Diskussionsbeiträge / Discussion Paper Series

Volkswirtschaftliches Seminar / Department of Economics
Universität Göttingen / University of Goettingen, Germany

Beitrag Nr. 117 / Issue No. 117

Increasing Returns and Spatial Unemployment Disparities

Jens Suedekum
University of Goettingen
April 2003

ISSN 1611-7522

Increasing Returns and Spatial Unemployment Disparities

Jens Suedekum*)
University of Goettingen

ABSTRACT

Standard models of the new trade and location theories usually assume full employment and are thus ill-equipped to study spatial unemployment differences, which in reality are more pronounced that income disparities. Regional labour market theories like the ´wage curve´-approach on the other hand can not endogenously explain the origin of regional economic disparities. We analyse regional agglomeration and regional unemployment in an unified approach by combining a wage curve with an increasing returns technology. We find that regional unemployment rates closely resemble the core-periphery structure of regional GDP per capita. This matches the stylised facts from EU-15.

JEL Classifications: F4, J6, R1.

Keywords: Regional Unemployment, Economic Geography, Increasing Returns, Wage Curve, Migration, Labor Mobility.

---

*) Correspondance address: Jens Suedekum, Department of Economics, University of Goettingen. Platz der Goettinger Sieben 3, 37073 Goettingen, Germany. Phone: +49/551/39-7633. e-mail: jsuedek@gwdg.de

The author is grateful to Federico Cingano, Harry Garretsen, Andreas Haufler, Michael Pflueger and Peter Ruehmann for several very useful comments on an earlier version of this paper. Of course I am fully responsible for all remaining errors.

1) Introduction

Economic activity differs markedly across European regions. People from the richest European regions (London, Brussels, Luxemburg, Hamburg) have an average real purchasing power about five times higher than people from the poorest areas (Ipeiros, Acores). Spatial divides are even larger with respect to unemployment rates. In the European Union today, regions with practically full employment and regions with excessive mass unemployment coexist. In many cases they coexist even within the same country. Germany, Italy and Spain are the most prominent examples, where some regions have unemployment rates below 5 per cent, whereas others are stuck with figures well above 20 per cent. Such spatial unemployment disparities within and across countries exist for decades. In recent years, there was even a tendency for them to increase.

Moreover, regional unemployment rates in the EU follow a quite distinct spatial pattern of trans-national clusters that closely resembles the core-periphery-structure of regional GDP per capita (see section 2). Regional unemployment rates are low in the rich core regions of the European Union, where population, production and income are agglomerated. On the contrary, high unemployment rates are found in the small and economically peripheral regions with low levels of output and income per capita. National borders do not play a very dominant role in this division scheme of areas with low, intermediate and high unemployment rates.

The main aim of this paper is to explain this spatial coincidence of low (high) unemployment and high (low) GDP per capita-levels in the NUTS2-regions of EU-15. Put differently, we aim to explain the spatial structure of regional unemployment rates within an integrated economic area like the EU in relation to the corresponding regional economic agglomeration. This is a largely unexplored issue in the literature.

Unemployment has always been a prominent topic for macroeconomists, who predominantly think in national dimensions. Regional issues traditionally play a minor role in this debate. However, regional labour market analysis has gained some prominence during the last years.

One useful *regional* approach comes from David Blanchflower and Andrew Oswald (1990, 1996), who have compiled a great deal of empirical evidence about regional labour markets and claim to have distilled an "empirical law" of economics from the data, known as the *wage curve*. The wage curve theory is useful for our purposes, since it draws an inherent link between key labour market variables on a regional level, namely the unemployment rate and the real wage level. But the existing wage curve models alone are insufficient to understand the regional dimension of economic activity in the EU. This is so, because one can not endogenously explain why there are so pronounced core-periphery divides in production and income across space with the Blanchflower/Oswald-model, effectively because it leaves no room for endogenous agglomeration forces.

The vastly growing field of economic agglomeration theories are the second string in the literature that our theoretical analysis relates to, namely the theories now known as the "new trade theory (NTT)" and "new economic geography (NEG)" (Krugman, 1980, 1991). Especially the latter can be seen as a modern theory of regional agglomeration that explicitly shows how core-periphery divides of economic activity can endogenously emerge and persist within an integrated area due to the presence of localised increasing returns to scale. Nevertheless, this vastly growing literature usually has nothing to say about unemployment. The models of NTT and NEG mostly assume that labour markets always automatically clear.[1] The phenomenon of regional unemployment disparities can thus not be analysed explicitly.

We will therefore propose a theoretical framework in this paper that attempts to close this gap in the literature. Our aim is to marry a wage curve, which is thought of as a labour market equilibrium curve, with a product market that exhibits the essential features of the new regional agglomeration theories. The innovation from a theoretical point of view is twofold: Firstly, our model can be seen as an improvement of the general equilibrium approach from

[1] The notable exceptions in this respect are Peeters/Garretsen (2000) and Matusz (1996), whose focus, however, is somehow different, namely on the overall impact of globalisation on unemployment.

Blanchflower/Oswald, since the regional disparities can develop endogenously. And secondly, it is an attempt to introduce the element of unemployment to the new regional agglomeration theories. Our main finding is that large core regions with high per capita income levels have low unemployment rates and vice versa. Hence, our theoretical framework implies results that are consistent with the stylised facts about regional unemployment disparities and regional agglomeration in the EU as a whole.

The rest of this paper is organized as follows. After a brief overview about regional disparities in the EU in section 2, we introduce the essential ideas of the wage curve model of Blanchflower/Oswald in section 3. In section 4 we point to some problems of this model and argue that it alone is ill-equipped to understand the regional labour market disparities in the EU. Our own model structure with an increasing returns technology, which is designed to cope with these problems, is introduced in section 5. Section 6 then provides a discussion of this approach as well as some concluding remarks.

2) Regional economic disparities in the European Union

In almost all EU member countries there exist non-negligible, in some cases even extreme intra-national unemployment disparities on the usual level of regional gradation, NUTS2. Figure 1 shows the region with the lowest and the highest unemployment rate in 2000 for those 13 EU-countries that consist of more than one NUTS2-region.[2]

As can be seen, the intra-national differences in some countries are by far more pronounced than the differences between countries. Most notably this is so in Italy, Spain and Germany. But also in some smaller countries, e.g. Finland, Belgium and Greece, differences are significant and range around 9-10 percentage points.

[2] Denmark and Luxemburg are not further divided below the level of NUTS0.

Figure 1: EU-15 – Regional Unemployment Disparities 2000

Country (national unemp. rate)	Min-region	Max-region	Difference
Italy (10,8)	Trentino/Alto Adige (3,1)	Calabria (27,7)	24,6
Spain (14,4)	Navarra (4,9)	Ceuta y Mellila (25,5)	20,6
Germany (8,1) [West Germany]	Oberbayern (3,5)	Halle (19,2) [Bremen (10,5)]	15,7 [7,0]
Finland (11,0)	Aland (1,7)	Ita Suomi (15,5)	13,8
France (9,6)	Alsac (5,3)	Languedoc-Rousillon (16,1) [Réunion (33,1)]	10,8 [27,8]
Belgium (6,7)	Vlaams Brabant (2,9)	Hainaut (13,1)	10,2
Greece (11,1)	Ionia Nisia (5,1)	Dytiki Makedonia (14,7)	9,6
UK (5,6)	Berkshire (1,9)	Merseyside (11,2)	9,3
Sweden (6,2)	Stockholm (3,6)	Norra Mellansverige (8,8)	5,2
Portugal (4,1)	Centro (1,8)	Alentejo (5,7)	3,9
Austria (3,9)	Oberösterreich (2,6)	Wien (5,8)	3,2
Netherlands (2,8)	Utrecht (2,1)	Groningen (4,6)	2,5
Ireland (4,4)	Southern/Eastern (3,9)	Midland/Western (5,8)	1,9

Source: Eurostat. European Commission.

But let us also look at the European Union as a whole from a bird's perspective. The maps 1 and 2 in the appendix show regional unemployment rates and regional GDP per capita for the EU-27. When focussing on the current EU-members (EU-15), the maps reveal a quite distinct spatial pattern that could be described as a figure of concentric circles.

There is an area, geographically located in the middle of the continent, where unemployment rates are on a very low level. This core area contains Northern Italy, Southern Germany and Austria, the Netherlands and the southern part of Great Britain. Map 2 makes clear that the highest levels of regional GDP per capita are found precisely in this area, which is often called the „European banana", where economic activity is highly agglomerated.[3]

Exactly the opposite characteristics can be found in the geographically remote areas at the outside borders of EU-15. The regions in Southern and Easters Spain, Southern Italy, Greece and Eastern Germany have high or very high unemployment rates. They all belong to the

[3] The regions in this central area reveal also some other favourable economic characteristics, like a high participation rate, a high fraction of skilled labour and a high innovative activity (Suedekum, 2003a; EU-Commission, 2001).

group of regions with a GDP per capita level below 75 per cent of the EU-15-average and are thus eligible for "objective 1"-funding from the EU structural funds. Yet, not all "objective 1"-regions have mass unemployment. The notable exception is Portugal. All Portuguese are relatively poor, but unemployment rates are modest. One might thus put it this way: Belonging to the group of "objective 1"-regions is a necessary, but not a sufficient condition for having extraordinarily high unemployment rates. All in all, however, "objective 1" regions on average have unemployment rates well above the EU-average (15,8% vs. 9,7% in 1999).

