

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

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 Flemish 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. Economics 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 macroeconomic 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.skillslabour.ie



Expert Group on Future Skill Needs



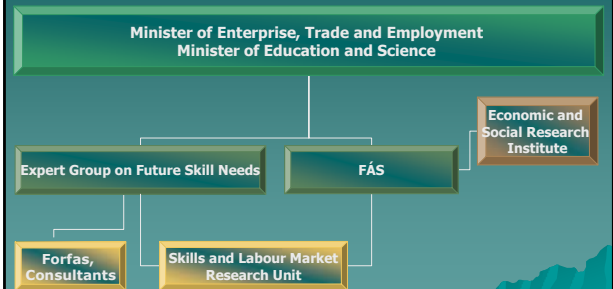
Structure of the Presentation

- ◆ 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.

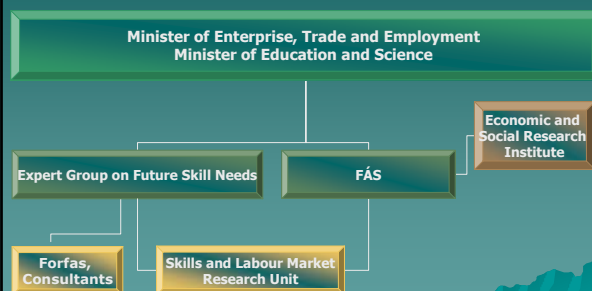
Disadvantages of FAS/ESRI Model

- ◆ 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
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Labour Market, Maastricht University

4-7-2007

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<http://www.fgewb.unimaas.nl/roa>

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

4-7-2007

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Goals of the labour market model

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

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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)

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Ingredients National Model

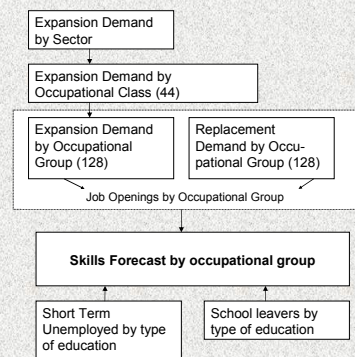
Use of reliable national data sources:

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

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6

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

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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

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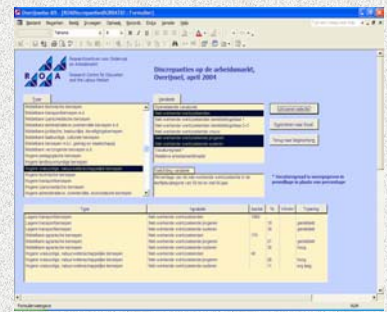
Example: Overijssel



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Example: Overijssel



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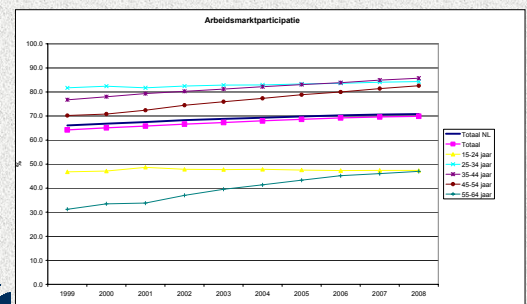
Example: Overijssel

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

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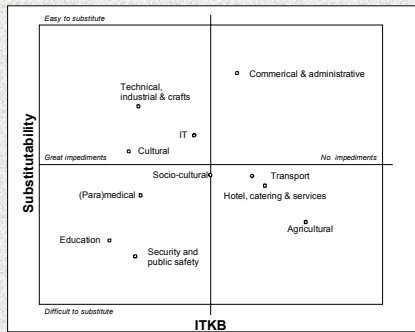
Example: Overijssel



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Example: Overijssel



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Challenges

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

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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%

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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

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Conclusion

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

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1

Time Series Forecasting of Regional Employment

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



Overview

2

- 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 \Leftrightarrow Time Series Model
 $Y = f(X_1, \dots, X_n) \Leftrightarrow Y = f(t)$
- 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

AutoRegressive Integrated Moving Average

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

where

W_t is the response series of 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
 $\theta(B) = 1 - \theta_1(B) - \dots - \theta_p(B)^P$
 - (3) $\phi(B)$ is the **autoregressive** operator, represented as a polynomial in the back shift operator:
 $\phi(B) = 1 - \phi_1(B) - \dots - \phi_p(B)^P$
- ε_t is the independent disturbance, the **random error**.



Integration of Two Stochastic 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

