Forecasting the Development of Employment: Methodologies and Systems

An International Expert Workshop

- Documentation -

2nd July 2007

at the Johann Wolfgang Goethe University

in Frankfurt a.M., Germany

HESSEN
Hessisches Ministerium für Wirtschaft, Verkehr und Landesentwicklung

Europäischer Sozialfonds

About the Workshop

The workshop is part of a regional model project financed by the Hessian Ministry of Economics, Transportation and State Development through the European Social Fund and by the project partners. The objective of this project is to design a system for forecasting the regional development of employment and occupation in the short and medium term. The short-term component will rely on micro data from enterprises operating in the region.

The medium term forecasting system will be developed on the basis of an econometric model in combination with estimations of experts of the labour market. In this context, the workshop is intended

- to present different international approaches to forecasting systems,
- to review the applicability of these systems for a regional medium-term approach, and
- to discuss the integration of quantitative and qualitative methods in a forecasting system.

In the morning, we will present two international established approaches of forecasting systems. Around midday three German examples of these systems will be presented. In the afternoon, needs and methodologies for a qualitative approach are shown.

Programme

9:30h Registration and Refreshment

10:00h Welcome
Dr. Susanne Eickemeier, Representative of the Johann Wolfgang Goethe University Frankfurt am Main, Department of Research and Development of the University

10:15h Objectives and Structure of the Workshop
Prof. Dr. Alfons Schmid, Johann Wolfgang Goethe University Frankfurt am Main, Institute for Economics, Labour and Culture (IWAK)

10:30h Identifying Skill Needs in the Short to Medium Term – the Case of Ireland
John McGrath, Foras Aiseanna Saothair, FAS Baggot, Training and Employment Authority, Dublin, Ireland

11:15h National to Regional - Challenges of Regional Forecasting in the Netherlands
Dr. Ben Kriechel, Research Centre for Education and the Labour Market, ROA, Maastricht, The Netherlands

12:00h Coffee Break

12:15h Time Series Forecasting of Regional Employment
Prof. Dr. Franz-Josef Bade, Universität Dortmund, Fakultät Raumplanung, Germany

13:00h Lunch Break

14.00h Regional Employment Forecasts. How Important are Spatial Dependencies?
Dr. Rüdiger Wapler, Institut für Arbeitsmarkt- und Berufsforschung, Nürnberg, Germany

14:45h Concept and Methodology of a Regional Medium Term Forecasting System
Claudia Knobel, Dirk Crass, Institute for Economics, Labour and Culture (IWAK)
Lioba Trabert, HessenAgentur

15:30h Coffee Break

16:00h Importance and Methodologies for a Qualitative Approach regarding Forecasts for Skill Needs
Paul Schatteman, Ministry of the Flemmish Community, Department of Education and Training, R/D Director of Vocational Training (DBO), Brussels, Belgium

16:45h Conclusion for a Regional Medium Term Forecasting Model
Dr. Ben Kriechel, Research Centre for Education and the Labour Market, ROA, Maastricht, The Netherlands

17.15h Closing Speech
Prof. Dr. Alfons Schmid, Johann Wolfgang Goethe University Frankfurt am Main, Institute for Economics, Labour and Culture (IWAK)

17:30h End

Welcome

Dr. Susanne Eickemeier

Dear Prof. Schmid,

dear ladies and gentlemen,

it is indeed my particular honour to welcome you at the Johann Wolfgang Goethe University Frankfurt am Main on behalf of the president Prof. Rudolf Steinberg.

The University can look back on productive years:

Following the example of US American Universities, we are well on our way to build the first German endowed university, based on the beliefs of those citizens of Frankfurt who founded this university in 1914 through private donations. With 35.000 students Goethe-University today is one of the largest, most international universities in Germany, located in the very heart of Europe.

Its main research areas are for example in finance and are closely linked to the specific economic strengths of the city of Frankfurt and the region. But Frankfurt is not only the most significant financial center on the European Continent, it also offers pharmaceutical and biotechnological know-how. Law and finance, as well as life sciences and – last but not least: another tradition of Frankfurt University – the humanities and social sciences shape the university's research-profile.

Under the current board of presidency, the University of Frankfurt is striving to return to the tradition of endowments, simultaneously opening itself to new university structures and systems with increased autonomy and excellence. The aim is to turn the university into an educational institution which is respected on both a national and international scale by its centenary in 2014.

The Goethe University's institutional metamorphosis is going hand in hand with a building programme. The University of Frankfurt will receive two new campuses within the context of what is currently Germany's largest university-related construction programme and will cost a total of more than 1 billion euros.

For the humanities and social sciences a new central campus is being built. It is already considered one of the most beautiful university locations in Europe.

The consolidation of the natural sciences at the Riedberg campus will simultaneously result in a "Science City". And the construction of new buildings is also currently being implemented on the university's third medical campus.

The three university campuses will provide researchers and students alike with a unique selection of spaces for communication, working and encounters, promoting an interdisciplinary and academic dialogue.

Such ambitious amendments to an existing university, previously unknown in Germany on this scale, cannot be implemented without political support. The state of Hesse, under the

leadership of Primeminister Roland Koch, has recognised the university's great potential and has granted both the constructional and institutional changes its energetic support.

An increasing number of private sponsors are deciding to accompany the University of Frankfurt on its journey, enabling the university to revive its great endowment tradition of the 1920s and 1930s from now on.

Successfully implementing this vision will be critical for the future development of academic teaching and research at our University.

Forecasting Developments - however - is rather your business than mine. On the other hand we take it as an encouraging signal that the Institute for Economics, Labour and Culture - IWAK as we call it - at the moment being an independent and internationally-oriented organisation – is right now seriously considering to become part of the university again. The IWAK (Institute for Economics, Labour and Culture) as an scientific centre at Goethe-University could contribute to reinforcing the position of Frankfurt as one of the most international centres of research and higher education.

Thank you very much!

I would now like to hand over again to Prof. Schmid wishing you a very interesting and inspiring day as well as an exciting project following the Workshop.

Objectives and Structure of the Workshop

Prof. Dr. Alfons Schmid

Ladies and Gentlemen,

It's a great pleasure to welcome you to our international expert workshop "Forecasting the Development of Employment: Methodologies and Systems" at the university of Frankfurt. I hope you had a good trip and no trouble finding us.

For those who are our guests for the first time, I may briefly introduce myself: My name is Alfons Schmid. I am Professor at the Johann Wolfgang Goethe-Universität Frankfurt and I teach Economics at the faculty of social sciences, i.e Economis for non-economists. I am a director of the Institute of Economics, Labour and Culture, shortened IWAK, as well. This Institute is a non-profit organisation. It focuses on the analysis of regional labour market developments and it combines theory and practice in this field.

This workshop has been organised by IWAK in cooperation with ROA (Research Centre for Education and the Labour Market) at the university of Maastricht and the university of Frankfurt.

Now I would like to make some introducing remarks. Our expert workshop today deals with "Forecasting Regional Employment". The starting point of this issue is twofold. One aspect refers to our network of regional labour market monitoring. In our meeting last year in Brussels one of the four working groups dealt with the issue of regional forecasting. The need for regional forecasting is caused by an intensifying competition between regions. An important instrument to deal with this stronger competition is adequate information on regional employment. Information on future developments of regional labour markets will be an adequate basis for regional actors to deal with the intensified competition.

The participants in our working group in Brussels agreed that there is a need for forecasts on a regional level. Therefore they also agreed to intensify an exchange of information of regional forecasting in European countries concerning regional labour markets. This workshop is a step to improve the communication.

The second starting point of this expert workshop lays in a project which is based in the Rhine-Main-area. This project includes a short term forecast at the firm level and a medium term forecast at a regional level. The region encompasses the Rhine-Main-area and within this area the cities of Frankfurt and Offenbach and the district of Groß-Gerau.

One focus of this project is to forecast demand and supply of occupations. On the basis of this supply and demand forecast we will identify matches or mismatches. The central question is: Will there be a deficit or a surplus of occupations in a medium perspective in the participating cities respectively the participating district? This information of future excess supply or excess demand of professions should give adequate information to the relevant regional actors. It also should lead to adequate measures improving the functioning of regional labour markets and improving the effectiveness of regional labour market policies.

In this project of regional forecasting a distinctive cooperation between several partners has

established: EWR Consulting, Hessenagentur, the Institut für Arbeitsmarkt- und Berufsforschung bei der Regionaldirektion Hessen (Employment Office) and the Wirtschaftsministerium Hessen. The regional partners also support our work. These are the Wirtschaftsförderung Frankfurt (Economic development), die Stadt Offenbach und der Kreisausschuss des Kreises Groß-Gerau. You will find them enlisted in the programme of our workshop. In the afternoon we will give you more detailed information of this project in our presentation. I would like to thank our partners and our supporters. Without their help we couldn't realise our project.

The twofold foundation of this workshop is represented in the organization. In cooperation with Dr. Ben Kriechel from ROA, the Research Centre for Education and the Labour Market in Maastricht, we have prepared and organized this workshop.

You all know how difficult a medium term forecast is. I may mention a personal experience. After my study of economics I started my working life at Siemens, the well known firm. My first task was to analyse the usefulness of a macroeconometric model of a medium term forecasting. As far as I know because of the difficulties of forecasting for a whole business cycle Siemens did not pursue this model any longer; may be me or my results were the reason.

These difficulties of medium term forecasting arise at a regional level as well. It is well known that forecasting employment for a small region for a medium term is more difficult than at a national level. Nevertheless there is a need for a regional forecasting of employment and occupations, I already mentioned the increasing competition of regions.

This need is the main reason for our workshop today. With this workshop we intend to contribute to the development of a concept of regional forecasting. As you know there are several methods of regional forecasting, which range from a simple trend extrapolation to neural networks. We focus on a concept of regional forecasting, which is not too complicated, has valid results, is of practical convenience, can be used to forecast occupations, and could be a basis for other regions in Europe as well. In my opinion in the long run a valid European method of regional forecasting should be developed.

In the short run our interest in this workshop is less ambitious. One purpose aims at the beginning of an intensified exchange of information and knowledge. Another purpose is based in our project. We hope to get insights from existing regional forecasting for our forecasting of professions in the Rhine-Main-area.

These purposes are pursued within this workshop. Different forecasting methods will be presented and the applicability of these methods for a regional medium-term approach will be reviewed. In the morning some international established approaches of regional forecasting concepts and methods will be presented. Then some German examples of regional forecasting will be discussed. In the afternoon we present our own thoughts on the project we work on. Then the need and the methods for a qualitative approach are shown.

Identifying Skill Needs in the Short to Medium Term – the Case of Ireland

John McGrath

Abstract

In this short paper, the author discusses how skill needs are identified at the national level in Ireland. The author outlines the key players involved in this process and pays particular attention to the institutional framework within which the research is initiated and evaluated.

The author discusses three main methodologies which are applied to the task of identifying skills. He contends that no single methodology is sufficient in itself for this task; he points out that each methodology has its strengths and weaknesses and that a combination of all three, together with qualitative research, provides the most robust results.

Identification of skill needs in the short to medium term

- the case of Ireland

www.fas.ie/information_and_publications/slmru/index.html
www.skillsireland.ie

Expert Group on Future Skill Needs

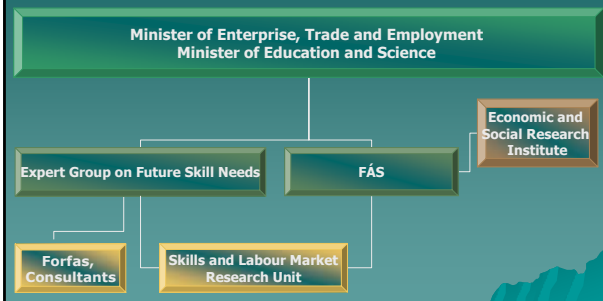
Structure of the Presentation

- The institutional framework
- Research methodologies
- Concluding observations

Institutional Framework

- The Expert Group on Future Skills Needs
- Forfas – the National Policy and Advisory Board for Enterprise, Trade, Science, Technology and Innovation.
- FAS – the National Employment and Training Authority
- The Economic and Social Research Institute

Institutional framework



Expert Group on Future Skill Needs

- Established in 1997
- To advise Government on skill shortages
- Reports to both Ministers of Enterprise Trade and Employment; and Education and Science
- Tri-partite structure, employers, unions, Government
- Linked to Implementation Group
- Administration Services provided by Forfas

The Skills and Labour Market Research Unit (SMLRU)

- In 2001 Expert Group created its own in-house research team
- This is the FAS Skills and Labour Market Research Unit (SLMRU)
- To provide data and analysis on skills demand and supply
- www.skillsireland.ie

Methodologies

- A National Skills Database
- Medium term forecasting of job-openings
- Studies of specific sectors of economy

National Skills Database

- Electronic storehouse
- All nationally produced data
- Skills supply and demand
  - Structure of employment
  - Immigration data
  - All vacancies
  - Education enrolment, graduation
  - Job-seeker activity

Sources of data -Public

- Employment data: National Household Quarterly Survey (i.e. LFS) – 120,000 individual records
- Vacancy data: FAS Public Employment Service
- Education data: Education authorities
- Immigration Data: Department of Education and Science
- Job-Seeker data: FAS Public Employment services

Sources of data - Private

- Vacancies: Newspapers (Irish Times)
- Vacancies: www.irishjobs.ie
- D T F vacancies: monthly survey with Economic and Social Research Institute
- DTF vacancies: Quarterly survey of recruitment agencies (pilot stage)

Outputs from the Data-base

- National Skills Bulletin
- Trends in the Supply of Skills
- Regular policy-related papers

The National Skills Bulletin

- Analysis of over 300 occupations
- In terms of current or future shortage
- Using 11 different indicators
- Distinguishes between skill and labour shortages

Indicators of shortage

- Numbers employed
- % Female
- % part-time
- Unemployment (> or < average)
- % >55 years
- % Non-Irish
- Average annual growth
- Work permits
- Work visas
- Difficult to fill vacancies
- Replacement rate

Trends in the Supply of Skills

- Applications by field of study - future supply
- Enrolment by field of study – future supply.
- Gender balance
- Graduates by field of study – current supply
- Destination of graduates – current supply
- International comparisons

Regular policy-related papers

- Regional skills and education profiles for the Development Agencies
- Recommendations for inclusion in immigration schemes
- Occupation profiles for career guidance – placed on national portal

Use of SLMRU research

- Education provision
  - New degree in logistics (Limerick IT)
  - Third school of architecture (Limerick University)
  - Financial advisors courses (FAS)
- Immigration policy
  - Skills for inclusion in Visa/Authorisation scheme
  - Skills for inclusion on new greencard/work permit schemes
- Career guidance
  - Information on employment trends

N D S - Advantages

- Up-to-date trend data
- Covers skills supply and demand
- Provides reports quickly and cheaply
- Retains the intelligence in-house

NDS - disadvantages

- Occupations limited to existing codes
- Does not include emerging skill-sets
- Provides only very short-term forecasts
- Does not offer explanations for shortages
- No linkage to economy

Methodologies

- A National Skills Database
- Medium term forecasting of job-openings
- Studies of specific sectors of economy

FAS/ESRI Model Forecasts

- ESRI Macro-Economic Model provides sectoral employment projections five years ahead.
- Detailed Analysis of past trends in occupations (45) by sectors (29).
- Forecasts of occupational shares, applied to sectoral employment forecasts, to provide forecasts for employment in 45 occupations.

FAS/ESRI Model Replacement Demand Forecasts 2001

- Replacement Demand + Net Growth = Total Demand
- 3 Methods of Estimating Replacement Demand

a Labour Force Attrition, based on Annual Gross Labour Force Outflows (including net inter-occupational change).

b Net Replacement Demand, based on cohort survivors.

c Net Replacement Training Requirements, based on survivor cohorts above certain age-level.

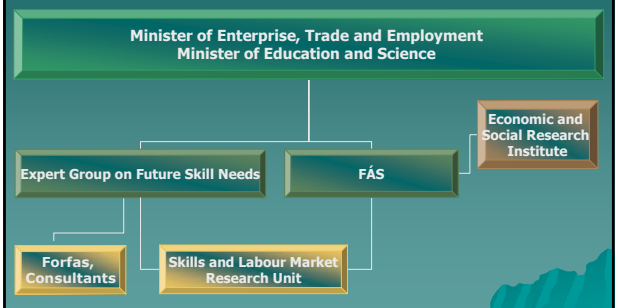
Disadvantages of FAS/ESRI Model

- Limited to existing codes
- Assumes no significant change
- Difficult to measure replacement
- Accurate only at broad occupational level
- Needs to be regularly up-dated

Methodologies

- A National Skills Database
- Medium term forecasting of job-openings
- Studies of specific sectors of economy

Institutional framework



Key Features of Sectoral Studies

- Integrate business aspects with employment/training issues
- Not a forecast but a plan
- Multiple objectives - quantitative and qualitative
- Multiple methodologies - desk research, surveys, discussions, forecasts
- Focus on sector's needs not provider driven

Key Components of Sectoral Study

- Current Situation in the Sector
- Change Factors for the Future
- Proposed Future Strategic Direction for the Industry
- Employment, Manpower and Training Requirements
- Recommendations

Current Situation in the Sector

- Industry Size and Composition
- Markets
- Technology
- Business Performance and Competitiveness
- Employment/Skills
- Education/Training supply
- Strengths and Weaknesses

Change Factors for the Future

- Global competition, tariffs, trade regulations
- Technological changes
- Legislative changes
- Labour Market changes and problems
- Threats and Opportunities

Proposed Future Strategic Direction for the Industry

- Markets; Domestic and Exports
- Industry Composition, Supply Chains
- Technology
- Work Organisation/HRD
- Other Changes

Employment, Manpower and Training Requirements

- Numbers and types of employment in future
- Training and Education requirements (quantities and types)
- Company HRD actions required
- Other Labour Market issues to be addressed

Recommendations

- National and Industry strategic HRD policies/actions
- Education/training providers' and funders' actions
- Company actions (in a range of respects including HRD)
- Other Government Departments' and development agencies' actions

Concluding observations

- One methodology is not sufficient
- Use composite indices
- Have a formal structure
- Which incorporates both demand and supply-side of the labour market
- Provides qualitative sources of data
- Ensures findings are implemented

National to Regional – Challenges of Regional Forecasting in the Netherlands

Dr. Ben Kriechel

Abstract

Skill need forecasting has been used extensively on a national level for several countries. In this paper we will discuss the Dutch approach to skill need forecasting. There is a special focus on the relation between national forecasts and regional forecasts. Using the case of the Dutch province of Overijssel, we will show the approach that was taken to overcome the typical difficulties of regional labour market forecasts: data availability and sample size for the regional level. Furthermore, we will discuss some practical approaches to the dissemination of information that were taken in the context of Overijssel.

National to Regional:
Challenges of regional forecasting in the Netherlands

Dr. Ben Kriechel
Research Centre for Education and the Labour Market, Maastricht University

Overview

- The national model
- The need for a regional implementation
- Outcomes are just as good as its ingredients
- An example: Overijssel
- Implementation and use of the regional data

Goals of the labour market model

- Increasing the *transparancy* on the labour market
- *Early warnings*: medium term forecasts by occupation and education
- '*Ex ante*' forecasts: agents on the labour market may react

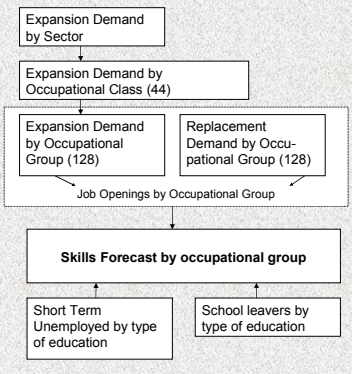
Cooperation and funding in the Netherlands

- Independent research institute affiliated to Maastricht University: ROA
- Ministry of Education and science
- Public employment office (CWI, RWI)
- Branche organisations: advise schools on the qualification structure of vocational education
- Commercial institutions on educational and occupational choice (LDC, Choice)

Ingredients National Model

Use of reliable national data sources:

- Labour Force Survey (EBB)
- School Leavers Survey (SIS)
- Forecasts by CPB
- Student enrolment (MinOCW)



Regional Models

- Matching of some occupational labour markets is predominantly regional
- Regional labour markets differ in their demographic and occupational structure
- Policy maker on regional level need to understand *their* specific labour market

Ben Kriechel – Maastricht University
<Ben.Kriechel@roa.unimaas.nl>

Ingredients Regional Model

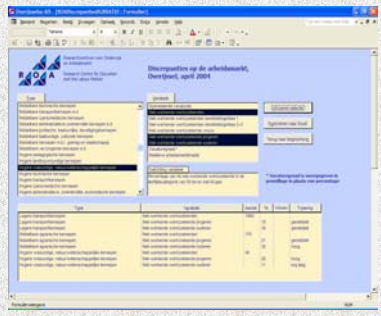
- Expansion demand is based on sectoral employment forecast for provinces
- "National" trends of occupational shifts are applied to sectoral data
- Regional age distribution and participation rates are combined with national occupational age distributions to predict replacement demand
- School leavers and unemployed are regional
- Focus of forecast by education is on lower and intermediate education levels

Ben Kriechel – Maastricht University
<Ben.Kriechel@roa.unimaas.nl>

Example: Overijssel

Ben Kriechel – Maastricht University
<Ben.Kriechel@roa.unimaas.nl>

Example: Overijssel



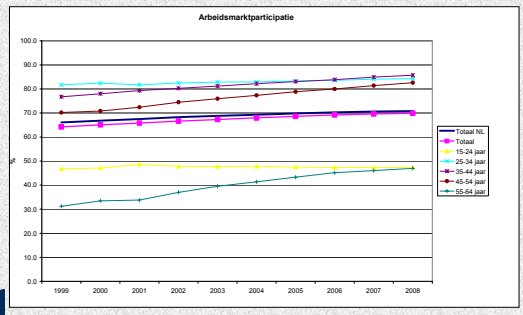
Ben Kriechel – Maastricht University
<Ben.Kriechel@roa.unimaas.nl>

Example: Overijssel

	Elementary	Intermediate	Higher
Agriculture	+	-	=
Food	=	-	=
Chemical	-	++	-
Metal & Electro	--	+	++
Other industry	++	--	-
Energy	=	-	+
Building	++	--	-
Trade	-	+	+
[...]			

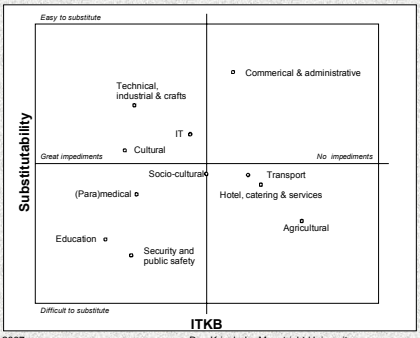
Ben Kriechel – Maastricht University
<Ben.Kriechel@roa.unimaas.nl>

Example: Overijssel



Ben Kriechel – Maastricht University
<Ben.Kriechel@roa.unimaas.nl>

Example: Overijssel



Challenges

- Data
- Detail versus regionalization
- Bottom-up versus top-down

Cell size problem

	National	Region
Number of occupations with less than 2500 workers	2	79
Percentage of the total number of occupations	1.60%	61.70%
Percentage of the workforce	0.10%	15.60%

Bottom-up versus top-down

- Top-down
  - Comparable methodology
  - Builds on national models
  - Degree of regionalization
- Bottom-up
  - Builds on regional specialities
  - Harder to compare across regions

Conclusion

- Skills forecasting an art rather than a science?
- Trade-off between regionalisation and detail
- Forecasts are always limited by the underlying data

In: Reggiani, Aura; Nijkamp, Peter (Hrsg.), Spatial Dynamics, Networks and Modelling, Cheltenham 2006, S. 293-318

12. Evolution of Regional Employment in Germany: Forecast 2001 to 2010

Franz-Josef Bade

12.1 INTRODUCTION

Theoretically, regional policy like other areas of politics should principally be based on explicit estimations of the future perspectives of regions. Actually, in Germany, as in many other countries, it is just the opposite. One of the few exceptions is the coordination of regional policy by the 'Gemeinschaftsaufgabe "Verbesserung der regionalen Wirtschaftsstruktur"'. This institution is a joint committee of the Federal state and the 16 states ('Länder') and has the task to coordinate the rules of regional assistance in order to avoid an unfair competition between rich and poor states and to prevent collusive behaviour of firms applying for regional subsidies.