In between these two trans-national clusters, there is a group of regions with intermediate income levels and unemployment rates. This group contains most parts of France, Eastern Spain, the middle part of Italy, North-Western Germany, Scandinavia and the Northern part of UK. In a stylised manner, the geographic structure of income and unemployment can thus be characterised as in figure 2.

Figure 2: Concentric circles – The regional dimension of economic activity in the EU-15

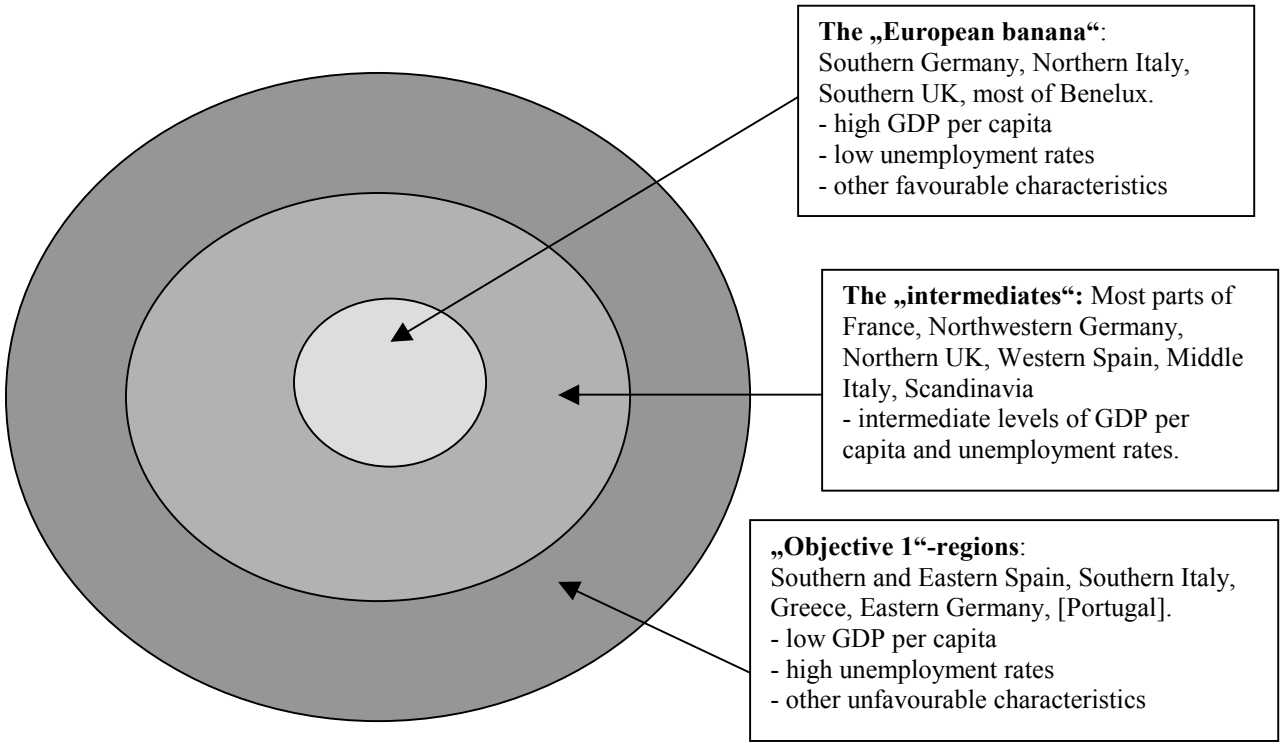


Figure 2 casts some doubts whether it is really useful to predominantly think about unemployment along national borders. In fact, regional unemployment rates in the EU-15 seem to follow a trans-national core-periphery structure that closely resembles the spatial configuration of GDP per capita.[4] Put differently, the membership of a specific region to one of the three income clusters („European banana“, “objective-1“, “intermediates”) seems to be a much more reliable indicator for the regional unemployment rate than the assignment to a nation. Overman/Puga (2002) call this phenomenon the “neighbouring effect“, according to which there is a much higher similarity of unemployment rates between regions from different countries that are geographically close to each other than between the unemployment rate of a particular region with the respective national average.[5]

This spatial pattern is probably the result of an intra-national divergence and polarisation process of regional unemployment rates that occurred over the last 15 years or so. Overman/Puga (2002) and Puga (2002) show that regions that used to have comparatively high unemployment rates in 1986 usually also have high unemployment rates in 1996. The same is true for regions with comparatively low unemployment rates, but not for those regions that had unemployment rates around the European average in 1986. The unemployment rates of these areas often moved to either of the two extremes, and only a small fraction of regions remained in range with intermediate relative unemployment rates. This can be seen by the transition probability matrix in figure 3 that is taken from Puga (2002). The matrix is constructed in the following way: The unemployment rates of the European NUTS2-regions relative to the EU-average are divided into five groups. The numeric values in the matrix are the

[4] See also CER (1998): “the high unemployment regions in Europe have a low per capita income (30% below the EU average) and a similar production structure, in which manufacturing represents a lower than average share of output and is characterized by technologically stagnant industries such as food, mining, leather and apparel. On the contrary, the low unemployment regions are characterized by a 10% higher than average per capita income and a production structure in which manufacturing is prominent and diversified, with a prevalence of industries such as machinery, precision instruments and electronics”.

[5] The authors also show that there is a truly *spatial* dimension in European unemployment, since the similarity between unemployment rates of remote areas with a comparable sectoral structure is significantly weaker than between regions that are in close proximity to each other (Overman/Puga, 2002).

relative frequencies of group membership in 1996, given the information about the group assignment in 1986. Hence, along the main diagonal there is the fraction of regions that ended up in the same range in 1986 and 1996.

The table shows that there is a high degree of inertia for the groups with high and low unemployment rates, but far less in the intermediate ranges. Many of those regions with relative unemployment rates from 0.6 to 1.3 of the European average in 1986 (mainly regions from France, Italy and Spain) moved either of the two extreme groups.

Figure 3: Transition probability matrix of regional unemployment rates

1986 Unemployment Rate	1996 Unemployment rate					
	< 0.6	**0.6-0.75**	**0.75-1.0**	**1.0-1.3**	**>1.3**
< 0.6	0.81	0.19	0.00	0.00	0.00
0.6–0.75	0.52	0.26	0.09	0.09	0.04
0.75-1.0	0.24	0.29	0.26	0.21	0.00
1.0-1.3	0.06	0.22	0.34	0.19	0.19
> 1.3	0.00	0.00	0.16	0.22	0.62

Source: Puga (2002)

The polarisation process has not been reversed since 1996, but rather got more extreme (Suedekum, 2003a). Furthermore, one can show that the described process was mainly driven by the labour demand side rather than by labour supply. By definition, a regional unemployment rate changes either because of a rise or decline of labour force participation (labour supply), or of employment (labour demand). It seems to be the case that the successful central regions with low and declining unemployment rates on average also experienced an increase of labour supply by receiving internal migrants from other European regions (EU-Commission, 2001). The rise in labour supply, however, was outperformed on average by a stronger increase in labour demand (Martin/Tyler, 2000). In other words, the core regions (which mostly already had a significantly higher population density) managed to integrate more people into their labour markets, including the internal migrants, and thus saw unemployment rates fall. The

ployment rates fall. The already sparsely populated sending regions on the other hand, where competition on the labour supply side was even relaxed through emigration, nevertheless faced high and rising unemployment.

3) The theory of the wage curve

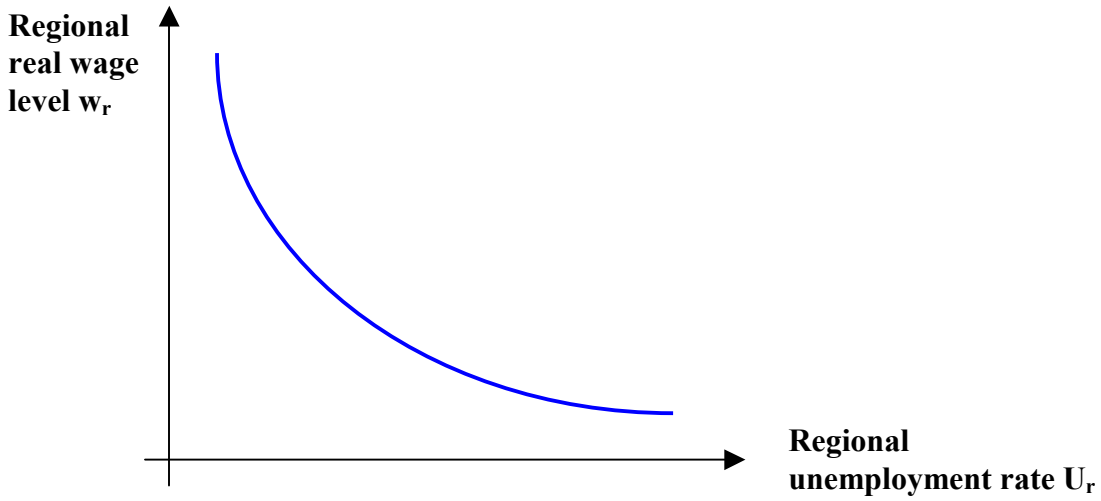
We now turn to the theory of regional unemployment and income disparities. As mentioned above, one useful approach for the analysis of regional labour markets is the wage curve literature pioneered by Blanchflower/Oswald [B/O] (1990, 1996), since it explicitly addresses the relationship between regional unemployment and real wage disparities (which should be closely correlated with real income disparities). In this section, we broadly review some essential elements and concepts of the wage curve. We put special emphasis on the theoretical work of B/O by introducing one general equilibrium model of B/O with the wage curve as an integral part.

