveals regional unemployment disparities and a regional wage structure that is consistent with the situation in West Germany.

The remainder of this paper is organized as follows. Since the analytical part contains a two-region model, section 2 splits up the 10 Länder of West Germany (without Berlin) equally into two regions NORTH and SOUTH and presents the evidence on persistent regional disparities of unemployment, wages and internal migration in an illustrative aggregated framework. Section 3 deals with the issue of internal labour migration. First a net migration equation for West Germany is estimated. The regression seems to suggest that migration in Germany is such that regional disparities should be eliminated over time, but due to the selective character of labour migration, it is argued that this result does not necessarily follow. After a brief and surely incomplete review of the literature concerning the skill bias in internal migration, section 4 presents the two-region model of unemployment differentials. Section 5 concludes and draws some policy implications.

2. Regional disparities in West Germany: An aggregate illustration

Figure 1 shows two regional unemployment rates covering the time period 1967-1999. The region NORTH contains the five West German Laender Schleswig-Holstein, Niedersachsen, Hamburg, Bremen and Nordrhein-Westfahlen. The regions SOUTH consists of Bayern, Baden-Württemberg, Rheinland-Pfalz, Saarland and Hessen. This division is in some sense arbitrary, but it is insightful since at the beginning of the observation period both regions had about the same population size, roughly 28 million people.

Starting from a situation of identical unemployment rates until 1975, the macroeconomic shocks of the 70s and 80s caused wide divergence of the regional rates amounting to 4 percentage points in 1986. After the macroeconomic turbulences calmed down, West Germany now faces a stable difference of about 2 percentage points which is persisting since 10 years and shows no tendency to vanish.

- Figure 1 here -

One would expect the NORTH to reveal higher effective wages than the SOUTH, because they would act as a compensating differential or amenity for the northern workers[4], thereby constituting an equilibrium configuration of regional unemployment disparities that represents individuals underlying preferences. But this is not the case.

- Figure 2 here -

Figure 2 shows the development of the effective gross wage bill per employee for the two regions. Since 1977 the wage bill in the SOUTH is steadily increasing, the opposite happened in the NORTH. Since 1987 the SOUTH is the region with both higher wages and lower unemployment, whereas the NORTH is lagging behind in both respects. It is important to note that figure 2 depicts effective earnings. Since there is so little regional variation in contracted wages, the regional dispersion of effective earnings can point to two factors. The average skill level in the SOUTH can be higher, or there is a regional variation in the gap of effective wages above contracted wages.

For this regional distribution of labour market features the expected direction of labour migration is of course clear: from NORTH to SOUTH. And this is just what happened.

- Figure 3 here -

[4] For the concept of compensating differentials see Harris/Todaro (1970), Hall (1970), Roback (1987), Marston (1985)

Figure 3 shows net internal migration 1988-1999. The data refer only to migration within West Germany. Migration with East Germany and whole Berlin has been subtracted[5]. Obviously the NORTH has been constantly loosing population to the SOUTH in all years of the observed time period. This is not surprising, since an above-average regional unemployment rate and a below-average wage level should foster out-migration and deter inward migration, thereby lowering the net migration rate according to all conventional migration theories.

3. Internal Labour Migration in West Germany

This heuristic results corresponds with a more rigorous estimate on the determinants of internal migration. In this section a net migration rate for West Germany is estimated using a pooled cross-section and time series framework for the 10 West German Laender covering the time period 1988-1999. The methodology used is similar to those in Pissarides/McMaster (1990), who estimated a net internal migration equation for nine regions in the UK.

The dependent variable is m_{it}, the state´s net migration rate. Independent variables to include are the lagged migration rate $m_{i,t-1}$ to account for serial auto-correlation, the relative unemployment compared to the national average $\left(u_i / u\right)_{t-1}$ lagged one period and the level and the growth rate of the logarithmic relative wage $\Delta ln\left(w_i / w\right)_{t-1}$.

Regressions with constant intercept and with regional fixed effects are considered. Variables and data sources are defined more precisely in the appendix.

Table 1 shows the regression results. In all presented regressions the coefficients of regional relative unemployment and the growth of relative wages have the expected signs and are significant at high levels. As in Pissarides/McMaster (1990) it is the *growth rate*, not the *level* of relative regional wages that is a significant explanatory variable. In regressions (3) and (4) the relative wage level is added, but in any specification it is insignificant and does not contribute at all to the goodness of fit.

- Table 1 here -

This regression result seems to suggest the existence of a long-run equilibrium where regional unemployment disparities can not persist due to labour migration, except for those associated with compensating wage differentials. Migration is said to be *macro-efficient*[6]. But does this in any case imply that the economy is really moving towards this equilibrium? Some authors

[5] Data for the time period before 1988 were not easily available. Moreover, accurate data are available only since 1991. For 1988-1990 are constructed. See appendix for details.

[6] See Ritsilä/Tervo (1999)

have argued that way while admitting that with the equilibrating forces so particularly weak as in Germany, the "long run" to reach the compensating equilibrium in fact is very long, something beyond 20 years or so. This paper takes a different strand towards the problem for obvious reasons: The extremely long persistence of unemployment disparities in West Germany and the *diverging* development of earnings that cast doubts on the prediction that West Germany is moving towards a compensating equilibrium.