Amongst other things, this coordination is achieved through the definition of those areas where subsidies for firms are possible. The selection of the assisted areas is based on a few indicators, one of which is a forecast of regional employment change. In this article, we report how these forecasts are made, what their main results are, and last, but not least, how reliable the results have been in the past. Since the current forecast 2001–10 is the most recent part of a series of forecasts,[1] it offers not only the possibility of *ex post* control but, perhaps more importantly, it also allows us to learn from the errors made in the previous estimations.

In the following, we first give a short outline of the forecast methodology. As the approach consists of developing, testing and forecasting a large number of time-series models, we concentrate on the philosophy of the approach. After that, we show some selected results of the expected changes in the spatial structure of Germany. The report ends with a look back at the accuracy of previous forecasts. In principle, it is not a necessary objective of forecasts that they match the real development at the end; especially in socio-economic policy areas forecasts are often an instrument to prevent the continuation of the status quo development. Nevertheless, precision in the

past is an essential precondition for trust in the future; that is why at the end of our report the previous forecasts are compared with the real changes.

12.2 METHODOLOGY

12.2.1 The Basic Principles

The forecasts have a mid-term perspective of about nine years which is a compromise between the wish for a long-term estimation of regional perspectives and the limits due to the forecast methodology. Due to its political purpose, a hierarchy of future regional competitiveness, the forecast may be restricted to a comparative view of regional development. The relative change of regional employment is analysed and predicted, that is, the regional growth rate in relation to the federal average rate. It is identical with the change of the regional share of national employment, and is therefore sometimes referred to as 'regional elasticity.'

Let b_0 and b_1 be the employment of a particular region in $t = 0$ and $t = 1$, and B_0 and B_1 the respective variables for the national employment, then the *'relative'* change of employment is:

$$\frac{b_1}{b_0} \Big/ \frac{B_1}{B_0}. \tag{12.1}$$

As the regional share of national employment is defined as:

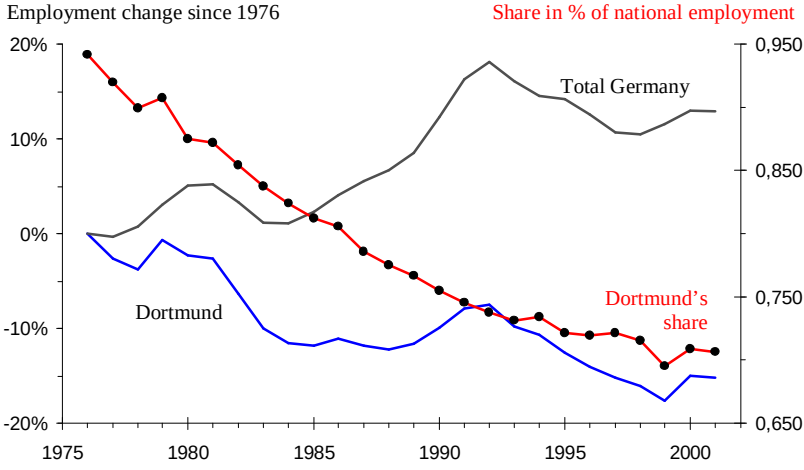
$$r_t = \frac{b_t}{B_t}, \tag{12.2}$$

the *'relative'* change of employment share is identical with the change of regional share:

$$\Delta r = \frac{r_1}{r_0} = \frac{b_1}{B_1} \Big/ \frac{b_0}{B_0} = \frac{b_1}{b_0} \Big/ \frac{B_1}{B_0}. \tag{12.3}$$

As illustrated in Figure 12.1, the restriction to relative changes has one essential advantage: By the standardization to national employment, the perspective focuses on regional particularities and disregards those influences which are more or less effective in all regions such as the business cycles or other nation-wide longer-term tendencies. Although the city of Dortmund shows a distinctly below-average performance, it nevertheless reflects the business ups and downs. By standardization, however, it can be recognized

that Dortmund's economy behaves in rather stable way compared with the national growth, that is, the annual change of Dortmund lies continuously at a rate of about 1 per cent under the national change.



Source: Statistical Offices; own estimations.

Figure 12.1 Relative change of employment of Dortmund, 1976–2010

The concentration on 'relative' changes does not exclude the estimation of 'absolute' changes. The only precondition is a forecast of the national employment. National predictions have their own complexity which is, theoretically as well as empirically, mostly independent of regional estimations. Furthermore, as national economic forecasts are rather frequently offered by other organizations, the restriction to relative changes allows us to benefit from a division of labour by using external expertise for those parts of the prognosis which are not the primary focus of regional interest. Given the externally forecasted size of national employment, the predicted regional share can be transformed into the size of regional employment by multiplying it with the number of national employment.

The forecasting procedure is founded on two basic hypotheses concerning the forces of spatial change:

(1) Firstly, it is assumed that spatial structural change is characterized by strong inertia, that is, the change of region's share in the total national employment is characterized by great stability, as shown in Figure 12.1. The example of Dortmund is an typical example which stands for many other regions.

The stability of spatial structural change is primarily an empirical finding. Although its theoretical reasons are not yet clearly understood, the finding has been observed in many countries for a long time.[2] Beyond that, in other areas of economy, too, structural change reveals secular stable tendencies: for example, the expansion of the service sector or the shifts of qualification structures.[3]

In spite of the empirical unambiguousness, the hypothesis is sometimes misunderstood. The thesis of stability refers to the course of spatial structural change, not to the structure itself. Similar to sectoral structural change for example, the spatial distribution of workplaces experiences large shifts: employment growth varies a lot between regions and produces related changes in the regional shares of national employment. For Germany, for example, on long-term average, over 1 per cent of all workplaces are annually 'redistributed' over the districts (NUTS III level) of former West Germany – measured by the 'total turnover,' the sum of (absolute) changes of regional share. Including former East Germany, this figure has increased to over 1.5 per cent p.a. in the 90s.

Thus, the thesis of stability is restricted to just direction and speed of structural change. Only the course of change is regarded as being stable, not the spatial structure, in the sense that abrupt deviations are less likely. As can be seen in Figure 12.1, whereas the annual loss of Dortmund has decreased since the mid-90s, course changes may happen, but, in general, they happen rather slowly. Metaphorically, we may speak of a tanker which cannot abruptly change its ongoing direction. If the direction and tempo of its past course are known, its future location can be predicted rather reliably. Applied to regional structural change the past course of regional share should reliably indicate the future development of employment in a region compared with the federal average.

(2) The second hypothesis refers to the forces that determine the changes of spatial structure.

Due to the inertia of regional development processes, it is assumed that strong and lasting influences are necessary for changing the regional trend. Expressed in the metaphor of the tanker, great forces (and long distances) are needed to be able to change the direction of the course once it has been taken. Based on empirical analyses that have been made in connection with the previous forecasts, we postulate as second thesis that a (longer-term) change of direction is only possible when it is carried by the growth poles of the regional economy.

The growth pole theory[4] was among the first regional approaches pointing out that, in principal, there are two different ways how an industrial sector may influence total regional economy respectively employment. The direct influence consists of the employment which is created within the regional

industry itself: namely the increase or decrease of employment within the respective industry. In fact, most sectoral analysis of regions is restricted to this direct impact: for example, the frequently used shift-share-method.

In addition, however, indirect influences are also possible which are created via buying intermediate goods (backward linkages) as well as by selling their own products which may give rise to further processing (forward linkages). The essential characteristic of both backward and forward linkages is that they need other economic partners in order to be effective. Indirect influences are not only possible, but probable, too. Some evidence for their significance, for example, is the 'sectoral parallelism of regional development,'[5] which can be observed in many regions: Regions which are growing in total, are not only characterized by a special increase in growth industries, but they generally perform above-average, even in those economic lines of business with nationwide decrease. Likewise, lagging regions show their particular weakness in both nationally-growing as well shrinking sectors. Obviously, there must be some links between them which influence the regional sectors in the same direction.

As there are various possibilities of indirect influences, there is as yet no simple answer to the question concerning which industrial sector belongs to the growth poles of a region. In principle, most sectors could act as a driving force; whether they really do depends on a number of circumstances which may vary from region to region. Because of pragmatic restraints such as data restrictions and the necessity of investigating each region individually, we will concentrate on three characteristics in our analysis: firstly, the industrial sector must be principally capable of giving the first impulse, for which – at the least to some extent – it has to be autonomous, that is, independent of the regional demand. This autonomy can be given in a variety of ways, an extreme case is governmental transfers. Presumably, the most frequent case, however, is a national or international market area.[6]

The primary impulse only has an effect if the industrial sector is 'motorique'. This means that the industrial sector must be integrated into the regional economy in order to be able to transmit growth impulses to the regional economy through its various relationships inside and presumably outside business. In the short term, multiplicator processes[7] on the (intermediate and final) demand side appear to have the greatest effect. The supply side influences usually work more indirectly. Their effects can be noticed only over the longer term; for example the products of an industrial sector may initiate a further processing in other firms of the region or, by some economies of scope, they make the subsequent production more competitive, consequences which are particularly stressed by the growth-pole theory.

Thirdly the primary impulse has to have a certain minimum size in order to be noticed in total regional development. The interplay of different industrial sectors produces a lot of 'white noise', which may overlay many impulses. Only industrial sectors of a certain size are able to break through this layer and to influence the course of regional development in a significant and noticeable way. Of course, in a long term perspective, small firms, too, may have this influence. But because of the mid-term frame of this forecast we postulate that, above all, it is the largest industrial sectors of a region which may act as growth-poles, provided that they fulfil the other two criteria mentioned above.

12.2.2 The Forecasting Procedure

12.2.2.1 Univariate analysis of total employment

Both basic hypotheses imply a forecasting procedure which goes bottom-up. At the beginning, it focuses on the development of each single region. At the end, however, after having made predictions for all regions the total consistency of the individual estimations is checked due to the trivial, but very severe, restriction that the sum of regional shares must sum up to 1.

The forecast procedure of a single region consists of two modules corresponding to the two basic hypotheses. Using the tanker metaphor, the first set of methods concentrates on the course of the tanker: its past route is analysed in order to detect stable tendencies which can be extrapolated into the future. In other words, we hypothetically assume at this stage that all relevant information for forecasting is contained in the past time series.

Formally speaking, univariate time series are analysed by applying the ARIMA model which predicts a value as a linear combination of both its past values and past 'errors' or shocks:[8]

$$W_t = m + \frac{q(B)}{f(B)} a_t, \tag{12.4}$$

where:

- W_t is the response series of Y_t or a difference of the response series $W_t = (1 - B)^d Y_t$;
- m is the mean term;
- B is the *backshift* operator; that is, $BX_t = X_{t-1}$;
- $q(B)$ is the *moving-average* operator, represented as a polynomial in the back shift operator $q(B) = 1 - q_1(B) - \ldots - q_Q(B)^Q$;
- $f(B)$ is the *autoregressive* operator, represented as a polynomial in the back shift operator $f(B) = 1 - f_1(B) - \ldots - f_P(B)^P$;
- a_t is the independent disturbance, the random error.

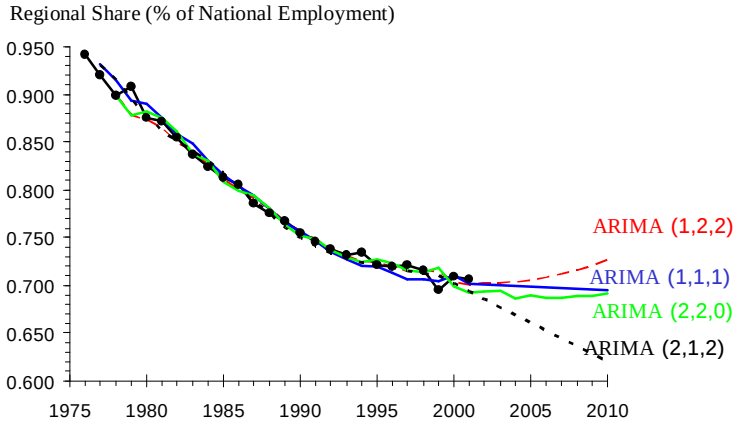
The ARIMA model integrates the two main types of probabilistic processes: autoregressive (AR) and moving average processes (MA). The latter assume that the current time series is related to the random errors from previous time periods. In contrast, autoregressive models estimate a process where the current time series value is related to the actual time series values from previous time periods. As the autocorrelation functions of both processes behave dualistically to each other, the identification of ARIMA-processes is rather complex. Usually, the autocorrelation function of MA (q) processes is finite, that is, it stops after lag q, whereas the autocorrelation function of autoregressive processes is infinite and behaves exponentially.

Because of its complexity, which increases with the order of processes, the model analysis is usually separated in three steps: as firstly introduced by Box and Jenkins,[9] the first task is to identify the underlying model of the time series process. Then the model parameters are estimated and the diagnostics are checked before, finally, the future behaviour of the process is forecast. One important element of the identification phase is to guarantee the stationarity of the time series, that is, that the mean and the variance is constant over time. This necessary precondition for (most of) the probability theory of time series is usually guaranteed by transforming the time series either within the ARIMA model (by differencing) or outside by using log or sinusoidal transformation.

The ARIMA model is applied individually for each region. Since both processes may have different orders and the backshift may cover different time lags, the usual connotation is ARIMA (p,d,q), with p for the order of the autoregressive process, q for the order of the moving-average process, and d for the order of differencing.

At the end of the first module, the question which model is the best is decided by the goodness of fit. As criteria, beside the standard error estimate, the Akaike's Information Criterion[10] is used. It differs from the standard error by taking the number of model parameters into account, that is, it prefers lower-order models by including a 'punishing' term to the error variance.

Usually, for most regions, the result of the first module is a corridor of forecast functions. Although several models attain an equivalent goodness of fit, their forecast may differ more or less strongly, as illustrated in Figure 12.2. Consequently, the question which model has the highest plausibility can not formally be answered on the basis of the estimation parameters. A good fit to the past development is a necessary condition, but some forecast functions deliver such extreme values for the future that they are obviously unrealistic – what may be interpreted as a further argument to support the general scepticism about the extrapolation of trends.



Source: Statistical Offices; own estimations.

Figure 12.2 Univariate forecasts of the relative change of employment of Dortmund, 1976–2010

In our example, Dortmund, those models that tend to underestimate the recent change of direction, such as ARIMA (2,1,2), attain a very good fit, but their forecast appears rather too pessimistic (see Table 12.1).

Table 12.1 Univariate models of the relative change of employment of Dortmund

Model	Diff. Lag	AR Ord.	MA Ord.	Err. Var.	AIC	Share 2010 of Nat. Empl.
ARIMA (1,2,2)	2	1	2	0.00009	–146.645	0.72658
ARIMA (1,1,1)	1	1	1	0.00010	–149.873	0.69490
ARIMA (2,2,0)	2	2	0	0.00010	–143.441	0.69168
ARIMA (2,1,2)	1	2	2	0.00007	–152.124	0.62057

Source: own estimations.

12.2.2.2 Sectoral Analysis

The objective of the second module is to concentrate the corridor of formally determined forecasts to a smaller spectrum of plausible changes. Its theoretical basis is given by the second thesis mentioned above that strong and lasting changes in regional employment are mostly caused by a small number of industries. However, which industry is fundamental for the development of a region may vary over the regions according their size and their intraregional linkages. Therefore, we have first to investigate which economic sectors could be regarded as growth-poles of the region in question. This investigation is done for each of the regions.

Theoretically, as presented above, a growth pole is characterized by it autonomy, its intraregional linkages, and its size. Empirically, however, only employment data is available at the regional level. Therefore, a two-step procedure is applied to identify the relevant industries. Firstly, the employment figure as well as localization coefficient are used to select a broader group of sectors (around 15 out of a total set of 66 lines of business) which could potentially have a significant influence on the growth of that particular region. Employment is taken as a proxy for size whereas the localization coefficient is used as criteria for autonomy. The larger the size (employment) of the analysed sector – compared with the federal average –, the higher its regional overrepresentation. According to central place theory, this indicates the 'significance surplus' due to a large market area and, by that, the independence from the regional total demand and its future development.

Secondly, time series regression is used to test their influence on total regional development. This regression is an extension of the above-mentioned ARIMA model insofar as an additional term for exogenous 'input' time series is included.

$$W_t = m + \frac{q(B)}{f(B)} a_t + \sum_i w_i(B) B^{k_i} X_{i,t}, \qquad (12.5)$$

where:

X_i is the ith input series (or a difference);
k_i is the pure time delay for the effect of the ith input series;
$\omega_i\,(B)$ is the (numerator) polynomial of the transfer function for the ith input series.

In principle, the time series regressions follow the same procedure as the univariate analysis before. The first precondition is to guarantee the non-stationarity of both the endogenous and the exogenous variables. Consequently, the error process has to be identified and estimated before the

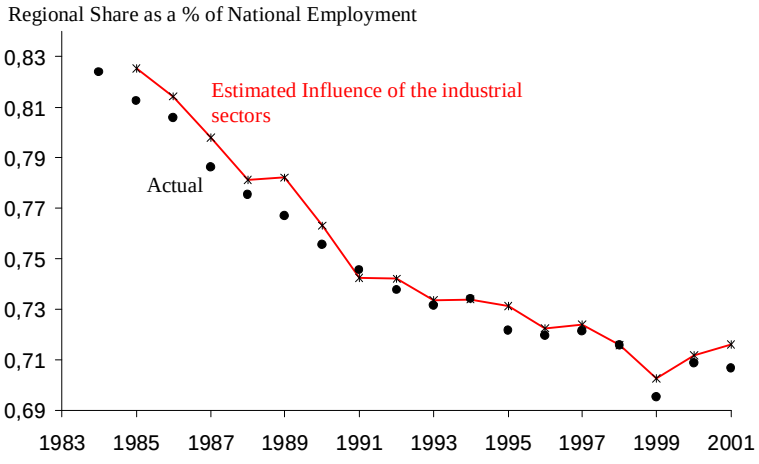
regression can be calculated and the significance of the different exogenous variables is estimated.[11]

The outcome is a group of regional industries, individual for each of the regions, which appear to influence the total regional development, in the sense that their time series are significantly correlated with the change of total employment of the region in question. As an example, Table 12.2 shows the selected industries for Dortmund. Interestingly, as most calculations are characterized by a lot of fuzziness such as the above-mentioned parameterization of the multivariate model, it may happen that some regional industries are negatively related to the change of total employment. Therefore, the final group of industries is rather broadly defined. In total, however, as measured by test statistics such as the root mean square error in Table 12.2, as well as in Figure 12.3, this group of selected industrial sectors appears to be most decisive for the development of Dortmund.

Table 12.2 Parameter estimates of the time series regression: the influence of selected industrial sectors on the employment change of Dortmund

Statistics of Fit			
Root Mean Square Error	0.0076		
R^2	0.9499		
R^2 adjusted	0.9110		
Parameter Estimates			
Industrial sectors	Estimate	Std. Error	t-value
Machinery	0.0640	0.0234	2.74
Electrical	0.0111	0.0079	1.41
Motor Vehicles	0.0884	0.0363	2.43
Beverages	0.0441	0.0188	2.35
Insurances	0.2435	0.0192	12.67
Consulting	0.0532	0.0111	4.78
Other business services	0.0481	0.0094	5.11
Research, Education	–0.0813	0.0163	–4.97

Source: own estimations.



Source: Social Security Data; own estimations.

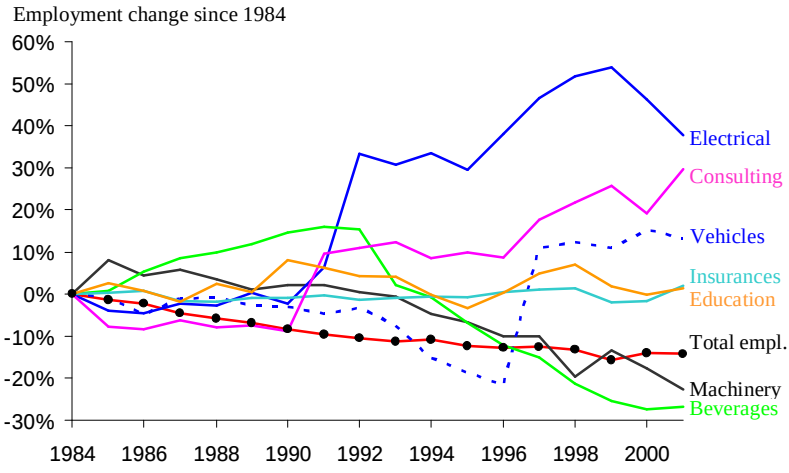
Figure 12.3 Influence of selected industrial sectors on the change of employment of Dortmund, 1983–2001

The next step is to estimate and to forecast the future development of the selected industries and to integrate them into the estimation of total regional development. One way consists of using the same procedure as for total employment: namely, an univariate time series model. However, most sectoral time series are rather unstable (see Figure 12.4 as example); thus, their forecasts show much more variance.

That is why additional information are used in order to get a broader impression of their future competitiveness. Essentially, these are the productivity of a branch and its research and development intensity. With both indicators the focus is on the temporal change during recent years. Especially in the case of research and development, the change is regarded as indicator for the companies' subjective evaluation of their competitiveness. The base of this argument is that a company which has an above-average investment in research and development obviously expects to get a return on its investment. Since investment in research and development has more long- than short-term results, it can be concluded that, in principle, the company should have an optimistic view of its future.

The last step is to integrate the sectoral assessments into the forecast of total regional change. Formally, this is done by using the multivariate time series regression model mentioned above and introducing the sectoral

forecasts as future values of the exogenous variables, called input time series.[12]



Source: Social security data; own estimations.

Figure 12.4 Change of employment in selected industrial sectors of Dortmund, 1984–2001

However, given the high uncertainty of the sectoral forecasts (in addition to the original uncertainty of the multivariate model), these formal calculations can only give a tentative orientation. Consequently, the last fine tuning has to be done 'by hand': there is no formal model which enables the various information to be integrated in an uniform way for all regions.[13]

12.2.3 Consistency Check

Beyond the complexity and uncertainty of information, there is another reason for the iterative ('handish') forecasting process which results from the bottom-up-structure of the forecast: The two modules – the estimation of the development corridor and the analysis of regional growth-poles – are applied to each individual region. Since the forecast values are regional shares of national employment, in the end, the sum of all regional forecasts must be equal to 100 per cent. In practice, however, the first round of estimations does not fulfil this condition. Consequently, the regional forecasts have to be re-examined and adjusted.

As the consistency check is possible for different regional aggregations, it gives the chance for further investigation and understanding of regional change. For example, by grouping districts to greater regions, the influence of spatial autocorrelation may be taken into account. Given the bottom-up procedure, there is no possibility to integrate formal autocorrelation methods in the calculation for an individual region. Altogether, four different regional levels are used for forecasting: the states ('Länder');[14] 38 large areas (according to the old 'Bundesraumordnungsprogramm'); 97 planning regions ('Raumordnungsregionen'); and the 440 districts ('Kreise') as the base unit.

In total, about 600 single regional forecasts are produced (including all analytical steps described above). The separate forecasts on the various levels are compared with the respective sub-aggregates, as shown in Figure 12.5.

