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Structural change and regional disparities in (un)employment

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Structural change and regional disparities in (un)employment

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Abstract

One of the key issues in economics is the explanation of unemployment and its variation across different economies. Doing so "modern mainstream macroeconomics" frequently refers to institutional structures and their variation across countries. Those countries with "more flexible" labour markets have lower unemployment rates. This "mainstream" is based on the so-called European Labour Market Model of Layard, Nickell & Jackman (1991, 2005, cf. Carlin & Soskice 2006).

However, unemployment *within* the European states varies as much as between these countries (Südekum 2005). Within a country, however, there are only minor differences in the institutions. Therefore the large variation in regional unemployment and the development of employment is puzzling. In Germany, for example, there are regions in which virtual full employment prevails (e.g. Munich Area or Eichstätt) and others which are affected by a deep labour market crisis (e.g. Ruhr Area, Bremerhaven or large parts of East Germany).

Our explanation of this regional variation of unemployment builds on structural change, the regional industry composition and technical progress. Depending on the life cycle phase of the respective industries technical progress has different effects on employment and thus on unemployment. In the early stages of the industry life cycle product demand is elastic and increases in productivity result in employment growth. Across subsequent life cycle stages demand becomes inelastic and productivity increases lead to a reduction in employment.

Industries are usually regionally concentrated and regions are specialised on specific industries (Krugman 1991, Möller, Tassinopoulos 2000). The development of a region dominated by a specific industry depends strongly on the life cycle of this industry. The region falls into crisis when the main product of the respective industry reaches a phase of saturation with inelastic demand. Thus the mechanism of product life cycle, price elasticity and technical progress leads through the specialisation of regional economies to different spatial development paths.

We model formally this mechanism building on Schettkat (1997), Appelbaum and Schettkat (1999) and Möller (2001). It can be shown that a transition from the elastic into the inelastic range of the demand function for the most important product(s) can already suffice to plunge a region into crisis. The simple model structure is intended to keep the reasoning transparent and takes findings of the micro-founded model developed by Blien and Sanner (2006) into account.

In our empirical analysis we use industry level time series data on output, prices, employment and national income for Germany provided by the Federal Statistical Office and the OECD. We estimate Marshallian type demand functions using an instrumental variables estimator to derive the price elasticities for different industries and link this information than to the regional labour market performance of the respective industries and regions.

Keywords: Structural change; Productivity growth; Labour market dynamics

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1. Introduction

One of the key problems in economics is explaining the level of unemployment in different economies. To do this "modern mainstream macroeconomics" frequently refers to institutional structures and their variation across countries. Countries with more flexible labour markets have lower unemployment rates.

One prominent "mainstream" explanation of unemployment is the so-called European Labour Market Model of Layard, Nickell & Jackman (1991, 2005, cf. Carlin & Soskice 2006 for an integration with traditional macroeconomics). There, unemployment results from the competing claims of groups of economic subjects (Franz 1992: 12). The claims of workers and firm owners on the social product are kept in balance by unemployment. In order to increase employment, economic policy therefore has to create institutions which restrain these demands.

In a review written on the occasion of the new edition of the book by Layard et al., Blanchard (2007) emphasises that the theory contained in the book has been empirically confirmed (also Layard, Nickell & Jackman 2005, introduction). Nonetheless, since the end of the 1990s there has been increasing criticism on the mainstream approaches. For example, some authors state that the empirical basis has been proving to be ambivalent (e.g. Howell et al. 2007).

Another point of criticism concerns the idea that various labour market institutions could simply be replaced or abolished in order to combat unemployment. Freeman (1998, 2001) argues that the institutions of an economy are connected and that there might be strong complementarities (see also the discussion on varieties of capitalism Hall, Soskice 2001; Paunescu, Schneider 2004). If a specific institution is removed, this could have far-reaching consequences. The complete structure of institutions could be destroyed and a far less optimal solution with even higher unemployment could develop.

One major short coming of the European Labour Market model and other macroeconomic approaches is their inability to explain the variation of unemployment and of the development of employment *within* countries. After all, unemployment *within* a nation shows about the same level of variation as it does between countries (Südekum 2005). Within countries, however, there are only minor differences in the institutions and macro economic factors. From this point of view, the large variation in regional unemployment in Germany constitutes a problem for the economic mainstream. Under the relatively uniform institutional conditions of a country there are regions in which virtual full employment prevails and others which are affected by a deep labour market crisis. This is for example true for the difference between East and West Germany as well as the differences within these two parts (e.g. areas with n (nearly) full employment like Munich Area or Eichstätt versus areas with persistent labour market crises Ruhr Area,). These regional disparities are neglected by most explanations of (un)employment.

Our alternative explanation of employment and unemployment builds on structural change, the industry life cycle, the regional industry composition and technical progress. Depending on the life cycle phase of the respective industries technical progress has different effects on employment and thus on unemployment. The major line of reasoning has already been published in a

paper by Neisser (1942). There, however, it is virtually assumed to be trivial and is not formally substantiated. This was done in various pathbreaking papers written by Ronald Schettkat (1997), partly in cooperation with Eileen Appelbaum (Appelbaum, Schettkat 1999). However, improvements are still of value. Their work does not include a microfoundation of the basic theorem. Unemployment is not endogenous and therefore an integration of the labour market is lacking. We have written our paper to complete the approach in these respects.[1] Additionally, we use the approach to explain regional variation in the development of employment by the regional industry composition. We also add empirical evidence which is missing until yet.

The price elasticity of demand transmits the effects of technical progress[2] (or productivity increases – we use the terms as synonyms) on employment. To see this we distinguish between two effects of productivity increases. As the same product can be produced using less labour, technical progress first leads to a drop in the demand for labour for a given quantity. This is the *displacement effect* of technical progress. In addition, however, the reduction in costs as a result of technical progress also leads to a drop in price. This in turn increases demand for the particular product and therefore also demand for workers who are employed in production. Here a *compensation effect* occurs. This effect is the stronger the more price elastic demand is.[3] Typically the price elasticity is higher in the early stages of the product life cycle or the industry life cycle. Continuous technical progress causes a permanent structural change, characterized by increases in the share of economic activity for industries with more price elastic demand and decreases for those with less elastic demand.

This process has substantial impact on regions. The development of regional employment depends on the regional industry composition. The higher the share of industries with high demand elasticities the better the regional labour market performance will be. This induces a process of regional structural change in which the regions with a high share of prospering industries will gain employment while those with a high share of industries with inelastic demand will lose employment.

We call our model "labour market model of structural change". The reason for this name is firstly that the specialisation of economies which has developed as a consequence of structural change serves as the point of departure. Some nations or regions have specialised in industries with elastic demand and others in industries with inelastic demand. Strong consequences for the development of employment and unemployment are the result. Secondly these mechanisms are as discussed themselves strong driving forces of structural change as they make some industry grow and others decline.

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1 A parallel effort is taken by Blien & Sanner (2006). There, the focus is on the development of employment, the generalization of the basic theorem to many markets and the modelling of the product cycle while microfounding the model through consumer behaviour.