Since the regression results are unambiguous for the macro-determinants of internal migration, one part of the solution to this puzzle maybe lies in the distinction between the determinants and the macroeconomic effects of migration. To the best of my knowledge all estimates on net migration functions reach very similar qualitative results about the macro-determinants of internal migration[7]. But there is often no distinction been made on who is actually migrating out of problem areas. If it turns out, that mostly high skilled labour practises contracted out-migration in response to unfavourable local labour market conditions, the actual macroeconomic effects of migration alter from neoclassical predictions with homogenous labour. It is highly questionable whether the emigration of young, well educated workers relieves the local labour market problems from the supply side. Instead, there might be counteracting negative effects that makes this type of selective labour migration very unpleasant for the sending regions.

In other words: The existence of a long-run compensating equilibrium depends on the effects that internal migration produces and those effects in turn depend upon whether internal labour migration is a selective process. If labour were homogenous, the regression result would clearly imply a temporary character of the regional disparities and a slow but steady process of equilibration. But if only high skilled labour migrates, if labour migration takes the form of a "brain-drain" out of problem regions, this equilibration process is not to expect.

Self-selection of internal migrants in the literature

It has been pointed out quite often in the literature that there tends to be a bias towards high-skilled workers in the process of internal migration[8]. The bias towards younger migrants can easily be explained by the higher value of the discounted income stream that must at least match the moving costs to make a migration favourable.

To give an example of the most clear-cut statement I found about the skill bias of migration, let me cite Fassmann/Meusburger (1997): "*Internal migration leads to the social erosion in*

[7] See for example Büttner (1999), pp.81 ff., Alecke/Untied (2000), Decressin (1994).

[8] See for example Greenwood (1975), p.406f., Martin (1997), p. 245; OECD (2000), p.33; Hughes and McCormick (1985), p.123; Ritsilä/Tervo (1999), p. 174. One classic reference is Myrdal (1957)

the regions of origin and not to the automatic adjustment of region´s endowment with factors of production. The origin areas lose human capital to the destination areas. This very uneven process of internal migration in terms of qualification between centre and periphery reinforces the regional economic disparities" (page 187, own translation). Or even more pronounced: *"The basic question of regional economics, whether migration contributes to the adjustment of regional […] disparities, has to be answered with ´no´ from a short- and a medium-run perspective*" (page 190).

But despite this informal argument there exists also more rigorous theoretical reasoning and empirical work about the skill bias, even though to the best of my knowledge not for the West German case. The seminal theoretical work on self-selection of migrants has been done by Borjas (1987). Within the framework of the Roy-Model, Borjas specified conditions for which immigrants tend to come from the upper tail of the ability or income distribution of the sending country. The important determinant is the relative equality of income distribution in the sending and the destination country. In a later paper, Borjas (1992) verified the same predictions for internal migration in the United States. Hunt (2000) applied the predictions of Borjas for the case of migration from East to West Germany, which seems to be the closest approximation for the West German reality. She finds strong evidence that internal migration tends to be selective. She concludes: *"Emigrants are much younger than stayers, and conditional on age are more skilled, as predicted by the Roy model of migration selection.[…] This youth and brain-drain suggests that emigration from the east could be a legitimate concern for policy-makers anxious about the economic viability of the Eastern region.*" (page 28).

Mauro/Spilimbergo (1998) present empirical results for Spain within a VAR framework and find strong evidence on different adjustment behaviour of skill groups to labour market shocks: *"The high-skilled are found to migrate very promptly in response to a decline in local labour demand, whereas the low-skilled drop out of the labour force or stay unemployed for a long time.*" (see page 3).

Theoretical rationale for selective migration can be found by considering fixed moving costs but variable gains from moving as it has been done by Dohmen (2000). The difference between the value of employment and the value of unemployment is higher for people with higher education and wages. Combined with fixed moving costs, high-skilled workers will reveal a higher propensity to change regions than low-skilled workers. Beneath moving costs one can also easily think about other impediments to mobility that often will have institutional origins[9], and will also be more relevant for people with low skills and low wages. A relatively

[9] see Bertola (2000)

compressed regional earnings structure and generous unemployment benefits for example are factors that will erode labour mobility primarily of low-skilled workers.

In sum, there seems to reasonable theoretical and empirical justification to use the not entirely realistic, but therefore enormously simplifying assumption in the following model: the distinction of two types of workers on the labour market - high-skilled and low-skilled - where the first one is perfectly mobile, the second one completely immobile.