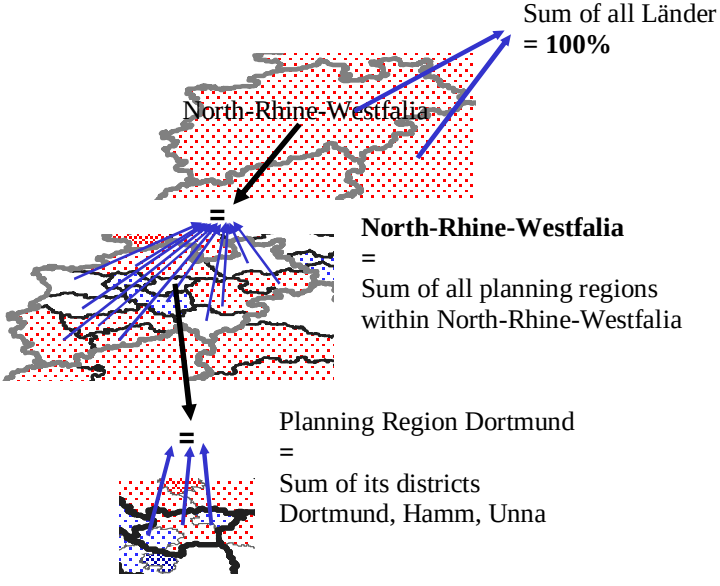


Figure 12.5 Consistency check of forecasts at different regional levels

The sum of Dortmund and its two surrounding districts must equal the forecast for the planning region Dortmund; the sum of all planning regions in North-Rhine-Westfalia must equal the forecast of North-Rhine-Westfalia; and the sum of all states must add up to 100 per cent. This adjustment can only be done 'by hand' since each single forecast of the entire region and its sub-regions has to be checked for plausibility and made congruent.

12.2.4 Data Base

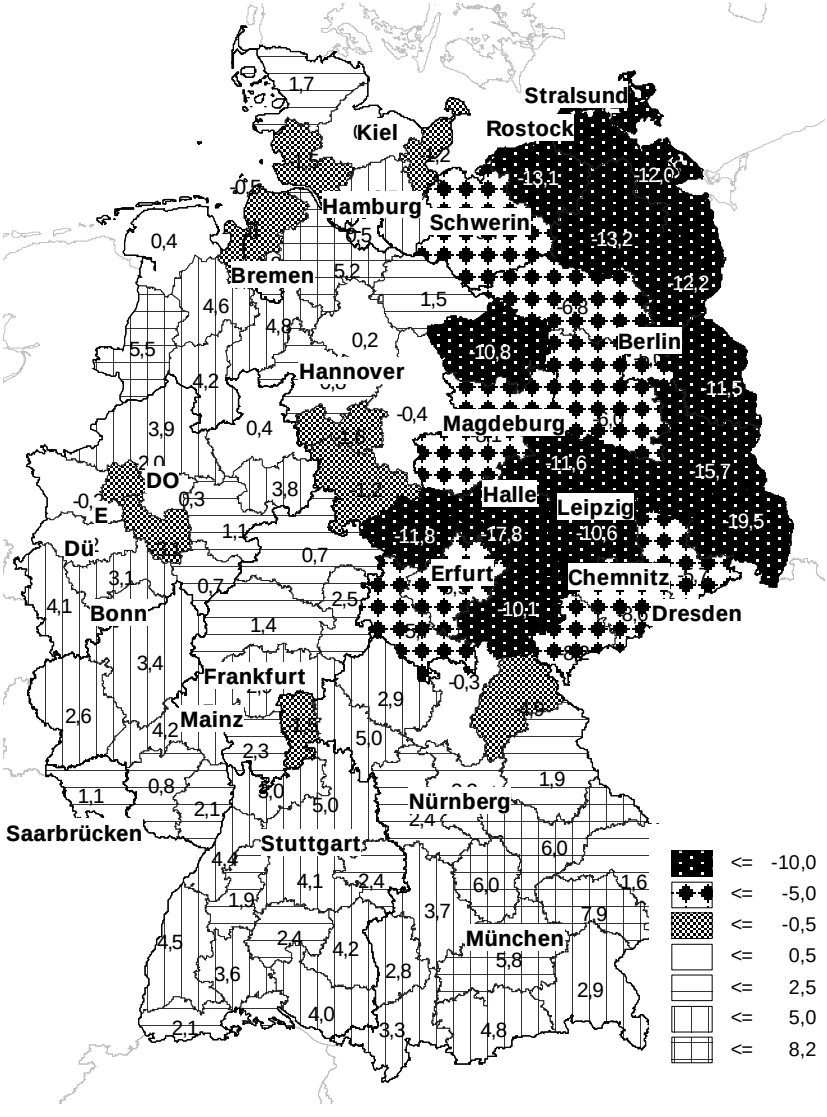
Data are drawn from two different sources. First, total employment is estimated by the Statistical Offices of Länder[15] and is used here to determine regional employment in the base year of forecast.

The second source is the social security statistics that are used for the time series analyses. The additional use of employment statistics offers three important advantages. Firstly, social security data is available back till 1976 (for former East Germany till 1993). Secondly, the data are highly differentiated by industrial industrial sectors, which is necessary for identifying and analysing the regional growth-poles. And thirdly, in addition to the sectoral structure of regions, the social security data provide other information such as occupations of employees or the sum of wages, which are used to investigate the competitiveness of growth-poles.

The disadvantage of these data is that they only cover about 75 to 80 per cent of all employed persons in a region.[16] However, since the changes in direction and tempo of such a large subset should strongly correlate with the entire set, this underrepresentation is not regarded as essentially harmful. Evidently, the temporal change of total employment to a considerable extent corresponds to the change of social security employment at the regional level.[17]

12.3 REGIONAL EMPLOYMENT DEVELOPMENT 2001–10

A first overview on the expected employment development for the planning regions is given by Figure 12.6 (and by Figure 12.A1 in the annex). A clear result is the West-East-decline of growth rates. Although a lot of direct and indirect transfers are still going from West to East as well as to industrial locations in former East Germany that are highly subsidized,[18] all Eastern regions have to expect rates of change clearly below the federal average. The highest loss (–19.3 per cent) is estimated for the Oberlausitz-Niederschlesien region; not much better is the development of its neighbouring region Lausitz-Spreewald (–15.7 per cent) or Halle (–17.8 per cent). Only in a few regions, do the estimated losses make up less than 10 per cent. Berlin with a loss of 5.1 per cent looks well off in comparison.



Notes: Regional change rate 2001 to 2010, related to the federal average (in percentage).

Figure 12.6 Forecast of employment change 2001–10: planning regions

Compared with the early 1990s, the perspective of former East Germany has declined significantly. The assessment is even worse when taking into account that former East Germany experienced a rather favourable upswing

in the mid-1990s. The loss of employment till the end of the millennium has been so large that, meanwhile, employment has fallen under the initial level of the early 1990s which is usually regarded as the minimum forced directly by the transformation process after the destruction of the Berlin Wall. However, the detailed investigations of this forecast can hardly give any hope that this development will become significantly better in the coming years.

Table 12.3 Employment change in former East and West Germany, 1992–2001–2010

	Employment (in millions)			Share of national employment %			Forecast 2010	
	1992	2001	Change	1992	2001	Change	Share %	Change
West	28.4	29.2	+2.9%	79.0	80.3	+1.7%	82.1	+2.3%
East	7.5	7.2	–5.1%	21.0	19.7	–6.2%	17.9	–9.2%
Germany	35.9	36.4	+1.2%	100.0	100.0	-	100.0	-

Source: Statistical Offices; own estimations.

Since this forecast refers to relative changes, the loss of former East Germany in national employment does not necessarily stand for a decrease in employment. However, to compensate for the loss of share without losing employment would mean that the national employment of Germany has to increase by 4.6 per cent to 38.1 million, which is hardly probable.[19] According to the latest forecast (Lutz et al. 2002), employment in Germany will increase by only 1.1 per cent by 2010. For former East Germany a further (continued) decrease in employment is quite likely.[20]

The expected losses in the East correspond with a share increase in the West which amounts to +2.3 per cent. Figure 12.6 shows only a few regions (Bremerhaven and Southwest Schleswig-Holstein, parts of the Ruhr Area and Eastern Lower Saxony as well as Oberfranken-East), which are expected to have a (for the most part slight) under-average development. At first glance, this result appears quite favourable for some regions in former West Germany which are traditionally regarded as weak economies. Eventually, the favourable perspective is not the least due to the expected decrease in the East. Indeed, taking the average of former West Germany as basis, the growth rate differences vary between +7.9 per cent (Landshut) and –4.5 (Oberfranken-East) and –3.0 per cent (Bochum/Hagen).

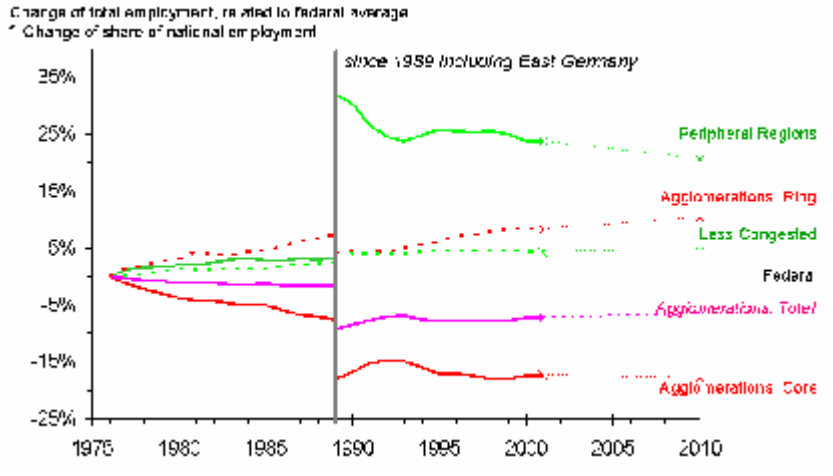
The last forecasts already indicated that the South-North-decline which had been discussed intensively at the end of the 1980s has weakened significantly. Some differences are still visible, especially the former border

areas in the North do not show much growth while Baden-Württemberg and Bavaria may expect a stable above-average development. In general, however, the northern half of western Germany is characterized by a belt of strong growth regions, which reaches from Paderborn and Münster over Osnabrück to the southern environs of Hamburg. In the South, exceptional growth rates are expected for the regions between Munich, Regensburg and Landshut.

Other main tendencies of the spatial structural change become visible when the results are differentiated according the agglomeration structure. For the sake of simplicity, we may classify the districts in four spatial categories according to their centrality. On the one hand, we have centres the main agglomerations of Germany which are further divided into core and ring. From the other part of Germany, we select those regions which can be classified as peripheral because of their low accessibility and density. The remaining part of Germany (as a third category between peripheral regions and agglomeration rings) is a more mixed group of various regions which are neither peripheral nor do they belong to a larger agglomeration. Here, we call this category 'less congested areas'. At first glance, Figure 12.7 might imply a turning away from the spatial deconcentration characterizing the change of spatial structure of Germany in the past. This change of direction is discussed in the literature under the keyword 'urban revival'.[21] However, the figure reveals too that change of deconcentration is tied up with the reunification of Germany. The following Figure 12.8 therefore focuses exclusively on former West Germany (without West-Berlin) with its average as the standard of comparison.

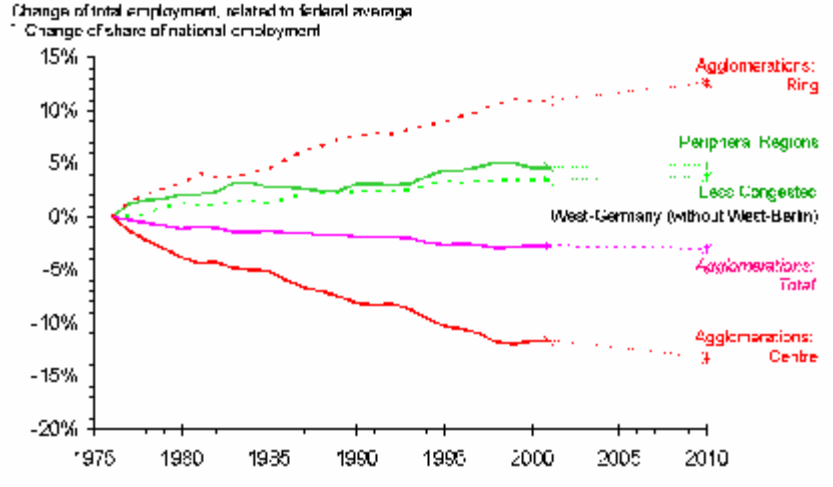
Evidently, the process of deconcentration is still going, on although we observe a slowing down. According to the forecasts, spatial deconcentration will continue in the West, most strongly by suburbanization and somewhat reduced by the gains of peripheral areas (+0.2 per cent versus +0.8 per cent from 1992 until 2001).

The average forecast for the agglomerations in former West Germany is not necessarily typical for each agglomeration since the overall results are dominated by the size of the Ruhr Area and its losses. Actually, winners and losers are about even in numbers. At the top is the agglomeration of Munich (with +3.4 per cent in comparison with former West Germany and +5.8 per cent in comparison with Germany as a whole) as well as Karlsruhe (+2.1 per cent and +4.4 per cent, respectively). The largest loss is expected for Wuppertal-Hagen (–5.4 per cent and –3.2 per cent, respectively), followed by the Ruhr Area (–3.4 per cent and –1.2 per cent, respectively). Even if the Eastern states are included in the data pool, these two agglomerations (as the only ones within former West Germany) have to expect a growth rate below the federal average.



Source: Statistical Offices; own estimations.

Figure 12.7 Regional employment development, 1976–2010



Source: Statistical Offices; own estimations.

Figure 12.8 Regional employment development in former West Germany, 1976–2010

In former East Germany, on the other hand, the tendencies of spatial structural change are turned upside down: favourable chances are seen for the agglomerations where 'favourable' means a relatively small share loss compared with the average for Germany as a whole. This is caused mostly by Berlin which is – as mentioned above – expected to have a share loss of 5 per cent and dominates the average of all Eastern agglomeration centres by its size.

Especially interesting is the development in the rings of the Eastern agglomerations. According to Table 12.4, they performed much better than the agglomeration centres, and could even surpass the national average. In fact, the suburbs of Leipzig even exceed the average growth of all agglomeration suburbs in western Germany. In the recent years, however, their prospects have seriously worsened: since the mid-90s the loss of employment has increased seriously, to the extent that we have to expect a continuation of that process in the coming years.

Table 12.4 Employment change by spatial types of area, 1992–2001–2010

	Development 1992–2001						Forecast 2010			
	former West Germany (with West Berlin)			former East Germany (with West Berlin)			Fed. Share in %		Change	
	1992	2001	Change	1992	2001	Change	West	East	West	East
Total	79.0	80.3	+1.7%	21.0	19.7	–6.2%	82.1	17.9	+2.3%	–9.2%
Agglomerations	43.5	43.9	+1.0%	10.2	9.7	–4.4%	44.9	9.0	+2.1%	–6.8%
- Cores	23.2	22.8	–1.9%	6.5	6.0	–7.7%	23.0	5.7	+0.7%	–5.7%
- Rings	20.2	21.1	+4.3%	3.7	3.7	+1.3%	21.9	3.4	+3.7%	–8.7%
Non-Agglomeration Areas	35.5	36.4	+2.5%	10.8	10.0	–7.9%	37.3	8.8	+2.4%	–11.6%
- Less Congested Regions	25.3	25.9	+2.2%	6.0	5.5	–7.5%	26.6	4.9	+2.5%	–10.2%
- Peripheral Regions	10.2	10.5	+3.0%	4.9	4.5	–8.3%	10.7	3.9	+2.2%	–13.4%

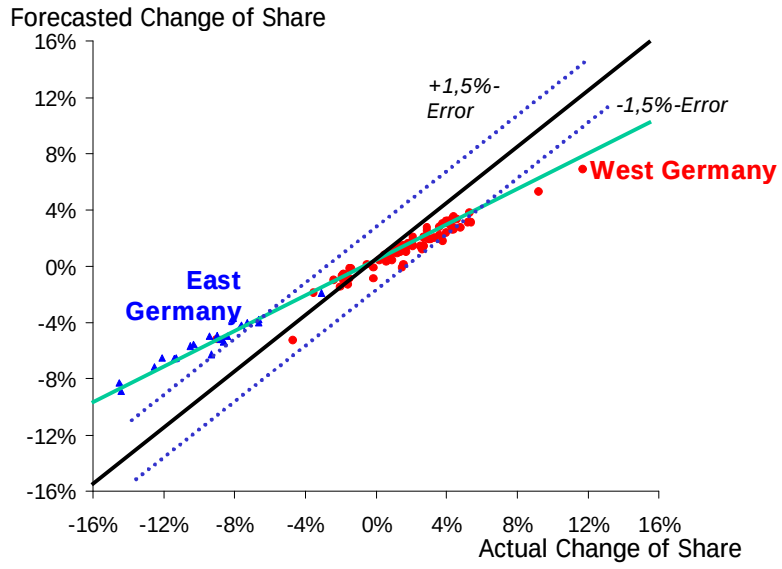
Source: Statistical Offices; own estimations.

The worst prospects among all types of areas are for the peripheral regions of former East Germany: their share is expected to decrease by –13.4 per cent. Compared with the agglomeration rings, this loss is not surprising, since most of the peripheral regions had already suffered a large decrease in the 1990s (–8.3 per cent).

12.4 FORECAST ERRORS

Although the forecaster may have a basic right to be wrong (Tietzel 1989), it is out of question that the precision of previous forecasts is an essential precondition for the credibility of a new forecast. Finally, despite all efforts to achieve a consistent forecasting methodology, the success of a forecast is measured by the match with the actual change rates. Since the forecasting methods have been applied several times in the past, the previous forecasts offer an opportunity for an *ex post* control.

In Figure 12.9, the change rates which were estimated in the 2004 forecast are compared with the actual changes until 2001.[22] Every point marks one of the 97 planning regions differentiated between former East and West Germany. Evidently, there is a very close correlation between the estimated and actual change; consequently, the regional hierarchy of growth rates are captured quite well by the forecasts.



Source: Bade (1999); Statistical Offices; own estimations.

Figure 12.9 Forecast and actual change rates, 1997–2001

Less satisfactory is the frequency of forecast errors: calculating a regression between forecasted and actual change rates – which is sometimes called Mincer-Zarnowitz-Regression[23] – the square of the correlation ($r^2 = 0.98$) as well as of the intercept ($\alpha = 0.001$) is quite close to the optimal value. However, the gradient of $\beta = 0.60$ is quite far from the optimal value of $\beta = 1$, which would imply a perfect concurrence of forecast and actual values.

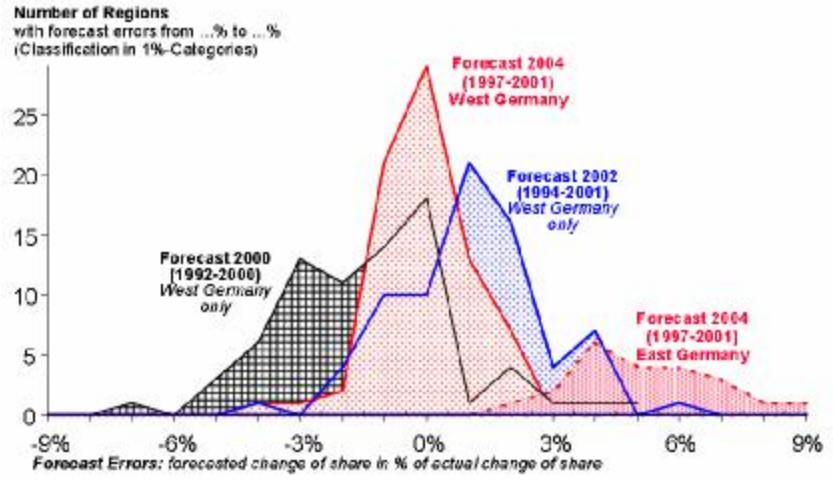
By the 1.5 per cent error interval for each forecast, Figure 12.9 reveals two main reasons for the forecast errors. First, while in the mid-range the change rates differ from the actual changes by less than ±1.5 per cent, the errors continuously increase in the lower range. More concretely, the employment growth of former East Germany had been estimated far too optimistically. The recovering tendencies until the mid-1990s were actually not continued but instead turned down in the reverse direction. The decline was so drastic that many regions are now below the initial level of the beginning at the 1990s (not taking account the transformation losses from 1989 to 1992!).

The second reason for the forecast errors can be observed in both parts of Germany: the stronger the absolute value of the actual change rate, the higher is the forecast error. This can be observed, for instance, for the two outliers

Ingolstadt and Munich in former West Germany. This regularity as source of error has already been identified in the previous forecast and will presumably be avoided in the future: actually, for both regions the highest increase (of all regions) had been forecast, but, nevertheless, the prognosis was too 'careful'. The explanation lies in some more or less obvious psychological limits: normally the attitude prevails to rather underestimate the speed of changes than to overestimate it. Extreme changes in the future are estimated as being less plausible. Thus, they are checked once again and in most cases corrected (not the least in the consistency check, as mentioned above).

The underestimation of the East German decline can also be observed in Figure 12.10, which shows the frequency of forecast errors. Here, the Eastern regions are found in the positive field (overestimation) and range from 1.2 per cent (South Thuringia) to 8.4 per cent (Lausitz-Spreewald). Figure 12.10 also shows the error frequency in previous forecasts 1994–2002[24] and 1992–2000, that exclusively cover former West Germany. Evidently, at least for West Germany, the precision of the forecast has been improved from forecast to forecast: the shaded areas are not only getting slimmer, but are also concentrated more around zero.

Finally, the improvement of the error frequency (for former West Germany) can be shown by the mean forecast error (MAPE), the mean of all absolute percentage errors:[25] for the 1992–2000 forecast the mean lies at 1.7 per cent, for 1994–2001 at 1.4 per cent, and for 1997–2001 at 1.0 per cent (West Germany only).



Source: Bade (1994, 1996, 1999); Statistical Offices; own estimations.

Figure 12.10 Frequency of forecast errors

Comparing these errors with other economic forecasts has only limited significance, since the forecasting conditions (as well as the expectations of precision) vary considerably depending on the economic areas. One possibility in considering the different difficulties of forecasting is to take into account the variance of the actual change rates – following the idea underlying the 'Theil Projection Coefficient' (Andres and Spiwoks 1999). The 'standardized forecasting error' for the forecasts presented here has a value around 30, which is much below the values (65 and more) Grömling (2002, p. 9, Table 2) or Hinze (1996, p. 75, Table 6) calculated for short-term forecasts of business cycles.

NOTES

1. Bade (1991, 1994, 1996, 1999).
2. Salin (1928); Blanchard and Katz (1992); Hohls and Kaelble (1989); Tsionas (2000); Pehkonen and Tervo (1998); Keil (1997).
3. See, for example, Mertens (1980) or Heckman (1997).
4. For example, Perroux (1950); Schilling-Kaletsch (1976).
5. See, for example, Molle (1997) and Bade (1986).
6. Other reasons for autonomy could be interregional transfers of income which are of benefit to a particular industry. Likewise, the governmental sector appears to be quite independent from the regional economic development.
7. See, for example, Kampmann (1988).
8. All calculation are made with the SAS Software package, v. 8.02.
9. Box and Jenkins (1976).
10. Akaike, H. (1978). The AIC is defined as $\ln \hat{s}^2 + 2\frac{(p+q)}{T}$.
11. For all calculations PROC ARIMA is used (see above).
12. In this case, the ARIMA model is also called Transfer Function Model (Granger and Newbold 1986). About the possibilities and limitations of such models, see, for example, Jäger (1995).
13. The use of formal and econometric methods as well as subjective evaluations of various contexts at the same time is labelled 'iterative-analytical' in the literature about economic situation forecasts. Most forecasts today – for example, those of the National Economic Council ('Sachverständigenrat') – are based on this method (see Weidmann 2002, and Nierhaus and Sturm 2003). A more formalized alternative is proposed by Blien and Tassinopoulos (2001), who integrate heterogeneous information as a constraint in a matrix model.
14. Hamburg, Bremen and Berlin are aggregated with their respective surrounding state (Hamburg with Schleswig-Holstein).
15. See Arbeitskreis 'Erwerbstätigenrechnung des Bundes und der Länder'.
16. See Wermter and Cramer (1988).
17. Which is actually not so surprising, since social security data are used for the estimation of total regional employment.