The focus on theory is worth stressing, since the wage curve is above all an empirical research programme. B/O have worked with large scale microeconomic datasets (e.g. the "International Social Survey Programme") with individual earnings data and ran in principle standard wage equations á la Mincer (1974), only with the regional unemployment rate as an additional explanatory variable.[6] It is well understood that the earnings level of an individual i will depend on personal characteristics, like his or her level of education, the work experience, the gender etc, as well as on factors such as the business cycle etc. The main finding of B/O is that, when controlling for all these characteristics, there is a significantly negative impact of the unemployment rate in the region of residence on the individual's earnings level. This is so in virtually all OECD countries and time periods under consideration. Even more surprising, the magnitude of this partial effect seems to be roughly the same in all countries.

[6] Econometric and estimation issues are intensively discussed in Blien (2001:129 ff.)

In an aggregate sense, the wage curve observation implies that regional real wage levels and regional unemployment rates within any given country are robustly negatively correlated. At any point in time, there exist regions with both high wages and low unemployment rates, and regions with low wages and high unemployment rates.[7] Frequently this relationship is graphically represented. Qualitatively the wage curve is a non-linear downward sloping curve in the real wage/unemployment rate-space as presented in figure 4.

Figure 4: The wage curve



Ongoing debates and criticism notwithstanding (see in particular Partridge/Rickman, 1997), it seems safe to conclude that today the majority of studies concludes that a wage curve in fact exists in most OECD countries.[8]

[7] The implications of the wage curve stand in sharp contrast to those models that were dominating research about the relation of wages and unemployment across space all over the 1970s and 1980s. The literature that descended from the work of Harris/Todaro (1970) and Hall (1970, 1972) implied that regional wage levels and regional unemployment rates are *positively* correlated.

[8] B/O (1994:9) go as far as to point out that "*this hypothesis [of a positive correlation] is as decisively rejected by the international microeconomic data as it is possible to imagine*". Some support for this rather drastic claim, yet less enthusiastic, can be found in Blien (2001: ch.8), Buettner (1999:ch. 5+6) or Card (1995).

Wage curve theory: Foundations of the partial labour market equilibrium relation

If one accepts the wage curve empirically, one has to think about a consistent theoretical model. B/O interpret the wage-curve as a long-run equilibrium curve in regional labour markets, not as a representation of permanent dis-equilibrium or sluggish adjustment. If this is so, competitive models of the labour market seem inapplicable as the theoretical foundation. However, rationale for the wage curve can be grasped from approaches that work with the concept of imperfect competition and that were already in use in the field of macroeconomics (see Layard/Nickell/Jackman, 1991; Lindbeck, 1992; Blanchard/Katz, 1997).

In the theoretical part of their work, B/O present three plausible stories why a higher regional unemployment rate depresses the regional wage level. The first approach is based on the idea of implicit contracts. It seems fair to say that it is the most complicated but the least convincing of the three (see Card, 1995:796; Blien, 2001: 84). Apart from that, a labour market equilibrium curve in style of the wage curve can either be rationalized through collective bargaining models, or by using efficiency wage models. The underlying logic of either of the two approaches is relatively straightforward.

Suppose a union sets nominal wages in relation to a given or expected price level. It is quite intuitive that the union's bargaining power and thereby the bargained real wage is a positive function of the employment rate. With high unemployment, insider power is low. Outsiders are willing to underbid wages more aggressively, and insiders can rely on turnover costs to a smaller extent. In tight labour markets, unions can negotiate higher real wages, strike announcements are more credible etc.[9] A wage curve-type relation follows from this argument.

The second common foundation comes from efficiency wage theory. If unemployment is high, it alone acts as a disciplining or motivating device for workers who fear to loose their

[9] For a more complete discussion of this approach see Layard/Nickell/Jackman (1991:83ff.) or Carlin/Soskice (1990:387 ff.).

jobs, and there is no need to pay efficiency wages.[10] If the unemployment rate is low, however, joblessness can be perceived to be a minor threat by workers. They might consequently feel induced to engage in shirking behaviour, low commitment to employers, low investments in firm-specific human capital etc. The wage curve then represents the level of real wages that firms are willing to pay in order to achieve their motivation or screening objectives for any given unemployment rate.

Which of the two stories is most appropriate for the purpose to address regional labour market disparities in the European Union? It is often spelled out that union models reflect fairly well the institutional situation in continental Europe, whereas the efficiency wage models apply more to the more "flexible" labour markets in the UK and the USA. One might thus expect that a collective bargaining approach is more appropriate to address European unemployment. However, recall that from now on we are concerned with the *regional* dimension of an economy. It is true that continental European labour markets are highly unionised. But at the same time they are characterised by a very low degree of regional differentiation of union wages (Faini, 1999). Collective bargaining e.g. in (West) Germany takes place at the sectoral level, but with virtually nil regional differentiation of contracted wages.[11] If at all, regional differentiation in Germany occurs through differences in *effective earnings*, when employers consciously pay above the union minimum wage (Suedekum, 2003b; Schnabel, 1995).

Hence, an approach that bases a wage curve on regional differences in bargaining strength of inherently regional unions is not appropriate given the institutional structure of most continental European labour markets. Quite contrarily, one can argue that it is *precisely because* of the low degree of regional differentiation of union wages that intra-national unemployment dis-

---

[10] as Blanchard/Katz (1997:53 f.) rightly notice, it is really the outflow rate from unemployment that determines the strength the perceived penalty, not so much the overall unemployment rate. However, the overall unemployment rate is commonly used as a proxy for the labour market prospects of the unemployed.

[11] Formally, the regional sub organizations of the nationwide unions and employers associations bargain on the level of the German Bundesländer in most sectors. De facto, however, this hardly means anything. Typically there is one pilot agreement that is reached in one region, which subsequently is applied without any notable modification to all firms in that sector all over the nation (Buettner, 1999:99 ff.; Bispink, 1999), since "equal pay for equal work" in all regions is perceived to be the only socially acceptable form of wage setting.

parities are so evident (Suedekum, 2003b; Faini, 1999). In the vein of the wage curve approach, efficiency wages seem to be the much more appropriate micro-foundation. Regional earnings differentiation occurs, because firms from different regions pay above the union minimum wage to a different extent. The reasons for this positive wage drift presumably may be found in efficiency wage considerations (Blien, 2001:86).

A wage curve based on efficiency wages

We will therefore use the concept of efficiency wages to provide proper micro-foundations for the wage curve as a labour market equilibrium curve. In their monograph,. B/O use a modified version of the shirking approach of Shapiro/Stiglitz (1984). We will use an even more simplified version of the Shapiro/Stiglitz-model in this paper. We consider an economy in continuous time consisting of two regions r={1,2}, and we assume risk-neutral workers, who gain utility from wage income w_r, but disutility from work-effort e_r. Utility V_r is assumed to be linear.

$$V_r = w_r - e_r. \tag{1}$$

Effort at work is assumed to be a technologically fixed number $e_r > 0$. Individuals can choose to "shirk" at work and spend zero effort $e_r=0$. Shirking individuals run the risk of being detected and then fired. The detection and firing probability $(1-\gamma_r) < 1$ is less than perfect. Once fired, an individual enters the pool of the unemployed. Yet, following Shapiro/Stiglitz (1984), there is also some exogenous destruction rate of firms $R_r > 0$ that likewise leads to an inflow from employment to unemployment. For simplicity, we assume that unemployed persons have no other source of income.[12]

[12] In most parts of the efficiency wage framework of B/O, they assume that regions might differ with respect to the level of unemployment benefits. We do not consider these cases, because it is irrelevant for most continental European countries. Unemployment benefits are generally not differentiated across regions. We therefore have assumed that unemployment benefits b_r are equalized on the level $b_r=0$. This normalization, however, is only for analytical simplification.

The unemployed have a chance α_r of re-entering into a job. This endogenous variable depicts the flow from unemployment back into the pool of the employed. In the steady state equilibrium, the two labour market flows must be equal. Given that nobody will shirk in equilibrium, we can write this condition as $R_r N_r = \alpha_r (L_r - E_r)$, where L_r is the labour force and E_r is employment. The definition of the unemployment rate is $U_r = 1 - E_r/L_r$. This determines the function α_r to be $\alpha_r = (R_r / U_r) - R_r$. Thus, the outflow probability from unemployment is decreasing in the regional unemployment rate U_r.