2 We use the term technical progress in a wide sense which includes any outward movement of the production functions. For example changes in the organisational practices of a firm that increase productivity are included in this definition of technical progress.

3 The Marshall-Hicks-rules of labour demand are also establishing a link between employment and the price elasticity of demand. However, this link relates to the wage effects on labour demand and not technical progress.

We develop our explanation in several stages. We begin by describing the background of our reasoning in the dimensions of space and time. This is followed by a small basic model, which summarises the present state of theory. This constitutes the preparation for a more complex microfounded model of labour demand. Discussions about the relationship between elasticities and labour market performance follow. In section four we provide empirical evidence. We conclude with a brief summary and discussion of the implications.

2. Specialisation in space and time

In the spatial dimension, specialisations of economies are discernible both at regional and national level. For Krugman (1991: 5) the most striking characteristic of the geography of economic activity is its concentration. Localisation effects lead to the specialisation of regions in a few "preferred" industries. Although this concentration of particular industries in specific regions has declined somewhat in the last decades (cf. for the USA: Krugman 1991: 75ff.; for western Germany: Möller, Tassinopoulos 2000), its extent remains astonishingly.

Krugman (1991: 123ff.) focuses on labour market pooling as driving force of regional concentration and specialisation. He develops a model with the fundamental assumption that the business cycles for different firms do not precede entirely synchronologically. It is therefore advantageous for firms and workers to form a joint pool of labour. Firms will settle in places where there are already firms from the same industry in order to be able to hire workers when their own demand is high and that of the other firms is low. Such behaviour reduces unemployment or, in the case of flexible wages, ensures that wage development remains steady. Krugman's model shows that the advantage associated with this can carry more weight that the deterioration of the competitive position that subsequently results for a firm.

Localisation effects lead to the specialisation of regions in particular industries and product families. It tends to prove advantageous for a firm to choose a location in which other firms with a related product are already represented. In this case it is possible that a product is produced in one single region and that a large area is supplied with this product from this region. Thus, regions have a tendency to specialise in specific industries. These specialisations and the resulting industry might be different form region to region. Whether or not this situation occurs depends on the level of transport costs and the strength of the localisation effects.

Specialisations are important at national level, too. The developed economies produce clearly different national product mixture as for example put forward in the varieties of capitalism approach (Hall, Soskice 2001; Paunescu, Schneider 2004). If, for example, the production of the German economy is compared with that of other developed countries, a disproportionately large specialisation can be seen in the area of manufacturing. In addition many high-quality goods are manufactured in relatively small series. In order to explain this specialisation of nations, usually the theory of comparative advantages is used.

However, such a specialisation can also be explained by the German institutional structure generating as specific production system. Streeck (1991, 1997) and Sorge and Streeck (1988) described this system and named it diversified quality production. This production system requires

among other things particularly highly skilled workers. In Germany the institutional pre-requisite for this is the dual system of vocational training. This system is geared mainly towards occupations in the manufacturing industry.

In general the "Varieties of Capitalism" literature suggest that institutional settings across a broad set of subsystems like the educational system, the financial system and the labour market are gearing economies towards specific industry compositions. For example coordinated market economies like Germany are expected to have their strengths in sophisticated but not to innovative manufacturing industries. Liberal market economies like the Anglo-Saxon countries are expected to be strong in new services and innovative high tech manufacturing (Hall, Soskice 2001).

Specialisations, once they have been developed, have a tendency to persist. The particular specialisation can then prove to be a strength or a weakness with regard to the labour market. If the particular product market responds elastically to (relative) price declines resulting from perpetual increases in productivity, then employment gains will result - and vice versa in the case of an inelastic response. This is the explanation provided by Ronald Schettkat (1997) for Germany's relatively high unemployment rates. The market for luxury cars is probably not exactly a classic example of price elastic demand.

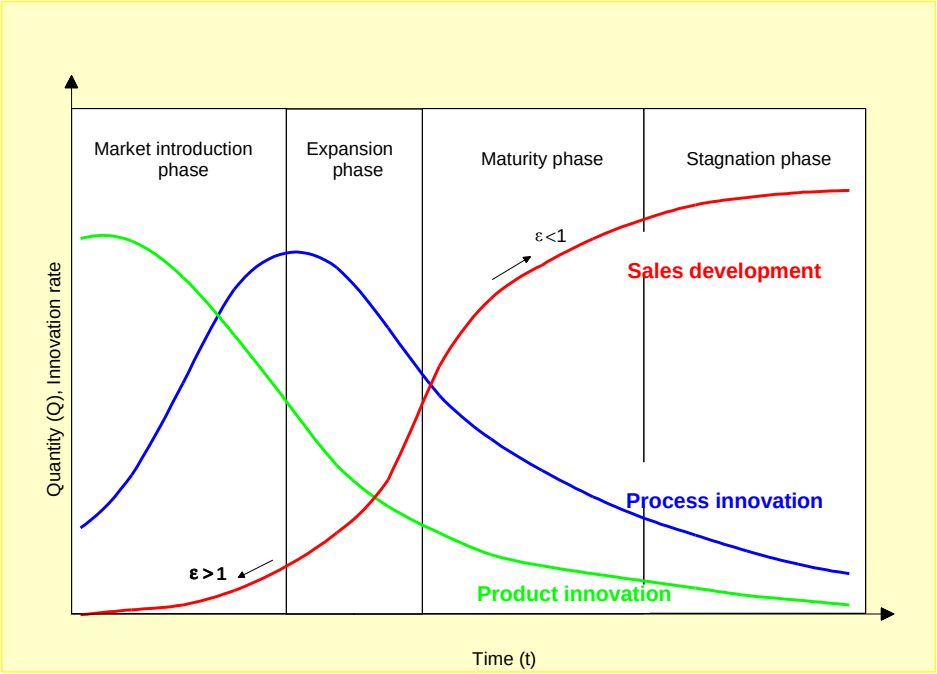
Another important dimension for understanding the relationship described here between productivity, demand elasticity and employment or unemployment is the idea of the product cycle. It goes back to Schumpeter among others (1939; cf. Wienert 1990; Weinstein et al. 1985: 63ff.) and was then further developed and integrated into the industry life cycle (Gorth, Klepper 1982; Abernathy, Clark 1985; Klepper 1996).[4] These theories on the industry or product life cycle are primarily concerned with innovation. We instead look at the various effects of technical progress on labour demand which vary across the life cycle stages.

Figure 1 illustrates that the product life cycle (or the product cycle, to avoid the biological association) can already result in employment problems before the "death" of the particular product. In the market introduction phase both product innovations and process innovations are high, while employment grows. A new product first enters the market as a small series at a very high price. The manufacturing firm frequently occupies a more or less pronounced monopoly position. Increasing experience with the production and efforts to improve productivity lead to the start of larger series and to clear price reductions, which, if demand is unsaturated (elastic), result in large increases in production which by far exceed the productivity improvements. In the course of time demand gets increasingly satisfied and technological leeway is exhausted. Now improvements in productivity and declining prices lead to small increases in the quantity of goods sold and thus to falling turnover and reduced employment. If regions are really specialised, as discussed above, then production and employment is dominated by specific industries and their main products. Yet, products do not generally meet with endless solvent demand. Products have only a finite "lifetime". Then a regional (or national) economy falls into crisis when this product reaches a phase of market saturation or the end of the product cycle. Thus the mechanism of product life cycle, price elasticity and technical progress leads through the specialisation of regional economies to different spatial development paths. A transition from the elastic into the

[4] If industries focus on a single product, then industry and product life cycle are identical. Theories on these life cycles share common assumption (Klepper 1996, Neffke et a. 2008). Thus we use these terms interchangeable.

inelastic range of the demand function for the most important product can already suffice to plunge a region into crisis. This mechanism is modelled formally in the next section.