18. Presently, the net amount of public transfer (including social security) is still about €83 billion p.a. All Eastern areas belong to the Objective-1-category of European Structural Funds.
19. See, for example, Lutz et al. (2002) or Fuchs et al. (1998).
20. Interestingly, Lutz et al. (2002) project a much smaller share loss for Eastern Germany than this forecast (see Table 2 in their publication). Apart from the different forecast approaches, a possible cause might be that they project an overall employment increase for Berlin of 4.5 per cent and a share increase of 3.4 per cent. On the basis of the analysis used here, it is plausible to exclude this development (for Berlin).
21. Lately, for example, Geppert and Gornig (2003).
22. The estimated share for 2001 was calculated by a linear interpolation between the base year 1997 and the forecast for 2004.
23. See, for example, Weidmann (2002, p. 744).
24. The estimated share for 2001 was calculated by a linear interpolation between the base year 1994 and the forecast for 2004.
25. $\text{MAPE} = \frac{1}{n}\sum_{i=1}^{n}\hat{e}_i$ with $\hat{e} = (\hat{r} - r)/r$.

REFERENCES

Arbeitskreis 'Erwerbstätigenrechnung des Bundes und der Länder', '20 Jahre Arbeitskreis Erwerbstätigenrechnung des Bundes und der Länder - Porträt, Arbeitsweise, Datenangebot, Wiesbaden 2004.

Akaike, H. (1978): On the Likelihood of a Time Series Model. In: The Statistician, **27**, 217-235

Andres, P. and M. Spiwoks (1999), 'Prognosequalitätsmatrix', *Jahrbücher für Nationalökonomie und Statistik*, **219** (5–6), 513–42.

Bade, F.-J. (1986), 'The de-industrialisation of the Federal Republic of Germany and its spatial implications', in P. Nijkamp (ed.), *Technological Change, Employment and Spatial Dynamics*, Berlin: Springer-Verlag, pp. 196–220

Bade, F.-J. (1991), 'Regionale Beschäftigungsprognose 1995', *Forschungsberichte zur Raumentwicklung*, **21**.

Bade, F.-J. (1994), 'Die beschäftigungsentwicklung bis zum jahr 2000 in den regionen der Bundesrepublik Deutschland – Prognose 1992–2000 und ex-post-kontrolle der prognose 1987–1992', *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung*, **2**, 137–51.

Bade, F.-J. (1996), 'Prognose der regionalen beschäftigungsentwicklung 2002 – Fortschreibung und ex-post-kontrolle', *Informationen zur Raumentwicklung*, **9**, 571–96.

Bade, F.-J. (1999), 'Regionale entwicklung der erwerbstätigkeit 1997 bis 2004', *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung*, **4**, 603–17.

Blanchard, O.J. and L.F. Katz (1992), 'Regional evolutions', *Brookings Papers on Economic Activity*, **1**, 1–75.

Box, G.E.P. and G.M. Jenkins (1976), *Time Series Analysis: Forecasting and Control*, San Francisco: Prentice Hall.

Blien, U. and A. Tassinopoulos (2001), 'Forecasting regional employment with the ENTROP method, *Regional Studies*, **35** (2), 113–24.

Fuchs, J., P. Schnur, U. Walwei and G. Zika (1998), 'Arbeitsmarktperspektiven bis 2010 - Trübe aussichten signalisieren hohen handlungsbedarf. Erste modellrechnungen mit schwerpunkt Ostdeutschland', *IAB-Werkstattbericht*, **12**.

Geppert, K. and M. Gornig (2003), 'Die renaissance der großen städte - und die chancen Berlins', *DIW Wochenbericht*, **26** (3), 1–6.

Granger, C.W.J. and P. Newbold (1986), *Forecasting Economic Time Series*, San Diego: Academic Press.

Grömling, M. (2002), 'Konjunkturprognosen - Methoden, risiken und treffsicherheiten' *iw-Trends*, **2**, 1–17.

Heckman, J.J. (1997), 'The value of quantitative evidence on the effect of the past on the present', *The American Economic Review*, **87** (2), 404–8.

Hinze, J. (1996), 'Konjunkturprognosen unter veränderten rahmenbedingungen. Auswirkungen der deutschen und europäischen einigung', *Hamburger Jahrbuch für Wirtschafts- und Gesellschaftspolitik*, **41**, 59–64.

Hohls, R. and H. Kaelble (eds) (1989), *Die Erwerbsstruktur im Deutschen Reich und in der Bundesrepublik 1895 – 1970*, St. Katharinen, Germany: Quellen und Forschungen zur historischen Statistik von Deutschland.

Jäger, U. (1995), *Regionale Beschäftigungsprognose. Eine empirische Anwendung von Transferfunktionen zur Prognose der kurzfristigen Beschäftigungsentwicklung in Nordrhein-Westfalen auf Kreisebene*, Köln, Germany: Reihe Quantitative Ökonomie.

Kampmann, R. (1988), 'Möglichkeiten und grenzen regionaler multiplikatoranalysen', *RWI-Mitteilungen*, **39**, 193–213.

Keil, S.R. (1997), 'Regional trends in British manufacturing employment: tests for stationarity and co-integration, 1952-1989', *Regional Studies*, **31** (1), 13–24.

Lutz, C., B. Meyer, P. Schnur and G. Zika (2002), 'Projektion des arbeitskräftebedarfs bis 2015.' *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung*, **3**, 305–26.

Mertens, D. (1980), 'Von der beharrlichkeit struktureller trends. Reflexionen zur prognostik des vergangenen jahrzehnts', *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung*, **3**, 319–21.

Molle, W. (1997), 'The regional economic structure of the European Union: an analysis of long-term developments', *Zeitschrift für Wirtschafts- und Sozialwissenschaften*, **5**, 13–32.

Nierhaus, W. and J.-E. Sturm (2003), 'Methoden der konjunkturprognose.' *ifo Schnelldienst*, **4**, 7–23.

Pehkonen, J. and H. Tervo (1998), 'Persistence and turnover in regional unemployment disparities', *Regional Studies*, **32** (5), 445–58.

Perroux, F. (1950), 'Economic spaces: theory and applications', *Quarterly Journal of Economics*, **64**, 89–104.

Salin, E. (1928), 'Standortverschiebungen der deutschen Wirtschaft', in B. Harms (ed.), *Strukturwandlungen der Deutschen Volkswirtschaft*, Berlin: Verlag von Reimar Hobbing, pp. 76–106.

Schilling-Kaletsch, I. (1976), *Wachstumspole und Wachstumszentren - Untersuchung zu einer Theorie Sektoral und Regional Polarisierter Entwicklung*, Hamburg:

Wirtschaftsgeographische Abteilung des Instituts für Geographie der Universität Hamburg.

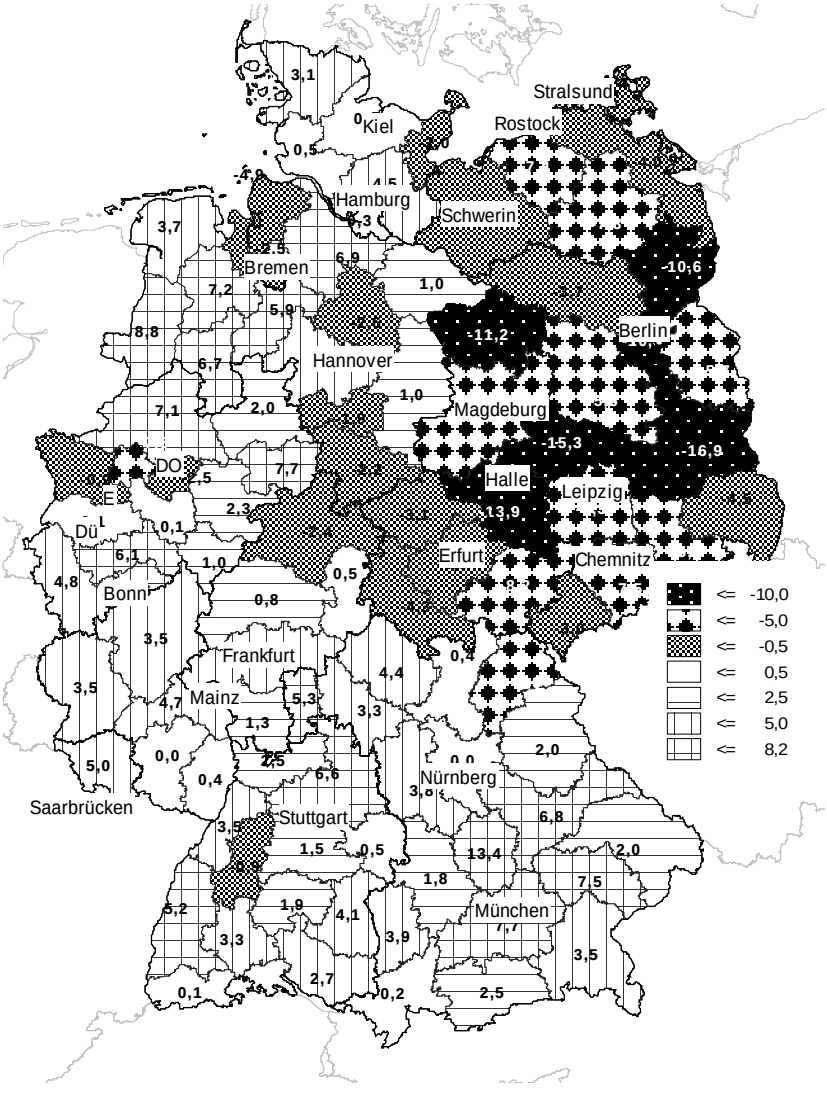
Tietzel, M. (1989), 'Prognoselogik oder: warum prognostiker irren dürfen', *Jahrbücher für Nationalökonomie und Statistik*, **206** (6), 546–62.

Tsionas, E.G. (2000), 'Real convergence in Europe. How robust are econometric inferences?', *Applied Economics*, **32** (11), 1475–82.

Weidmann, J. (2002), 'Hat sich die prognosetreffsicherheit des sachverständigenrates systematisch verändert?', *Wirtschaftsdienst*, **12**, 741–7.

Wermter, W. and U. Cramer (1988): 'Wie hoch war der beschäftigtenanstieg seit 1983?', *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung*, **4**, 468–82.

ANNEX 12.A



Notes: Regional Change Rate 1994 to 2001, related to the Federal Average, in percentage.

Figure 12.A1 Employment change 1994 to 2001: planning regions

Time Series Forecasting of Regional Employment

Franz-Josef Bade
Department of Regional Economics
franz-josef.bade@uni-dortmund.de

Workshop
"Forecasting the Development of Employment:
Methodologies and Systems"
Frankfurt a. M., 2.7.2007

Overview

I. Time Series Analysis

II. Forecasting Regional Employment
- Univariate Time Series
- Enlargements

III. Results, Ex-post-Controlling

IV. Conclusions

"Prognosen sind schwierig,
besonders dann, wenn sie die Zukunft betreffen."
(Karl Valentin?)

"Prediction is very difficult,
especially if it's about the future"

(Nils Bohr?)

"Philosophy"

3

**"I have seen the future and
it is very much like the present, only longer."**
Kehlog Albran, *The Profit*

- Causal Models ⇔ Time Series Model
  $Y = f(X_1, \ldots, X_n) \Leftrightarrow Y = f(t)$
- present observation (event/effect)
  depends on observations realized in previous periods
  ➡ "historical perspective"
- Objective:
  To identify **stable behavior patterns** in the past
- long periods of observation are **required**:
  the more complex the pattern, the longer the period

I: Theoretical Model of Time Series Analysis

4

ARIMA Model
Auto**R**egressive **I**ntegrated **M**oving **A**verage

$$W_t = \mu + \frac{\theta(B)}{\phi(B)}\varepsilon_t$$

where

W_t is the response series of $\boldsymbol{X}_t$ or
a difference of the response series $W_t=(1-B)^d X_t$

μ is the mean term,

(1) B is the backshift operator; that is, $B\,X_t=X_{t-1}$

(2) $\theta(B)$ is the moving-average operator, represented as a polynomial in the back shift operator
$\theta(B) = 1 - \theta_1(B) - \ldots - \theta_P(B)^P$

(3) $\phi(B)$ is the autoregressive operator, represented as a polynomial in the back shift operator:
$\phi(B) = 1 - \phi_1(B) - \ldots - \phi_P(B)^P$

ε_t is the independent disturbance, the random error.

I: Integration of Two Stochastical Processes

5

(3) ➢ **Autoregressive Prozesse (AR)**

the random variable X_t is a function of
- the **previous random variables X_{t-1}** and
- a stochastically independent error term

$$X_t = c + \varphi X_{t-1} + \ldots + \varepsilon_t$$

(2) ➢ **Movering Average (MA)**

the random variable X_t is a function of
- **its mean value μ** and
- some stochastically independent disturbances, random errors, in and before t

$$X_t = \mu + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} \ldots$$

Bade 2.7.2007

I: Autoregression in ARIMA-Modellen

6

Die Autoregression ist die
gemittelte Summe der vorausgehenden Daten
und muss deshalb anders behandelt werden als eine Standardregression, weil

- ➢ die in Beziehung stehenden Daten die Unabhängigkeit des Fehlers beeinflussen können
- ➢ und die Anzahl der einfließenden vorhergehenden Daten explizit bestimmt werden muss.

⇨ **Stationarität**

Bade 2.7.2007

I:

Stationarität von Zeitreihen

7

Eine Zeitreihe ist **stationär**,
wenn wesentliche statistische Eigenschaften wie
Mittelwert, Varianz oder Autokorrelation
konstant über die Zeit sind.

- Stabilität in der Vergangenheit erleichtert Übertragung in die Zukunft
  "I have seen the future, and it is very much like the present…"
- Nicht-Stationarität verzerrt Schätzungen

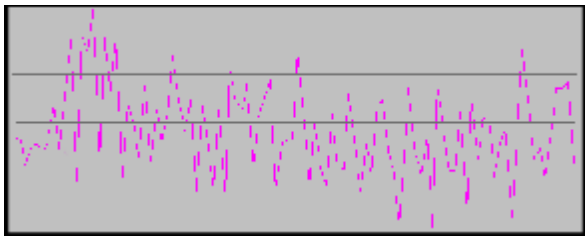
Bade 2.7.2007

I:

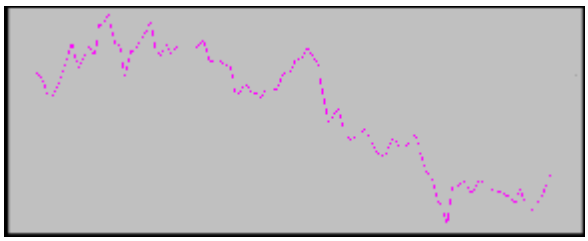
Beispiele für Stationarität

8

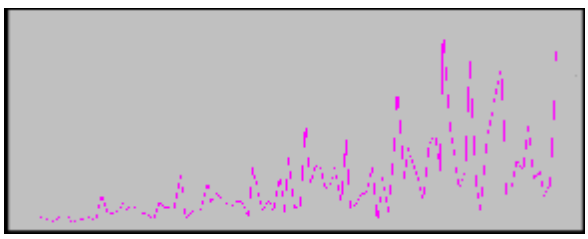
Stationär
- im Mittelwert und
- in der Varianz



Stationär in der Varianz, aber
nicht stationär im Mittelwert



Nicht stationär

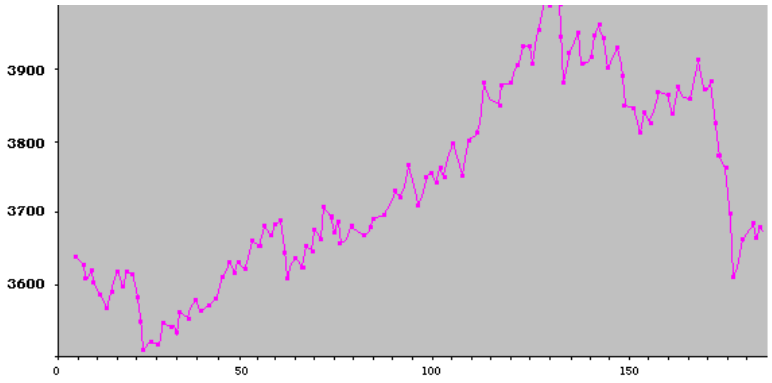


Bade 2.7.2007

I: Beseitigung der Stationarität durch Differenz-Bildung

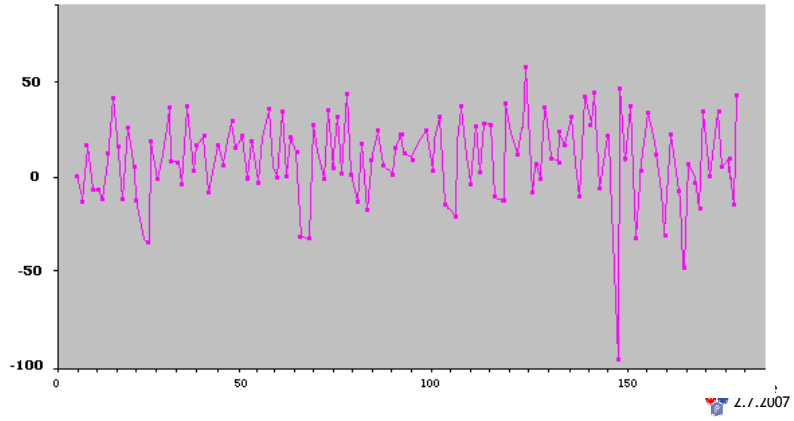
9

Nicht-stationäre Zeitreihe (Dow-Jones-Index)



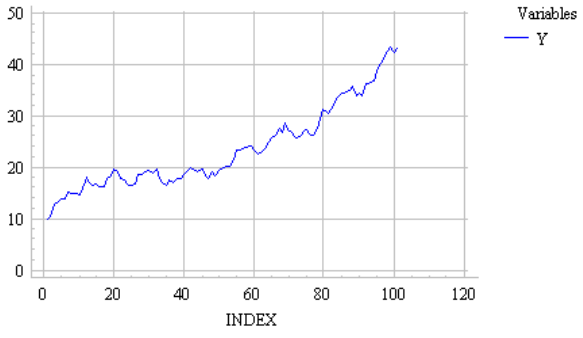
Stationär durch Differenz-Bildung

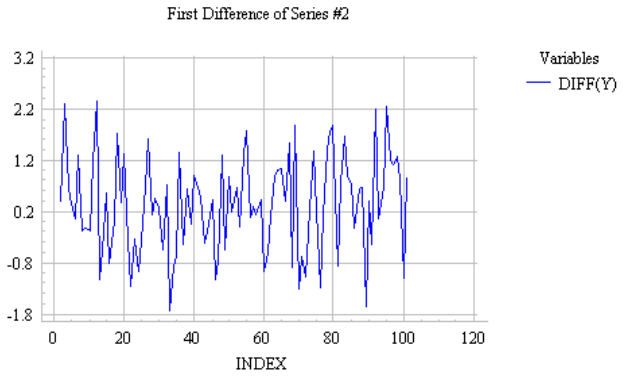
$$X_t' = X_t - X_{t-1}$$

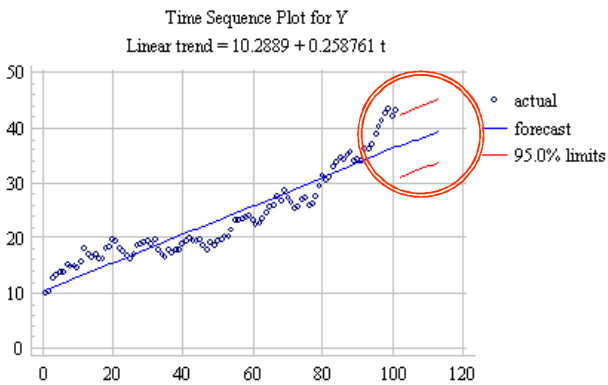


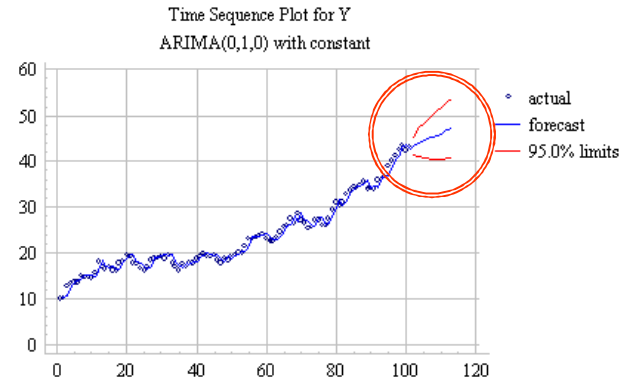
I: Estimation bias of non-stationary time series

10









Bade 2.7.2007

I:

Structure of ARIMA-Model

11

Ein ARIMA-Modell wird bestimmt durch

- **den Grad der Autoregressionsgleichung** (Autoregressiver Prozess, AR)

$$X_t = c + \varphi X_{t-1} + \ldots + \varepsilon_t$$

- **den Grad des „gleitenden Mittels“** (Movering Average, MA)

$$X_t = \mu + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} \ldots$$

- **den Grad der Differenzierung**

$$X_t' = X_t - X_{t-1}$$

⇨ **ARIMA (*p*, *d*, *q*)**

p order of the autoregressive process
d differencing order
q order of the moving-average process

Bade 2.7.2007

I:

Estimation of ARIMA-Models

12

BOX-JENKINS Methode

- **Identification**
  - Modellprüfung
  - Stationarität durch Bildung von Differenzen u. a. Transformationen
- **Estimation**
  - Schätzung der Modellparameter
  - Evaluierung
- **Forecast**

Bade 2.7.2007

Overview

13

I. Time Series Analysis

II. Forecasting Regional Employment
- Univariate Time Series
- Enlargements

III. Results, Ex-post-Controlling

IV. Conclusions

II: Forecasting Regional Employment

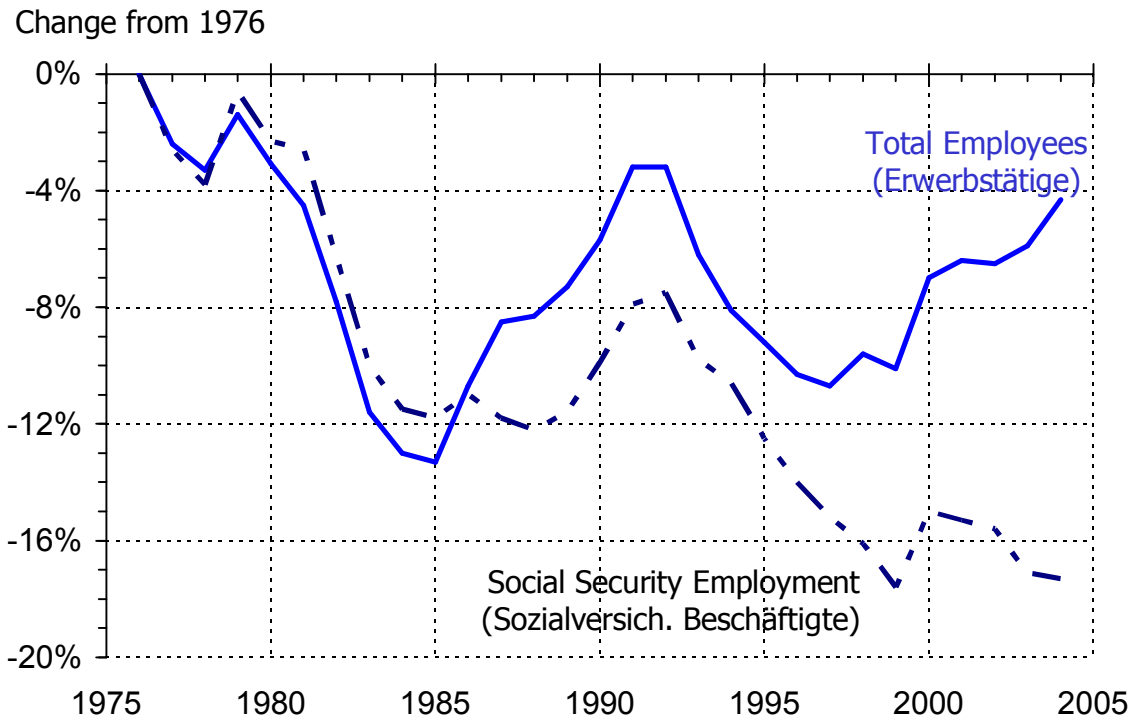
14

- Univariate Estimations
- Enlargements:
  - Analysis of regional "growth poles"
  - Consistency checks and re-estimation of regional forecasts