4. A simple model of regional unemployment differentials

Consider a nation consisting of two regions (i=1,2) and two factors of production: Skilled labour H_i and unskilled labour L_i, which are both supplied perfectly inelastically. Each region produces the same good with a Cobb-Douglas-Technology:

$$(1)\ Y_i = A_i H_i^{\ a} L_i^{\ 1-a}$$

Unskilled Labour L_i is regionally immobile, i.e. a region specific input factor, and is distributed equally among regions.

$$(2)\ \overline{L_1} = \overline{L}_2 = \overline{L}$$

Skilled labour is perfectly mobile across regions, so that the total number of skilled $\overline{H}$ equals the sum of skilled workers in the two regions.

$$(3)\ H_1 + H_2 = \overline{H}$$

Human capital is paid according to its marginal product.

$$(4)\ w_i^H = \alpha A_i H_i^{a-1} L_i^{1-a}$$

According to (1) the demand for unskilled labour in each region is given by

$$(5)\ L_i^d = \left(\frac{w_i^L}{(1-\alpha) A_i H_i^a} \right)^{-1/a} = \left(\frac{(1-\alpha) A_i}{w_i^L} \right)^{1/a} H_i$$

But wages for unskilled labour are not determined by market forces. Instead, wage setting is unionised. For region i the contracted or minimum wage is

$$(6)\ w_i^L = \overline{w}_i$$

Consequently there can be unemployment (U_i) resulting. For every fixed wage level $\overline{w}_i$ above the market clearing wage, the regional unemployment rate u_i is given by

$$(7a)\ u_i = \frac{U_i}{\overline{L} + H_i} = \frac{\overline{L} - \left(\frac{(1-\alpha) A_i}{w_i^L} \right)^{1/a} H_i}{\overline{L} + H_i}$$

And the disparity between the unemployment rates of region 1 and region 2 is

$$(7b)\ u_1 - u_2 = \frac{\overline{L}}{\overline{L}+H_1} - \frac{\overline{L}}{\overline{L}+H_2} + \frac{\left(\frac{(1-\alpha)A_2}{\overline{w}_2}\right)^{\frac{1}{\alpha}} H_2}{\overline{L}+H_2} - \frac{\left(\frac{(1-\alpha)A_1}{\overline{w}_1}\right)^{\frac{1}{\alpha}} H_1}{\overline{L}+H_1}$$

If wages for unskilled labour are fixed, the important determinant of regional labour demand is the number of locally available skilled workers. The Cobb-Douglas Production function is such that an increase in one input factor also shifts up the productivity and the demand of every other factor. One can also think about it this way: an increase of skilled labour in one region produces a pecuniary external effect for unskilled labour and vice versa.

It can been seen from equation (7a) that the number of skilled workers H_i lowers the regional unemployment rate. This happens for two reasons:

- skilled workers in this model are never unemployed since they are paid competitively, but they are still counted within the region´s labour force. Hence, they increase the denominator and therefore for a given enumerator decrease the region´s unemployment rate u_i. This effect is more a matter of accounting.
- The skilled workers add to the productivity of unskilled workers. For a given $\overline{w}_i$ on a non-competitive level, firms are only willing to hire more unskilled labour if it becomes more productive, justifying the wage level $\overline{w}_i$. This effect can be seen in the enumerator, which is decreasing in H_i.

<u>Union wage setting without regional differentiation</u>

Suppose that the fixed union wage $\overline{w}$ is valid equally in both regions.

$$(8)\ \overline{w}_i = \overline{w} \quad \text{for i=1,2}$$

This type of wage setting is fairly typical for West Germany as pointed out before. The distribution of skilled labour among the two regions is then crucial for the regional unemployment rate. Perfect mobility of skilled labour ensures, that wages must be equal in both regions.

$$(9a)\ \alpha A_1 L_1^{1-\alpha} H_1^{\alpha-1} = \alpha A_2 L_2^{1-\alpha} H_2^{\alpha-1}$$

Rearranging terms yields

$$(9b)\ \frac{H_1}{H_2} = \left(\frac{A_1}{A_2}\right)^{\frac{1}{1-\alpha}} \frac{L_1}{L_2} \quad \Leftrightarrow \quad H_1 = \frac{\theta L_1}{L_2 + \theta L_1}\overline{H} \qquad \text{, with } \theta = \left(\frac{A_1}{A_2}\right)^{\frac{1}{1-\alpha}}$$

Suppose there is identical technology in both regions ($A_1=A_2=A$) and skilled labour is initially equally distributed among regions ($H_1=H_2$). From (9b) and (7b) it follows that regional unem-

ployment rates will be identical. Necessary for a non-zero unemployment rate is a nationwide predetermined wage $\overline{w}$ on a non-competitive level.

However, with this type of wage determination for the unskilled and identical technology ($\theta = 1$), the equilibrium distribution of production and thereby the unemployment disparity is widely indeterminate, since the nation is operating under constant returns to scale.

This can be seen by supposing the following notion: starting from the situation of complete regional identity, human capital moves for whatever reason from region 2 into region 1. Caused by this move there will be job creation for unskilled workers in region 1 according to the labour demand function (5), whereas some workers in region 2 will lose their jobs. Since the size of the total population of unskilled workers is identical in region 1 and 2 (as stated in equation (2)), the regional unemployment rate in region 2 will be higher than in region 1.

But there exists an economic limitation for the skilled workers. There need to be enough unemployed unskilled workers available locally who can enter the job that the skilled workers have created by their move. Otherwise human capital has no incentive to pool together since it is also subject to diminishing marginal returns. There will be no such problem of, if the wage $\overline{w}$ set by the union is at least as high as

$$(10a)\quad \overline{w} = \hat{w} = (1-\alpha)A\left(\frac{\overline{H}}{\overline{L}}\right)^{\alpha}$$

With a wage level $\hat{w}$ it is ensured that human capital can freely choose the location, always earning the same wage, but having the power to open up spatial unemployment disparities. If all human capital is pooled in one region there is full employment for the unskilled in this region, an employment of zero in the other. For all predetermined wage levels $\overline{w} > \hat{w}$ there will be unemployment remaining in region 1, even if all human capital pools there.