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

- (2) ➤ **Moving 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

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

 Bade
2.7.2007


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

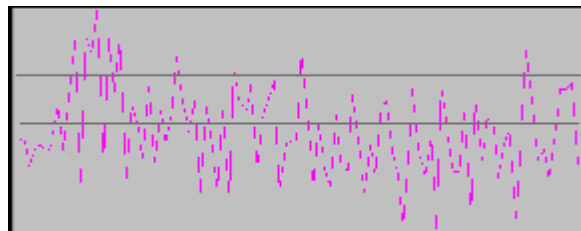


I: Beispiele für Stationarität

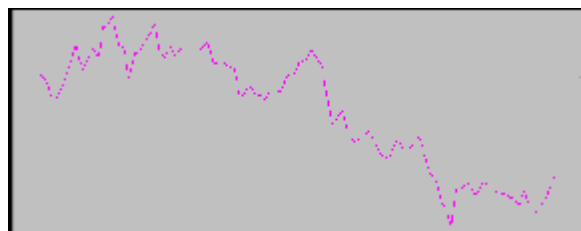
8

Stationär

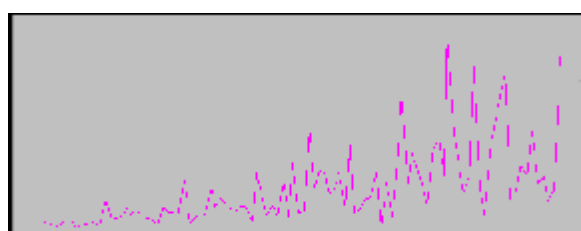
- im Mittelwert und
- in der Varianz



Stationär in der Varianz,
aber
nicht stationär im
Mittelwert



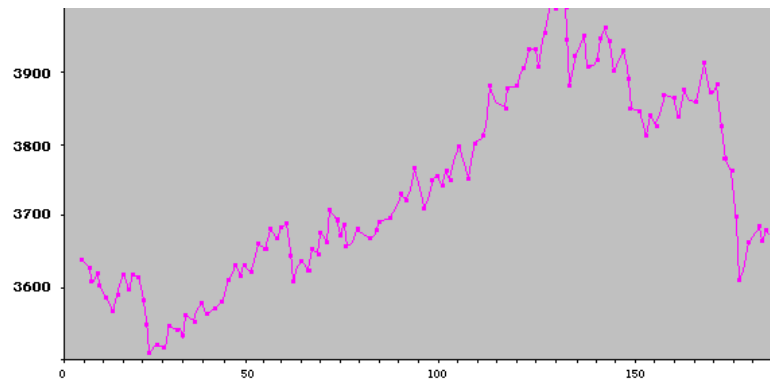
Nicht stationär





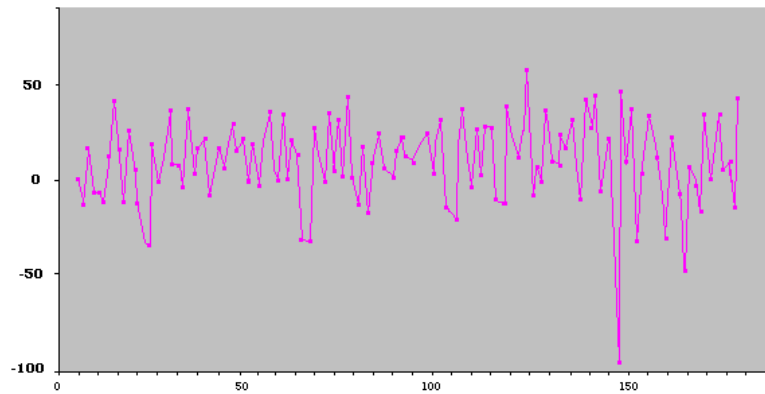
I: Beseitigung der Stationarität durch Differenz-Bildung

Nicht-stationäre Zeitreihe (Dow-Jones-Index)



Stationär durch Differenz-Bildung

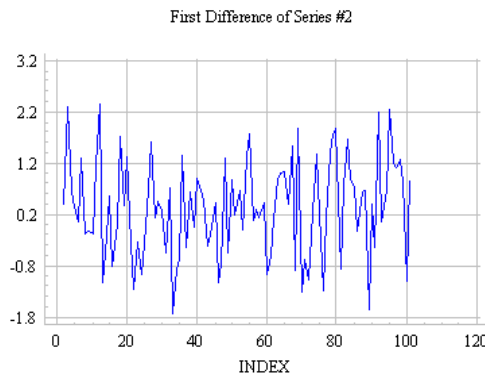
$$X'_t = X_t - X_{t-1}$$



I: Estimation bias of non-stationary time series

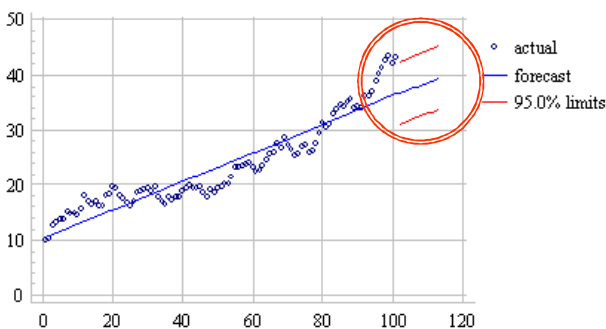


Variables
— Y

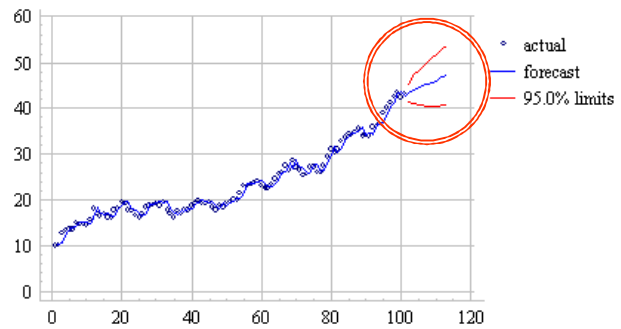


Variables
— DIFF(Y)

Time Sequence Plot for Y
Linear trend = 10.2889 + 0.258761 t



Time Sequence Plot for Y
ARIMA(0,1,0) with constant





Structure of ARIMA-Model

Ein ARIMA-Modell wird bestimmt durch

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

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

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

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

- **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



Estimation of ARIMA-Models

BOX-JENKINS Methode

- **Identification**

- Modellprüfung
- Stationarität durch Bildung von Differenzen u. a. Transformationen