The only decision to be made by an individual is whether to shirk or not. The utility of an unemployed individual (V_{ur}) is given by

$$V_{ur} = \alpha_r (w_r - e_r). \tag{2}$$

Non-shirking employed workers and shirkers have utility levels V_{enr} and V_{esr} respectively

$$V_{enr} = w_r - e_r \tag{3}$$

$$V_{esr} = \gamma_r w_r + (1-\gamma_r)(\alpha_r(w_r - e_r)). \tag{4}$$

The firm has an interest to prevent shirking and will thus pay efficiency wages that are just sufficient to ensure equal utility for shirkers and non-shirkers, i.e. $V_{esr} = V_{enr}$. Equating (3) and (4) yields after some manipulations the following expression

$$w_r = e_r + \frac{\gamma_r e_r}{(1-\gamma_r)(1-\alpha_r(U_r))} \tag{5}$$

Equation (5) is the regional wage curve and can be interpreted as the aggregate non-shirking condition in region r. It shows the efficiency wage that is sufficient to prevent shirking for any given regional unemployment rate and is derived from the equilibrium conditions in the regional labour market. Graphically, equation (5) can be represented as in fig. 4.

Finally, we abstract from structural differences between the two single regions and assume that e_r and γ_r are the same in both regions. The interpretation of this assumption might be that there are no differences in labour market institutions. We come back to this issue in the final section 6. This warrants that both regions face the same wage curve locus.

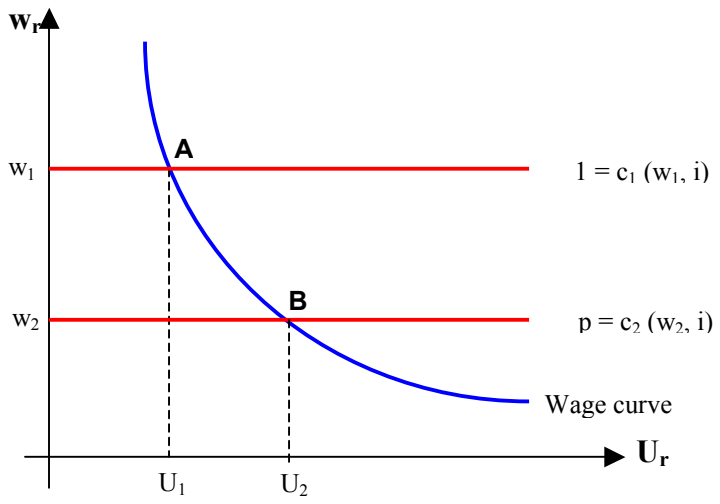
The general equilibrium model of Blanchflower/Oswald

The wage curve (5) represents "one half" of the full equilibrium in the B/O-model. More precisely it describes the labour market side of this two-region economy. The way in which B/O (1996:77 ff.) introduce product markets to this model, i.e. the labour demand side, is in fact very simple. They assume that each of the two regions produces a distinct tradable commodity under constant returns to scale and perfect competition. The production function for the regional tradable good Y_r is given by $Y_r = f(N_r,K_r)$. K_r is assumed to be an essential input of production for which the price i is determined on world markets. Labour and capital in both regions have to be used in fixed proportions. Under constant returns to scale, total minimum costs are thus simply the product of minimum unit cost (c_r) and the quantity of output Y_r.

$$C_r(Y_r, w_r, i) = \min_{N_r, K_r} \{ w_r N_r / Y_r + i K_r / Y_r \} = Y_r \; c_r(w_r, i) \qquad (6)$$

Perfect competition and zero profits imply that $c_r(w_r,i)$ need to equal the product price p_r, which is exogenous to any single firm. Without loss of generality, B/O normalize the given product price for the good from region 1 to unity. The price of the product from region 2 is denoted p. General equilibrium in either region is reached when product and labour market are jointly in equilibrium. Since both regions face the same wage curve locus, the graphical representation of the general equilibrium can be illustrated in only one diagram, fig. 5.

Figure 5: Full equilibrium in both regions in the Blanchflower/Oswald-model



If p<1, nominal wages are higher and unemployment is lower in region 1. With freely tradable goods, workers from both regions face the same consumer price index and thus nominal wage differences are equal to real wage differences. In this constellation, individuals from region 2 have an incentive to migrate to region 1.

What happens in case of this internal migration? With given capital stocks in both regions, every additional worker has a marginal productivity of zero, since the technology requires fixed input proportions. However, the technologically efficient amount of labour (measured e.g. in working hours) can simply be shared among a higher number of workers. The total wage income in both regions would thus remain constant, but the wage *per worker* in region 1 and 2 would converge. Migration would thus lead to convergence of per capita remunerations and ultimately to an erosion of the wage curve relation.

However, B/O (1996: 81f.) assume that there are intrinsic regional amenities that compensate for the "economic" variables w_r and U_r. They introduce an utility supplement ξ_r and assume that it is negatively proportional to the population density of region r. In other words, as workers move to region 1, the place becomes gradually crowded and thereby unattractive. With this construction of congestion, it is possible to construct a general equilibrium configuration where the two regions are located along the wage curve locus as in fig.5, but with no further migration incentives. Region 1 offers higher real wages and a lower unemployment rate, but it is intrinsically unattractive because of the regional congestion. Since the variable ξ_r is unobservable, there is a wage curve visible in the data that is stable in the long run, since the regional disparities in w_r and U_r will show no tendency to vanish.

4) A critical review of the Blanchflower/Oswald-model

Several critical remarks can be made about this wage curve model, which all have to do with the product market specification. Most importantly, the substantial origin of regional differences remains an open issue. Regions are assumed to produce different final goods and sell

them at exogenous prices under perfect competition. The fact that one region is assigned to produce a "better" good then leads to disparate regional development.

There is an apparent identification of regions with sectors or specific products. This is problematic for several reasons. One firstly has to take into account that regions in Europe are far from being specialized in one or only a few products. By the same token, specific industries are not very much concentrated in only one region. The regional concentration of industries might be increasing due to the process of European integration. At the moment, however, it is certainly not high enough so as to set regions equal with industries. Moreover, it seems to be a well established empirical fact that differences in regional unemployment rates can only weakly be attributed to the sectoral specialization patterns of regions.[13] There rather seems to be a truly regional dimension to the problem of spatial unemployment disparities that can not be explained by sectoral components (see also section 2).

It is completely unspecified in the B/O-model why regions specialize in certain products and why they do not change their specialization patterns if they see better performances with other commodities. This *complete* exogeneity might not even be that critical. One can think of model extensions where regions are characterised by different factor endowments that shape the sectoral specialization through comparative cost advantages. However, such an approach would probably still be insufficient.

The are good reasons to believe that the regional economic landscape in Europe is not only driven by comparative advantage (Ottaviano/Puga, 1998). It was shown in section 2 that the reality in the EU-15 is characterised by a clear core-periphery structure. Production is distributed very unevenly across space, with a high degree of spatial concentration of economic activity in an industrial core belt. The rich core regions clearly do not have their status *only* be-

[13] See e.g. OECD (2000), R.Martin (1997), Taylor/Bradley (1983), or Elhorst (2000) (and the references therein), who concludes that "most empirical applications have indicated that spatial differences in industry mix account for little, if any, of the variation in unemployment rates between regions. The same industry seems to experience different unemployment rates in different regions."

cause of underlying endowments. Instead, today's spatial economic configuration is also the result from endogenous cumulative processes and circular causation mechanisms. A product market specification like in the B/O-model can not take such processes into account.

A final critique concerns the analysis of labour mobility. In fig. 5, individuals from region 2 would want to move to region 1. But B/O assume, in an "ad-hoc" way, that regional preferences are operating as an opposing factor in form of a compensating regional amenity. The nasty point about this construction is that the long-run stability of the wage curve crucially hinges on it. If the compensating amenities were not there, the wage curve would gradually disappear.

All in all, one has to conclude that essentially everything is driven by exogenous factors in the general equilibrium model of B/O. Regional disparities exist only *by assumption*. This problem, however, can be resolved by altering the product market structure of the model. It is necessary though to depart from the conventional framework with constant returns and perfect competition towards an environment that works with localised increasing returns to scale and imperfect competition and tradability of commodities in spirit of the new agglomeration theories that were mentioned in the introduction. The use of a product market structure in this vein will essentially overturn the criticism from this section. And in fact, the case for the long-run stability of the wage curve will get even stronger then perceived by B/O themselves.

5) Endogenous agglomeration economies

Our alternative product market specification is build around the central ideas of localised increasing returns to scale and the presence of spatial transaction costs. We suppose a two-sector model where both regions r = {1,2} produce a final consumption good Y by assembling a variety of intermediate inputs X, which are produced and traded in both regions. All Y-producers in both regions use all available intermediates symmetrically, i.e. production of Y in region 1 requires both local inputs (X_{11}) and imported inputs (X_{21}). Increasing returns are

present in the model, because the production costs in the Y-sector are a decreasing function of the number of available industrial intermediates from either region (N_r). This argument for increasing returns, the expansion of the variety of intermediate inputs, is a standard feature of numerous models from the NTT and dates back to the seminal paper of Ethier (1982). Yet, contrary to the Ethier-model, we work with an explicitly spatial framework by assuming that transportation of intermediate inputs across space imposes ´iceberg´ transportation costs $\tau > 1$. For each unit X_{sr} dispatched, only $1/\tau$ units arrive. The final consumption good Y on the other hand can be traded freely across space. The production function for the consumption good Y in region r = {1,2} is given by a symmetric CES function

$$Y_r = \left(N_r X_{rr}^{\ \theta} + N_s \left[\frac{X_{sr}}{\tau} \right]^{\theta} \right)^{1/\theta} \qquad \text{with } 0 < \theta < 1 \text{ [14]} \qquad (7)$$

where s = {1,2} denotes the other region. From (7), the demand functions for intermediates X_{rr} and X_{sr} are given by

$$X_{rr} = p_r^{\frac{1}{\theta-1}} G_r^{\frac{\theta}{1-\theta}} Y_r \qquad \text{and} \qquad X_{sr} = (\tau p_s)^{\frac{1}{\theta-1}} G_r^{\frac{\theta}{1-\theta}} Y_r , \qquad (8)$$

where p_r is the mill price of an symmetrical intermediate from region r, and G_r is the regional intermediates price index, and at the same time the minimum cost function of producing one unit of Y_r in region r. This function G_r is given by

$$G_r = \left(N_r (p_r)^{\frac{\theta}{\theta-1}} + N_s (\tau p_s)^{\frac{\theta}{\theta-1}} \right)^{\frac{\theta-1}{\theta}} \qquad (9)$$