II.1:

Change of Employment
Dortmund

15



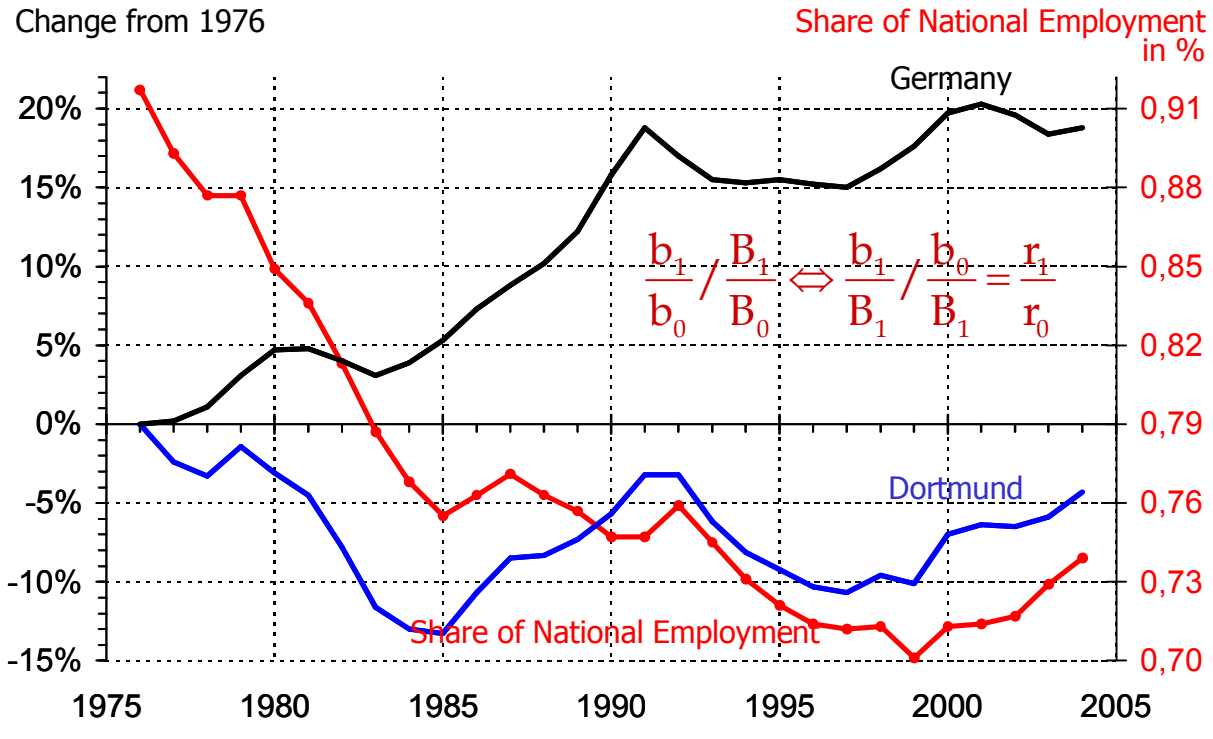
Quelle: Erwerbstätigenrechnung der Länder; Bundesanstalt für Arbeit; eigene Schätzungen

Bade 2.7.2007

II.1:

Relative Change of Employment

16



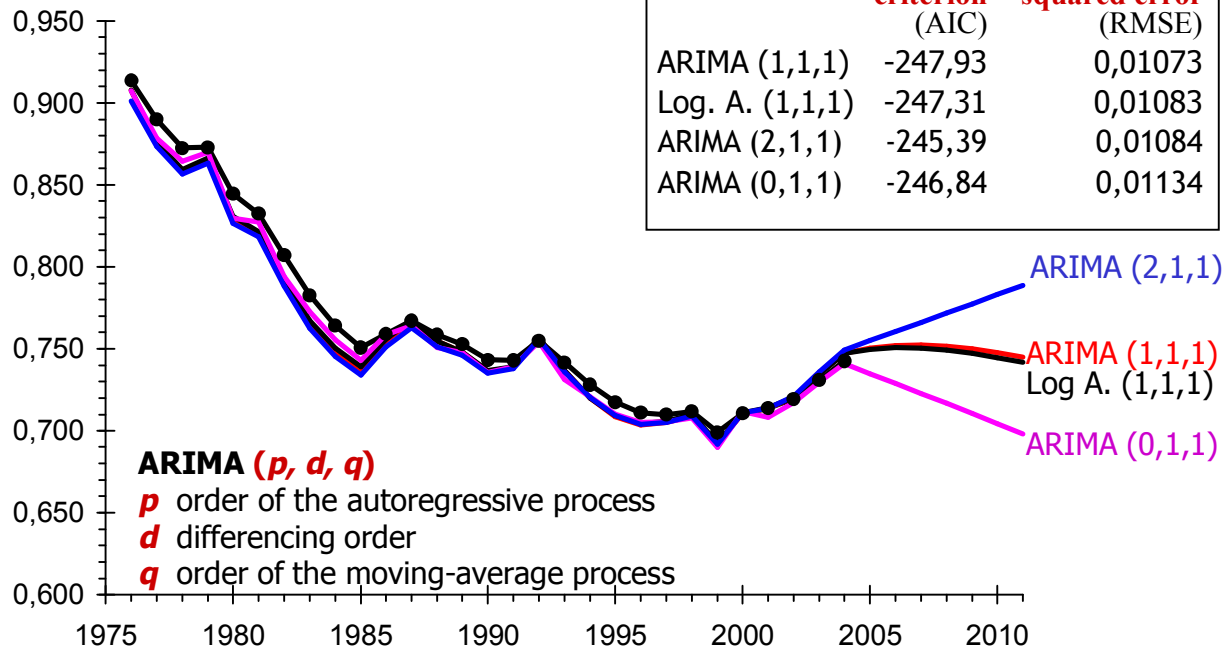
Quelle: Erwerbstätigenrechnung der Länder; Bundesanstalt für Arbeit;
eigene Schätzungen

Bade 2.7.2007

II.1: Univariate Analysis and Forecasting of Regional Shares

17

Dortmund's share of national employment in %



	Akaike's information criterion (AIC)	Root mean squared error (RMSE)
ARIMA (1,1,1)	-247,93	0,01073
Log. A. (1,1,1)	-247,31	0,01083
ARIMA (2,1,1)	-245,39	0,01084
ARIMA (0,1,1)	-246,84	0,01134

Quelle: Erwerbstätigenrechnung der Länder; eigene Schätzungen

Bade 2.7.2007

18

"Fitting ARIMA models is as much an art as it is a science."

SAS Help and Documentation, SAS 9.13, SAS Institute

Bade 2.7.2007

II.2: Forecasting Regional Employment

19

- Univariate Estimations
- **Enlargements:**
  - **Analysis of regional "growth poles"**
    - Identification of "growth poles"
    - Forecasting their future development
    - Integration into the forecast of total regional employment
  - Consistency checks and re-estimation of regional forecasts

Bade 2.7.2007

II.2.1: Sektorale Einflüsse auf die regionale Wirtschaft

20

Wirtschaftliches Ergebnis einer einzelnen Branche
(Umsatz , Einkommen, Beschäftigung)

direkte Einflüsse
eigene Beiträge, die in den Betrieben der Branche selbst stattfinden

indirekte Einflüsse

Nachfrageeffekte
„Rückwärtskopplung"
- Zwischennachfrage (Vorleistungen)
- Endnachfrage (Investitionen, Konsum)

Angebotseffekte
„Vorwärtskopplung"
- Kostensenkung
- Produktivitäts-steigerung (effizientere oder höherwertige Produktion)

Gesamtwirtschaft der Region
(Umsatz, Einkommen, Beschäftigung)

Bade 2.7.2007

II.2.1: Wachstum-Pol-Ansatz

21

Ein Wachstumspol prägt das wirtschaftliche Wachstum seiner Region

- weil er **autonom** und damit zu einem Primärimpuls imstande ist,
- weil er **motorisch** ist, d.h. geschäftlich (und vermutlich auch außergeschäftlich) in die regionale Wirtschaft eingebunden ist,
- weil er eine (gewisse Mindest-) **Größe** besitzt und der Primärimpuls spürbar Einfluss auf die regionale Gesamtentwicklung ausübt.

Verflechtung		
groß „motorisch"	komple-mentär	**Wachstums-pol**
gering	banal	Enklave
	gering	groß **Export**

Bade 2.7.2007

II.2.1: Identification of Regional "Growth Poles"

22

Characteristics

- **Autonomy:**
  the group must be **independent from the regional demand** and be able to give a **primary impulse**
- **Impact:**
  the group must have a certain **economic importance** to give the impulse an perceptible **impact** on regional economy
- **Linkages:**
  the group must be **linked within** the regional economy to generate economic effects by the primary impulse (forward and backward)

⇨ **Endogenous instead of exogenous analysis**

Bade 2.7.2007

Size and Locational Importance of Selected Industries of Dortmund

23

Name	Soc. Empl.	Share of Total Empl.	Location Coefficient
Versicherungsgewerbe	6.200	3,1%	291,8%
Datenverarbeitung und Datenbanken	5.371	2,7%	238,2%
Hochschulen	3.271	1,7%	225,4%
Technische Ingenieurbüros	3.761	1,9%	179,7%
Eisenbahnen	1.868	0,9%	176,9%
Energie, Wasser	3.444	1,7%	173,7%
Landverkehr	4.953	2,5%	169,2%
Nachrichtenübermittlung	3.346	1,7%	163,0%
Übrige Dienstleistungen für Unternehmen	11.017	5,6%	155,5%

Bade 2.7.2007

II.2.1: Identification of Regional "Growth Poles"

24

- **Linkages ⇒**

  ARIMAX Dynamic Regression

  Transfer Function Model

$$W_t = \mu + \frac{\theta(B)}{\phi(B)}\alpha_t + \sum_i \omega_i(B) B^{ki} X_{i,t}$$

where

X_i is the ith input series (or a difference)

k_i is the pure time delay for the effect of the ith input series

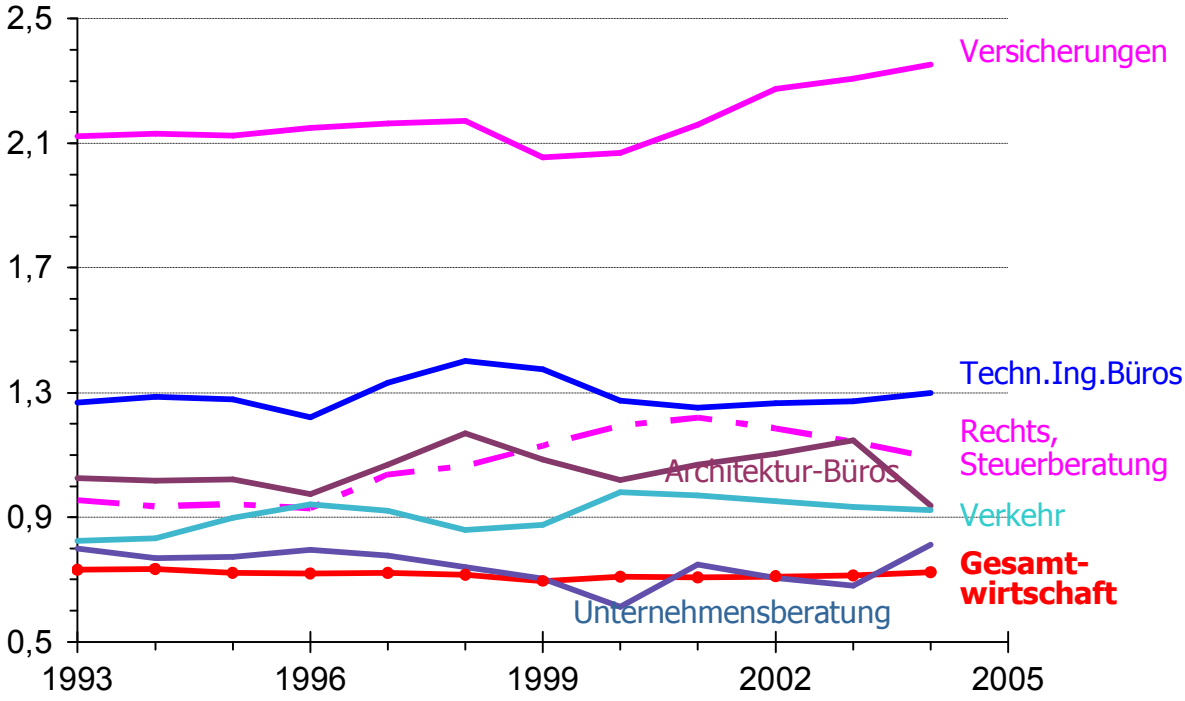
$\omega_i(B)$ is the (numerator) polynomial of the transfer function for the ith **input series**

Bade 2.7.2007

II.2.2: Employment Development of Selected Groups of Dortmund

25

Share of national employment of the resp. group in %



Quelle: Beschäftigtenstatistik; eigene Schätzungen

Bade 2.7.2007

II.2.2: ARIMAX Model
Transfer Function Model

26

$$W_t = \mu + \frac{\theta(B)}{\phi(B)}\alpha_t + \sum_i \omega_i(B)\, B^{ki} X_{i,t}$$

where

X_i is the i[th] input series (or a difference)

k_i is the pure time delay for the effect of the i[th] input series

$\omega_i(B)$ is the (numerator) polynomial of the transfer function for the i[th] **input series**

μ is the mean term,

B is the backshift operator; that is, $B\,X_t = X_{t-1}$

$\phi(B)$ is the autoregressive operator, represented as a polynomial in the back shift operator:
$\phi(B) = 1 - \phi_1(B) - \ldots - \phi_P(B)^P$

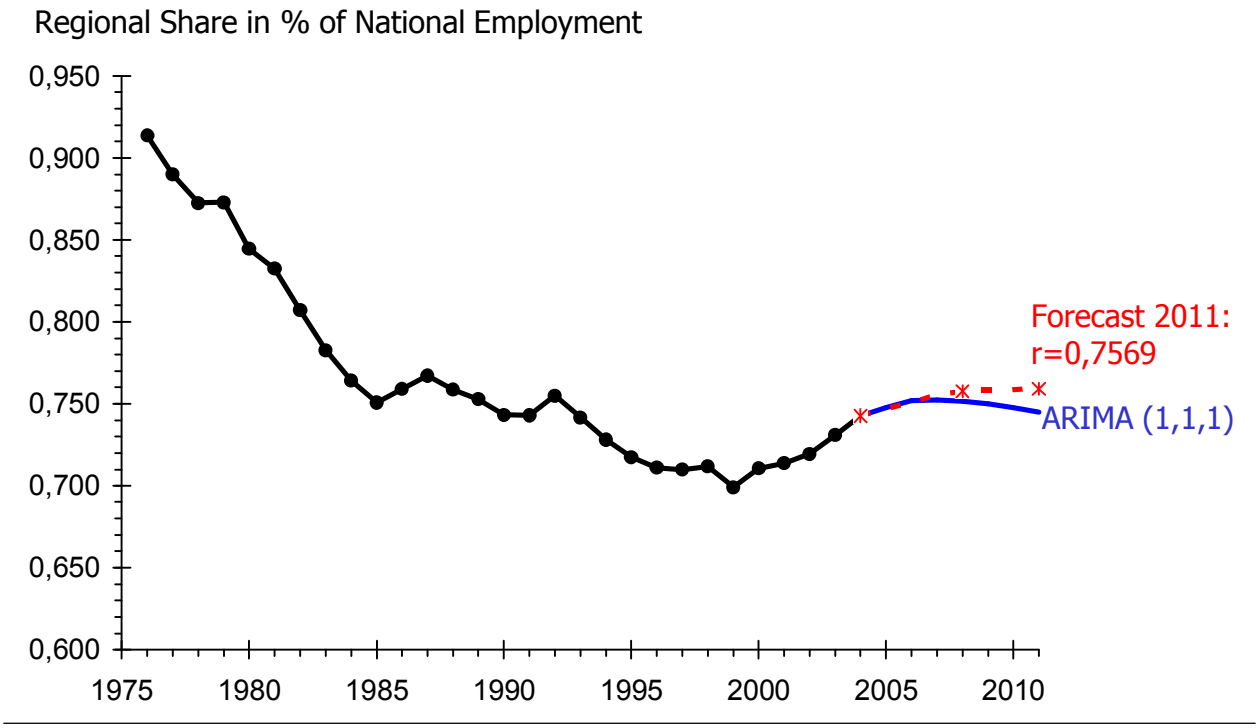
$\theta(B)$ is the moving-average operator, represented as a polynomial in the back shift operator
$\theta(B) = 1 - \theta_1(B) - \ldots - \theta_P(B)^P$

α_t is the independent disturbance, the random error.

Bade 2.7.2007

II.2.3: Final Forecast of Regional Share
Dortmund

27



Source: Statistical Offices; own estimations

Bade 2.7.2007

II.2: Forecasting Regional Employment

28

- Univariate Estimations
- Enlargements:
  - Analysis of regional "growth poles"
  - **Consistency checks and re-estimation of regional forecasts**

Bade 2.7.2007

II.3:

Consistency Check(s)

Bottom up Estimations

29

Estimation Level

4. Germany

Sum of shares of all Länder

= ! 100%

Nordrhein-Westfalen

3. Bundesland

=

Share of Nordrhein-Westfalen

= !

Sum of shares of all planning regions **within** NRW

2. Planning Region

Share of Planning Region Dortmund

= !

Sum of shares of Dortmund, Hamm, Unna

1. District

Bade 2.7.2007

III:

Overview

30

I. Time Series Analysis

II. Forecasting Regional Employment
- Univariate Time Series
- Enlargements

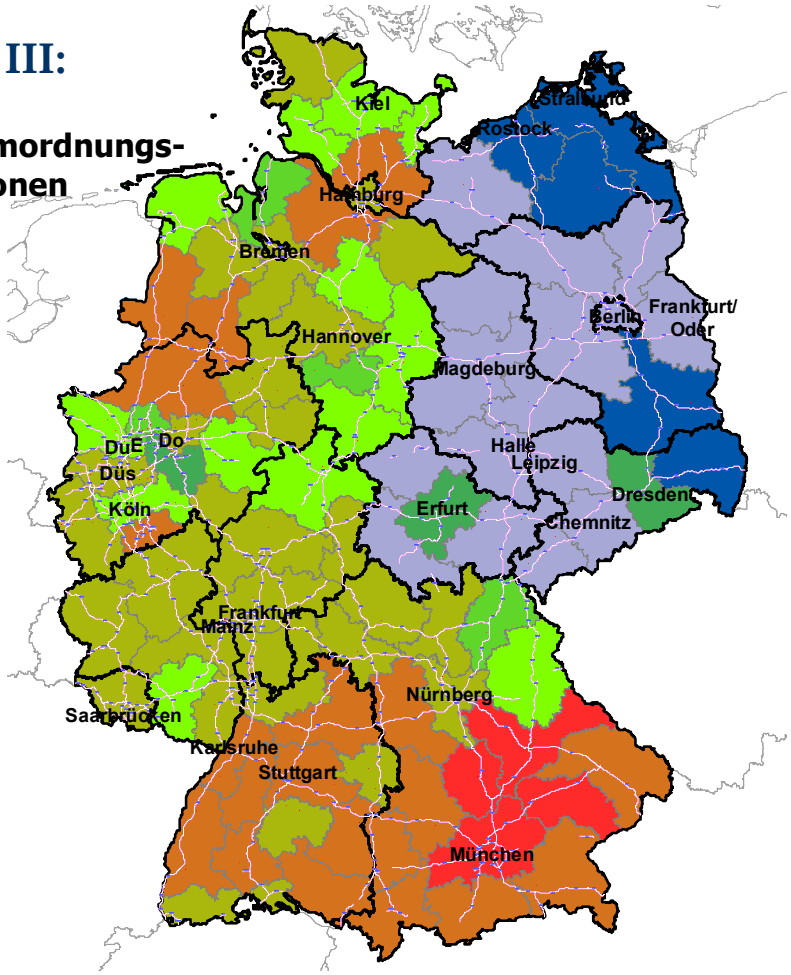
III. Results, Ex-post-Controlling

IV. Conclusions

Bade 2.7.2007

III:

Raumordnungs-regionen



Regionale Entwicklung der Erwerbstätigkeit 2004 - 2011 in %

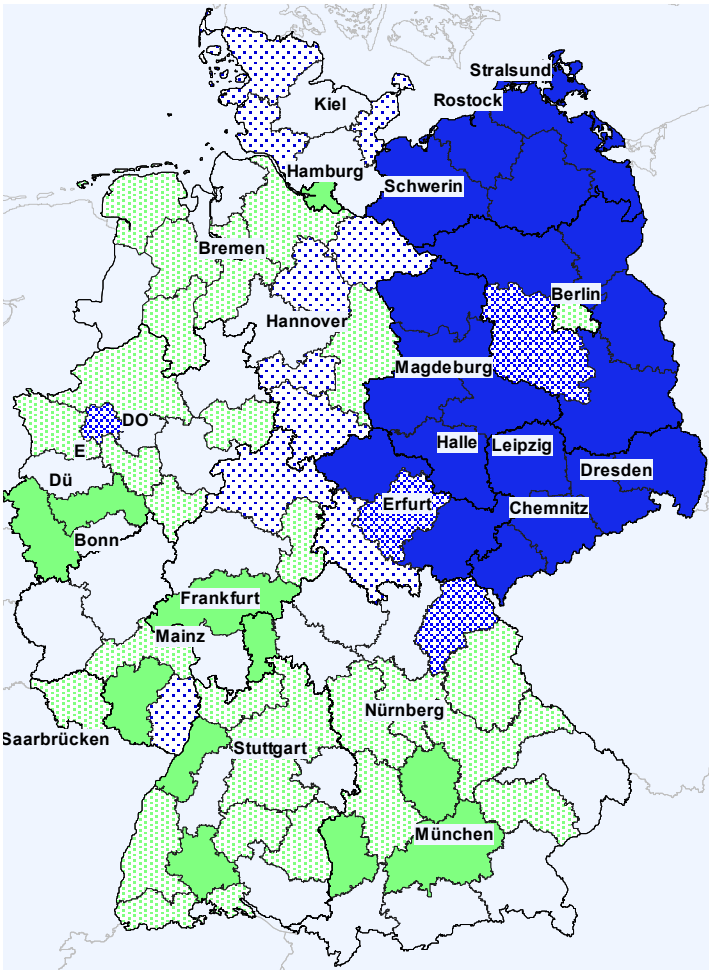
31

<=	-8,0
<=	-4,0
<=	-2,0
<=	-0,5
<=	0,5
<=	2,0
<=	4,0
<=	6,0

Veränderung im Vergleich zum Bundesdurchschnitt
=
Veränderung des Anteils an allen Erwerbstätigen

Bade 2.7.2007

III:



Accuracy of Forecasts 1997-2004

32

Prognostizierte Veränderung 1997-2004 in % der tatsächlichen Entwicklung
=
Prognostizierter Anteil 2004 in % des tatsächlichen Anteils an allen Erwerbstätigen