Figure 1: Product life cycle of innovations and product sales over time



3. The labour market model of structural change

3.1. A basic model

A basic model is expounded below which follows the formulation developed by Appelbaum and Schettkat (1999) and by Möller (2001) and therefore summarises the current state of the reasoning. The basic model has the advantage of providing rapid clarity regarding the relationships of technical progress, price elasticity of demand and employment. It begins with a definition equation for the productivity of labour π in a firm j in which the production quantity Q is related to the level of employment N.

$$\pi_j = \frac{Q_j}{N_j} \tag{1}$$

$$P_j = \frac{z_j W_j}{\pi_j} \tag{2}$$

$$Q_j = f(P_j, y), \quad \text{with} \quad dQ_j/dP_j < 0, \quad dQ_j/dy > 0 \tag{3}$$

The second equation is a price-setting function with a mark-up calculation. The price is P_j, z is a mark-up factor which also includes capital expenditure and W_j is the wage rate. Finally the third equation is a demand function that falls with the price and rises with the national income y. From

the base equations it follows for the growth rates, if ε_j is the price elasticity and η_j is the income elasticity of demand:

$$\hat{N}_j = \hat{Q}_j - \hat{\pi}_j \qquad (1)'$$

$$\hat{P}_j = \hat{z}_j + \hat{W}_j - \hat{\pi}_j \qquad (2)'$$

$$\hat{Q}_j = \eta \cdot \hat{y} - \varepsilon_j \cdot \hat{P}_j \qquad (3)'$$

From (1)' to (3)' it is possible to derive the following expression for a firm's employment development if $\hat{z} = 0$:

$$\hat{N}_j = \eta_j \hat{y} + (\varepsilon_j - 1)\hat{\pi}_j - \varepsilon_j \hat{W}_j \qquad (4)$$

After this we switch level and move on to examining an economy. This is here the region, though it could just as easily be a national economy. In order to be able to go over to examining individual sectors of an economy it is necessary to aggregate all firms j of the particular industry i. For this we assume in the following that all the firms of an industry i are identical:

$$\hat{N}_{ir} = \eta_i \hat{y}_{ir} + (\varepsilon_i - 1)\hat{\pi}_{ir} - \varepsilon_i \hat{W}_{ir} \qquad (5)$$

A multi-level problem has to be taken into account when conducting the aggregation: although it is possible to assume that the demand elasticities across all the firms of an industry can be determined in terms of forming a weighted average, the elasticity at sectoral level is of a different nature from that at the level of an economic unit. For the individual firm that is neither a monopolist nor an oligopolist, the behaviour of other firms appears to be given. If the firm lowers its price, demand for its products may increase very strongly because other firms, which maintain their prices, are displaced. If all the firms lower their price, however, the quantity sold may change only slightly. Under the conditions of monopolistic competition, individual firms will behave in a profit-maximising manner and only offer their products in the elastic area of demand. After the described aggregation of individual firms it is no longer possible to make such a statement for the aggregates.

The model describes productivity gains as Hicks-neutral technical progress, which is defined in such a way that the input ratio of the production factors remains constant. We make this assumption to ensure that shifts in labour demand are not stemming directly from the technical progress itself in a trivial way but that they are the consequence of the market mechanism. Additionally, the assumption simplifies the model structure. In the case of Hicks-neutrality $\hat{\pi}_j > 0$ simply applies. As a consequence, workers are displaced when product demand is inelastic (i. e. $\varepsilon_{ir} < 1$). When demand is elastic ($\varepsilon_{ir} > 1$) on the other hand, employment increases. This can be seen directly from (5). Therefore the theorem of the employment effects of increases in productivity (Neisser 1942, Appelbaum, Schettkat 1999) can be derived from the basic model.

The model also shows that the development of employment depends on two elasticities of demand. If income elasticity is high, the demand for a product can increase even under conditions of prices rising secularly. Thus, within the model positive employment effects on industry level can stem from both, high price elasticity and high income elasticity. Both main determinants of structural change, as identified for example in the three sector hypothesis, are also driving employment in our model.

While our approach basically explains labour demand on industry level it has also strong implications for regional employment and unemployment. Regions typically specialise in specific industries and products. Thus, the industry compositions of the regions are varying substantially. Consequently some regions have a higher share of young, high elasticity industries, in other regions the low elasticity industries are dominating. Depending on these differences in the industry composition regional employment will develop differently. The higher the share of industries with elastic demand is the better will be the regional labour market performance.

Furthermore the model can be used to examine the effect of wage increases. According to (5), in the realistic range of values for the demand elasticity (i. e. for $\varepsilon_{ir} > 0$), wage rises lead to decreasing employment. The effect is stronger the more elastic demand is, as we also know from the Marshall-Hicks-rules.

This simple model does not include unemployment directly. It does not contain a labour market and, thus, statements about the development of unemployment are only possible indirectly via the change in employment (cf. however Südekum 2005 and Uhlig 2006).

3.2. Generalisation and reformulation of the model idea

In order to obtain statements about unemployment a richer model is now developed which explicitly contains the labour market. The change in employment is modelled in the usual way as the development of labour demand. We begin with a case in which we treat the wage as fixed.

i. Fixed wage

$$Q = Q(P) \qquad \text{product demand} \qquad (6)$$

$$Q = AL^{1-\beta}K^{\beta} \qquad \text{production function, with } 0 < \beta < 1\text{, K fixed} \qquad (7)$$

With the function for product demand we now abstract from national income. We use a Cobb-Douglas type production function. In addition we start out from the assumption of price-setting with perfect competition. The equations are formulated for individual firms, but the subscript is dropped here. The cost function c (e.g. according to Varian 1992: 54f.) shows the minimal-cost factor combinations at given factor prices. For this it is necessary to determine in each case the quantity of a production factor that is necessary for a certain production level (L: labour, K: capital, A: technology factor, c: costs, r: interest).

$$c(r,W,Q) = \min(rK + WL) \qquad s.t.: Q = AK^{\beta}L^{1-\beta} \qquad (8)$$

$$= \min\left(rK + WA^{\frac{1}{\beta-1}}K^{\frac{\beta}{\beta-1}}Q^{\frac{-1}{\beta-1}} \right)$$

$$\frac{\partial c}{\partial K} = \quad r + \frac{\beta}{\beta-1}WA^{\frac{1}{\beta-1}}Q^{\frac{-1}{\beta-1}}K^{\frac{1}{\beta-1}} = 0$$

$$rK^{\frac{1}{1-\beta}} = -\frac{\beta}{\beta-1}WA^{\frac{1}{\beta-1}}Q^{\frac{-1}{\beta-1}}$$