As noted above, unit costs G_r are decreasing in the number of available intermediates N_r and N_s. Due to the transportation costs, the decline is stronger in N_r than in N_s. We assume that the Y-sector is perfectly competitive. This together with the assumption of costless transportation implies that there is price equalization on the market for the final consumption good. Y-

[14] The parameter θ is a measure of the differentiability of single intermediate inputs. If θ is close to one, they are nearly perfect substitutes. Rearranging yields $\sigma = 1/(1-\theta)$, the elasticity of substitution between single varieties.

producers in both regions have to take the price p^Y as given, potentially as determined on world markets outside the nation. Without loss of generality we can use p^Y as the numeraire and set it equal to one. This construction is owed to the trade model of Matusz (1996) and offers a good deal of analytical simplification. Zero profits and efficient production imply that unit costs in equilibrium need to equal one in both regions. The equilibrium condition is thus

$$1 = N_r (p_r)^{\frac{\theta}{\theta-1}} + N_s (\tau p_s)^{\frac{\theta}{\theta-1}} \tag{10}$$

In both regions, each of the single intermediates is produced by using labour only. The labour requirement ℓ necessary to produce the quantity X is given by

$$\ell = \alpha + \beta X \qquad with\ \alpha>0,\ \beta>0 \tag{11}$$

Due to the fixed costs α, and the unlimited number of potential varieties in the X-sector, every single intermediate will be produced by only one firm. Each firm from region r sells its distinct product X at price p_r. Following Dixit/Stiglitz (1977) we say that single producers are small relative to the market. This implies that profit maximizing prices are a constant mark-up over marginal costs, which are constituted solely by the wage costs w_r.

$$p_r = \frac{\beta}{\theta}\ w_r \tag{12}$$

Furthermore, profits for every single intermediate good are driven down to zero by the entry of potential competitors. This implies that all X-firm, regardless of their location, are operating at the same scale of output (13), which requires an exactly determined amount of labour per firm (14).

$$X = \left(\frac{\alpha}{\beta}\right)\left(\frac{\theta}{1-\theta}\right) \tag{13}$$

and

$$\ell = \frac{\alpha}{1-\theta} \tag{14}$$

The maximum number of intermediates that a region can potentially produce is restricted by labour supply $\bar{L}_r$ if the labour is fully employed. If a fraction U_r of the labour force is unemployed, the equilibrium number of firms is by definition

$$N_r = (1-U_r)\frac{\bar{L}_r}{\ell} \tag{15}$$

The higher is employment in region r, the more firms are active in that region, and the cheaper is Y-production in both regions, but particularly in the region r itself.

Equilibrium

With costless trade ($\tau = 1$), it would not matter where intermediates are produced, since they are equally available everywhere. As shown by Matusz (1996), regional wages would be equalised at $w_1 = w_2 = (\theta/\beta)(N_1 + N_2)^{(1-\theta)/\theta}$.[15] With transportation costs $\tau > 1$, however, the larger region has an advantage over the smaller one since it can produce more intermediates locally. Consequently, regional wage equalization does not occur if the regions differ in size, but the larger region pays an agglomeration wage premium. By substituting (15) and (12) into (10), where we have set $\beta=\theta$ for simplicity, we obtain for region r =1.

$$w_1 = \left(\frac{(1-U_1)\frac{\bar{L}_1}{\ell}}{1-(1-U_2)\frac{\bar{L}_2}{\ell}(\tau w_2)^{\frac{\theta}{\theta-1}}} \right)^{\frac{1-\theta}{\theta}} \tag{16}$$

The nominal (=real) regional wage w_1 is increasing in employment in both regions, but decreases with higher wages in region 2 and transportation costs τ. An analogous equation applies to region s = {1,2}. Solving for w_1 and w_2, we can obtain closed-form solutions for the regional equilibrium wages

[15] This result is one central insight of the ´new trade theory´ in spirit of Ethier (1982), namely that intermediates production does not need to be spatially concentrated, but that the exploitation of increasing returns can be "international".

$$w_1 = \left(T\,(1-U_1)\frac{\overline{L}_1}{\ell} \right)^{\frac{1-\theta}{\theta}}, \qquad w_2 = \left(T\,(1-U_2)\frac{\overline{L}_2}{\ell} \right)^{\frac{1-\theta}{\theta}} \tag{17}$$

$$\text{where } T = \frac{1-\tau^{\frac{2\theta}{\theta-1}}}{1-\tau^{\frac{\theta}{\theta-1}}}$$

At these wage levels, there is profit maximization and zero profits in both sectors and both regions. As can be seen, the equilibrium levels of w_1 and w_2 only depend (positively) on employment in the respective region itself. E.g., an increase in L_2 only has positive effects on the wage in region 2, but not in region 1. This is due to the symmetrical use of all intermediates in both regions. An increase in L_2 has at first instance also positive spillover effects in region 1. But once the endogenous effect on w_2 is taken into account, the impact will cancel out. Economically, (17) implies that the model incorporates a purely regional scale externality. A larger labour force in region 2 implies higher equilibrium wages in that region due to the better exploitation of localised scale economies. But despite the openness, there are effectively no interregional spillovers of any type. It is also noteworthy that w_1 and w_2 decrease *proportionally* with the higher transportation costs τ. The variable T can be understood as an inverse measure of the resource waste from shipping and ranges between T = 1 (if $\tau \to \infty$), and T=2 (if $\tau \to 1$). Formally, the regional wages in (17) are consistent with efficient production in the Y- and X-sectors in both regions. But moreover, they also imply clearing of all markets in this economy. The wages w1 and w2 from (17) are thus the *true* equilibrium wages. This proposition is proofed in the appendix.

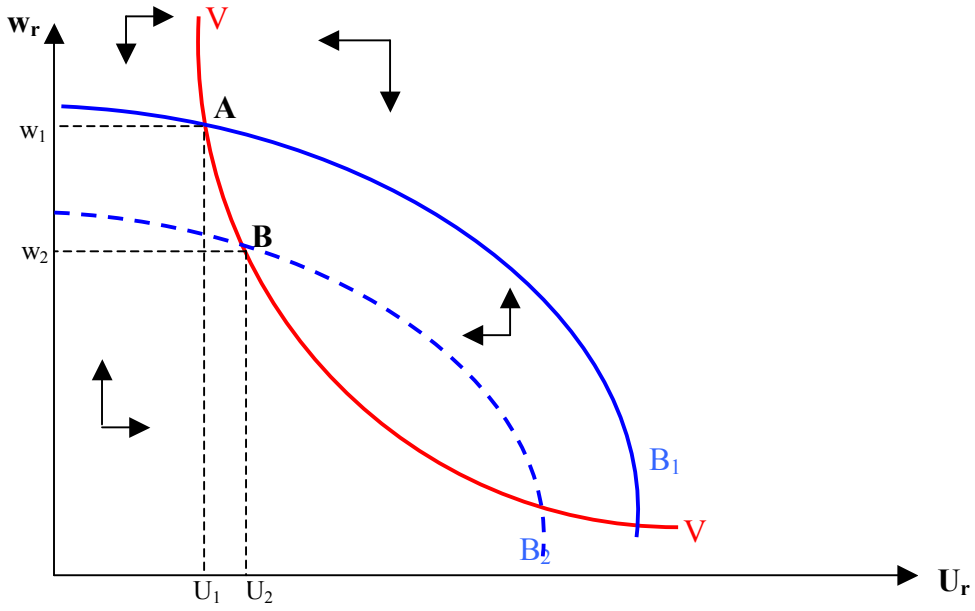
Graphically, (17) is represented by the curves B_1B_1 and B_2B_2 in fig. 6. The product market equilibrium curves are no longer horizontal lines as in the B/O-model (fig. 5), but are now downward sloping curves due to localised internal increasing returns. For any given unemployment rate, the region with the larger labour force (r=1) pays the higher equilibrium real

wage. The intuition for this scale effect is straightforward. Region 1 produces more local intermediate goods than region 2, since total employment is higher. Region 1 thus saves on transportation costs. It must consequently pay higher wages for the zero profit conditions in the Y- and the X-sector to hold. Hence, for all points below a BB-schedule, wages are too low for a given unemployment rate. This determines the vertical phase arrows. The higher is the difference between L_1 and L_2, the further apart are B_1B_1 and B_2B_2. An increase in τ shifts both curves downwards and to the left, because the dead weight loss of resources wasted in transportation increases. The same shift occurs as α, β, or θ increase.