<=	-1,5
<=	-0,5
<=	0,5
<=	1,5
<=	3,0
<=	8,4

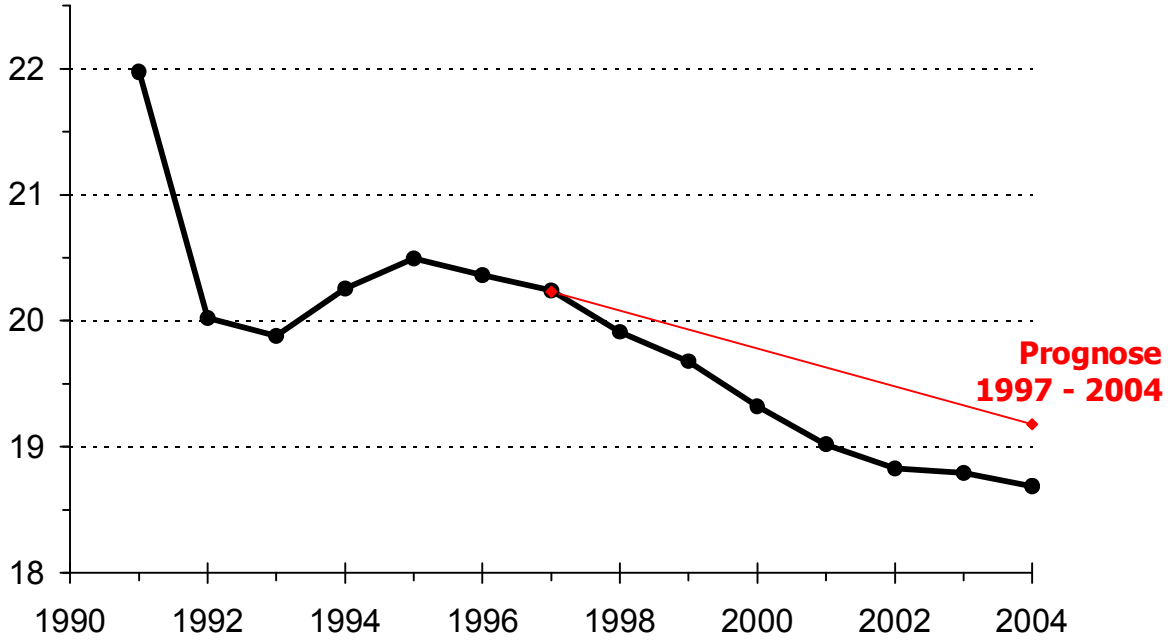
Bade 2.7.2007

III:

Ostdeutschland
Prognose 1997 bis 2004

33

Anteil in % an allen Erwerbstätigen im Bundesgebiet



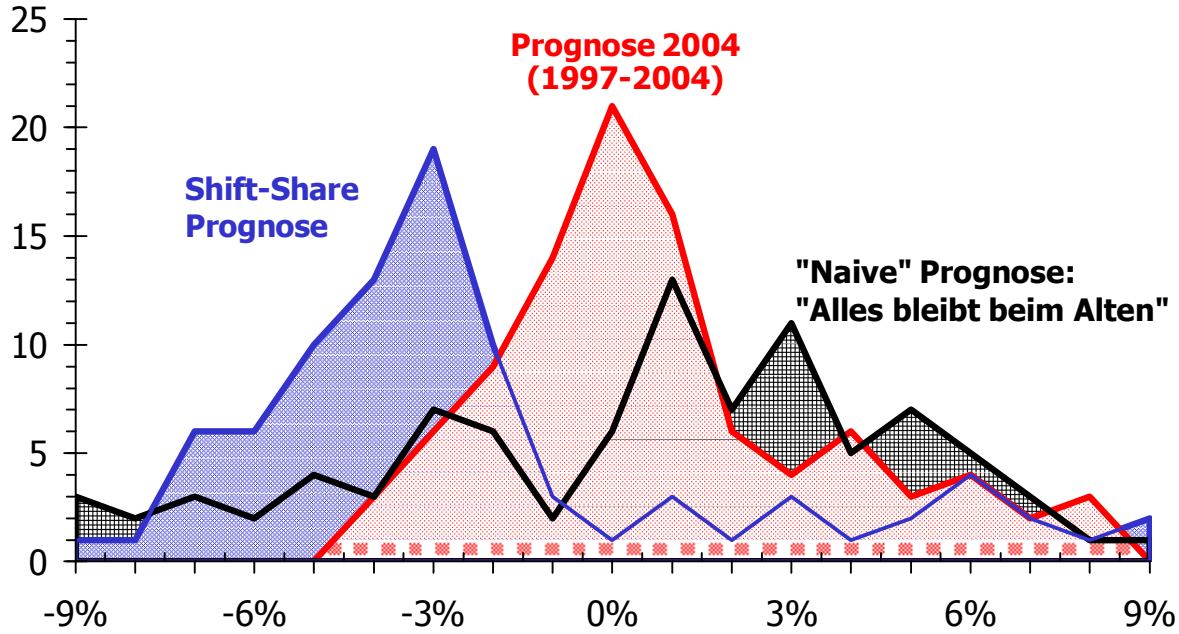
Quelle: Bade (1999); Erwerbstätigenrechnung Länder; eigene Schätzungen

Bade 2.7.2007

34

Vergleich Prognosefehler

Zahl der Raumordnungsregionen mit einem Prognosefehler von ...% bis zu ...% (1%-Klassen)



Prognosefehler: *Prognostizierte Veränderung in % der tatsächlichen Veränderung*

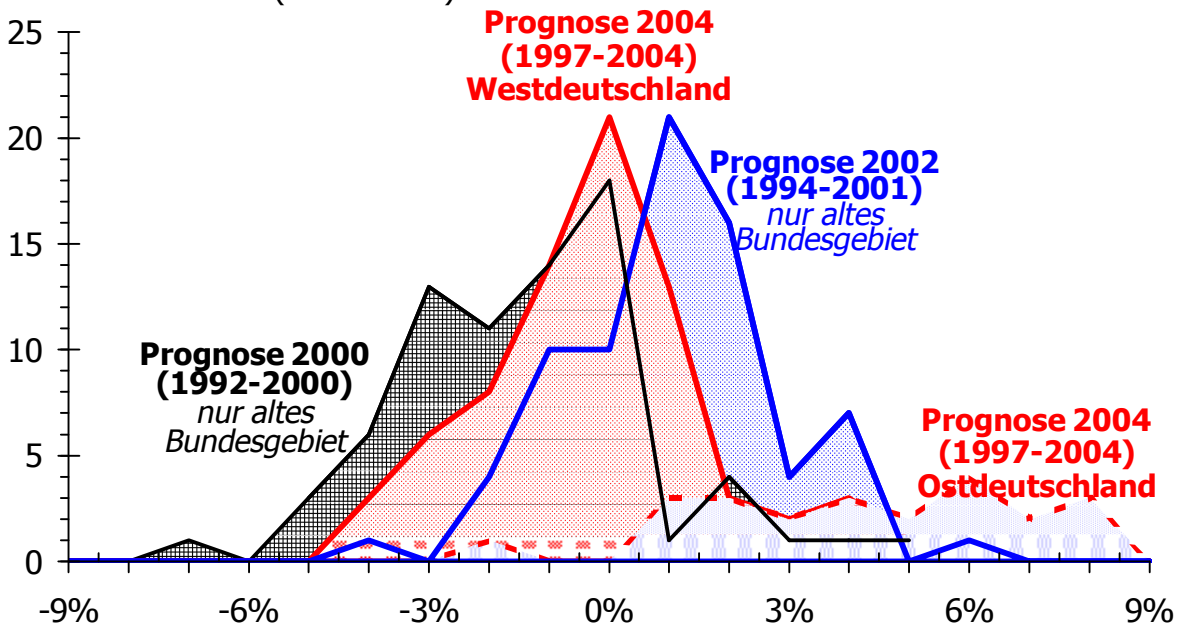
Quelle: Bade (1999); Erwerbstätigenrechnung der Länder; eigene Schätzungen

Bade 2.7.2007

Häufigkeitsverteilung der Prognosefehler

35

Zahl der Raumordnungsregionen mit einem Prognosefehler von ...% bis zu ...% (1%-Klassen)



Prognosefehler: *Prognostizierte Veränderung in % der tatsächlichen Veränderung*

Quelle: Bade (1994); Bade (1996); Bade (1999); Erwerbstätigenrechnung der Länder; eigene Schätzungen

Bade 2.7.2007

Regional Employment Forecasts. How Important are Spatial Dependencies?

Dr. Rüdiger Wapler

Abstract

The labour-market policy-mix in Germany is increasingly being decided on a regional level. This requires additional knowledge about the regional development which (disaggregated) national forecasts cannot provide. Therefore, we separately forecast employment for the 176 German labour- market districts on a monthly basis. We first compare the prediction accuracy of standard time-series methods: autoregressive integrated moving averages (ARIMA), exponentially weighted moving averages (EWMA) and the structural-components approach (SC) in these small spatial units. Second, we augment the SC model by including autoregressive elements (SCAR) in order to incorporate the influence of former periods of the dependent variable on its current value. Due to the importance of spatial interdependencies in small labour-market units, we further augment the basic SC model by lagged values of neighbouring districts in a spatial dynamic panel (SCSAR). The prediction accuracies of the models are compared using the mean absolute percentage forecast error (MAPFE) for the simulated out-of-sample forecast for 2005. Our results show that the SCSAR is superior to the SCAR and basic SC model. ARIMA and EWMA models perform slightly better than SCSAR in many of the German labour-market districts. This reflects that these two moving-average models can better capture the trend reversal beginning in some regions at the end of 2004. All our models have a high forecast quality with an average MAPFE lower than 2.2 percent.

Regional Employment Forecasts. How Important are Spatial Dependencies?

Norbert Schanne (IAB Reg. Office)
Antje Weyh (IAB Saxony)
Dr. Rüdiger Wapler (IAB Baden-Württemberg)

- Forecasting the Development of Employment: Methodologies and Systems
- 02. July 2007

Motivation

- Short-term forecast of the number of (un)employed at the **labour-market district** level (*Arbeitsagentur*) and for the **federal states**
- Increased demand for information at a regionally disaggregated level

Stylised Facts

- Outcomes are influenced by global, national, regional and local factors
- Regions are to a high degree heterogeneous in their development over time (trend, season, trend reversal)
- Strong influence of past development on current development in a region
- No leading indicator variables available for all regions

Spatial Interdependencies

- Regional development is interdependent
- Regions can be “Leaders” or “Followers”
- The development of a leading region can be exploited as information about the future of its followers
- This can be accounted for by modelling spatial interdependencies

Forecast Methodology

- Separate coefficients for each region
- No clear functional relationship
  - Three standard time-series models (ARIMA, EWMA, SC)
  - Three extensions to the SC-model to include autoregressive and spatial factors
  - Pooling
- Inclusion of national and global influences

Standard Models

- ARIMA

$$\Delta^{12,1} y_{r,t} = \mu_{r,t} + \sum_{k=1}^{p} y_{r,t-k}\alpha_k + u_{r,t} \text{ with } u_{r,t} = \sum_{k=1}^{q} u_{r,t-k}\rho_k + \varepsilon_t$$

- EWMA (Seasonal Holt-Winters)

$$y_{r,t+\tau} = \widetilde{a}_{r,t} + \widetilde{b}_{r,t}\tau + \widetilde{s}_{r,t+\tau-L} + \upsilon_{r,t}$$

- SC

$$\Delta^{1} y_{r,t} = \mu_{r,t} + \gamma_{r,t} + \psi_{r,t} + \zeta_{r,t} \text{ with } \mu_{r,t} = f(t) + \nu_{r,t}; \nu_{r,t} \approx \left(0, \sigma^2_{\nu,r,t}\right)$$

$$\gamma_{r,t} = \sum_{j=1}^{[s/2]} \alpha_j \cos\lambda_j t + \delta_j \sin\lambda_j t \text{ and } \lambda_j = 2\pi j / s$$

Spatial Models

- SC with contiguity or distance

$$\Delta^1 \vec{y}_{r,t} = \vec{\mu}_{r,t} + \vec{\gamma}_{r,t} + \vec{\psi}_{r,t} + \vec{\xi}_{r,t} + \zeta_{r,t}$$

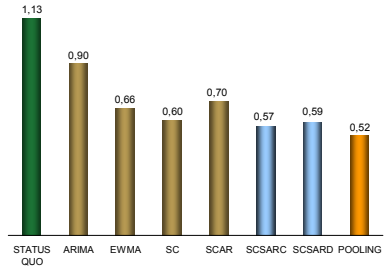
with $\xi_{i,t} = \sum_{\tau} \sum_{j=1}^{N} w_{ij} y_{j,(t-\tau)} \kappa_{i\tau}, \tau \in \{1,\ldots,13\}$

and $w_{ij} = 1$ (contiguity)

or $w_{ij} = \frac{e^{-d_{ij}}}{\sum_{j=1}^{N} e^{-d_{ij}}}$ (distance)

- Selection of components analogous to basic model
- Prais-Winsten with panel-corrected standard errors
- Two-step selection procedure:
  - (1) Test in which regions the spatial lag is significant and
  - (2) Check whether these significant lags improve the AICC

Forecast Performance – MAPFE



Conclusion

- Inclusion of spatial interdependencies improves the forecast performance
- All models perform well (in the short-run)
- Importance of pooling

Concept and Methodology of a Regional Medium Term Forecasting System

Claudia Knobel, Dirk Crass

Abstract

The need for regional forecasting is caused by an intensifying competition between regions. An important instrument to deal with this competition is adequate information of regional employment. Information of future developments of regional labour markets will be an adequate basis for regional actors to deal with the intensified competition.

Here starts the project. The objective of the project is the development of a forecasting system of employment which generates information for a region. The regional focus is the Rhine-Main Area with the two cities Frankfurt and Offenbach as well as the district Groß-Gerau. There are many interdependencies within this metropolitan region, especially with regard to commuters who work in one area and live in the other. The aim of the project is to develop and establish a forecasting system which shows labour market mismatches or matches in a metropolitan region.

To this end we will develop both a short term forecasting system (1-2 years) for large-scale enterprises as well as a medium term forecasting system (5 years) of the development of employment and occupation and the construction of a internet based regional panel of experts.

The short term component is a forecasting system on the enterprise level which aim is the early identification of structural changes in and of large scale enterprises. The starting point is an existing short term forecasting system for banks in Rhine-Main region. This instrument will first be refined and evaluated in other banks in the region. We will than transfer the system to large scale enterprises in other sectors. Moreover the quantitative indicators will be combined with qualitative indicators. The short term forecasting tool consists of hard and soft indicators. Information about the hard indicators (10 to 12) will be extracted from public company information, such as financial statements, risk statements and accompanying notes. The source of the soft indicators (8 to 10) will be expert questionnaires which contain questions about the industry, the economic situation and the business environment.

The medium term forecasting system shows the development of employment on the supply side as well as on the demand side. Here the employees will be differentiated according to occupational groups and, in addition, according to type of qualification. The results of the development of the supply side and the demand side will be contrasted so that mismatches become manifest. The supply side forecasting shows the development of the supply of the 10 biggest occupations in each city/district. The output data comprise population development, employed (subject to social insurance contribution), unemployed, graduates and trainees who completed their vocational training. The demand side forecasting shows the development of the demand for the same 10 biggest occupations in the same cities and district. We will be using time series data of employees who are subject to social insurance contribution. Different statistical methods will be combined and enhanced by expert opinions. The opinions of the experts will be collected by means of an internet supported panel.

The results are valuable both for labour market actors and for those active in labour market policy. The comparison of supply and demand of future employment makes manifest mismatches and potential problems on the future labour market. This information is crucial also for small and medium enterprises and labour market actors to create efficient vocational training policies.

Forecasting the Development of Employment: Methodologies and Systems – An International Workshop
2nd July 2007 in Frankfurt am Main

Concept and Methodology of a Regional Medium Term Forecasting System

Claudia Knobel, Dirk Crass

Contents

I. Concept of the Project

1. Objective of the Project

Development and establishment of a forecasting system of employment and labour market mismatches in a metropolitan region

Instruments:

- Short term forecasting system for large-scale enterprises
- Medium term forecasting system of the development of employment and occupational group
- Constitution of a internet-based regional panel of experts

2. Target Groups and Consequences

Target groups: labour market actors
actors in labour market policy

Comparison of supply and demand of future employment
Identification of mismatches and potential problems on the future labour market

Vocational training and advanced vocational training

Personnel policy of small and medium enterprises

3. Project Partners / Financiers

4. Short Term Forecasting System on the Enterprise Level

Early identification of ongoing restructuring in and of individual large scale enterprises

Starting point:

Existing short-term forecasting system for banks of the Rhine-Main region

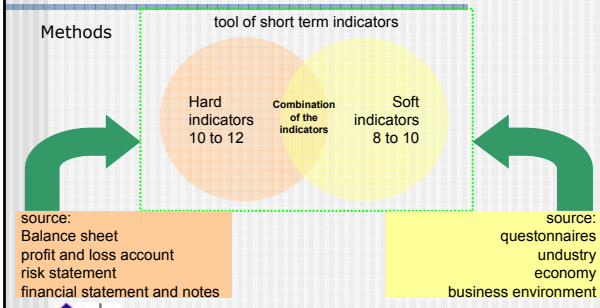
Expansion:

Further refinement of this instrument and evaluation in other banks in the Rhine-Main region

Transfer to large scale enterprises in other sectors

Combination of quantitative with qualitative Indicators

4. Short Term Forecasting System on the Enterprise Level



4. Short Term Forecasting System on the Enterprise Level

Example of a bank:

Kennzahlen in Mio €	2006	Δ Vorjahr	2005	Δ Vorjahr	2004	Ampel
Zinsüberschuss	4.281	34%	3.202	0%	3.188	
Provisionsüberschuss	2.861	18%	2.415	7%	2.250	
Handelsergebnis	1.177	72%	685	27%	539	
Operative Erträge	7.076	23%	5.746	16%	4.950	
Risikovorsorge im Kreditgeschäft	-878	69%	-521	-38%	-836	
Verwaltungsaufwand	5.457	16%	4.699	2%	4.593	
Operatives Ergebnis	2.375	38%	1.720	108%	828	
Periodenergebnis	1.597	35%	1.187	202%	393	
Cost-Income-Ratio	72,5%	-2%	73,9%	-17%	89,3%	
Anzahl Ø Mitarbeiter	35.975	9%	33.056	1%	32.820	
Bilanzsumme	608.339	37%	444.861	5%	424.879	
RoE (Eigenkapitalrentabilität)	11,2%	20%	9,3%	133%	4,0%	
RoRaC	18,7%	29%	14,5%	135%	6,2%	
Grundsatz I (Solvabilität)	11,1	-11%	12,5	-1%	12,6	
Grundsatz II (Liquidität)	1,2	8%	1,1	-8%	1,2	
Unternehmensrating	1	0%	1	0%	1	

5. Medium Term Anticipation of Regional Employment

Forecasting of the development of employment:

- Supply and Demand side
- Occupational groups

Identification of Mismatches

5. Medium Term Anticipation of Regional Employment

Supply side forecasting:

Forecasting the development of the 10 biggest occupational groups in Frankfurt, Offenbach and Groß-Gerau

Labour supply comprise:

- demographical development
- employees with social insurence contribution
- retirement of the older employed
- labour participation of the younger
- unemployed

5. Medium Term Anticipation of Regional Employment

Demand Side Forecasting:

Forecasting the development of the demand for the 10 biggest occupational groups in Frankfurt, Offenbach and Groß-Gerau

Data: Employees with social insurence contribution

Application of various statistical methods combined with expert interviews

Internet-supported panel of experts

II. Methods of Medium Term Forecasting

Overview

1. Methods of Medium Term Forecast
2. Conceptual Framework
3. Data
4. Approach
5. Questions

1. Methods of Medium Term Forecasting

Medium term forecast (5 years)

- employment trends in selected occupational groups
- Regional forecast on cities of Frankfurt and Offenbach and on county Groß-Gerau

2. Conceptual Framework *Existing Concepts*

- Bade (2006)
  Evolution of Regional Employment in Germany: Forecast 2001 to 2010
  - Combination of univariate analysis and identification of the locally trendsetting industries
  - Total employment for all regions in Germany
- Our focus:
  - The employment trend by occupational groups
  - For just three regions

2. Conceptual Framework *Existing Concepts*

- Van Suntum; Rusche (2006):
  Integrierte Regionalprognose 2020
  - Forecasting of the employment trend for each region in Germany
  - Separately for each economic sector
  - Data: time series of employees (1993-1999)
- Our focus:
  - Occupational groups
  - Just three regions

2. Conceptual Framework *Conclusions for our approach*

Part 1: data model

- univariate and multivariate time series models and testing of different specifications

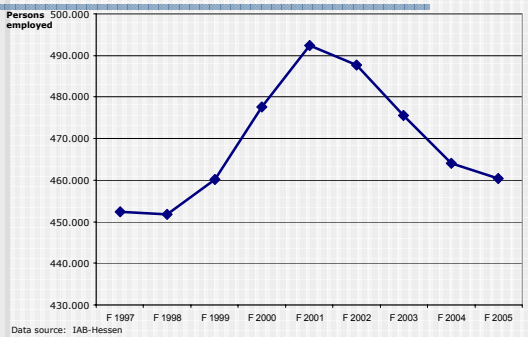
Part 2: knowledge model

- knowledge of regional labour market experts

3. Data

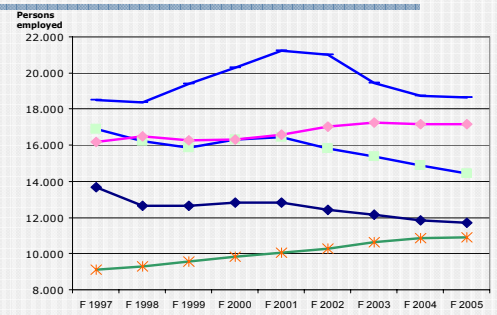
- Time series of employees
  - Differentiated by occupational groups ("Zweisteller")
  - Frankfurt, Offenbach and Groß-Gerau
- Annual data: 1987-2006
  - ~ 20 observations
- Quarterly data: 1999-2006
  - ~ 29 observations
- Additional input variables
  - Early indicators (e.g. order bookings, ifo-index)

Examples for Data
Total Employment (Frankfurt)



Data source: IAB-Hessen

Examples for Data
Occupational groups (Frankfurt)



Data source: IAB-Hessen

Data Dilemmas

- Number of observations: very small
  - Most of the statistical tests: not significant
  - But: consistent estimator
- Measurement error
  - Data: not as accurate as it looks like
  - But: aggregation level is convenient
- Data is not available until the end of July

4. Approach (1)
Related to the data model

- Univariate analysis
  - Specifying and testing an ARIMA model for each occupational group in each region.
- Cluster analysis
- Combination with additional input variables
  - Control for the business cycle
    - Using an early indicator
    - Filter out the business cycle
  - Control for the area
    - Additional Variables
- Combination of different time series
  - Vector autoregressive model (VAR)
  - Control for cointegration and endogeneity problems

4. Approach (2)
Support by Experts

- First group of experts
  - Separately for each occupational group
  - Making their own forecast
- Second group of experts
  - For the whole regional labor market
  - Verification of the results from the data model

4. Approach (3)
Scenario development

- The employment trend is associated with the business cycle.
- A five year forecast of the business cycle is not reliable.
- Idea: Development of three different scenarios.

4. Approach (4)
Our final forecast

- Combination of the robust forecasts for each of the three scenarios
- Includes: time series analysis and the view of our experts

5. Questions

- Your opinion about this approach?
  - Comments, warnings, ideas
- Are there other methods
  - Not too complicated
  - Valid result
  - Of practical convenience

Importance and Methodologies for a Qualitative Approach regarding Forecasts for Skill Needs

Paul Schatteman

Flemish Ministry of Education and Training
Department of Education
Director R§D VET Service (DBO)

Preface

As I was asked at the end of 2005 to develop an instrument for "Early Identification of Skill Needs" (E.I.S.N.) and so help to make proposals for future new educational curricula for Vocational Educational and Training (VET) programs, I new that this was not going to be simple.

With a dynamic approach and a lot of networking skills I had hoped to be ready after one year to formulate an outline of a project to develop such an instrument for the VET Service (DBO) of the Department of Education of the Flemish Ministry of Education and Training. Great was my surprise that after 6 months of literature research and contacts with mainly Skillsnet I realised that an instrument allowing a general or even a sectoral approach has not been developed.

Although Skillsnet has made a great number of publications since their first workshop in Berlin May 2002,"Early recognition of skill requirements in Europe", I couldn't find a publication I was looking for. Indeed all methodologies described for forecasting skill needs used only quantitative approaches.