The demand function for capital with a given production quantity and given factor prices (conditional demand function) is then:

$$K(r,W,Q) = \left[\frac{\beta W}{(1-\beta)r}\right]^{1-\beta} A^{-1}Q \tag{9}$$

The corresponding demand function for labour takes the following form:

$$L(r,W,Q) = \left[\frac{(1-\beta)r}{\beta W}\right]^{\beta} A^{-1}Q \tag{10}$$

It then follows for the cost function with (maximum-profit) demand quantities inserted:

$$c(r,W,Q) = rK(r,W,Q) + WL(r,W,Q) =$$

$$= r\left[\frac{\beta W}{(1-\beta)r}\right]^{1-\beta} A^{-1}Q + W\left[\frac{(1-\beta)r}{\beta W}\right]^{\beta} A^{-1}Q$$

$$= \left(r\left[\frac{\beta W}{(1-\beta)r}\right]^{1-\beta} + W\left[\frac{\beta W}{(1-\beta)r}\right]^{-\beta}\right)A^{-1}Q$$

$$= \left(rr^{\beta-1}W^{1-\beta}\left[\frac{\beta}{(1-\beta)}\right]^{1-\beta} + WW^{-\beta}r^{\beta}\left[\frac{\beta}{(1-\beta)}\right]^{-\beta}\right)A^{-1}Q$$

$$= \left(\left[\frac{\beta}{(1-\beta)}\right]^{1-\beta} + \left[\frac{\beta}{(1-\beta)}\right]^{-\beta}\right)W^{1-\beta}r^{\beta}A^{-1}Q$$

$$c = \beta^{-\beta}(1-\beta)^{\beta-1}W^{1-\beta}r^{\beta}A^{-1}Q \tag{11}$$

as:

$$\frac{\beta^{1-\beta}}{(1-\beta)^{1-\beta}} + \frac{\beta^{-\beta}}{(1-\beta)^{-\beta}}$$

$$= \frac{\beta^{1-\beta}(1-\beta)^{-\beta} + \beta^{-\beta}(1-\beta)^{1-\beta}}{(1-\beta)^{1-\beta}(1-\beta)^{-\beta}}$$

$$= \frac{\beta^{-\beta}(\beta(1-\beta)^{-\beta} + (1-\beta)^{1-\beta})}{(1-\beta)^{1-2\beta}}$$

$$= \frac{\beta^{-\beta}(1-\beta)^{-\beta}(\beta + (1-\beta)}{(1-\beta)^{(1-2\beta)}}$$

$$= \frac{\beta^{-\beta}(1-\beta)^{-\beta}}{(1-\beta)^{(1-2\beta)}}$$

$$= \frac{\beta^{-\beta}}{(1-\beta)^{(1-\beta)}}$$

The price is equal to the marginal costs (with $\mu = \beta^{-\beta}(1-\beta)^{\beta-1}$):

$$P = \frac{\partial c(W,r,Q)}{\partial Q} = \frac{\partial(\beta^{-\beta}(1-\beta)^{\beta-1}W^{1-\beta}r^{\beta}A^{-1}Q\ )}{\partial Q} = \frac{\partial(\mu W^{1-\beta}r^{\beta}A^{-1}Q\ )}{\partial Q}$$

$$P = r^{\beta}W^{1-\beta}\mu A^{-1} \qquad (12)$$

We derive from 12 the change labour demand resulting from technical progress:

$$L = A^{-1}\left(\frac{\beta W}{(1-\beta)r}\right)^{-\beta} Q(P(A)) \qquad \text{labour demand}$$

$$\frac{\mathrm{d}L}{\mathrm{d}A} = -A^{-2}\left[\frac{\beta W}{(1-\beta)r}\right]^{-\beta} Q + A^{-1}\left[\frac{\beta W}{(1-\beta)r}\right]^{-\beta} \frac{\mathrm{d}Q}{\mathrm{d}P}\frac{\mathrm{d}P}{\mathrm{d}A} \qquad (13)$$

$$= -A^{-2}\left[\frac{\beta W}{(1-\beta)r}\right]^{-\beta} Q + A^{-1}\left[\frac{\beta W}{(1-\beta)r}\right]^{-\beta} \frac{\mathrm{d}Q}{\mathrm{d}P}\cdot(-A^{-2})r^{\beta}W^{1-\beta}\mu$$

$$= -\left(A^{-2}\left[\frac{\beta W}{(1-\beta)r}\right]^{-\beta} Q\right)\left(1 + Q^{-1}\frac{\mathrm{d}Q}{\mathrm{d}P}A^{-1}r^{\beta}W^{1-\beta}\mu\right)$$

$$\frac{\mathrm{d}L}{\mathrm{d}A} = -\left(\frac{K^{\beta}L^{1-\beta}}{A}\left(\frac{\beta W}{(1-\beta)r}\right)^{-\beta}\right)\cdot\left(1 + \frac{P}{Q}\frac{\mathrm{d}Q}{\mathrm{d}P}\right) \qquad (14)$$

(14) yields directly the fundamental theorem on the employment effects of technical progress. The employment response to productivity increases is positive if the elasticity of demand is greater than 1. However, this is always fulfilled for individual firms under perfect competition ($\eta >> 1$). If the firms of an industry are aggregated, however, the employment in an industry can be related to the overall demand for this aggregate. Then equation (15) applies for the entire industry. The aggregation is possible since the production function shows constant economies of scale.

ii. Reaction of wages to unemployment

In the following we start out from the (extreme) simplification that the economy only produces one single good. This assumption allows establishing a connection with the labour market, because now the function for labour demand depicts the overall demand on a labour market. The aim of the following analysis is to construct a model that is similar to a certain degree to that of Layard et al. Since the formalization is standard, only some basic equations are given. Here we do not bother with the microfoundations of the model.

For reasons of simplification, in the following employment L is measured as a share of the active population, which is in turn standardised to 1 ($N = 1$). Unemployment results accordingly with $U = 1 - L$. In the spirit of the work by Layard, Nickell & Jackman (1991/2004) and Carlin, Soskice (2006) for the national level and by Blanchflower, Oswald (1994, 2005) for the regional level, it is assumed that the wage responds inversely to regional or national unemployment (wage -setting curve or wage curve). In order to make the calculations easier it is assumed that the wage curve is not semilogarithmic but linear. The following expression results:

$$W = \gamma' - \tau U \tag{15}$$

$$= \gamma' - \tau \frac{1-L}{1}$$

$$= \gamma' - \tau + \tau L$$

$$W = \gamma + \tau L \tag{16}$$

The rationale behind this formalisation is quite analogous to that of Layard et al. The wage (setting) curve can be derived concerning efficiency wage approaches and wage negotiation models. The fact that a linear and not a log-linear formulation is adopted here does not constitute a limitation. Empirical studies on the regional wage curve do not clearly favour either of the two formulations over the other (Blien 2001).