The more interesting case is a situation where $\overline{w}$ is fixed above the market clearing wage, but well below $\hat{w}$. In this case, human capital has no motivation to pool completely in one region, because the created vacancies can not be filled up. Assume that the union only claims

$$(10b)\ \tilde{w} = \gamma\, \hat{w} \qquad \text{, with } \gamma < 1.$$

Expression (10b) may not be understood as an optimal decision rule arising from the point of view of the union. The analysis simply takes $\tilde{w}$ as exogenously given and points to the consequences if the wage claim has a certain magnitude. The parameter γ might reflect the union or insider power or the degree of labour market imperfection in the economy. Full employment for L_1 is reached when

$$(11a)\quad L_1 = \left(\frac{(1-\alpha)A}{g(1-\alpha)A\left(\frac{\overline{H}}{\overline{L}}\right)^{\alpha}} \right)^{1/\alpha} \quad H_1 = \overline{L}\ ,$$

which can be rewritten as

$$(11b)\quad H_1 = g^{1/\alpha}\ \overline{H}\ .$$

Note that the union can not set $\gamma < (½)^{\alpha}$, because this would be the market wage with equal distribution of human capital. The crucial point is that human capital will not want to migrate into region 1 beyond the point (11b), after which full-employment is reached. The reason is that in the underemployed region 2 there is still job creation possible, which is exactly offsetting decreasing marginal returns for human capital.

So far, there was no endogenous motivation for skilled labour to move from one region to the other, but instead this first version of the model gives rise to an equilibrium indeterminacy for regional unemployment disparities. Under the constraints specified above they are solely due to the locational decision of the skilled. And the economy literally obeys to human capital.

An asymmetric exogenous shock

This, however, makes the economy very sensitive to exogenous shocks. This can be seen if we assume a negative asymmetric shock only affecting region 2, i.e. $A_1 > A_2$.

This shock might represent the situation in West Germany at the beginning of the 80s. The shock surely affected both regions, but the NORTH with its traditional industries like coal-mining and shipbuilding more adversely. This brought about the much steeper increase in unemployment (see figure 1).

As an immediate effect of the technological shock, labour demand for unskilled workers (5) in region 2 will decrease, since it is directly affected by TFP. But skilled labour is also affected by this technological shock in two ways. First directly, since wages for the skilled also depend on TFP (see (4)). But additionally, the decrease in labour demand for the unskilled in region 2 also negatively influences the wage for the skilled in this region. As a result, human capital will flow from region 2 to region 1 in response to this shock. Unemployment in region 2 will further be fostered by this emigration. On the contrary, region 1 will benefit in terms of a lower unemployment rate.

To which extremity this type of circular logic is taken depends on the prevailing wage level $\overline{w}$ for the unskilled workers. Suppose it is set at least on a level

$$(12)\quad \overline{w} = \hat{w} = (1-\alpha)\, A_1 \left(\frac{\overline{H}}{\overline{L}} \right)^{\alpha} .$$

In this case the consequences of this shock are most extreme in this model, because as a result of the asymmetric shock –no matter how small it may be- the new equilibrium will be a complete pooling of all human capital in region 1. Since enough unemployed unskilled workers are available in region 1, the move of human capital is not associated with diminishing returns.

If, however, the union wage $\overline{w}$ is fixed below $\hat{w}$, labour market pooling of human capital might not be complete because of unfillable vacancies. Consider again the case in which the union´s nationwide wage claim only has the magnitude:

$$(13)\quad \tilde{w} = \gamma\, \hat{w} = \gamma\, (1-\alpha) A_1 \left(\frac{\overline{H}}{\overline{L}} \right)^{\alpha} \qquad \text{, with } \gamma < 1$$ [10]

In response to a shock, human capital will clearly flow into region 1 at least until full employment is reached. This is achieved at the pooling level (11b). At that point, the skilled workers face a tradeoff: Due to the higher TFP in the region 1, they can earn a higher wage there. But since there is already full employment, skilled workers now also face diminishing returns. To evaluate this trade-off we have to consider the equilibrium condition (9b) with $L_1 = \overline{L}$. Then we make use of the labour demand equation (5).

$$(14a)\quad L_2 = \frac{\theta\, \overline{L}\,(\overline{H} - H_1)}{H_1} = \left(\frac{(1-\alpha) A_2}{\tilde{w}} \right)^{1/\alpha} (\overline{H} - H_1) \Rightarrow H_1 = \frac{\theta\, \overline{L} (\tilde{w})^{1/\alpha}}{\left((1-\alpha) A_2\right)^{1/\alpha}}$$

We know that the prevailing wage is (13) and can rewrite (14a) to

$$(14b)\quad H_1 = \theta \left(\frac{A_1}{A_2} \right)^{1/\alpha} \gamma^{1/\alpha}\, \overline{H} = \left(\frac{A_1}{A_2} \right)^{\frac{1}{1-\alpha} + \frac{1}{\alpha}} \gamma^{1/\alpha}\, \overline{H}$$

Since $A_1 > A_2$, human capital will pool stronger in region 1 as suggested by equation (11b)[11]. The pooling of human capital in region 1 is more intense, the higher is the difference in TFP and the higher is the union power γ. This can be seen in table 2a, which shows numeric results for the pooling process of human capital depending on the shock intensity A_1/A_2 and the parameter γ. The value of α is chosen to be 0,8, which restricts γ to 0,5744. Since the move of

[10] Since the wage claim is valid nationwide, it is oriented towards the TFP level of region 1, since this one was prevailing prior to the asymmetric shock.