- **Estimation**

- Schätzung der Modellparameter
- Evaluierung

- **Forecast**



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

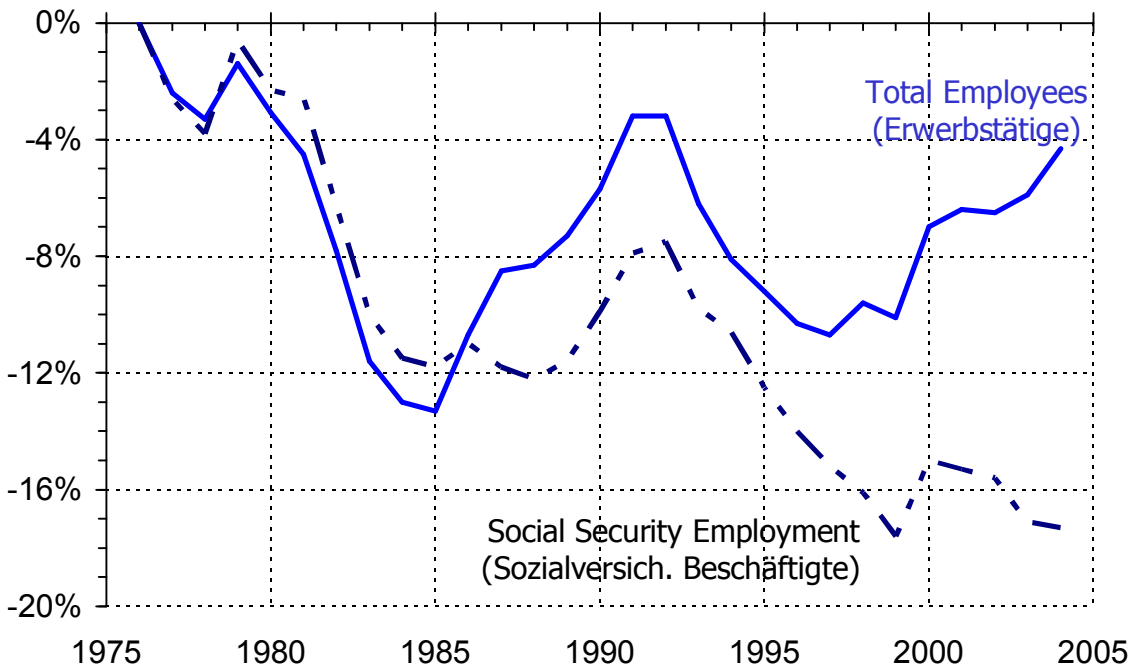


II.1:

Change of Employment Dortmund

15

Change from 1976



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

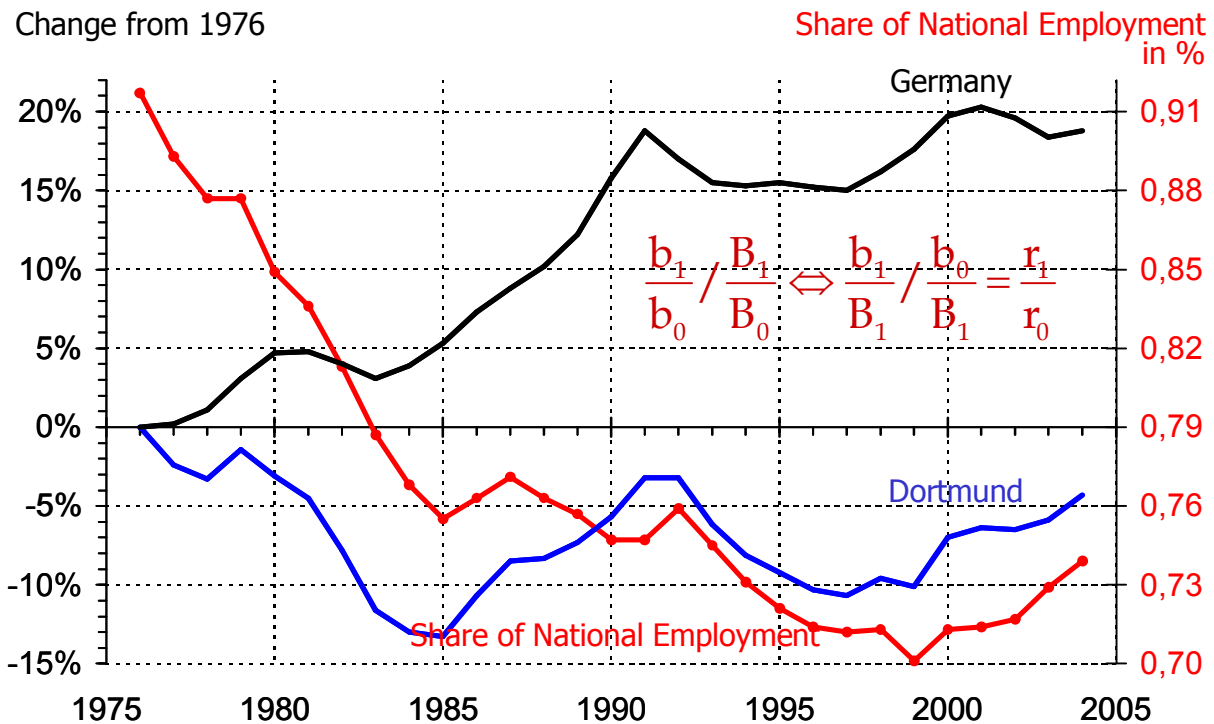


II.1:

Relative Change of Employment

16

Change from 1976



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

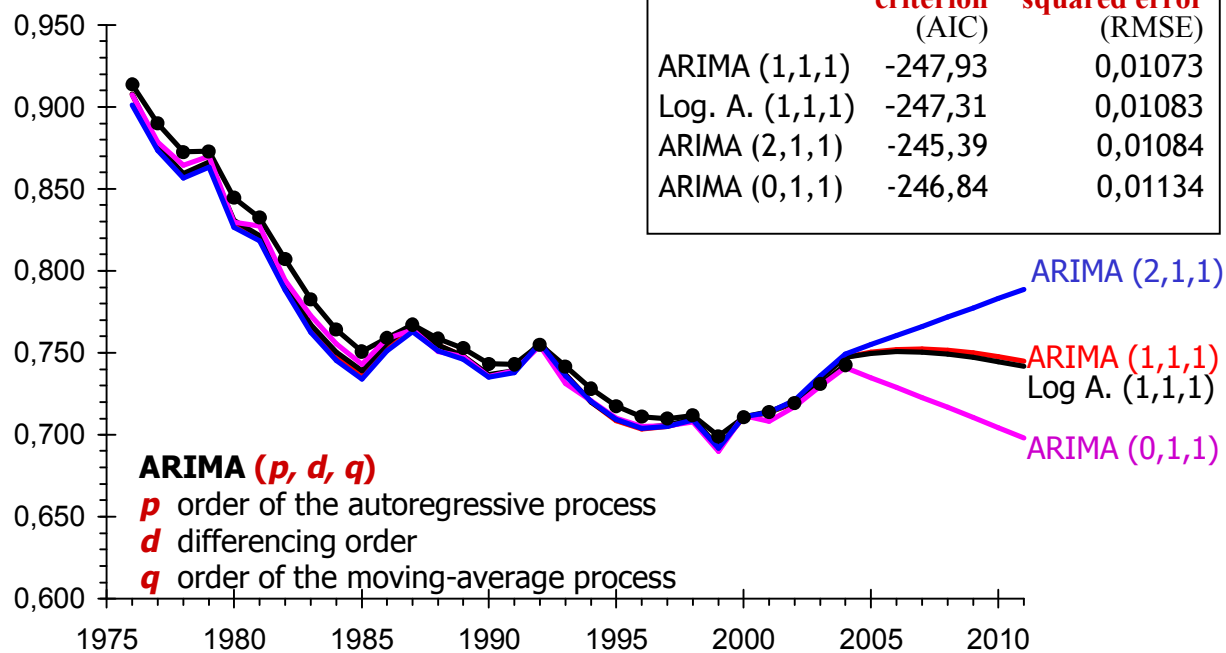




II.1:

Univariate Analysis and Forecasting of Regional Shares

Dortmund's share of national employment in %



Quelle: Erwerbstätigenrechnung der Länder; eigene Schätzungen



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

SAS Help and Documentation, SAS 9.13, SAS Institute



II.2:

Forecasting Regional Employment

19

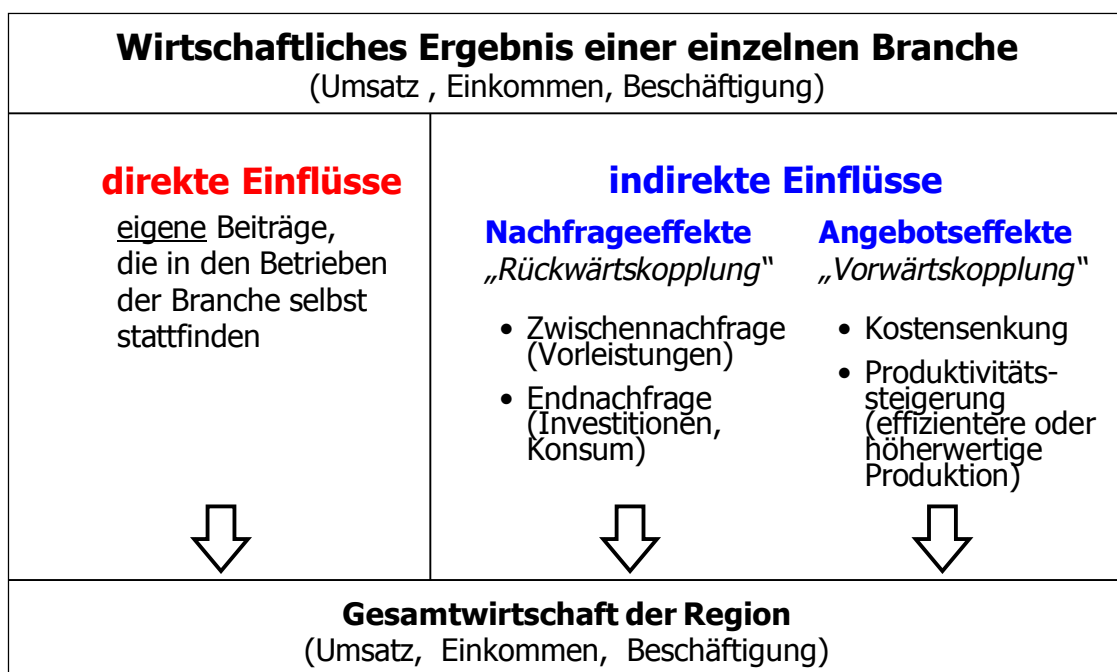
- Univariate Estimations
- **Enlargements:**
 - **Analysis of regional "growth poles"**
 - ❖ Identification of "growth poles"
 - ❖ Forecasting their future development
 - ❖ Integration into the forecast of total regional employment
 - Consistency checks and re-estimation of regional forecasts



II.2.1:

Sektorale Einflüsse auf die regionale Wirtschaft

20





II.2.1:

Wachstum-Pol-Ansatz

21

Ein Wachstumspol prägt das wirtschaftliche Wachstum seiner Region

- weil er **autonom** und damit zu einem Primärimpuls instande 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%



II.2.1: Identification of Regional "Growth Poles"