iii. Equilibrium

In the following the wage is endogenised.

$$L = A^{-1}\left(\frac{\beta W}{(1-\beta)r}\right)^{-\beta} Q$$

$$L = A^{-1}\left(\frac{\beta(\gamma+\tau L)}{(1-\beta)r}\right)^{-\beta} Q \tag{17}$$

$$L = A^{-1}\beta^{-\beta}(\gamma+\tau L)^{-\beta}(1-\beta)^{\beta} r^{\beta} Q$$

$$L(\gamma+\tau L)^{\beta} = A^{-1}\beta^{-\beta}(1-\beta)^{\beta} r^{\beta} Q$$

implicit function:

$$G = L(\gamma+\tau L)^{\beta} - A^{-1}\beta^{-\beta}(1-\beta)^{\beta} r^{\beta} Q = 0 \tag{18}$$

$$\frac{dL}{dA} = -\frac{\partial G/\partial A}{\partial G/\partial L} = -\frac{\left(\frac{K^{\beta}L^{1-\beta}}{A}\right)\left(\frac{\beta}{(1-\beta)r}\right)^{-\beta}\left(1+\frac{PdQ}{QdP}\right)}{(\gamma+\tau L)^{\beta} + \beta L(\gamma+\tau L)^{\beta-1}\tau - \frac{\partial Q}{\partial P}A^{-2}\left(\frac{(1-\beta)r}{\beta}\right)^{\beta} r^{\beta}(1-\beta)(\gamma+\tau L)^{-\beta}\tau\mu} \tag{19}$$

difference between (14) and (19):

$$= \frac{(\gamma+\tau L)^{\beta}}{(\gamma+\tau L)^{\beta} + \beta L\,\tau(\gamma+\tau L)^{\beta-1} - \frac{\partial Q}{\partial P}A^{-2}r^{\beta}\tau\mu\left(\frac{(1-\beta)r}{\beta}\right)^{\beta}\frac{(1-\beta)}{(\gamma+\tau L)^{\beta}}} = S$$

$$= \frac{(\gamma+\tau L)^{\beta}}{(\gamma+\tau L)^{\beta} + \beta L\,\tau(\gamma+\tau L)^{\beta-1} - \frac{\partial Q}{\partial P}A^{-2}r^{\beta}\tau\mu\left(\frac{(1-\beta)r}{\beta}\right)^{\beta}\frac{(1-\beta)}{(\gamma+\tau L)^{\beta}}} = S \tag{20}$$

with $0 < S < 1$ if $\frac{\partial Q}{\partial P} < 0$

Thus the effect of increases in productivity is weaker in the case of endogenous wages. However, the turning point of the development, in other words the elasticity of one, is the same. Thus the previous finding, that employment on industry level depends on the price elasticity of demand and that consequently the regional development of employment is depending on the industry composition is still holding.

3.3. Comparison: the labour market model of structural change and the European Labour Market Model

In the "European Labour Market Model" the level of unemployment is attributed to the fundamental institutional setting of an economy (Layard, Nickell & Jackman 2006). Unemployment is explained by competing claims made by economic subjects. A strongly simplified version can be presented in one diagram. Two functions are constitutive for the model:

The wage setting curve expresses the demands of the labour force for a specific share of the social product. When the share of the labour force that is in employment is large (= low unemployment rate), it is more likely that the claims made by the labour force on the national product can be pushed through.

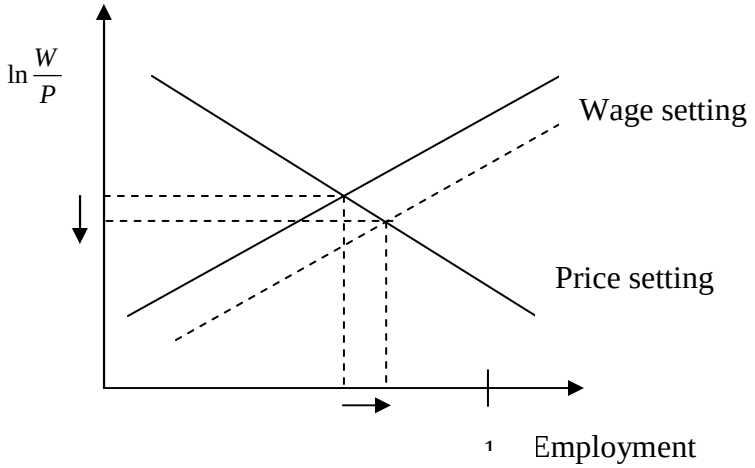
The price setting curve reflects the demands of the firm owners. When there is a high level of activity in the economy, i.e. when unemployment is low, firms can set higher prices. This lowers W/P, the real wage.

The point where the two curves intersect reflects an equilibrium situation in which the demands of the economic subjects are compatible. In this equilibrium a certain positive level of unemployment occurs, a rate which is known as *NAIRU* ("Non-Accelerating Inflation Rate of Unemployment"). The *NAIRU* is equivalent to a change in inflation of zero. If the unemployment rate is low, inflation rises, if it is high, inflation falls.

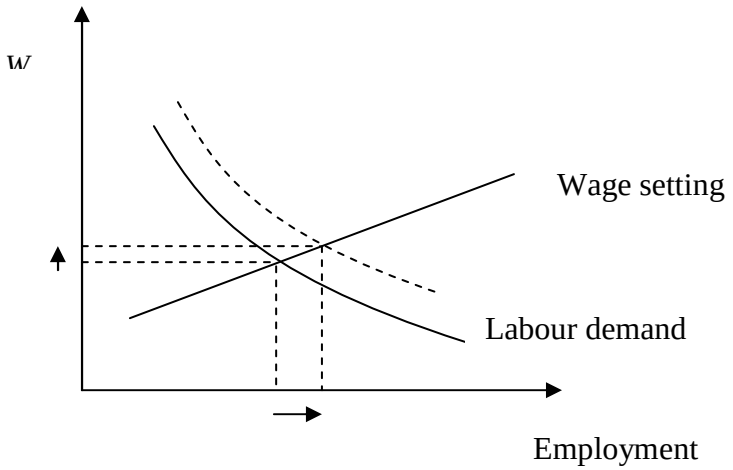
Our labour market model of structural change can be depicted in a way parallel to the fundamental diagram by Layard, Nickell, Jackman. However, in the model on structural change it is not monopolistic competition that is taken as a basis, as in Layard et al., but perfect competition. The labour demand curve given above replaces the price-setting curve. Owing to the assumption of constant economies of scale, this does not depend on the price P. The function described in this way falls since it is inversely linked with the wage level:

$$L = \frac{1}{AW^{\beta}}\left(\frac{\beta}{(1-\beta)r}\right)^{-\beta} Q \qquad (21)$$

Figure 2: Comparison of the labour market model of structural change and the European labour market model



Layard et al.



Labour market model of structural change

Both of the models refer to the institutional setting of the economy:

- Layard et al. take into account the labour market setting in the narrower sense.
- In the labour market model of structural change this may also be of importance, but institutions related to the product market and to other social areas are important, too:
    - The incidence of innovations and the extent, to which innovations are facilitated by the institutional structure, are crucial.
    - The structure of the system of education and training might facilitate a particular specialisation of the economy.