[11] Note that you can not use equation (14b) for the case of a positive asymmetric shock only affecting region 2, since we have used $L_1 = \overline{L}$ in the derivation.

human capital is restricted by the point at which $H_1 = \overline{H}$, the pooling level is bounded by unity.

- table 2a here -

The stronger the pooling of human capital in region 1, the higher is the unemployment in region 2 and the wider the unemployment disparity between the two regions (remember that the unemployment rate in region 1 is zero). This effects can be seen in table 2b that shows the actual employment rate for the unskilled in region 2 depending on the same exogenous parameters.

- table 2b here -

In region 1 there is excess demand for unskilled labour at the going wage rate $\tilde{w}$, since human capital pooling exceeds (11b). The labour demand in region 1 with the contracted wage (13) and human capital pooling (14b) is given by

$$(15)\quad L_1^d = \left(\frac{A_1}{A_2}\right)^{\frac{1}{1-a}+\frac{1}{a}} \overline{L} > \overline{L}$$

This excess demand can push up effective wages in region 1 without any effect on the pooling level, since the pooling of human capital depends on the actual level of employment $\overline{L}$, not on labour demand for unskilled workers. This upward tendency of w_1^L above $\tilde{w}$ is to expect, because collectively bargained wages constitute wage floors with allowance for an upward wage gap. The wage for unskilled in region 1 w_1^L can lie in the range

$$(16)\quad \tilde{w} \le w_1^L \le \tilde{w}\left(\frac{A_1}{A_2}\right)^{\frac{a}{1-a}+1}$$

With the wage equal to the upper bound, labour demand will exactly match labour supply $\overline{L}$. But where in this range the actual wage w_1^L will lie is a matter of bargaining power and can not be answered by this model.

What is established is a "wage curve"-type relationship because the low-unemployment region 1 is also revealing higher regional wages for two reasons:

- The excess demand for unskilled labour can drive up their effective over their contracted wages without affecting employment negatively. So region 1 will exhibit a positive wage gap.
- There are more skilled workers living and working now in region 1, who are of course also counted within the regional statistic of average effective earnings, as reported in section 2.

Predetermined wages with regional differentiation

What seems very extreme in this model is the rigidity of the wage setting behaviour of the nationwide union, which does not pay any attention to regional disparities. Even though this is not too unrealistic for the German case, since the popular call "equal pay for equal work" leaves no room for considering regional productivity differences, we should nevertheless have a look at another wage setting regime: a union wage with some degree of productivity oriented regional wage differentiation. This analysis might be appropriate for the situation in East Germany, where the wage convergence with the West was very rapid after reunification, arguably too rapid, but still an example for regional differentiation in German union contracts.

For the model it is most appropriate to think that the predetermined regional wage at least complies to the *regional level of TFP*. The wage claim for the regions will therefore not be necessarily alike as in equation (13), but instead

$$(17a)\quad \tilde{w}_1 = g(1-a)A_1\left(\frac{\overline{H}}{\overline{L}}\right)^a$$

$$(17b)\quad \tilde{w}_2 = g(1-a)A_2\left(\frac{\overline{H}}{\overline{L}}\right)^a$$

Starting again from a symmetric distribution of human capital and a subsequent asymmetric TFP shock ($A_1>A_2$), there is now an additional effect to consider for the locational decision of human capital. On instance, human capital will again clearly flow into region 1 up to the point of full employment of local unskilled labour, since on instance $w_1^H > w_2^H$ due to $A_1>A_2$, and moves being not associated with diminishing returns.

But as soon as full employment is reached in region 1, human capital again faces the same trade-off as before: Should it move further into region 1 and face diminishing returns, or should it better stay in region 2 with constant returns, but a lower level of TFP? The additional effect to consider is that labour demand for unskilled workers in region 2 is no longer artificially distracted by the compliance of wage claims to the TFP level in region 1. This will bring about a lower level of human capital pooling in region 1 as in equation (14b). To illustrate this, we can take the same approach as before. We impose $L_1 = \overline{L}$ in the equilibrium condition (9b), use the labour demand equation (5) and take into account the two distinct regional contracted wages $\tilde{w}_i$ from equations (17a) and (17b). We reach the expression:

$$(18)\quad H_1 = \theta g^{1/\alpha}\overline{H} = \left(\frac{A_1}{A_2}\right)^{\frac{1}{1-\alpha}} g^{1/\alpha}\overline{H}$$

Compared to (14b), the pooling process will not be as intense. But even if we allow for regional wage differentiation, the pooling in the advantaged region prevails[12]. Table 3a shows the pooling of human capital with the same parameter constellations but under the new wage setting regime. The pooling level is strictly lower.