24

➤ **Linkages** ⇒

ARIMAX Dynamic Regression

Transfer Function Model

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

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

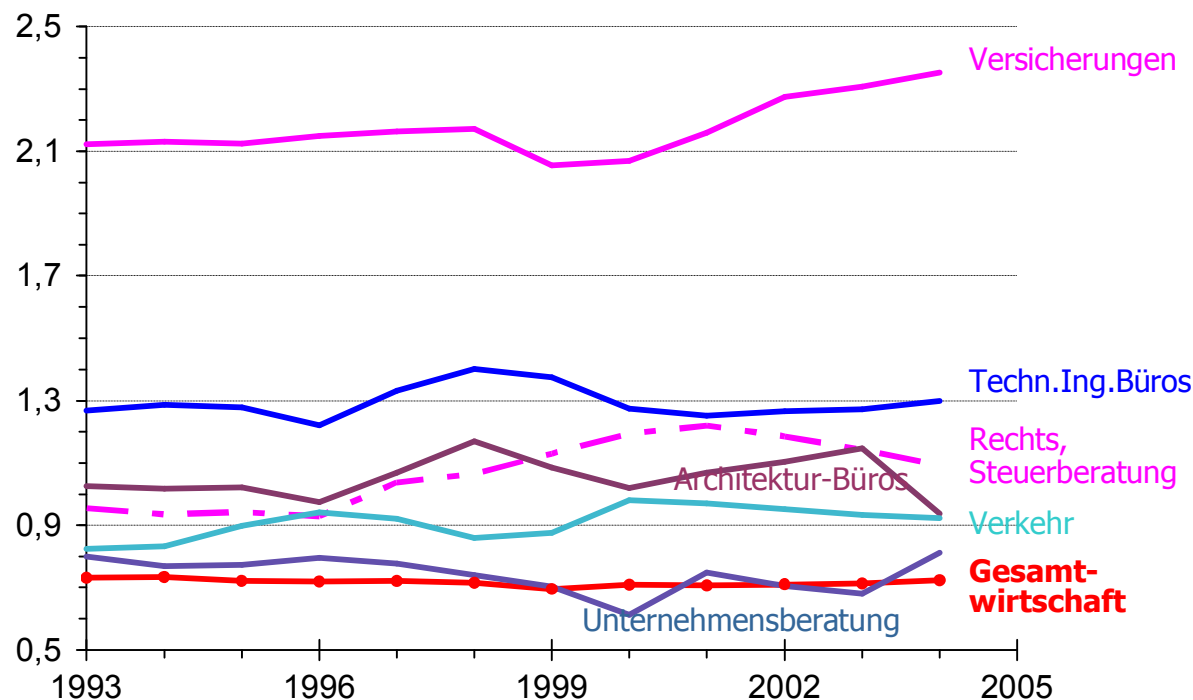
$\omega_i(B)$ is the (numerator) polynomial of the transfer function for the i th **input series**



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

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

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:

$$\phi(B) = 1 - \phi_1(B) - \dots - \phi_p(B)^p$$

$\theta(B)$ is the **moving-average** operator, represented as a polynomial in the back shift operator

$$\theta(B) = 1 - \theta_1(B) - \dots - \theta_p(B)^p$$

α_t is the independent disturbance, the random error.

Bade
2.7.2007

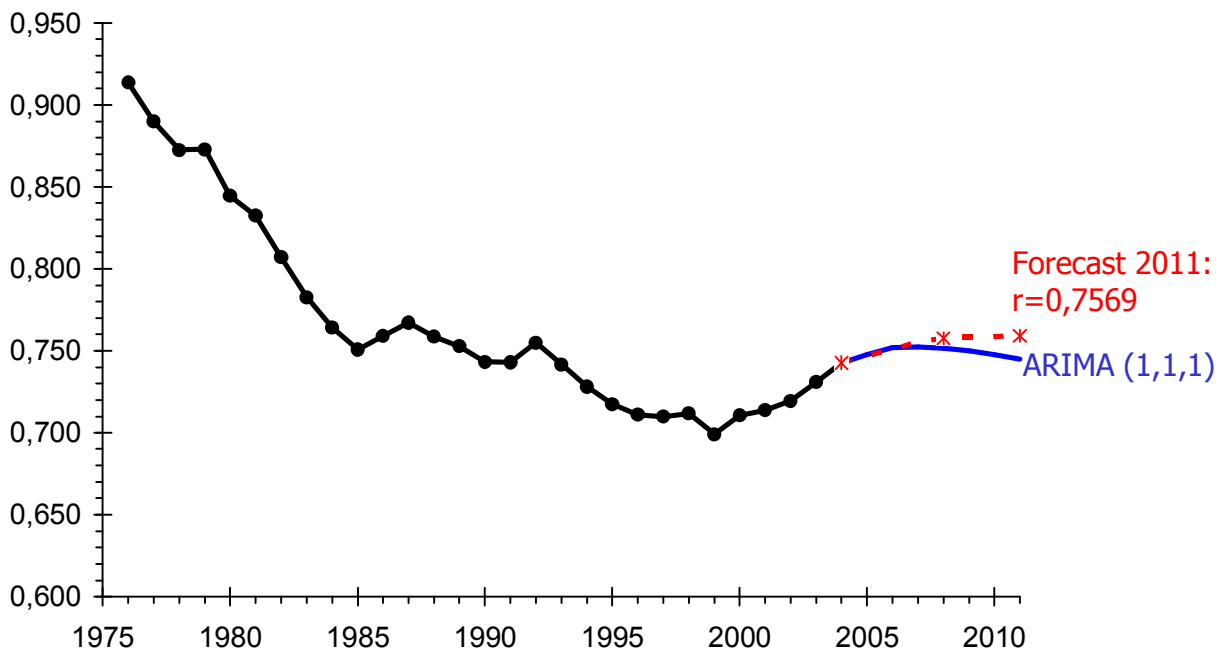


II.2.3:

Final Forecast of Regional Share Dortmund

27

Regional Share in % of National Employment



Source: Statistical Offices; own estimations

 Bade
2.7.2007


II.2:

Forecasting Regional Employment

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

 Bade
2.7.2007



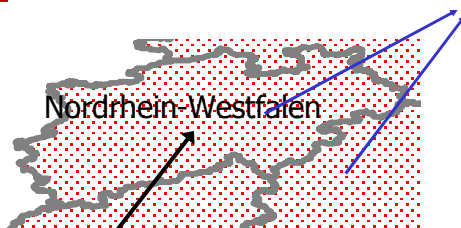
II.3:

Consistency Check(s) Bottom up Estimations

29

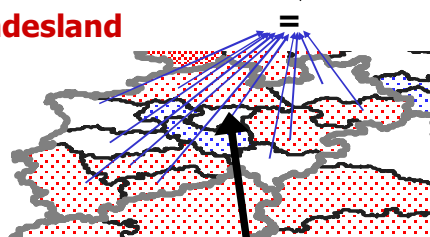
Estimation Level

4. Germany



Sum of shares
of all Länder
= ! 100%

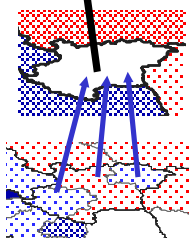
3. Bundesland



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



III:

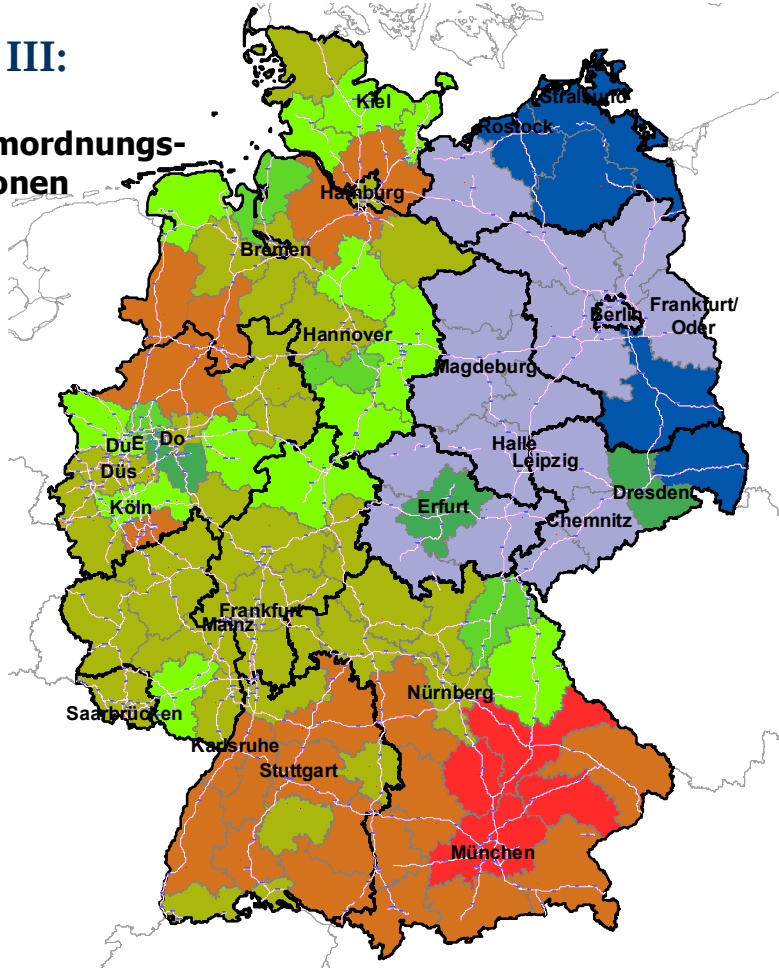
Overview

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- I. Time Series Analysis
- II. Forecasting Regional Employment
 - Univariate Time Series
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**III:
Raumordnungs-
regionen**



**Regionale
Entwicklung der
Erwerbstätigkeit
2004 - 2011
in %**

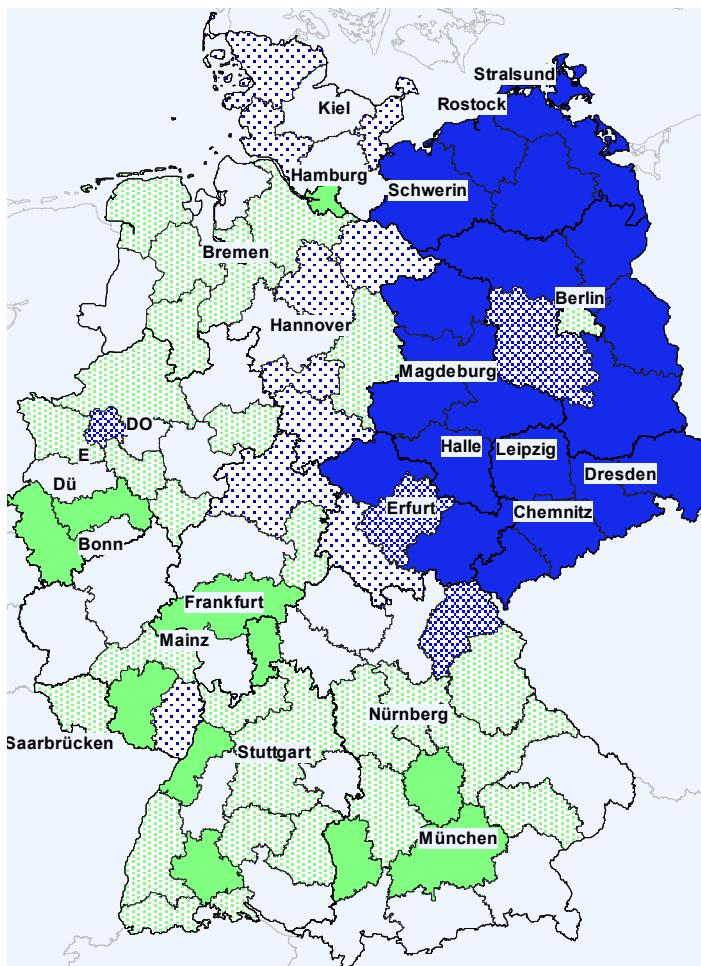
31



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



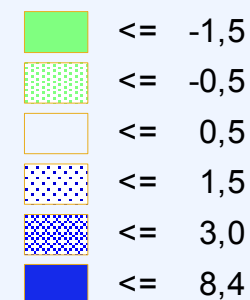
III:



**Accuracy
of Forecasts
1997-2004**

32

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

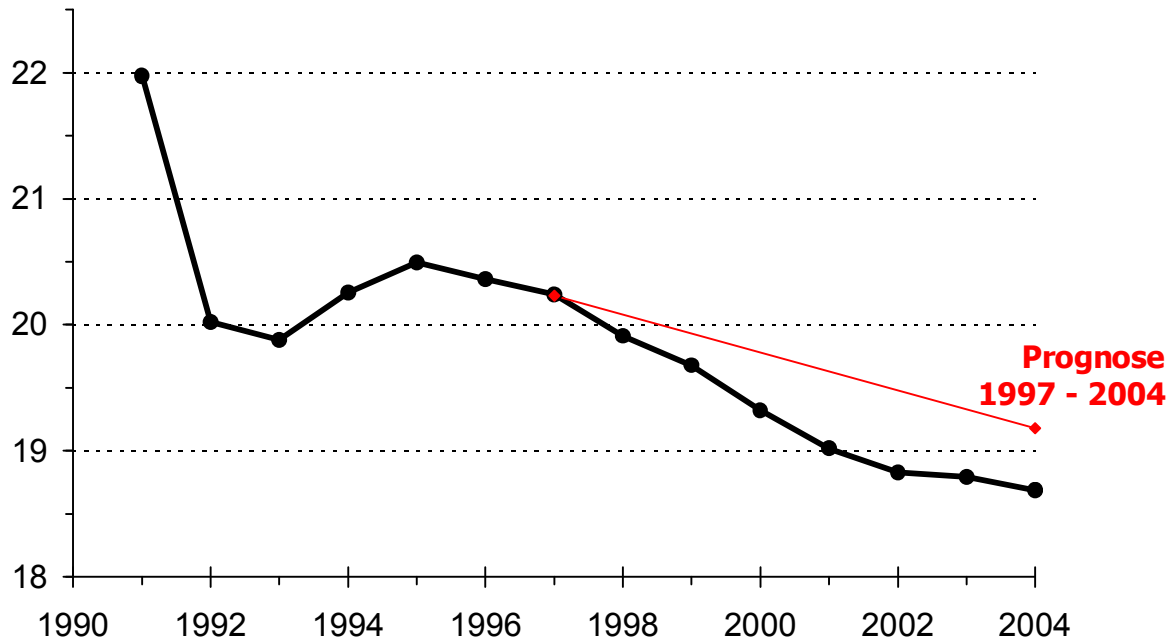




III: Ostdeutschland Prognose 1997 bis 2004

33

Anteil in % an allen Erwerbstätigen im Bundesgebiet



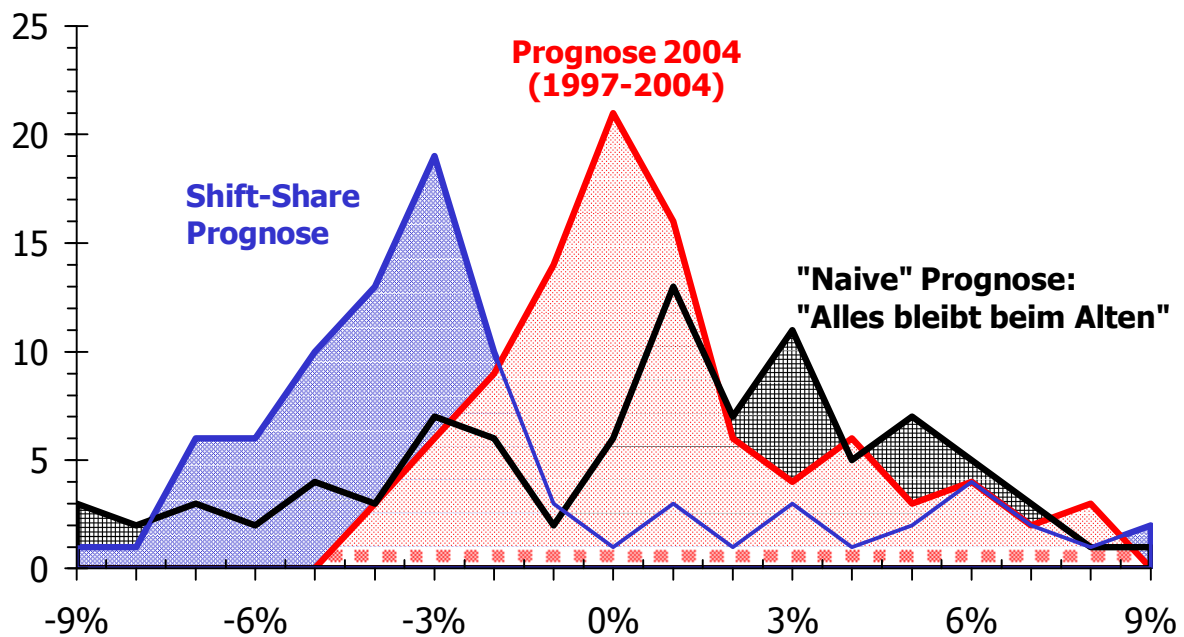
Quelle: Bade (1999); Erwerbstätigenrechnung Länder; eigene Schätzungen