My surprise was getting bigger when I consulted an IRDAC -(Industrial Research and Development Advisory Committee of the Commission of the European Communities) Report: *"Skills shortages in Europe".* Main conclusion of this report published in 1991 is shocking if I see what has been realised since then: "*if we do not pay enough attention to the problem of the skills shortages especially in areas subject to technological changes, the competitive position of Europe will be threatened."*

I am not a researcher but would like to become one of the users of a methodology which allows identification of skill needs for future qualifications with a view to their transfer into education and training policy and practice.

Therefore this paper should be considered as a request to researchers and research institutes to

fill this gap urgently as suggested by IRDAC.I will therefore limit my input to this research project by outlining my experiences since January 2006 and my expectations from such an instrument for educational purposes.

I would like to thank Waldemar Mathejczyk (IWAK) to integrate the qualitative aspects of "Anticipating Europe's Skill Needs" in to the European Network of Regional labour Market monitoring. I also want to thank Ben Kriechel (ROA) who made it possible to tackle the

qualitative aspects of “Regional Forecasts” and Claudia Knobel (IWAK) organizer of this workshop.

CONTENTS

1 The importance of forecasting qualitatively skill needs

1.1 Introduction

As a former General Manager in the industry I have been confronted very often to find adequate personnel in the biotechnology sector in the 1980's. The same problem appeared for the R&D division of L&H speech products (LHSP) for Artificial Intelligence in the 1990's.

Each area meets the same problem every 10 years. Yet governments have not been capable to anticipate this regularly returning need and deliver qualified employees for the industry for new technologies in due time.

Industry has therefore been obliged to give adequate training in new technologies themselves.

Well supported very often by Universities and High Schools which remain in the forefront of modern technologies, industries suffer more and more from a lack of qualified staff in industrial fields such as production, quality assurance, sales ,marketing and distribution.

The need of an adequate instrument to detect in an early stage new qualifications and related skills is very urgent. To allow a positive discussion about how such an instrument should be conceived I have made a list of the most important publications and initiatives that I have consulted in 2006 (*see Annexe 1).*

Although a lot of publications give interesting point of views, I have found only one publication with relevant information regarding the qualitative skill needs for future new occupations and qualifications: "*Identification of skill needs in nanotechnology*" (Skillsnet*).*

Most other publications either remain very general or limit their recommendations to the quantitative aspects of skill needs. There fore all described forecast models are not adequate as they do not take in consideration the impact of new technologies such as nanotechnology and artificial intelligence (A.I.).

1.2 Proposal to develop a methodology to forecast new occupations and qualifications with related skill needs

Based on the publications listed in annexe 1 it is obvious that there is an urgent need to develop a methodology which will allow early identification of skill needs, which is connected with questions regarding changing and new occupations. The University of Frankfurt, *Institut für Wirtschaft, Arbeit und Kultur (IWAK)* has taken the initiative on September 18th, 2006 to discuss these 2 important and related topics at the same time:

*"**Forecasting changing occupations and new occupations"*** and ***"The early identification of related skill needs".***

I hope that this Working Group will continue this initiative and also reactivate initiatives such as "New and Emerging Occupations" (Skillsnet) and "Future Projects" (Institute for Prospective Technology Studies).

I would also like to invite IPTS, the Euro Science and Technology Observatory (ESTO) and FISTERA (Foresight on Information Technologies in the European Research Area), which main objective is to map technology trends and future skill needs, to participate in this working group.

Obviously these different institutes and networks need to involve experts from the different industrial sectors which are going to launch new technological developments to define the impact of these new technological developments on new and changing occupations.

If all these important stakeholders, which all have a great experience and interest that such a project is put on track, participate to generate a tool which is going to be of enormous importance for everyone involved in labour and education policies, we might be capable in Europe to solve the problem of skills shortages as mentioned by IRDAC.

1.3 Future technological developments with impact on forecasts for new occupations

In order to develop a methodology to forecast new occupations it is important to have an idea of key technological areas for the future which will affect the different economical sectors the next 5 to 10 years.

An international comparison of key areas for the future based on recent technology exploration is indicated in table 1.3.

Table 1.3 International comparison of key areas for the future

EUROPE	UNITED STATES	JAPAN
Cognitive sciences	Nanotechnology	Information and communication
Complexity and system theory	Biotechnology	Electronics
Social and human sciences	IT	Life sciences
Biotechnology	Cognitive sciences	Healthcare
Communication technology	AI	Agriculture and food industry
IT including AI		Earth- and space sciences
Processing industry		Energy
Nanotechnology		Environment technology
Agriculture and food industry		Nanotechnology and materials
Energy		Processing industry
Transport		Industrial infrastructure
Environment technology		Social infrastructure
Healthcare		Social technology
Security		
Services		

Source: 'European Commission high Level Expert Group (EC-HLEG) synthesis report, 2005; United States National Science Foundation report 2002; National Institute of Science and Technology Policy Japan, 2005

This overview could be further explored by sector experts to define the impact of these new technological developments on new occupations and qualifications.

This recent report (EC-HLEG, 2005) clusters developments within 15 key areas wherein in the near future progress is going to be made and where in Europe can play the role of a leader.

Education and training policy makers should play a key role to make sure that the right changes are made to adapt future education and training programs to ensure that school leavers in the next 5 to 10 years have acquired the skills that the European industry will need by then.

2 Possible methodology to forecast when to start which educational program

2.1 Introduction

As a member of the vocational educational and training service we are in the first place interested in a methodology which can help to forecast on a medium term basis changes in the labour market .As we need to start new educational programs in due time to respond to the industrial needs we must start the new programs at least four years ahead of the moment that new qualifications will be required.

I think that for this purpose we need to know the opinion of experts. In order to increase the utility of the forecasts for policymakers, it is important that the results can be sufficiently disintegrated (by sector, region, profession, etc…).One should realise that the development and elaboration of an adequate statistical forecast model for the labour market is very time consuming (Feijen et al.; 2001.)

2.2 When is a forecast useful?

Good forecasts should allow to plan on a more structural and well thought-out manner the future supply of Education and Training programs. Not only regular education should benefit of these forecasts but also Life Long Learning-programs.

Forecasts should meet the following criteria (Gülker et al; 2000)

- Medium term : long-term forecasts don't allow to react timely on the continuous changing needs
- Statements should be made at the level of the professions
- Specify for target groups: sex, level of education, etc...
- Coordinate national, regional and local forecasts
- Take in consideration international trends (see chapter 3)
- Take in consideration the conditions for implementation : the findings should be useful for the different education- and labour market systems
- Models used should be used in a consistent way
- Collaboration of private and public actors is necessary
- A solid modeller foundation is a must

2.3 When is a forecast system successful?

One of the most important criterion is the power with which the system can predict which new occupations are going to be needed and when. The exact numbers which will be needed is in our qualitative approach at this point in time less relevant. It is of course of major importance that researchers which are involved in quantitative forecast models do take in consideration the start of new occupations, which will require new qualifications and related skills.

The major problem that can occur is that the system forecasts certain new occupations of professions which are not needed (on a particular predicted moment).Such a false alarm could cause financial problems as ministries of education or training institutes would have started education programs and invested a lot of money which are not needed. These false forecasts could have important social and personal implications for future employees.

The greatest difficulty when making forecasts is of course the fact that they always occur with a certain degree of incertitude (Borghans et al.2000).Therefore it would be wise to update at least once a year, by sector the midterm prognoses for new occupations and professions.

2.4 The quality of forecasts

Evaluation of forecasts based on prognosis models is a very critical matter. This means that one has to check if the predicted changes for new or changed occupations and professions really happen. The process which governs the forecasts is very crucial (Borghans et al., 2000).

Neugart (2001) describes two evaluation studies which have been performed in the past regarding forecasts from ROA (the Netherlands) and ESRI (Ireland; Hughes et al., 2000).

The evaluation for the Netherlands was related to a forecast performed in 1989 for 1994.The validation was of a qualitative nature. Both the forecasted and the realised situation were typed qualitatively in 4 categories (from good perspectives to bad perspectives).Subsequently they looked to the (mis) match between both.

The forecasts performed by Hughes from 1993 through 1996 related to groups of professions have been pretty successful.

From ROA it is known that they systematically evaluate their labour forecasts (Borghans et al., 1996; Smits § Diephuis, 2000).They also make public their methodological justification and critical evaluation studies.

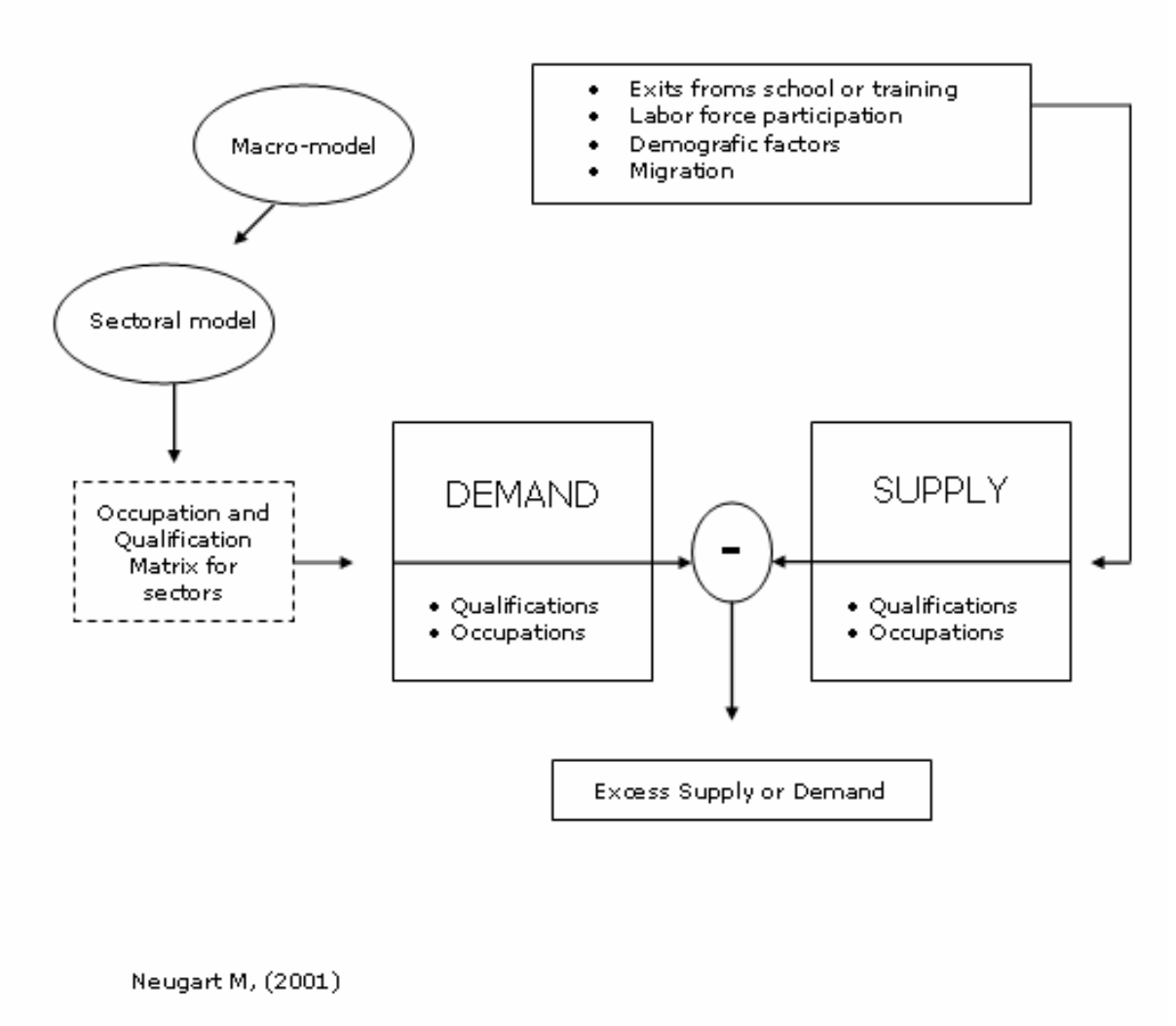
2.5 Existing forecasting models

2.5.1 General structure

The 'Wissenschaftszentrum Berlin' (WZB, Gülker, 2000; Neugart, 2001) has performed a comparative study from a number of forecasting models related to educational needs in different countries. The forecast models for educational needs and the needs in specific groups of professions are quite analogue.

The figure below shows a diagram of the global structure which can be found in the different forecast models (Neugart, 2001).

Figure 3.5.1.General structure of a 'forecasting model'



Neugart M, (2001)

A macro model is the starting point for the different models. This model is completed with data from the supply structure regarding labour forces and data from companies. The different countries prefer to use existing economic projections to model the macro perspective. Next a sectoral model is developed with the macro model as basis, which can be used to construct a vocational- and educational matrix. The information for this matrix is provided by large scale interviews or 'household panels'. Forecasts are usually made based on the flow from and to the labour market in a specific period in the future. The supply is calculated with the help of (1) data from school leavers and people who finish an education; (2) labour forces participation; (3) demographic factors; and (4) information regarding migration flows. Next the demand side is confronted with the supply side in the model. This demand-supply confrontation can be performed for both professional groups as well as for educational- and training programs.

I would like to suggest as an additional input, that the sectoral model experts do take in account the impact of new technologies such as biotechnology, information technology including artificial intelligence, nanotechnology etc (see table 2.3). Nanotechnology f.i. will lead to the introduction of new measures of training and further training. These qualifications profiles do not lead necessarily to new professions. (Skillsnet," Identification. of skill needs in nanotechnology").

2.5.2 The best choice for a forecasting model for the link between education and labour market

As we are mainly interested in a forecasting system which can help to launch new educational programs in due time I think that the forecasting system of ROA fits best these needs.

ROA indicates a number of more or less structural characteristics of the different types of trainings. One of the risks of a choice of an education is the degree by which the employability of people with this background is subject to conjunctural fluctuations. On the other hand the escape routes of a specific education are also very important. Are the employment perspectives limited to a certain profession or occupation sector or does one have a large choice of possibilities?

'Large' educations do have the advantage to offer more escape routes, but do have the disadvantage for school leavers that they will encounter more competition.

Gülker et al. (2000) notify that the forecast model of ROA is very progressive .The core of the ROA model is the strong scientific base from their studies. ROA tests continuously their forecasts and their methodologies. ROA also evaluates systematically their forecasts. From these evaluation studies it appears that their forecasts are doing pretty well.

2.5.3 Methodology of ROA's Regional Forecasting Model

For a complete understanding of the ROA system the following documents are very important :de Grip , Heijke § van der Velden(1998); ROA (1999a) ; ROA (1999b); van Eijs, de Grip, Diephuis, Jacobs, Marey § de Steur (1999b); Nekkers G., van Eijs P., de Grip A. § Diephuis B. (2000); Vlasblom § Diephuis (2000); ROA (2001).

As all these documents exist only in Dutch I will explain shortly the main characteristics of the ROA model by referring to Ben Kriechel (2007).

"The model is built to provide medium term, 5 year, forecasts on a detailed occupation and educational level. It allows changes in the occupational structure over time (e.g. skill upgrading), as well as substitution processes. The regional forecasting model is based on the national methodology.

The same components as in the national model are used for demand, expansion and replacement demand, and for supply, the short term unemployed and the school leavers. Whenever possible, data and estimates are done on the regional level.

The model is developed to make efficient use of the regional information available, and by using national input whenever necessary. Different from the national model, the regional model puts a *stronger emphasis on the lower and intermediate education level.* Those groups are the most regionally oriented, especially among school leavers."

The problem of detailed labour markets forecasts that can be used for E.I.S.N. is that they usually are not only structurally included in the labour market monitoring of the regional actors, but they don't include forecasts of new qualifications and new occupations.

As stated by Ben Kriechel:" A sophisticated forecasting model should incorporate the general employment trends, demographics of the workforce, and the changing structure and composition of occupations and the education within the workforce for E.I.S.N."

For the Netherlands, ROA provides biannual forecasts for more than hundred different occupations and educational degrees. Borghans et al. (2006) describe the most recent national forecast. The basic methodology of this national model is described in Cörvers, de Grip and Heijke (2002).

3 How can we integrate this qualitative approach in the ROA model?

3.1 Introduction

The ROA system (ROA 1999) takes in consideration 121 professional categories and 97 types of education. The question should not only be to indicate existing professional categories, but also look at new professions and occupations or changing professions and occupations in order to take in consideration new qualifications and related skills.

A forecast should not only indicate the number of expected new job openings for existing professions but also be capable to help policy makers for educational programs when to start new programs for future labour market needs.

The ROA model *assumes* that the employment by professional group is completely determined by the demand side of the market. As this in general a true factor it is obvious that for midterm prognoses one should also take in consideration the impact of new technologies on shifts in the employment between departments." The development of new products and services also demands more well-trained staff in manufacturing, quality assurance, marketing and distribution". (Skillsnet, "Identification of skill needs in nanotechnology"; 2006;p.8).

3.2 How to adjust the statistical basic data?

Maybe I am oversimplifying by stating that, the quality of such a strong conceived model that has proven to be successful can be improved. I think that their basic data can be adjusted by

the experts who participate in the sectoral model during the discussions regarding the occupation and qualification matrix in the different sectors. (Forecast Industrial Sector CPB)

To find out whether this is not only feasible but also acceptable for the developers of this model I would like to give an overview of the basic data used by ROA for their forecast model.

Table III.2 Statistical basic data from the ROA-forecast model

Statistical Basic Data
Statistical basic material CBS
Interview labour population (EBB)
Numbers of pupils in the different education systems
School leaver's research (RUBS, HBO, Monitor, and WO Monitor)
Forecast Industrial sector CPB
Forecasts Education OCW
Other statistical sources (OSA i.e.)

Source: de Grip, Heijke § van der Velden (1998)

A new initiative which attempts to map existing international European and national enterprise surveys which are used as a tool for identification of skill needs and skill gaps of the current and potential workforce planned by Skillsnet would certainly be very helpful for experts who participate in forecasts for sectoral models. The identification of future skill needs would be a very powerful tool to prepare new educational programs.

4 Conclusions

- It is obvious that there are great advantages for labour market monitoring to dispose of a reliable and informative forecast model. Less relevant until now is the use of prognoses for new occupations and the impact they should have on future new or modified educational programs and trainings.
- The advantage of forecasting on medium terms new occupations will certainly affect positively the reliability of the quantitative forecasting models. Secondly not only new occupations have to be prognosticated but also skill trends for existing qualifications and related occupations need to be monitored. Until now the identification of new professions and occupations with a view to transfer the related qualifications and skill needs into new education and training programs is practically non-existent.
- I hope that the discussions that can be organised regarding the integration of quantitative and qualitative methods will benefit from this presentation and will allow the development of an instrument which will offer more reliable quantitative labour market forecasts by including the prognoses of new qualifications and skill needs for educational purposes.
- The co-operation between ROA and other stakeholders such as Skillsnet, IPTS, ESTO, FISTERA and IWAK should allow to develop a regional medium-term forecast model which takes in consideration not only the qualitative aspects of the impact of new technologies on employment and occupation, but also all other qualitative factors which can have an impact on a global forecasting system.

Annexe 1

1 Overview of most important publications regarding E.I.S.N. in Europe.

1.1 Early recognition of skill requirements in Europe (Berlin 05/2002):

1.1.1 Research Projects in Europe:

- Selected OECD Countries-Identifying common trends (WZB, Germany)
- In Germany –the Research Network FreQueNz (Fraunhofer-Institute for Industrial Engineering)
- Qualifications for the future (Qualifications and Curriculum Authority, UK)
- Developing prospective tools for the recognition of skill requirements in Spain (Institut de Ciències de l'Educació)
- Network of national surveys on new skills in Italy (ISFOL, Italy)

2.2.1 Best Practices Examples for Different sectors

Industrial Maintenance – New and Traditional Skill Requirements ((Céreq , France)

- Identifying future qualifications needs in the transport sector in the UK (University of London, UK)
- ICT sector : addressing the ICT skills gap in Europe(Intel, Ireland)
- New qualification needs in logistics (Fraunhofer -Institute)
- Healthcare :Skill requirements in the care of elderly –the Swedish example(National board of health and welfare, Stockholm)

1.1.3 Best Practice Examples for Specific Target Groups and SME's:

- Gender : Forecasting Female shares of employment by occupation in Ireland (ESRI, Dublin)
- Disadvantaged: low skill people: Services in complex structures-trends in qualifications for lower qualified activities (bfz,Germany)
- SME's: Early recognition of international qualifications for SME's(BIBB,Germany)
- SME's : New qualifications in SME's for societal and technological change (isw,Germany)

1.1.4 Best Practice Examples at Regional and European level:

- Skill gaps and labour shortages in Spain: implications at the regional level (University Rovira)

- EU and candidate countries: Qualitative versus quantitative methods of anticipation of skill needs: Perspective of a country in transition(National Observatory, Czech Republic)
- Skill systems at turning points of societal modernization: A Hungarian Case study(Hungarian Academy of Science)
- Anticipation of skill needs –initiatives of five candidate countries (European Training Foundation, Italy)

2.3 Identifying Skill Needs for the Future. From research to policy and practice (Thessaloniki 05/2003):

2.2.1 Early identification of skill needs in Europe

1.2.2 Activities in early identification of skill needs in Europe, policy relevance and future needs

- The FreQueNz initiative – a national network for E.I.S. and qualification needs
- The need for E.I. of future skill requirements in the European Union

2.2.1 Good practice and different practice : examples of approaches and transfer to policy and practice

- Skill shortages enquiry by a combined method
- A network for identifying skill needs in Italy
- Identifying interactions between global and local developments :the observatory for the detection of skill and training needs in the Barcelona region

2.2.2 Early identification of skill needs in selected sectors

- Changing occupations : early identification of skill developments in the tourism sector
- How the service sector is moving from standardisation to increasing complexity: an example from the hotel industry
- Selected trends in the motor vehicle sector

2.2.3 Identification of transversal competences and qualifications

- Identifying and measuring ICT occupational and skill needs in Europe
- Skill and qualification needs at a time of structural change: the example of the IT sector in Germany

2.2.4 Early identification of skill needs in Europe : conclusions and perspectives

1.3 Trends and related skill needs in the tourism sector (Halle, 04/2004)

1.4 Construction of European qualification (Strasbourg, 09/2004)

1.5 Systems, institutional frameworks and processes for early identification of skill needs (Dublin, 11/2004)

- "The most efficient systems integrate the dissemination and implementation phases by linking them to counselling and guidance."
- "The systems that combine and complement results of research performed at different levels national, regional, local, sec oral company, occupation, etc…have showed their strength."
- "Other Member States mostly have a well-developed system of forecasting skills at macroeconomic level. These are often complemented by information coming from research in sectors and regions or surveys among employers."

1.6 Emerging technologies: new skill needs in the field of nanotechnology (Interworkshop; Stuttgart, 07/ 2005)

- "Nanotechnology brings great opportunities not only for science but also for industrial production and eventually for the every day life of individuals."
- "Even modest predictions estimate over 30% average growth per year overtaking bio- and information technologies growth."
- "Participants and speakers from 13 countries came to discuss and share their knowledge and experience on new skill needs in nanotechnology from the perspective of their backgrounds: research, business, education and training."
- "As nanotechnology is still very much under development and has a multidisciplinary character, it is difficult to identify future skill needs especially at intermediate level."
- "As soon as nanotechnology goes into mass production, the shortage of skills in the intermediary level of occupations will become obvious."