- table 3a here -

Also the logic of excess labour demand in region 1 and excess labour supply in region 2 prevails. Equation (19) shows labour demand in both regions.

$$(19a)\quad L_1 = \theta\overline{L} > \overline{L}$$

$$(19b)\quad L_2 = \left(\frac{1}{g}\right)^{1/\alpha}\frac{\overline{L}}{\overline{H}}(1-\theta g^{1/\alpha})\overline{H} = \left(\frac{1-\theta g^{1/\alpha}}{g^{1/\alpha}}\right)\overline{L} < \overline{L}$$

In region 1 there is consequently the possibility for a wage increase, since human capital migrates there beyond the point after which full employment is restored. The wage w_1^L can now lie in the range

$$(20)\quad \tilde{w}_1 \le w_1^L \le \tilde{w}_1\left(\frac{A_1}{A_2}\right)^{\frac{\alpha}{1-\alpha}}$$

In region 2 on the contrary, there is an excess supply of labour. Table 3b shows the fraction of employed unskilled workers as a function of γ and A_1/A_2, again with $\alpha = 0{,}8$.

- table 3b here -

In other words: in response to the asymmetric shock the region 2 will have to face both a lower wage ($\tilde{w}_2 < \tilde{w}_1 \le w_1^L$) and higher unemployment at a time. The regional differentiation of the union wage did therefore *qualitatively* not change the results from above, but well *quantitatively*, since regional wage differentiation led to lower unemployment disparities in response to asymmetric shocks of identical intensity.

5. Summary and Conclusion

The motivation for this paper is the observation that regional disparities in unemployment are persisting and that regions with high unemployment tend to be those with low regional wages.

[12] We could additionally to the compliance of the different TFP levels consider regionally distinct parameter values of γ. And for a sufficiently lower value of γ_2 it could actually turn out that human capital initially starts to migrate to region 2 despite the higher TFP in region 1. But this form of regional wage differentiation is not considered further.

The reason why internal migration fails as a corrective equilibrating force might lie in the skill bias that migrants reveal.

The two-region model points to the macroeconomic consequences of selective labour migration. It gives rise to a pooling process of human capital in response to an asymmetric technological shock to one region. The intensity of pooling depends on the magnitude of the shock, the type of wage setting and the degree of market imperfection in the labour market for unskilled workers. The locally available unskilled workforce benefits from the immigration of human capital in terms of a lower unemployment rate and a positive wage gap of effective over contracted wages. This mutually beneficial relationship or complementarity within a substitutional production function illustrates the circular logic in which an equilibrium is reached that is consistent with the illustrative evidence on spatial disparities in West Germany as presented in section 2.

The model provides intuition to why regions with above-average unemployment can exhibit below-average regional wages and vice versa. It points to the crucial importance of human capital localization for regional labour market conditions and is consistent with the predictions on the determinants of internal migration as estimated in section 3: People leave regions with above-average unemployment and below-average wages. But the model distinguishes between the determinants and the effects of migration and demonstrates why outward-migration of workers might not cure but rather perpetuate regional unemployment.

One must be cautious to draw policy implications from this analysis, since the model is too simple in structure and crucially depends on several simplifications and functional forms. But nevertheless it demonstrates how important it is to comply more to regional labour market conditions in collective wage bargaining. This is especially true when there are serious impediments to regional mobility for unskilled workers who are subject to unemployment much more than skilled workers are. However, the model also shows that regional wage differentiation might not be enough to prevent the rise of self-reinforcing regional downturns. If the "desire" of human capital to move out of a specific environment is bigger, the notion of "vicious cycles" still prevails.

This "desire" is represented in this model by the difference of regional TFP-levels that are completely exogenous to the model and essentially remain a black box. But just as many economists in the field of endogenous growth theory aim to open this black box and develop a "Theory of Total Factor Productivity" (E. Prescott) for whole countries, this is also interesting on a regional level, as one can immediately think of several stories about what all might influence a regional TFP-level.

Appendix

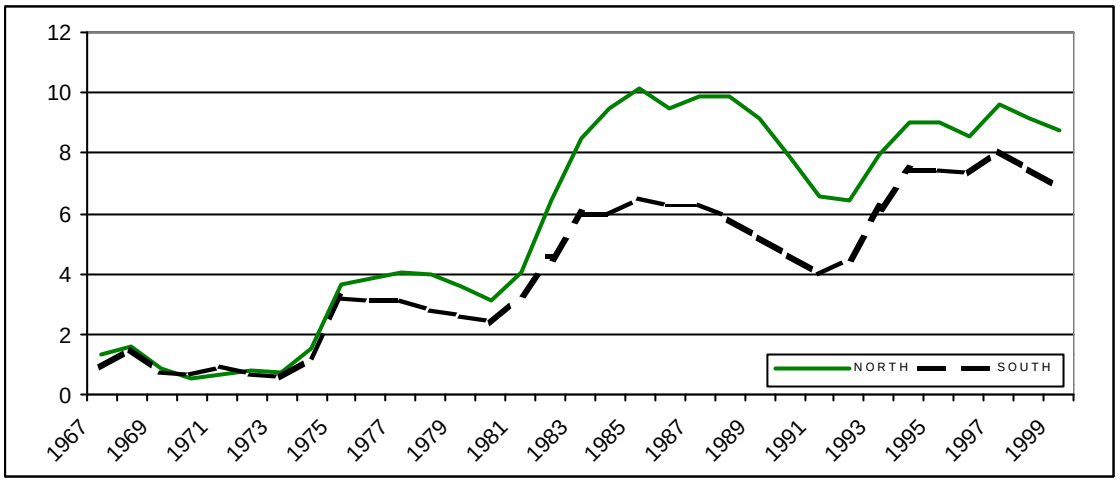
Definition of variables and data sources