The two approaches differ with regard to the possible consequences of economic-policy measures aimed at reducing unemployment. In the European labour market model, measures have the main function of reducing workers' demands on the national product. Measures of this type are linked with wage reductions. The approach does not allow for regional factors and measures.

From the labour market model of structural change it can be derived that another class of measures could help to increase employment and thus reduce unemployment. Measures in the following areas would be conceivable:

- Reorganisation of the education and training system
- Facilitation of innovations
- Reduction of bureaucracy and restrictions
- Promotion of technology for innovative sectors
- Regional policy

In general it is a matter of supporting those industries that show elastic demand and rapid technical progress, which can also be done on regional level. What is also important is that the market is globally orientated. In this sense supply side oriented policy would not only improve the conditions for firms and entrepreneurs but also the structure of the supply that is the product mix of the economy.

4. Empirical Evidence

For several reasons, for example data availability, it is not feasible to test our model directly. However, identifying the effects of the price elasticity of demand on the regional labour market performance will give evidence on the validity of our model. Thus, we have to identify the price elasticities of demand on industry level and then link these results to the regional labour market performance.

4.1. Empirical strategy

4.1.1. Identifying elasticities

Despite the theoretical simplicity of the price elasticities of demand its empirical identification faces several problems (Möller 2001). For example, estimating a classical Marschallian demand function for a specific good would require the inclusion of a vector of the prices of all other goods or at least of all other industries. This is, however, not feasible because of the limited numbers of observation available.

Following Möller (2001) we assume that products of each industry are substituted against a composite good, which is representing the product mixture of all other goods. Additionally we assume that the respective industries are small compared to the total economy yielding the following Marschallian type demand function:

$$q_{it} = \beta_{oi} + \beta_{1i}(p_{it} - p_t) + \beta_{2i} y_t + u_{it} \qquad (22)$$

where q_{it} is the industry real output, y_t is the real national income, p_{it} is the industry price level and p_t the national price level. All variables are in logarithms, thus p_{it}-p_t is giving the price of industry *i* relative to the general price level p_t. Estimates for β_{1i} are providing the price elasticities on industry level and those for β_{2i} are giving the income elasticities. This specification implies also that domestic and foreign consumers are identical and that the income elasticity concept is applying to intermediate goods.

β_{1i} should be negative with inelastic demand between 0 and -1. Demand is price elastic if $\beta_{1i} \leq -1$ holds. Industries with $\beta_{2i} > 1$ face income elastic demand. They are producing superior goods;

those with $0 \leq \beta_{2i} \leq 1$ are selling relative inferior products and those with $\beta_{2i} < 0$ offer absolute inferior ones. In our first step we estimate equation 22 and get estimates for the price and income elasiticities. These are then entered into our second step which establishes the link between elasticities and labour market development.

4.1.2. Elasticities and regional employment

The fundamental theorem on the employment effects of technical progress derived from our model (equation 14 and 21) states that the employment response to productivity increases is positive (negative) if demand is price elastic (inelastic). Lacking appropriate productivity measures we assume that there are productivity increases in each industry without quantifying them. Thus we could expect that industries with $\beta_{1i} \leq -1$ have positive labour market performance and that those with $\beta_{1i} > -1$ have a negative labour market performance. The bigger the share of industries with elastic demand in a regional economy the better will be the labour market performance of the region. Thus we will regress the development of employment on the employment share of price and income elastic industries on a regional level:

$$\Delta L_r = \alpha_0 + \alpha_1 SPEI_r + \alpha_2 SIEI_r + \alpha_3 X + v_i \qquad (23).$$

$SPEI_r$ and $SIEI_r$ are the shares of the price elastic industries and the share of the income elastic industries in the respective regions based on the estimated elasticities of demand from the first step (equation 22). ΔL_r is the relative change of employment for each region. The higher the share of industries with elastic demand the better should be the development of employment. Thus we expect positive signs for α_1 and α_2.

4.2. Data

One main source of data is the national account of Germany from the German Federal Statistical Office.[5] The national accounts provide information for gross value added on industry level (two digit) and the national GDP. The industry value added is given in nominal and real terms which allow calculating industry specific price indices. The federal statistical office is also providing the national consumer price index, which we take as an approximation of the national price level. All these variables are indexed with the base year 2000 (index value = 100). The national accounts also include the wage bill for each industry and the number of employed. We use this data to calculate the deflated wage per capita.

The data of the Federal Statistical Office is in principal available for a rather long time period. However, almost all economic data on Germany is suffering from the structural break caused by the unification. For this reason we skip data before 1994 resulting in a observation period form 1994 to 2007.

The information about employment is taken from the employment statistics of the German Federal Employment Agency.[6] This data covers all employed who are subject to the social insurance system. Fulltime equivalents are calculated by weighting part-time employed by 0.5. This data is on industry level only available from 1999 onwards. Thus, we are estimating the elasticities for a

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5 To be more precise it is the “Fachserie 18 Reihe 1.4”.

6 Beschäftigungsstatistik der Bundesagentur für Arbeit, February 2009

period a bit longer than we can calculate the employment change. Synchronizing both observation periods by cutting of the first years of the national account data would reduce the degrees of freedom of the elasticity estimation. This seems to us a price too high to pay. While our industry cycle argument is based on changing elasticities this is holding for long periods and is less relevant for the short periods we use for estimation. Thus we are not estimating time varying elasticities but constant ones. We are not capturing the industry life cycle by investigating the changing elasticities for each industry across time but by analyzing elasticities across 48 industries[7] at various stages of the life cycle.

We calculate the percentage change in employment for the period from 1998 to 2006. The resulting variable serves as dependent variable in estimating equation 23.

4.3. Estimating elasticities

We estimate the elasticities using equitation 22. q_{it} is approximated by the real gross added value on industry level, the industry price level (p_{it}) was derived by dividing the real gross added value by the nominal gross added value. p_t is approximated by the consumer price index and y_t by the real GDP. Remember, all values are indexed with the base year 2000 (100) and logarithm are taken.

We estimate four different specifications. The first variation is, that we substitute p_t for p_{it}-p_t. Thus we are not solely looking at the relative prices but also at the absolute price levels in each industry. The two resulting specifications are then estimated using OLS and instrumental variable estimator. We suspect that the prices might from endogeneity. To account for this problem we instrument p_t and p_{it}-p_t with the lagged values of q_{it}, p_{it} and p_t. While we prefer the instrumental variable estimator of the original equation, we give also the results of the other three specifications in Table 1 in order to check the stability of results. In our view the table indicates a high stability of results (signs and magnitude) if the small number of observations is taken into account. Thus, these estimation results are now entering as explanatory variable into our analysis of regional labour market performance.

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[7] At this stage we exclude the agricultural sector, the mining and quarrying industries and services in private households.