1.7 Feasibility workshop on European skill needs forecasting (Pafos, 10/2005)

1.7.1 Classifications, data and models for European skill needs forecasting (Cörvers, ROA, Maastricht)

1.7.2 Pan-European skills forecast (Wilson, University of Warwick, UK)

1.7.3 Skill needs forecasting in Austria (Steiner, Employment- Qualification-Innovation)

1.7.4 The occupations projections by the Planning Office in France (PMQ)

1.7.5 Skill needs forecast in Germany (IZA, Bonn)

1.7.6 Forecasting labour market and skill needs: the case of Greece (Employment Observatory)

1.7.7 Forecasting skill needs in Ireland (ESRI)

1.7.8 European skill needs forecasting: the case of the Netherlands (Cörvers, ROA Maastricht)

1.7.9 System of forecasting labour demand in Poland ((Governmental Centre for Strategic Studies)

1.7.10 Skills Forecasting in the UK (Wilson, University of Warwick)

Conclusions:

- The usefulness and relevance of forecasting skill needs at European level
- A common approach to European skill needs forecasting in methods and data
- A possible interim solution in a pilot project on macroeconomic skills or occupational forecasting
- A longer-term approach, with concrete suggestions for further practical steps and involvement of all interested European countries

1.8 The Cohort Component method of Deriving Replacement Demand –Lessons from Ireland (Paper presented to CEDEFOP Workshop on Anticipating Emerging Skill Needs, 2-3, November 2006; Roger Fox, Barry Comerford Planning and Research Dept FAS – the national training and employment authority, Dublin, Ireland 2006)

2 Important publications as a source to develop a methodology for E.I.S.N.

2.1 Typology of knowledge, skills and competences (Cedefop,03/2005)

2.1.1 Methodology

2.1.2 Conceptual underpinnings of knowledge, skills and competences

2.1.3 Use of typologies of KSC

2.1.4 European expertise with KSC

2.1.5 A prototype typology of K,S and C

2.1.6 Conclusions and recommendation

2.2 Towards a European Qualifications Framework for LLL (SEC, 07/2005)

2.2.1 Why a European Qualifications Framework?

2.2.1 The conceptual base for an EQF

2.2.2 The main purposes and functions of an EQF

2.2.3 Common reference levels of learning outcomes

2.2.4 An EQF as a framework for co-operation: common principles

2.2.5 Tools and instruments supporting learners

2.2.6 Commitments and challenges at national and sectoral level

2.2.7 Conclusions and questions for consultation

2.3 European ICT- Skills Meta Framework(CEN/ISSS,11/2005)

2.3.1 The realities of a changing ICT world

2.3.1.1 Some key ICT Practitioner Skills/Competence Frameworks

2.3.1.2 Structured Review of Key Existing Frameworks

2.3.1.3 Level Descriptors for ICT Practitioner Competence

2.3.1.4 Guidance for Appropriate and Effective Use of ICT Skills/Competence works

2.3.1.5 An “Ideal Scenario”

2.3.1.6 Recommandations for Next Steps

Bibliography

Borghans L., de Grip A; § Heijke H. (eds.) (1996), ‘ Arbeidsmarktprognoses naar opleiding en flexibiliteit op de arbeidsmarkt’, in CBS (ed.), *Flexibilisering: het Nederlandse antwoord op internationalisering? Arbeidsmarktstrategie in een mondiale economie,* CBS, Voorburg/ Heerlen, p. 124-137.

Borghans L., de Grip A. § Heijke H. (2000), *Alice in prognoseland: over dezin van arbeidsmarktprognoses,* Working papers, vol. ROA-W-2000/6, ROA, Maastricht.

Borghans L., de Grip A. § van Smoorenburg M; (1998), *Measuring skills shortages,* ROA Maastricht.

De Grip A., Heijke H. § van der Velden R., (1998), ‘ Het Researchcentrum voor Onderwijs en Arbeidsmarkt’, *Nieuwsbrief van het steunpunt WAV,* vol.4, p145-150.

Feijen J., Reubsaet T. § van Ootegem L. (2001.), *Instruments, tools ans policies to anticipate the effects of industrial change on employement and vocational qualifications,* Instituut voor toegepaste sociale wetenschappen, Nijmegen.

Gülker S., Hilbert C., Schöman K. § Hrsg. Bullinger H.J. (2000), *Lernen von der Nachbarn.Qualifikationsbedarf in the OECD Lândern,* Bertelmann Verlag, Bielefeld.

Hughes G., McCormick B. § Sexton J.J., (2000), *Occupational employment forecasts 2005,* ESRI, Ireland.

”IRDAC Opinion/EC, Commission, IRDAC [S.I] EC,1991—VII, p 50. “Working Party 11”.

Kriechel Ben, ROA,2007 “*Forecasting in Regional Labour Market Monitoring”* in “Monitoring of Regional Labour Markets in European States, Concepts, Experiences and Perspectives (Alfons Schmid, Christa Larsen and Waldemar Mathejczyk, Eds; chapter 4; page 135 - 140).

Nekkers G., van Eijs P., de Grip A. § Diephuis B., 2000, *Regional supply-demand discrepancies: A Training Perspective,* ROA, Maastricht.

Neugart M. (2001), *Skill needs in the EU: a comparison of forecasts and policy initiatives,*

Paper presented on the European Observatory Conference, 31/05-01/06, Stockholm.

ROA (1999), *Annual Report 1998,* ROA, Maastricht.

ROA (1999b), *De arbeidsmarkt naar opleiding en beroep tot 2004,* ROA, Maastricht.

ROA (2001), *De arbeidsmarkt naar opleiding en beroep tot 2006,* ROA Maastricht.

Skillsnet, Cedefop (2006), “*Identification of skill needs in nanotechnology.”* Panorama series; 120)’ (Luxembourg: Office for Official Publications of the European Communities; Table 12; p.42)

Smits W. § Diephuis B. (2000), *Evaluatie van de arbeidsmarktprognoses tot 1998.*

van Eijs P. § deGrip A.(1999), *De ontwikkeling van het project onderwijs-arbeidsmarkt1986-1998,* ROA, Maastricht.

Vlasbloem J.D. § Diephuis B.J.(2000), *Methodiek voor korte-termijn arbeidsmarktprognoses op basis van een stromenmodel,* ROA, Maastricht.

Dienst Beroepsopleiding
Vlaams ministerie van Onderwijs en Vorming
Paul Schatteman – 2 Juli 2007

Forecasting the Development of Employment: Methodologies and Systems

An International Expert Workshop

IMPORTANCE AND METHODOLOGIES FOR A QUALITATIVE APPROACH REGARDING FORECASTS FOR SKILL NEEDS

Paul Schatteman
Flemish Ministry of Education and Training
Department of Education
Director R§D VET Service (DBO)

Preface

- "Early Identification of Skill Needs" (E.I.S.N.)
- future new educational curricula for Vocational Educational and Training programs
- IRDAC - (Industrial Research and Development Advisory Committee of the Commission of the European Communities - "Skills shortages in Europe"
- "if we do not pay enough attention to the problem of the skills shortages especially in areas subject to technological changes, the competitive position of Europe will be threatened."
- identification of skill needs for future qualifications with a view to their transfer into education and training policy and practice

The importance of forecasting qualitatively skill needs

Introduction

- deliver qualified employees for the industry for new technologies in due time
- industries suffer more and more from a lack of qualified staff in industrial fields such as production, quality assurance, sales, marketing and distribution
- adequate instrument to detect in an early stage new qualifications and related skills is very urgent
- "Identification of skill needs in nanotechnology" (Skillsnet)
- other publications remain very general or limit their recommendations to the quantitative aspects of skill needs

Proposal to develop a methodology to forecast new occupations and qualifications with related skill needs

- early identification of skill needs, which is connected with questions regarding changing and new occupations
- "Forecasting changing occupations and new occupations" and "The early identification of related skill needs" (IWAK)
- "New and Emerging Occupations" (Skillsnet) and "Future Projects" (Institute for Prospective Technology Studies)
- IPTS, the Euro Science and Technology Observatory (ESTO) and FISTERA (Foresight on Information Technologies in the European Research Area) map technology trends and future skill needs
- involve experts from the different industrial sectors
- define the impact of these new technological developments on new and changing occupations

Future technological developments with impact on forecasts for new occupations

International comparison of key areas for the future

EUROPE	UNITED STATES	JAPAN
Cognitive sciences	Nanotechnology	Information and communication
Complexity and system theory	Biotechnology	Electronics
Social and human sciences	IT	Life sciences
Biotechnology	Cognitive sciences	Healthcare
Communication technology	AI	Agriculture and food industry
IT including AI		Earth- and space sciences
Processing industry		Energy
Nanotechnology		Environment technology
Agriculture and food industry		Nanotechnology and materials
Energy		Processing industry
Transport		Industrial infrastructure
Environment technology		Social infrastructure
Healthcare		Social technology
Security		
Services		

Future technological developments with impact on forecasts for new occupations

- technological areas for the future which will affect the different economical sectors the next 5 to 10 years
- synthesis report (EC-HLEG, 2005) clusters developments within 15 key areas wherein Europe can play the role of a leader
- Education and training policy makers should play a key role
- make sure that the right changes are made to adapt future education and training programs
- ensure that school leavers in the next 5 to 10 years have acquired the skills that the European industry will need

Possible methodology to forecast when to start which educational program

Introduction

- methodology which can help to forecast on a medium term basis changes in the labour market
- start the new educational programs at least four years ahead of the moment that new qualifications will be required
- we need to know the opinion of experts
- development and elaboration of an adequate statistical forecast model for the labour market is very time consuming

Possible methodology to forecast when to start which educational program

When is a forecast useful?

- To plan on a more structural and well thought-out manner the future supply of Education and Training programs
- Regular education but also Life Long Learning-programs should benefit
- Forecasts should meet the following criteria:
  - Medium term
  - Statements should be made at the level of the professions
  - Take in consideration international trends
  - Findings should be useful for the different education- and labour market systems

Possible methodology to forecast when to start which educational program

When is a forecast system successful?

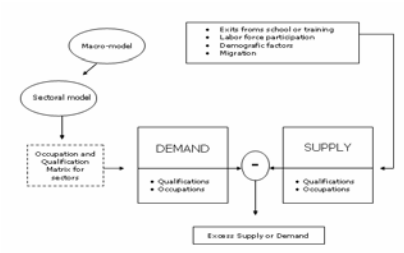
- One of the most important criterion is the power with which the system can predict which new occupations are going to be needed and when
- Quantitative forecast models should take in consideration the start of new occupations, which will require new qualifications and related skills
- Forecasts always occur with a certain degree of incertitude
- Update, at least once a year, by sector the midterm prognoses for new occupations and professions

Possible methodology to forecast when to start which educational program

Quality of forecasts:

- Evaluation of forecasts based on prognosis models is a very critical matter
- Check if the predicted changes for new or changed occupations and professions really happen
- The process which governs the forecasts is very crucial
- Neugart : two evaluation studies which have been performed in the past regarding forecasts from ROA (the Netherlands) and ESRI (Ireland; Hughes et al., 2000)
- ROA systematically evaluates their labour forecasts. They also make public their methodological justification and critical evaluation studies

Possible methodology to forecast when to start which educational program



General structure of a 'forecasting model'

Neugart M., (2001)

Possible methodology to forecast when to start which educational program

Existing forecasting models

General structure

- Gülker has performed a comparative study from a number of forecasting models related to educational needs in different countries. The forecast models for educational needs and the needs in specific groups of professions are analogue.
- A macro model is the starting point for the different models. This model is completed with data from the supply structure regarding labour forces and data from companies.
- Next a sectoral model is developed with the macro model as basis, which can be used to construct a vocational- and educational matrix.

Possible methodology to forecast when to start which educational programs

Existing forecasting models

General structure

- Supply is calculated with the help of:

  (1) data from school leavers and people who finish an education
  (2) labour forces participation
  (3) demographic factors
  (4) information regarding migration flows
- The demand-supply confrontation can be performed for both professional groups as well as for educational- and training programs
- Sectoral model experts must take in account the impact of new technologies such as biotechnology, information technology including artificial intelligence, nanotechnology etc…

Possible methodology to forecast when to start which educational program

Existing forecasting models

The best choice for a forecasting model for the link between education and labour market

- A forecasting system that can help to launch new educational programs in due time
- The forecasting system of ROA fits best these needs
- ROA indicates a number of more or less structural characteristics of the different types of trainings
- The risks of a choice of an education is the degree by which the employability of people with this background is subject to conjunctural fluctuations
- Are the employment perspectives limited to a certain profession or occupation sector or does one have a large choice of possibilities?

Possible methodology to forecast when to start which educational program

Existing forecasting models

The best choice for a forecasting model for the link between education and labour market

- 'Large' educations do have the advantage to offer more escape routes
- Disadvantage for school leavers: they will encounter more competition
- Gülker et al. (2000) notify that the forecast model of ROA is very progressive .The core of the ROA model is the strong scientific base from their studies
- ROA tests continuously their forecasts and their methodologies. ROA also evaluates systematically their forecasts. From these evaluation studies it appears that their forecasts are doing pretty well

Possible methodology to forecast when to start which educational program

Existing forecasting models

Methodology of ROA's Regional Forecasting Model

- ROA model by referring to Ben Kriechel (2007)
- The model is built to provide medium term, 5 year forecasts on a detailed occupation and educational level. It allows changes in the occupational structure over time (e.g. skill upgrading), as well as substitution processes. The regional forecasting model is based on the national methodology
- The same components as in the national model are used for demand, expansion and replacement demand, and for supply, the short term unemployed and the school leavers

Possible methodology to forecast when to start which educational program

Existing forecasting models

Methodology of ROA's Regional Forecasting Model

- The regional model puts a *stronger emphasis on the lower and intermediate education level*
- *Markets forecasts that can be used for E.I.S.N.* are usually not only structurally included in the labour market monitoring of the regional actors, but they don't include forecasts of new qualifications and new occupations
- Ben Kriechel:" A sophisticated forecasting model should incorporate the general employment trends, demographics of the workforce, and the changing structure and composition of occupations and the education within the workforce for E.I.S.N."

How can we integrate this qualitative approach in the ROA model?

Introduction

- The ROA system takes in consideration 121 professional categories and 97 types of education.
- Not only indicate existing professional categories, but also look at new professions and occupations or changing professions and occupations
- Take in consideration new qualifications and related skills
- A forecast should not only indicate the number of expected new job openings for existing professions, but also help policymakers for educational programs when to start new programs for future labour market needs

How can we integrate this qualitative approach in the ROA model?

Introduction

- The ROA model *assumes* that the employment by professional group is completely determined by the demand side of the market
- For midterm prognoses one should also take in consideration the impact of new technologies on shifts in the employment between departments." The development of new products and services also demands more well-trained staff in manufacturing, quality assurance, marketing and distribution".(Skillsnet, "Identification of skill needs in nanotechnology")

How can we integrate this qualitative approach in the ROA model?

How to adjust the statistical basic data?

- basic data can be adjusted by the experts who participate in the sectoral model during the discussions regarding the occupation and qualification matrix in the different sectors. (Forecast Industrial Sector CPB)
- feasible but also acceptable for the developers of this model ?

How can we integrate this qualitative approach in the ROA model?

How to adjust the statistical basic data?

Statistical Basic Data
Statistical basic material CBS
Interview labour population (EBB)
Numbers of pupils in the different education systems
School leaver's research (RUBS, HBO, Monitor, and WO Monitor)
Forecast Industrial sector CPB
Forecasts Education OCW
Other statistical sources (OSA i.e.)

.

How can we integrate this qualitative approach in the ROA model?

How to adjust the statistical basic data?

- Map existing international European and national enterprise surveys which are used as a tool for identification of skill needs and skill gaps of the current and potential workforce (new initiative planned by Skillsnet)
- Identification of future skills would be a powerful tool to prepare new educational programs

Conclusions

- Great advantages for labour market monitoring to dispose of a reliable and informative forecast model. Less relevant until now is the use of prognoses for new occupations and the impact they should have on future new or modified educational programs and trainings.
- Advantage of forecasting on medium terms new occupations will certainly affect positively the reliability of the quantitative forecasting models. Not only new occupations have to be prognosticated but also skill trends for existing qualifications and related occupations need to be monitored. Until now the identification of new professions and occupations with a view to transfer the related qualifications and skill needs into new education and training programs is practically non-existent.

Conclusions

•I hope that the discussions that can be organised regarding the integration of quantitative and qualitative methods will benefit from this presentation and will allow the development of an instrument which will offer more reliable quantitative labour market forecasts by including the prognoses of new qualifications and skill needs for educational purposes.

- The co-operation between ROA and other stakeholders such as Skillsnet, IPTS, ESTO, FISTERA and IWAK should allow to develop a regional medium-term forecast model which takes in consideration not only the qualitative aspects of the impact of new technologies on employment and occupation, but also all other qualitative factors which can have an impact on a global forecasting system.

Questions ?

Regional labour market forecasting -- Conclusions from the Frankfurt workshop

Dr. Ben Kriechel

Regional labour market forecasting is an important policy tool for labour market actors on the regional level. In order to choose between different approaches both the use of the forecast, and the availability of data and its format are of crucial importance. In order to learn about different approaches, serving different goals, an international workshop was organized in Frankfurt.

The workshop started out with two international presentations. Ian McGarth reflected on the use of the Irish national labour market information systems for regional use, while Ben Kriechel presented the use of the national skills forecasting model of the Netherlands in its determination of regional skills needs on the level of provinces.

The Irish model consists of three pillars, a database of current data, a forecasting module for intermediate time periods, and detailed sectoral studies. While the first data-source provides detailed data for the current labour market situation, the forecast is used for more intermediate level policies. The detailed sectoral studies are used to examined and uncover new, unusual development that a mechanical (quantitative) study would not reveal. Regional information needs are fulfilled by combining the national forecast with the detailed information on the current labour market, which includes the regional differences across Ireland.

For the Netherlands, Ben Kriechel showed that the biannual national skills need model can be adapted and estimated on the regional level. The problem of such a regionalization lies in the decrease of data availability, both in terms of quality and quantity. There is thus a trade-off between detail of the occupation skills forecasts and regionalization. For the Dutch case the combination of regional data with – where necessary – inputs from the national model, allowed for an detailed medium term forecast of skills needs on a regional level.

The regional share of the total labour volume and its short-term forecasts for regions was provided by Franz-Josef Bade and Rüdiger Wapler. Franz-Josef Bade explained in detail how the forecast depends on the choice of the time-series estimator, and included a discussion how the choice of the estimator can be guided by assumptions about the consistency of regional developments upon aggregation to the intermediate and finally national level.

Rüdiger Wapler showed that spatial spill-over effects are important to regional labour volume forecasts. Estimations including such spatial effects in time series models were shown to outperform other specifications without spatial elements. Furthermore, a weighted combination of different estimators was shown to improve forecasts of regional labour volumes on the regional level.

Claudia Knobel and Dirk Crass presented the methodology for the regional medium term forecasting system for the greater Frankfurt region. The regional labour market forecasting system will combine several elements, both short- and medium-term, quantitative as well as qualitative. For the short term the team extends an existing model of the banking system of the Frankfurt region. A set of indicators, both quantitative and qualitative, allows anticipating structural shifts in larger enterprises. The medium term labour market forecasting model differentiates between several (major) occupations and type of qualifications. Main data source are based on the (regional) IAB database on social insurance contributions. As in this medium term forecast the

team aims to include and incorporate qualitative interviews from experts for the major occupations.

Paul Schatteman concluded the seminar with a appeal for more qualitative approaches to be included in skill-needs forecasting. Especially for occupations used in quickly developing technologies and industries, there is a mismatch between the demand for labour fitting these new occupational demands and those provided by schools. This is partly due to the lack of an early warning system of new occupations, which the quantitative approaches will not be able to provide, as they extrapolate historical trends towards the future. Given that Europe wants to be the leading economic power in several new technologies, governments should make sure that they have (additional) adequate estimates of future occupations. These qualitative approaches could be integrated in existing quantitative models.

Closing Speech

Prof. Dr. Alfons Schmid

Ladies and Gentlemen, dear Colleagues,

I would like to make some closing remarks. In our workshop today we had interesting presentations and discussions. I believe that the presentations, discussions and the exchange of experience and knowledge at our meeting will contribute to a well based concept of regional forecasting.

I am convinced that today we have made

- progress in conceptualising regional labour market forecasting in greater detail,
- progress in specifying the concept of regional forecasting,
- progress in intensifying our communication concerning regional monitoring and
- I hope we made progress in establishing a continuous exchange of experience concerning the issue of regional forecasting.

Ben Kriechel drew well-founded conclusions for a regional forecasting concept in a medium term. I believe these conclusions are a good basis for further research. For our project in the Rhine-Main-area we will benefit from this workshop. We will include the results of the presentations and discussions into a concrete and efficient method to forecast professions and identify future mismatches for the participating cities and the participating district.

For the working group within the European network of regional labour market monitoring this workshop may be a base for further activities. We should continue within the working group to work about this topic. Perhaps some of the participants today would like to prepare and organize another workshop. We can offer our support.

We will present the main results of this workshop in the annual meeting in Rome at the end of September. Cedefop (the European Centre for the Development of Vocational Training) has asked the network to prepare one session at its conference next year concerning forecasting.

I believe that we should try to establish the topic of regional forecasting at the European Union. Regional forecasting will be an important instrument to improve the functioning of regional labour markets and to improve the effectiveness of regional labour market policy. Therefore our intention should be to contribute to a concept of regional forecasting that can be applied in the regions of the European Union. Our workshop could be one step on this way.

I may remind you of the annual meeting of our network of regional labour market monitoring in Europe, which will take place on the 28th, not as announced before the 21st of September in Rome and which is organized by Prof. di Nicola and his team.

I would like to thank you all for participating and working at our meeting. I think we especially should thank the speakers; they presented interesting papers.

I would also like to thank Ben Kriechel for the cooperation in preparing this workshop. Also many thanks to Dirk Crass and especially Claudia Knobel for preparing and organizing this workshop.

Have a safe trip home. I hope we will meet again on the issue of regional forecasting. Good bye und auf Wiedersehen.

List of Participants

Name		Institution	City	Country
Franz-Josef	Bade	University Dortmund	Dortmund	Germany
Nils	Beckmann	IWAK	Frankfurt	Germany
Thomas	Behrens	County Labour Board	Malmö	Sweden
Matthias	Böss	Planungsverband Ballungsraum Frankfurt/ Rhein-Main	Frankfurt	Germany
Jiří	Braňka	National Observatory for Employment and Training, National Training Fund	Praha	Czech Republic
Franz	Clement	CEPS/ INSTEAD	Differdange	Luxembourg
Dirk	Crass	IWAK	Frankfurt	Germany
Eddy	Donders	VDAB	Brussels	Belgium
Susanne	Eickemeier	Johannn Wolfgang Goethe University	Frankfurt	Germany
Anja	Gauler	HessenAgentur	Frankfurt	Germany
Markus	Höhne	Landesagentur für Struktur und Arbeit (LASA) Brandenburg	Potsdam	Germany
Carsten	Kampe	Landesagentur für Struktur und Arbeit (LASA) Brandenburg	Potsdam	Germany
Peter	Kania	Wirtschaftsförderung Frankfurt	Frankfurt	Germany
Claudia	Knobel	IWAK	Frankfurt	Germany
Ben	Kriechel	ROA	Maastricht	Netherlands
Christa	Larsen	IWAK	Frankfurt	Germany
John	McGrath	FAS Baggot, Training and Development Authority	Dublin	Ireland
Jeroen	Meuwissen	Etil	Maastricht	Netherlands
Paul	Schatteman	Ministerie van de Vlaamse Gemeenschap	Brussels	Belgium
Alfons	Schmid	Johannn Wolfgang Goethe University	Frankfurt	Germany
Andreas	Schur	EWR Consulting	Frankfurt	Germany
Lioba	Trabert	HessenAgentur	Wiesbaden	Germany
Rüdiger	Wapler	Institut für Arbeitsmarkt- und Berufsforschung	Nürnberg	Germany
Rob	Wilson	Institute for Employment Research, University of Warwick	Coventry	UK
Klaus	Wolf	Johannn Wolfgang Goethe University	Frankfurt	Germany
Gerd	Zika	Institut für Arbeitsmarkt- und Berufsforschung	Nürnberg	Germany

For further Information please contact:

IWAK
Institute for Economy, Labour and Culture
Robert-Mayer-Str. 1
60054 Frankfurt am Main
Germany

Prof. Dr. Alfons Schmid
E-Mail: alfons.schmid@em.uni-frankfurt.de
Phone: ++49 69 798 28229

Claudia Knobel
E-Mail: c.knobel@em.uni-frankfurt.de
Phone: ++49 69 798 23906

Dirk Crass
E-Mail: crass@em.uni-frankfurt.de