m_{it} Net internal migration rate. Net gain of immigrants over emigrants across state borders as a fraction of total state population. Data apply only to migration between the 10 West German states without West Berlin. Migration with East Germany is subtracted. Accurate data are only available since 1991. Data from 1988-1990 include net migration from the West German Laender with West Berlin. These (quantitatively negligible) numbers have been removed based on the assumption that migration with West Berlin has been symmetric for all West German Laender based on the fraction of total West German population. Data source: Statistical Office, Wiesbaden, "Binnenwanderung", 2000.

$\left(u_i / u\right)_{t-1}$ State unemployment rate divided by the national aggregate unemployment rate. Data source: Federal Statistical Office, Wiesbaden, Microcensus 2000.

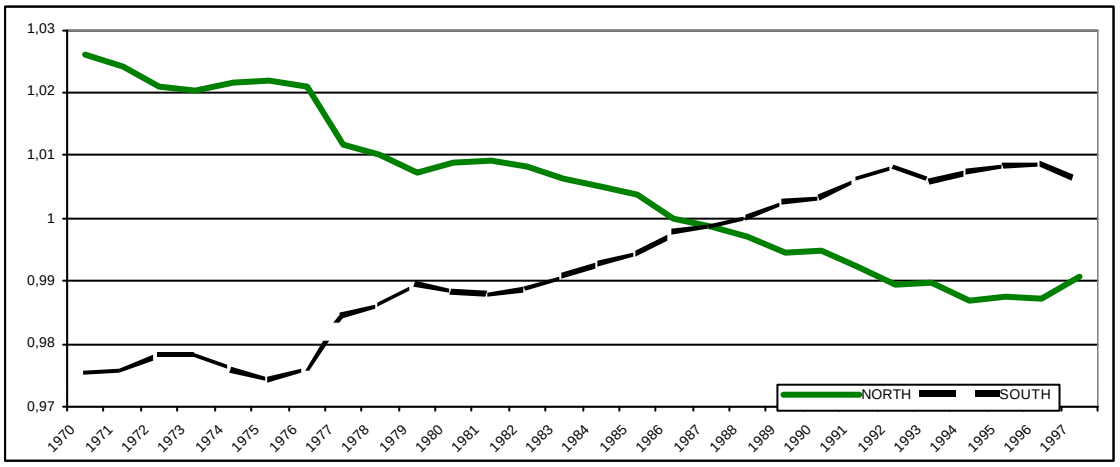
$ln\left(w_i / w\right)_{t-1}$ Relative regional level of the effective gross wage bill per employed worker compared to the national average. Data source: Statistical Office Baden-Württemberg, „Volkswirtschaftliche Gesamtrechnung der Länder", 2000.

Fig. 1: Unemployment Rates in North and South Germany, 1967-1999



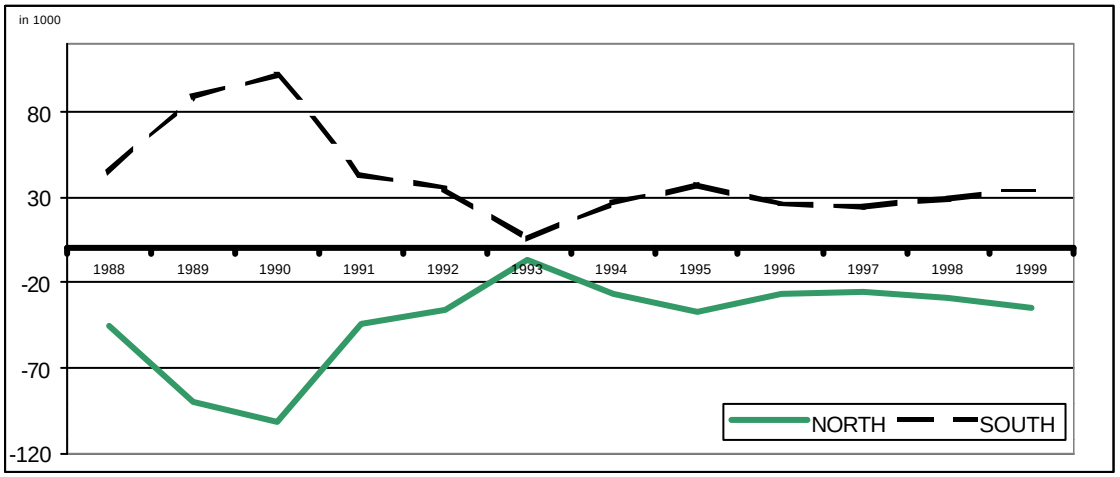
Source: Own calculations based on Stat. Bundesamt, Microcensus