Table 1: Estimated price elasticities of the four specifications

	OLS				IV			
	p_{it}		p_{it}-p_t		p_{it}		p_{it}-p_t	
	Elasticity	p-value	Elasticity	p-value	Elasticity	p-value	Elasticity	p-value
Manufacture of food producht and beverages	-0.711***	0.000	-0.685***	0.001	-0.456**	0.005	-0.313	0.236
Manufacture of tobacco products	-1.403**	0.003	-1.284*	0.011	-1.307**	0.002	-1.110*	0.022
Manufacture of textiles	-1.053	0.085	-0.304	0.541	-0.070	0.922	0.543	0.253
Manufacture of wearing apparel; dressing and dyeing of fur	-0.692	0.273	-0.082	0.850	0.729	0.479	0.573	0.254
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	-0.964	0.167	-0.229	0.792	-1.874*	0.023	-0.624	0.629
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	0.530	0.342	0.440	0.225	1.001	0.190	0.527	0.146
Manufacture of pulp, paper and paper products	-0.807***	0.000	-0.711***	0.000	-0.645***	0.000	-0.541***	0.000
Publishing, printing and reproduction of recorded media	-0.293	0.661	0.345	0.543	-0.757	0.284	0.334	0.588
Manufacture of coke, refined petroleum products and nuclear fuel	-1.014***	0.000	-1.008***	0.000	3.076	0.869	4.454	0.870
Manufacture of chemicals and chemical products	-1.440*	0.049	-1.378**	0.001	-3.503*	0.010	-1.674***	0.000
Manufacture of rubber and plastic products	-1.119**	0.002	-1.002***	0.000	-1.932**	0.001	-1.210***	0.000
Manufacture of other non-metallic mineral products	0.101	0.817	0.175	0.568	0.542	0.283	0.339	0.250
Manufacture of basic metals	-0.363***	0.000	-0.397***	0.000	-0.341***	0.000	-0.382***	0.000
Manufacture of fabricated metal products, except machinery and equipment	-1.769**	0.004	-1.012	0.063	-2.601*	0.025	-0.529	0.497
Manufacture of machinery and equipments n.e.c.	-0.718	0.142	-1.903***	0.000	-0.697	0.111	-2.529***	0.000
Manufacture of office machinery and computers	-0.932***	0.000	-0.906***	0.000	-0.955***	0.000	-0.920***	0.000
Manufacture of electrical machinery and apparatus n.e.c.	-4.067**	0.004	-1.799	0.080	-1.666	0.235	-0.449	0.600
Manufacture of radio, television and communication equipment and apparatus	-1.100***	0.000	-1.060***	0.000	-0.986***	0.000	-0.946***	0.000
Manufacture of medical, precision and optical instruments, watches and clocks	-0.972	0.343	-3.010**	0.005	0.168	0.837	-1.942*	0.028
Manufacture of motor vehicles, trailers and semi-trailers	-0.432	0.567	-1.135	0.071	-0.675	0.428	-1.669*	0.012
Manufacture of other transport equipment	-3.755*	0.011	-3.038*	0.039	-0.395	0.914	-0.889	0.686
Manufacture of furniture; manufacturing n.e.c.	-2.533***	0.000	-2.495**	0.007	-2.653***	0.000	-2.787***	0.001
Recycling	-0.949***	0.000	-0.988***	0.000	-0.994***	0.000	-1.048***	0.000
Electricity, gas, steam and hot water supply	0.138	0.564	0.091	0.732	0.383	0.113	0.377	0.176
Collection, purification and distribution of water	-0.002	0.995	0.092	0.825	0.759*	0.049	0.966**	0.008
Construction	-0.546	0.290	0.321	0.634	-1.163	0.073	0.252	0.786
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	-1.018*	0.022	-1.069**	0.001	-1.394**	0.003	-1.319***	0.000
Wholesale trade and commission trade, except of motor vehicles and motorcycles	-0.002	0.993	0.020	0.916	-0.116	0.608	-0.011	0.951

Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	0.051	0.861	0.373	0.143	0.096	0.865	1.067*	0.010
Hotels and restaurants	-0.706**	0.007	-0.524	0.162	-0.699***	0.001	-0.573	0.152
Land transport; transport via pipelines	-0.775***	0.000	-0.726**	0.002	-0.753**	0.005	-0.405	0.245
Water transport	-0.692*	0.031	-0.690*	0.020	-1.241**	0.003	-1.075***	0.001
Air transport	-0.104	0.848	0.003	0.995	0.792	0.299	0.690	0.259
Supporting and auxiliary transport activities of travel agencies	0.049	0.925	-0.716	0.190	0.883*	0.045	-0.384	0.557
Post and telecommunications	-0.213	0.677	-0.700	0.213	0.042	0.956	-1.431	0.136
Financial intermediation, except insurance and pension funding	-0.190	0.126	-0.202	0.152	-0.188	0.120	-0.224	0.124
Insurance and pension funding, except compulsory social security	-0.595***	0.000	-0.615***	0.000	-0.528***	0.000	-0.549***	0.000
Activities auxiliary to financial intermediation	-0.575***	0.000	-0.612***	0.000	-0.506***	0.000	-0.561***	0.000
Real estate activities	-0.867	0.106	-1.261**	0.002	-0.429	0.418	-1.117***	0.000
Renting of machinery and equipment without operator and of personal and household goods	-2.380*	0.013	-1.423	0.089	-2.041	0.103	-0.783	0.368
Computer and related activities	-0.786	0.499	0.110	0.881	-1.269	0.347	0.210	0.771
Research and development	-1.768	0.057	-2.689	0.225	-1.931*	0.013	-6.437*	0.036
Other business activities	-0.470*	0.011	-0.800***	0.001	-0.347*	0.021	-0.731***	0.000
Public administration and defence; complusory social security	-0.220	0.235	0.239	0.290	-0.349**	0.009	0.312	0.270
Education	0.086	0.721	0.319	0.306	0.174	0.395	0.869*	0.047
Health and social work	-0.093	0.906	-1.782*	0.025	1.037	0.410	-3.347***	0.001
Sewage and refuse disposal, sanitation and similar activities	-0.843*	0.019	-1.060**	0.002	-0.809*	0.014	-1.139***	0.000
Activities of membership organizations n.e.c.	-0.513	0.355	1.007	0.310	-0.591	0.202	1.781	0.111
Recreational, cultural and sporting activities	-0.795	0.151	-0.005	0.994	-1.313	0.231	2.564	0.090
Other service activities	0.235	0.378	-0.463	0.273	0.376	0.104	-0.027	0.953

4.4. Elasticities and labour market performance

In another paper we investigate empirically the elasticity-employment link on industry level. The overall evidence is supporting our hypotheses. Here we try to establish this linkage on the regional level.

For this purpose we are estimating equation (23). Thus, we regress the percentage employment change and the change in unemployment rate from 1999 to 2006 in the 326 West German "Kreisen" (NUTS III regions) on the employment shares of price and income elastic industries in these regions. We calculate these shares using the estimates of our first step. Industries have a price (income) elastic demand if $\beta_{1i} \leq -1$ ($\beta_{2i} > 1$) holds. We use the elasticities from the models with relative prices. We calculate the average shares across the period from 1999-2006. Our model is based on market mechanisms. Thus we exclude state driven industries (Agriculture; Fishing; Mining and quarrying; Public administration and defence; Ccompulsory social security; Activities of households as employers of domestic staff) from the calculation of the employment change and employment shares. This is however not possible for the change in the unemployment rate. Thus we are using for the respective estimates the share of the industries with elastic demand in total employment.