Full equilibrium is reached if both product and labour markets are jointly in equilibrium. Equilibrium in the labour market is represented by the wage curve VV in fig.6, which is given by equation (5) and identical to the wage curve from fig. 5. For all points to the right of VV, unemployment is too high for any given wage. Consequently firms can hire new workers and trust that they do not shirk. Equilibrium unemployment must fall.

The stable equilibrium points are at A and B respectively. As can be seen, region 1 has both the higher equilibrium wage and the lower unemployment rate. Recall that we have assumed that region 1 is larger than region 2, and can therefore better exploit the scale economies. The labour demand consistent with product market equilibrium is higher in region 1 for any given wage rate. This drives down unemployment at first instance and simultaneously increases the necessity to pay efficiency wages in order to prevent individuals from shirking. In equilibrium, the larger region ("the core") is advantaged over the smaller one along two dimensions: by having higher wages and a lower unemployment rate. In other words, the existence of unemployment exacerbates the agglomeration wage premium. It is not only because of technological factors and the better exploitation of scale economies that large regions pay higher wages. Our model suggests that it must pay an additional efficiency wage premium.

Figure 6: Equilibrium in the two-region economy with immobile agents



In fig. 6, we have not yet taken into account the effects of labor mobility in this economy. But spatial differences as indicated in fig. 6 of course constitute again a motive for workers from region 2 to migrate to region 1. Contrarily to the B/O-approach, where migration ceteris paribus led to the erosion of the wage curve, labour mobility in our model perpetuates regional disparities. If individuals were perfectly mobile across regions, there would be full concentration of all workers and thus all economic activity in one region in order to fully exploit the increasing returns in production. In the more realistic case with imperfect mobility, due maybe to similar arguments of regional congestion, the concentration process will be incomplete. But still, spatial disparities would be more pronounced the more migration occurs. In other words, the higher is the *degree of agglomeration,* the sharper are regional differences.

This result if of course fundamentally different from conventional neoclassical beliefs on the aggregate effects of labor mobility. Yet, empirical support for the neoclassical convergence hypothesis is mixed at best (see e.g. Waltz, 1995; Reichlin/Rustichini, 1998). Suedekum (2003b) has shown that the convergence hypothesis gets flawed even through very slight departures from the quite restrictive assumptions of neoclassical models. For our purpose, it is

most important to stress one essential point: if labour migration spurs regional divergence, this implies that the wage curve is a stable interregional relation with no tendency of erosion.

6) Discussion and concluding remarks

In section 4, we have pointed out some fundamental criticisms with respect to the wage curve model of B/O. In short, we have criticised: (a) that regional disparities can not develop endogenously, but must be due to exogenous assumptions, (b) that regions were essentially identified with sectors, (c) that the B/O-models is not able to explain regional agglomeration, even tough it is the most salient features of the European economic landscape, and (d) that labour mobility leads to an erosion of the wage curve, so that the long-run stability critically hinges on restrictive ad-hoc assumptions.

Our alternative approach from section 5 leads to different conclusions with respect to all these four points. Since we have incorporated a scale effect in the production function, we have taken into account an *endogenous* mechanism for regional disparities to develop, namely the presence of localised increasing returns to scale. Sectoral specialization patterns play no critical role in our model. Both locations are engaged in production activities within the same sectors. Differences in the production structure exist insofar that the larger region can produce a higher number of industrial intermediates. But all regional differentiation, and all interregional trade, is of an intra-industry type. Lastly, the wage curve is not put under strain by labour mobility as in the B/O-model, but rather strengthened by it. Hence, if one works with an increasing returns technology, the theoretical case for the existence of a wage curve is even stronger than it has been argued by B/O themselves. No "ad-hoc" construction of compensating regional amenities is needed to warrant the long-run stability of the wage curve.

The contribution of our paper, however, can also be interpreted differently, namely as an attempt to integrate the element of unemployment to the new regional agglomeration theories. We have argued in the introduction that the literature in NEG and NTT is vastly growing, yet

mostly silent about unemployment disparities. Our model is an attempt to partly close this gap. It is not strictly a NEG-model, effectively because the analysis is not about the trade-off between centripetal and centrifugal forces to shape an economic landscape. It is actually closer to models of the NTT (Ethier, 1982; Matusz, 1996). But contrarily to this literature, our model is an explicitly regional approach, as it takes into account spatial transaction costs and the effects of labour mobility.

The important result of our paper is that the large core region, where workers and production are agglomerated, will exhibit a lower unemployment rate than the sparsely populated peripheral region, and the core will pay a real wage premium. This result is consistent with the stylised facts about the geographical structure of economic activity in the EU-15. In section 2 we have shown that regional unemployment rates follow a trans-national core-periphery-structure that resembles the spatial configuration of GDP per capita. Low unemployment is centred in the agglomeration area (the "European Banana"), whereas the poor "objective 1"-regions mostly have very high unemployment rates. Moreover, we have shown that the spatial structure of joblessness today is the result of a polarisation process of regional unemployment rates that was mainly driven by the labour demand side. Densely populated and rich regions on average received immigrants, but experienced falling unemployment rates. The opposite happened in the already poor and sparsely populated sending regions.

These stylised facts can be understood with our theoretical model. The immigration of additional workers to the core regions does not primarily cause an increase of competition on the labour supply side. There are stronger secondary effects on the labour demand side, caused by the better exploitation of scale economies, that lead to higher wages and lower unemployment in the centre. All in all, we conclude that our model approach is not only an innovation from the theoretical point of view, but also is of empirical relevance.

As a final point, we want to discuss the issue of inter- versus intra-national unemployment disparities and the role of labour market institutions for determining regional unemployment

rates. Recall that we have assumed in section 3 that the parameters e_r and γ_r in the partial model of the labour market equilibrium curve are identical in both regions. The interpretation of this assumption, that warranted that the wage curve locus VV in fig. 6 is the same in both regions, could be that there is no regional variation in labour market institutions. One could easily think of model extensions where the parameters e_r and γ_r reflect structural characteristics of the respective labour market. The firing probability γ_r might e.g. be influenced by employment protection laws, or the work effort parameter e_r is a reservation wage dependent on welfare state arrangements etc.

The assumption identical institutions in the two regions restricts the applicability of our model at first instance to the case of intra-national unemployment disparities. Within the same country, there is typically very little institutional variation across regions. E.g., labour laws, welfare state arrangements, the tax regime etc. are typically valid nationwide. In other words, for the case of intra-national unemployment disparities, it seems reasonable to assume that all regions face the same wage curve locus. We have seen in figure 1 that the same set of (national) labour market institutions still can bring about utterly different unemployment rates on the regional level. Our model helps to explain this puzzle, since it suggests that unemployment disparities are mainly driven by regional economic agglomeration.

Nevertheless, our interest was not constrained to the case of *intra*-national differences. Our model is also applicable to understand the spatial structure of unemployment in the EU-area as a whole. Across the single EU-member countries, however, there is still a notable degree of variation in labour market institutions. Regions from France might e.g. face a different wage curve locus than regions from Germany or Spain. For the case of labour market disparities of regions that belong to different countries, we can thus no longer assume that they face the same VV-locus. The observed regional differences in this case are a combination of institutional differences (VV-curves) and the degree of agglomeration (BB-curves).

The fact that national borders play only a minor role as division lines of the three transnational unemployment clusters in the EU-15 (map 1) suggests that the actual influence of labour market institutions for determining unemployment might be smaller than it is frequently stressed in many academic and popular discussions. But labour market institutions are not irrelevant. The Portuguese regions are a good example for this claim. They all belong to the "objective 1"-cluster, but still unemployment rates are relatively low. This is supposedly so, because Portugal has at least in some respects a set of favourable institutions, i.e. a wage curve VV that is located closer to the origin as in other nations.[16]

To sum up, the regional labour market disparities, or more generally the spatial structure of unemployment in the EU-15, is determined by an interplay of (national) institutions and the degree of regional agglomeration. The influence of the latter seems to be greater. On a regional level, high unemployment seems to result primarily because of economic peripherality and a low degree of agglomeration. It seems not so much to be caused by unfavourable labour market institutions, since in many cases other regions from the same country demonstrate that very low regional unemployment rates are very well consistent with the same institutional frame.

[16] For a more detailed discussion about the particularities of the Portuguese labour market see Addison/Texeira (2001) or Bover/Garcia-Perea/Portugal (2000).

Appendix

Each intermediates firm supplies an regionally invariant quantity given by $X=\alpha/(1-\theta)$. Equilibrium requires that X equals total sales to both regions $X_{rr}+ \tau X_{rs}$. Using (8) together with the equilibrium condition $G_r=1$ we can write this as

$$X = (w_r)^{\frac{1}{\theta-1}} \left(Y_r + \tau^{\frac{\theta}{\theta-1}} Y_s \right) \tag{A1}$$

Using (17) and solving for Y_r, this can be written as

$$Y_r = \frac{X}{1-\tau^{\frac{2\theta}{\theta-1}}} \left((TN_r)^{\frac{1}{\theta}} - \tau^{\frac{\theta}{\theta-1}} (TN_s)^{\frac{1}{\theta}} \right) \tag{A2}$$

Equation (A2) determines the regional production level Y_r at which markets for intermediates clear. The total national production of Y is

$$Y_r + Y_s = \frac{X}{T} \left((TN_r)^{\frac{1}{\theta}} + (TN_s)^{\frac{1}{\theta}} \right) \tag{A3}$$

Since Y is freely tradable at $p^Y=1$, (A3) needs to equal total national income and consumption expenditure, which is given by

$$w_r(1-U_r)L_r + w_s(1-U_s)L_s \tag{A4}$$

By using (17) in (A3) and rewriting (A4), one can show that both expression are equivalent to

$$\left(\frac{T}{X} \right)^{\frac{1-\theta}{\theta}} \left[\left((1-U_r)L_r \right)^{1/\theta} + \left((1-U_s)L_s \right)^{1/\theta} \right], \tag{A5}$$

which proofs the proposition that (17) depicts the true equilibrium wages. Equation (A5) is the gross national product of this two-region economy: it is increasing in employment, and decreasing in transportation costs.