Fig.2: Gross wage bill per employee in % of national average



Source: Own calculations based on Stat. Landesamt Baden-Württemberg, VGR of the German Laender

Figure 3: Net Internal Migration 1988-1999 – West Germany without Berlin



Source: Own calculations based on Migration Data from Stat.Bundesamt

Table 1:
Net Internal Migration Regression for West German Laender (without Berlin)

Dependent Variable	m_{it}	*Number of cross-sections*	10	
Number of observations	120	*Time period*	1988-1999	
Regression-Method	(1) Pooled Least Squares	(2) Pooled Least Squares with Fixed Effects	(3) Pooled Least Squares with Fixed Effects	(4) GLS (SUR) with Fixed Effects
C	0.260013 (2,425) – (0,017)			
$m_{i,t-1}$	0.640797 (9,024) – (0,000)	0.484846 (5,775) – (0,000)	0.484570 (5,734) – (0,000)	0.475273 (22,24) – (0,000)
u_i / u	-0.249568 (-2,634) – (0,009)	-0.395632 (-1,957) – (0,531)	-0.394918 (-1,94) – (0,055)	-0.353503 (-18,68) – (0,000)
ln w_i / w			-0.363435 (-0,061) – (0,95)	-0.190652 (-0,928) – (0,355)
Δ ln w_i / w	21.68189 (1,924) – (0,057)	24.28687 (2,021) – (0,046)	24.12894 (1,954) – (0,054)	23.94176 (36,22) – (0,000)
Fixed Effects				
NDS		0.224125	0.208440	0.163012
SLH		0.331147	0.314812	0.270956
HH		0.480926	0.508567	0.437887
HB		0.424055	0.423466	0.352920
NRW		0.484699	0.485648	0.437357
BAY		0.370674	0.365478	0.337556
BAW		0.305388	0.309215	0.275485
HES		0.441380	0.448136	0.404240
RP		0.576349	0.572193	0.538208
SRL		0.515812	0.512897	0.460412
R^2	0,57	0,62	0,62	0,62
s.e. of Regression	0,246	0,240	0,241	0,241
F-Stat (p-value)	46,61 (0.00)	80,35 (0,00)	53,02 (0,00)	166,73 Log-Likelihood of Weighted Statistic

Notes: t-ratios and p-values [marginal level of significance] in parentheses.

Table 2a: Human capital pooling H_1 with regionally undifferentiated wages.

gamma	A1/A2=1,01	A1/A2=1,05	A1/A2=1,10
0,5744	0,532	0,678	0,907
0,6	0,562	0,716	0,958
0,65	0,621	0,792	**1,000**
0,7	0,681	0,869	**1,000**
0,75	0,743	0,947	**1,000**
0,8	0,805	**1,000**	**1,000**
0,85	0,869	**1,000**	**1,000**
0,9	0,933	**1,000**	**1,000**
0,95	0,998	**1,000**	**1,000**
1,0	**1,000**	**1,000**	**1,000**

Table 2b: Employment rate for the unskilled in region 2 with undifferentiated wages

gamma	A1/A2=1,01	A1/A2=1,05	A1/A2=1,10
0,5744	0,9240	0,6052	0,1647
0,6	0,8193	0,5054	0,0705
0,65	0,6412	0,3357	**0,0000**
0,7	0,4915	0,1931	**0,0000**
0,75	0,3640	0,0717	**0,0000**
0,8	0,2544	**0,0000**	**0,0000**
0,85	0,1591	**0,0000**	**0,0000**
0,9	0,0757	**0,0000**	**0,0000**
0,95	0,0020	**0,0000**	**0,0000**
1,0	**0,0000**	**0,0000**	**0,0000**

Table 3a: Human capital pooling H_1 with regionally differentiated wages.

gamma	A1/A2=1,01	A1/A2=1,05	A1/A2=1,10
0,5744	0,526	0,638	0,805
0,6	0,555	0,674	0,850
0,65	0,613	0,745	0,940
0,7	0,673	0,817	**1,000**
0,75	0,734	0,891	**1,000**
0,8	0,795	0,966	**1,000**
0,85	0,858	**1,000**	**1,000**
0,9	0,921	**1,000**	**1,000**
0,95	0,986	**1,000**	**1,000**
1,0	**1,000**	**1,000**	**1,000**

Table 3b: Employment rate for the unskilled in region 2 with differentiated wages

gamma	A_1/A_2=1,01	A_1/A_2=1,05	A_1/A_2=1,10
0,5744	0,9488	0,7235	0,3893
0,6	0,8427	0,6174	0,2832
0,65	0,6624	0,4371	0,1029
0,7	0,5108	0,2855	**0,0000**
0,75	0,3817	0,1565	**0,0000**
0,8	0,2707	0,0454	**0,0000**
0,85	0,1742	**0,0000**	**0,0000**
0,9	0,0898	**0,0000**	**0,0000**
0,95	0,0152	**0,0000**	**0,0000**
1,0	**0,0000**	**0,0000**	**0,0000**

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