Then we insert our first two control variables: the percentage change in disposal income and the percentage change in the number of inhabitants. While the share of income elastic industries is capturing a general demand relationship derived for Germany, the disposal income is a regional variable primarily influencing the local sector. Finally, we put dummies for the "siedlungstrukturelle Kreistypen", a widely used classification of German districts (Goermar and Irmen 1991) provided by the Federal Office for Building and Regional Planning (BBR), in our estimations. Our empirical research is in an early stage, thus we are only providing OLS estimates. The results are given in Table 2.

The results on the employment change are supporting our model. The coefficients of the employment shares of industries with elastic demand have the right sign and are in most cases highly significant. The greater the share of industries with elastic demand the better is the development of employment. Additionally, it seems the industries with income elastic demand have a greater positive impact on employment than those with price elastic demand.

The results on changes in the unemployment rate are, however, mixed. While the coefficients for the shares of price elastic industries have generally the right sign they are sometimes insignificant. The coefficients for the shares of industries with income elastic demand have the wrong sign, but are mostly insignificant. Thus, while the findings on employment are supporting our hypotheses the results on the change in unemployment are not as clear cut.

However, the results for the income elasticity are only superficially contradicting our theoretical approach. Firstly, the results on the change on employment are the more important ones, because the model is formulated in terms of labour demand. Secondly, unemployment is a result of a mismatch between labour supply and labour demand. We investigate theoretically and empirically only the latter. However, regional labour supply might not be independent from regional labour demand and react in ways counteracting the fluctuations in labour demand (commuting, migration or retreat from the labour market of discouraged workers). Thus, the results are not surprising.

Table 2: Estimation results of the elasticity-employment relationship

	Estimation of the impact of elastic demand on employment change					
	Elasticities from OLS estimation			Elasticities from IV estimation		
Employment share of price elastic industries	0.108**	0.160***	0.103**	0.145***	0.196***	0.146***
	(2.23)	(3.49)	(2.21)	(2.64)	(3.84)	(2.83)
Employment share of income elastic industries	0.416***	0.356***	0.452***	0.418***	0.353***	0.414***
	(9.34)	(8.41)	(9.30)	(8.95)	(8.03)	(8.48)
Change in disposable income per capita		0.143	0.101		0.0928	0.0647
		(1.21)	(0.82)		(0.79)	(0.52)
Change in population		1.187***	1.065***		1.178***	1.091***
		(7.73)	(6.83)		(7.68)	(6.94)
District classification dummies			yes			yes
_cons	-21.83***	-25.05***	-29.96***	-25.52***	-27.03***	-30.99***
	(-9.57)	(-9.40)	(-10.83)	(-10.59)	(-9.73)	(-10.72)
adj. R^2	0.243	0.358	0.401	0.243	0.356	0.385
F	53.08	46.23		53.03	46.01	17.95
	Impact of the price elasticity on changes in the unemployment rate					
	Elasticities from OLS estimation			Elasticities from IV estimation		
Employment share of price elastic industries	-0.0227***	-0.0221**	-0.00580	-0.0205**	-0.0229**	-0.00775
	(-2.62)	(-2.57)	(-0.68)	(-2.06)	(-2.35)	(-0.81)
Employment share of income elastic industries	0.0140*	0.0150*	-0.00810	0.00981	0.0136	-0.00448
	(1.74)	(1.85)	(-0.89)	(1.17)	(1.65)	(-0.50)
Change in disposable income per capita		-0.0838***	-0.0590***		-0.0925***	-0.0599***
		(-3.88)	(-2.66)		(-4.34)	(-2.69)
Change in population		-0.0966***	-0.0590**		-0.0938***	-0.0612**
		(-3.45)	(-2.11)		(-3.35)	(-2.20)
District classification dummies			yes			yes
_cons	0.786**	1.996***	2.910***	0.662*	1.961***	2.832***
	(2.18)	(4.37)	(6.17)	(1.72)	(4.13)	(5.84)
adj. R^2	0.018	0.080	0.170	0.008	0.076	0.169
F	3.941	8.061	6.558	2.252	7.685	6.497

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The empirically evidence can be summarised in the following way: the higher the share of industries with elastic demand is the better labour demand develops. The higher the share of industries with price elastic demand is the better unemployment develops. Thus, we view our theoretical predictions as empirically supported

5. Conclusions and outlook

In this paper we establish a theorem on the employment effects of productivity growth as driving force of structural change and labour market performance on industry level. In a first step we develop a simple model establishing the relationship between technical progress and employment. This model is then generalized taking the labour market explicitly into account which allows explaining unemployment and endogenising wages. The resulting model is then compared to the European labour market model. We derive empirical evidence in two steps. First, we estimate elasticities for 50 industries in Germany. The employment shares of industries with elastic demand price (and income) elasticities are then analysed with respect to their impact on regional labour market performance. Our findings are indicating that indeed regional employment develops the better the higher the share of industries with elastic demand is.

Thus, we provided an alternative explanation of unemployment to the usual macroeconomic and institutional approaches. This alternative can explain the regional variation in unemployment through the regional industry specialisation while the common approaches cannot explain regional disparities due to their focus on national parameters.

Additionally, our model can also explain the cross national variation caused by the broader set of institutions as discussed by the varieties of capitalism approach. This cross national variation is in our view not only influencing the labour market directly through labour market institutions as proposed by the European labour market model but also by the product mix resulting from the broad set of institutions. The higher the share of ‘young’ products and ‘young’ industries, the better is the labour market performance. Thus, resorting on empirical results of the varieties of capitalism literature (e.g. Paunescu, Schneider 2004) one would expect a better labour market performance in liberal market economies than in coordinated market economies, due to the industry structure of these economies and the processes described in the labour market model of structural change. This is what we find in reality. However, the linkage between our model and the varieties of capitalism concept although plausible is not modelled explicitly nor tested.

From these differences in explanations, there follow also different policy implications as we have discussed by comparing our model to the European labour market model. While the latter concentrates solely on the labour market and its institution our labour market model of structural change directs the attention also to the product market conditions and innovation friendly policies in general – including the educational and financial system.

Additionally in the macroeconomic approaches there is no scope for regional measures. Our alternative approach instead highlights the importance of regional activities.

The labour market model of structural change is – of course – related to structural change and the respective theoretical concepts. These connections are at least threefold. Firstly, the starting point of a specific regional or national mixture of industries is a result of the previous processes of structural change. Secondly, the mechanisms describing and driving the labour market outcome are in general determining industry growth and decline, thus they are determining and describing structural change. Following from this, thirdly, the main variables of the labour market model of structural change, that is productivity, price elasticity and income elasticity, are also important explanatory variable in theoretical concepts of structural change like the three-sector-hypotheses.

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