References

Addison, J.T., P. Teixeira (2001) "Employment Adjustment in a Sclerotic Labor Market: Comparing Portugal with Germany, Spain, and the United Kingdow", *Jahrbuecher fuer Nationaloekonomie und Statistik* 221 (4): 353-370.

Bispink, R. (1999) "Tarifpolitik und Lohnbildung in Deutschland am Beispiel ausgewählter Wirtschaftszweige", *WSI Discussion Papers* 80, Duesseldorf.

Blanchard, O., L. Katz (1997) " What We Know and Do not Know about the Natural Rate of Unemployment", *Journal of Economic Perspectives* 11: 51-72.

Blanchflower, D., A. Oswald (1996), *The Wage Curve*, Cambrige (Mass.): MIT Press.

Blanchflower, D., A. Oswald (1994) "An Introduction to the Wage Curve", *(mimeo)*, University College London.

Blanchflower, D., A. Oswald (1990) "The Wage Curve", *Scandinavian Journal of Economics* 92: 215-235.

Blien, U. (2001), *Arbeitslosigkeit und Entlohnung auf regionalen Arbeitsmärkten*, Heidelberg, New York: Physica.

Bover, O., P. Garcia-Perea, P. Portugal (2000) "Labour market outliers: Lessons from Portugal and Spain", *Economic Policy* 15, no. 31: 379-428.

Buettner, T. (1999), *Agglomeration, Growth, and Adjustment*, ZEW Economic Studies, Heidelberg, New York: Physica.

Card, D. (1995) "The Wage Curve: A Review", *Journal of Economic Literature* 33: 785-799.

Carlin, W., D. Soskice (1990), *Macroeconomics and the Wage Bargain. A Modern Approach to Employment, Inflation and the Exchange Rate*, Oxford: Oxford University Press.

CER (1998) "Il lavaro negli anii dell´Euro", *Rapporto CER* 3, Milano.

Dixit, A., J. Stiglitz (1977) "Monopolistic Competition and Optimum Product Diversity", *American Economic Review* 67: 297-308.

Elhorst, J.P. (2000) "The Mystery of Regional Unemployment Differentials: A Survey of Theoretical and Empirical Explanations", *University of Groningen Working Papers*.

Ethier, W. (1982) "National and International Returns to Scale in the Modern Theory of International Trade", *American Economic Review* 72: 389-405.

European Commission (2001), *Second Report on Economic and Social Cohesion*, Brussels. *available under:* http://europa.eu.int/comm/regional_policy/sources/docoffic/official/reports/contentpdf_en.htm

Faini, R. (1999) "Trade Unions and Regional Development", *European Economic Review* 43: 457-474.

Fuhita, M., P. Krugman, A. Venables (1999), *The Spatial Economy: Cities, Regions, and International Trade*, Cambridge (Mass.): MIT Press.

Hall, R. (1970) "Why is the Unemployment Rate so High at Full Employment?", *Brookings Papers on Economic Activity* 3: 369-402.

Hall, R. (1972) "Turnover in the Labor Force", *Brookings Papers on Economic Activity* 3: 709-756.

Harris, J., M. Todaro (1970) "Migration, Unemployment and Development: A Two-Sector Analysis", *American Economic Review* 60: 126-142.

Hughes, G., B. McCormick (1985) “Migration Intentions in the U.K. – Which Households Want to Migrate and Which Succeed?” *Economic Journal* 95:113-123, Conference Papers Supplement

Krugman, P. (1991) “Increasing Returns and Economic Geography”, *Journal of Political Economy* 99: 483-499.

Krugman, P. (1980) “Scale Economics, Product Differentiation, and the Pattern of Trade”, *American Economic Review* 70: 950-959.

Layard, R., S. Nickell, R. Jackman (1991), *Unemployment: Macroeconomic Performance and the Labor Market*, Oxford: Oxford University Press.

Lindbeck, A. (1992) “Macroeconomic Theory and the Labour Market”, *European Economic Review* 36: 209-235.

Martin, R. (1997) “Regional Unemployment Disparities and their Dynamics”, *Regional Studies* 31: 237-252.

Martin, R., P. Tyler (2000) “Regional Employment Evolutions in the European Union: A Preliminary Analysis”, *Regional Studies* 34: 601-616.

Matusz, S. (1996) “International trade, the division of labour, and unemployment”, *International Economic Review* 37: 71-84.

Mincer, J. (1974), *Schooling, Experience, and Earnings*, New York: Columbia University Press.

OECD (2000) “Disparities in Regional Labour Markets”, *OECD Employment Outlook* Paris, p. 31-78.

Ottaviano, G., D. Puga (1998) “Agglomeration in the Global Economy: A Survey of the ´New Economic Geography´”, *World Economy* 21: 707-731.

Overman, H., D. Puga (2002) “Unemployment Clusters across European Regions and Countries”, *Economic Policy,* no.34:115-147.

Partridge, M., D. Rickman (1997) “Has the Wage Curve Nullified the Harris-Todaro Model? Further US Evidence”, *Economics Letters* 54: 277-282.

Peeters, J., H. Garretsen (2000) “Globalisation, Wages and Unemployment: An Economic Geography Perspective”, *CESifo Working Paper* 256, Munich.

Puga, D. (2002) “European Regional Policies in Light of Recent Location Theories”, *Journal of Economic Geography* 2: 302-334.

Reichlin, P., A. Rustichini (1998) “Diverging Patterns with Endogenous Labor Migration”, *Journal of Economic Dynamics and Control* 22: 703-728.

Schnabel, C. (1995) “Übertarifliche Entlohnung: Einige Erkenntnisse auf Basis betrieblicher Effektivlohnstatistiken“, in: Gerlach, K., R. Schettkat (eds.), *Determinanten der Lohnbildung*, Berlin: Ed. Sigma.

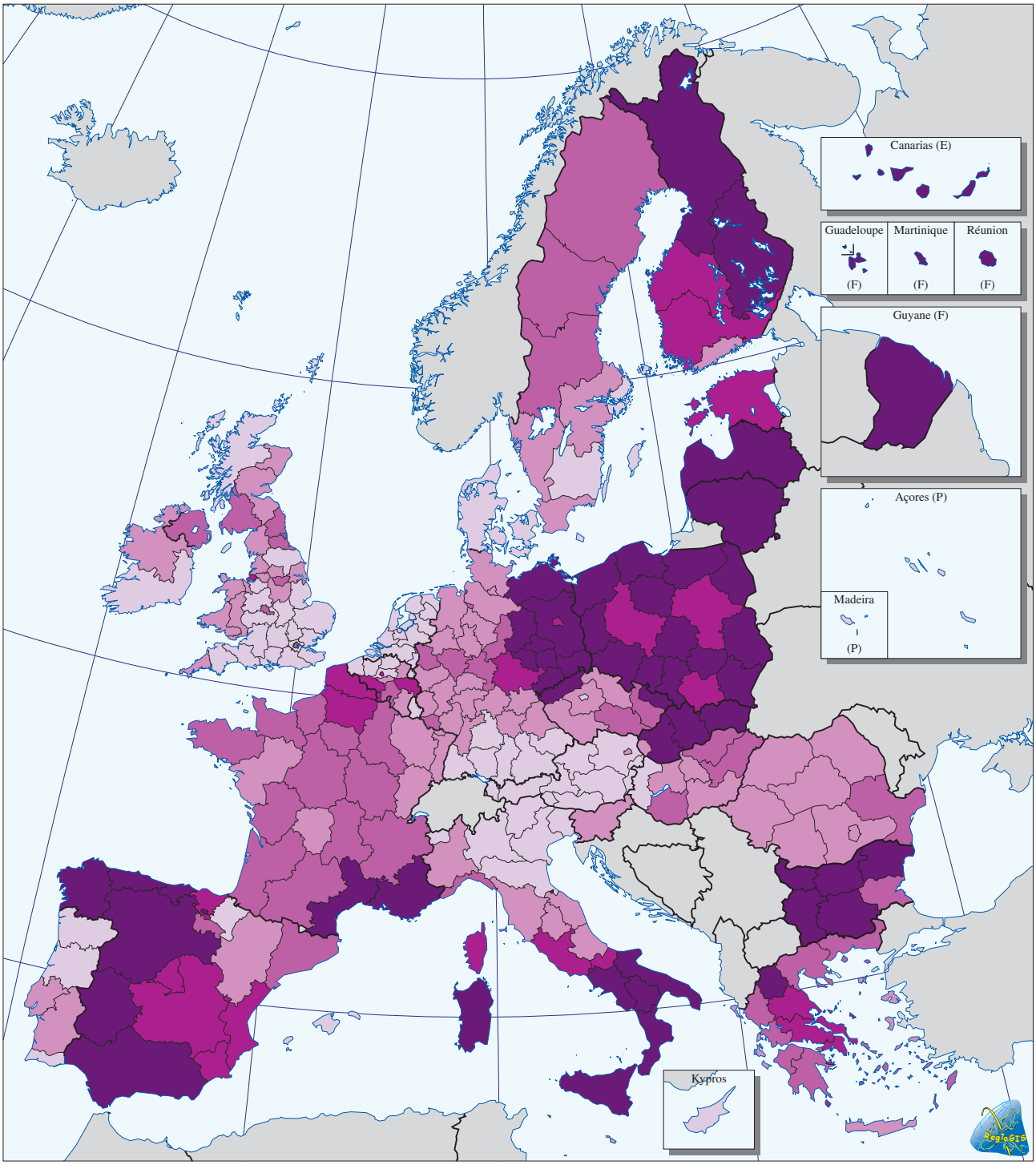
Shapiro, C., J. Stiglitz (1984) “Equilibrium Unemployment as a Worker Discipline Device”, *American Economic Review* 73: 433-444.

Suedekum, J. (2003a), *Agglomeration and Regional Unemployment Disparities*, PhD thesis, Goettingen University.

Suedekum, J. (2003b) “Selective Migration, Union Wage Setting, and Unemployment Disparities in West Germany”, (forthcoming) *International Economic Journal*.

Taylor, J., S. Bradley (1983) “Spatial Variations in the Unemployment Rate: A Case Study of North-West England”, *Regional Studies* 17: 113-124.

Walz, U. (1995) “Growth (Rate) Effects of Migration“, *Zeitschrift fuer Wirtschafts- und Sozialwissenschaft* 115: 199-221.



Map 1: Unemployment rate by region, 2000

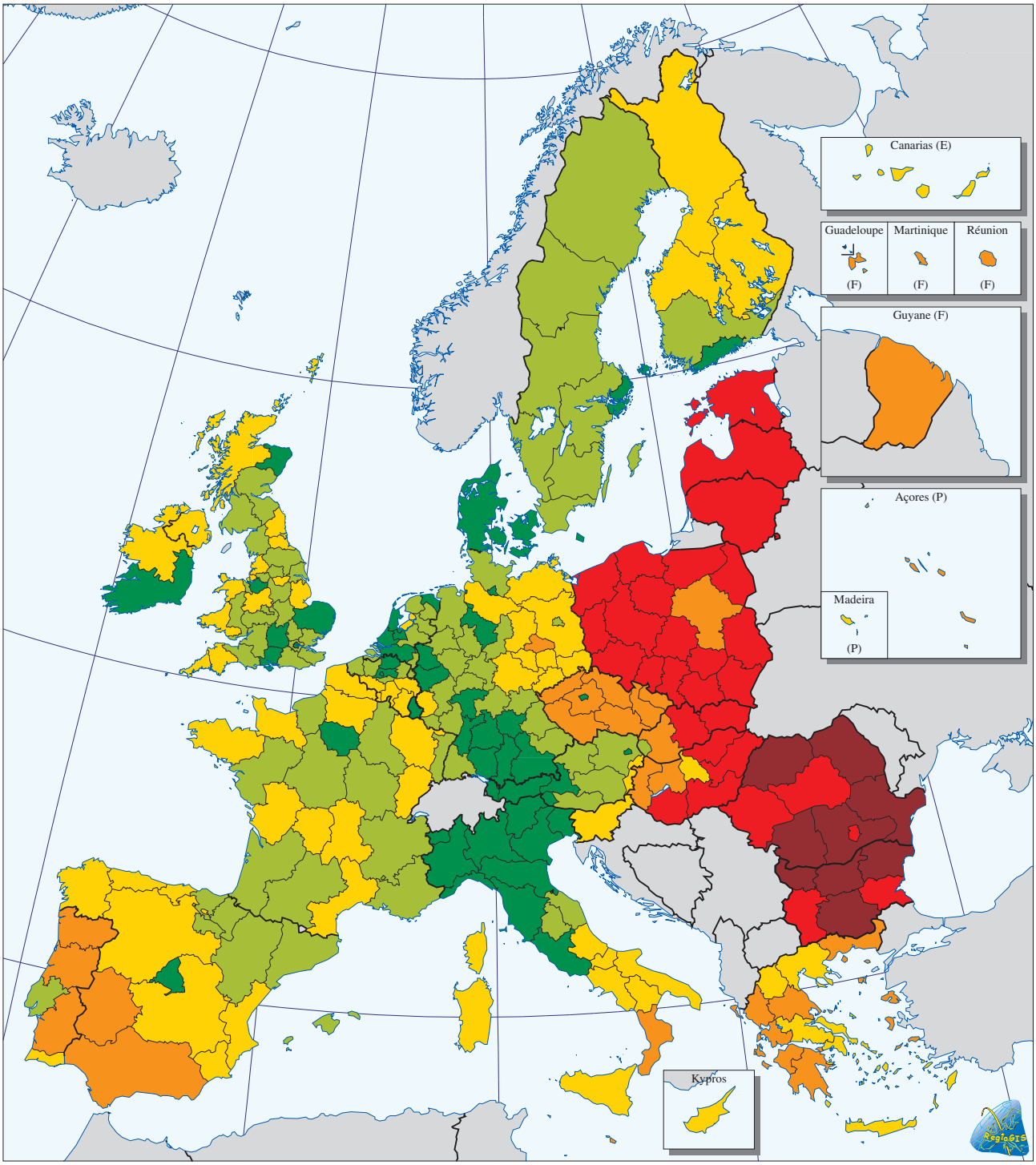
% of labour force

- < 4.95
- 4.95 - 7.85
- 7.85 - 10.75
- 10.75 - 13.65
- >= 13.65

EUR-27 = 9.3
Standard deviation = 5.74

Sources: Eurostat and NSI

0 100 500km



Map 2: GDP per head by region (PPS), 1999

Index, EUR-27 = 100

- < 30
- 30 - 50
- 50 - 75
- 75 - 100
- 100 - 125
- >= 125

Source: Eurostat

0 100 500km

Recent Discussion Papers

94. Lambsdorff, Johann Graf: Transaktionskosten der Korruption - eine institutionenökonomische Betrachtung. December 1997

95. Onozaki, Tamotsu / Sieg, Gernot / Yokoo, Masanori: Complex dynamics in a cobweb model with adaptive production adjustment. May 1998

96. Hennighausen, Axel: Die Leistungsabhängige Schwerverkehrsabgabe: Verkehrsverlagerung oder Steuerexport? 1998

97. Möller, Herbert: Geldumlaufgeschwindigkeit und Stabilität. January 1999

98. Gerloff, Axel: Stabilization during the Early Years of Transition - Some Stylized Facts. March 1999

99. Ahrens, Joachim: Governance, Conditionality and the Transformation of Post-Socialist Countries. April 1999

100. Mohsen, Fadi: Technischer Fortschritt und Humankapitalbildung in der Neuen Wachstumstheorie. September 1999

101. Sieg, Gernot: A political business cycle with boundedly rational agents. March 2000

102. Jarchow, Hans-Joachim: Geldpoltik bei extrapolativen, semirationalen und rationalen Inflationserwartungen. June 2000

103. Georgopoulos, Antonios / Salavrakos, Ioannis-Dionysios: Griechische Joint-Ventures in Ost-Europa - Ein erfolgversprechendes Kooperationsmodell? November 2000

104. Haufler, Andreas / Schjelderup, Guttorm / Stähler, Frank: Commodity Taxation and International Trade in Imperfect Markets. January 2001

105. Barbaro, Salvatore: Gibt es eine Umverteilung von den *Armen* zu den *Reichen* durch die öffentliche Hochschulfinanzierung? Tragen Akademiker die Kosten ihres Studiums? Einige methodologische Anmerkungen zum Forschungsstand über die Verteilungswirkungen der öffentlichen Hochschulfinanzierung in der Bundesrepublik Deutschland. May 2001

106. Krieger, Tim: Intergenerational Redistribution and Labor Mobility: A Survey. May 2001

107. Kalbitzer, Ute: Das Schweigen der Ökonomik. Wissenschaftliche Politikberatung als wirtschaftspolitischer Diskurs. May 2001

108. Haufler, Andreas / Pflüger, Michael: International Commodity Taxation under Monopolistic Competition, June 2001

109. Südekum, Jens: Home Goods and Regional Price Indices: A Perspective from New Economic Geography, July 2001

110. Onozaki, Tamotsu / Sieg, Gernot / Yokoo, Masanori: Stability, Chaos and Multiple Attractors: A Single Agent Makes a Difference, November 2001

111. Rühmann, Peter / Südekum, Jens: Severance Payments and Firm-Specific Human Capital, November 2001

112. Krieger, Tim: Immigration, Public Pensions, and Heterogenous Voters, April 2002

113. Lambsdorff, Johann Graf / Sitki Utku Teksoz: Corrupt Relational Contracting, May 2002

114. Barbaro, Salvatore: The Distributional Impact of Subsidies to Higher Education - Empirical Evidence from Germany, September 2002

115. Sauer, Christoph / Schratzenstaller, Margit: Strategies of international fiscal competition for foreign direct investment in a model with impure public goods, December 2002

116. Barbaro, Salvatore: The Combined Effect of Taxation and Subsidization on Human Capital Investment, January 2003