Vergleich Prognosefehler

34

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

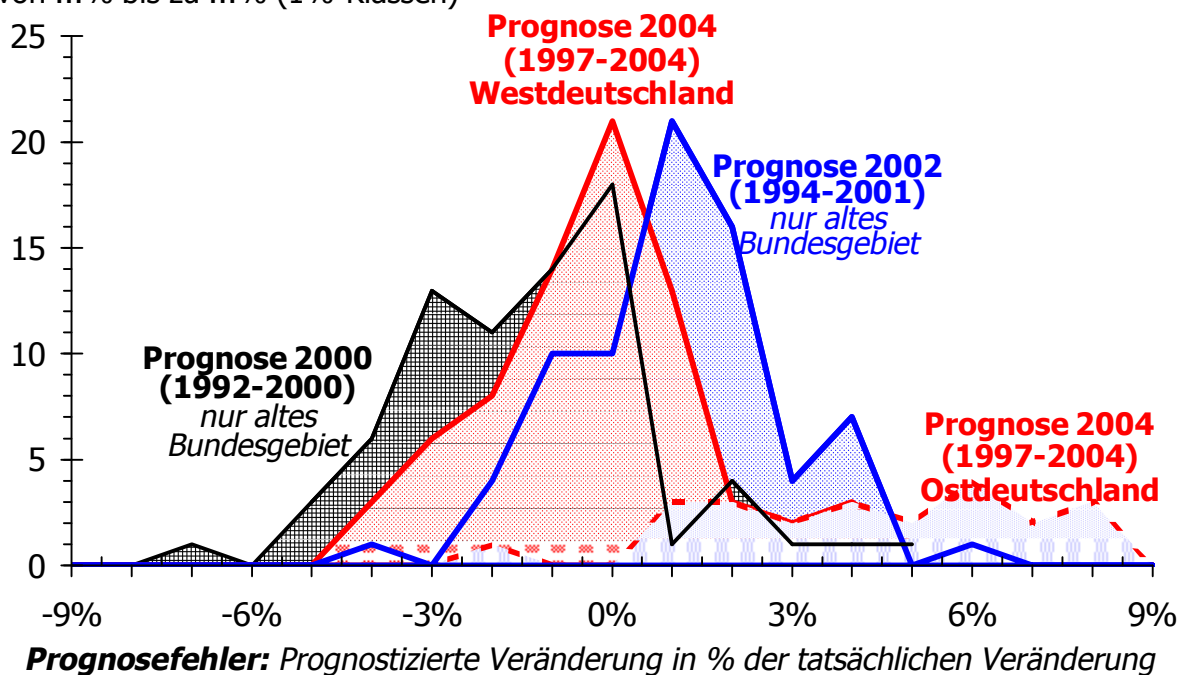




Häufigkeitsverteilung der Prognosefehler

35

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



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

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)

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

- SC

$$\Delta^1 y_{r,t} = \mu_{r,t} + \gamma_{r,t} + w_{r,t} + \zeta_{r,t} \text{ with } \mu_{r,t} = f(t) + v_{r,t}; v_{r,t} \approx (0, \sigma_v^2, v_{r,t})$$

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

Spatial Models

- SC with contiguity or distance

$$\Delta \tilde{y}_{r,t} = \tilde{\mu}_{r,t} + \tilde{\gamma}_{r,t} + \tilde{\psi}_{r,t} + \tilde{\epsilon}_{r,t} + \zeta_{r,t}$$

$$\text{with } \tilde{\epsilon}_{r,t} = \sum_{\tau=1}^k \sum_{j=1}^n w_{ij} y_{j,t-\tau} \kappa_{i\tau}, \tau \in \{1, \dots, 13\}$$

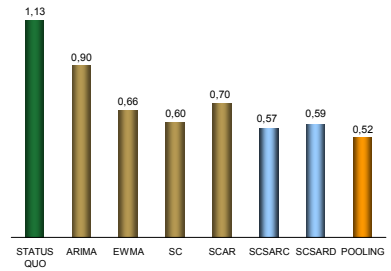
and $w_{ij} = 1$ (contiguity)

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

- 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

7

Forecast Performance – MAPFE



8

Conclusion

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

9

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.

Concept and Methodology of a Regional Medium Term Forecasting System

Claudia Knobel, Dirk Crass



Contents

- I. Concept of the Project
- II. Methods of Medium Term Forecasting



I. Concept of the Project

1. Objective of the Project
2. Target Groups and Consequences
3. Project Partners
4. Short Term Forecasting System on the Enterprise Level
5. Medium Term Forecasting of Regional Employment



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

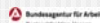
Comparison of supply and demand of future employment
Identification of mismatches and potential problems on
the future labour market

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:

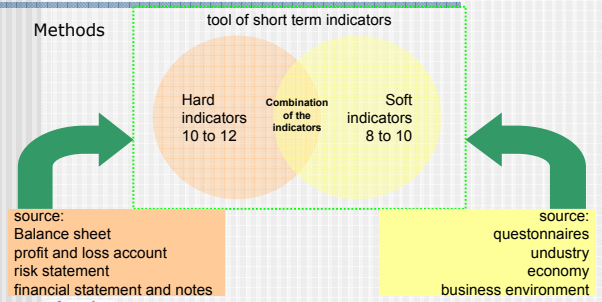
Further refinement of this instrument and evaluation in other banks in the Rhine-Main region

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	Green
Provisionsüberschuss	2.861	18%	2.415	7%	2.250	Green
Handelsergebnis	1.177	72%	685	27%	539	Green
Operative Erträge	7.076	23%	5.746	16%	4.950	Green
Risikovorlage im Kreditgeschäft	-878	69%	-521	-38%	-836	Green
Verwaltungsaufwand	5.457	16%	4.699	2%	4.593	Green
Operatives Ergebnis	2.375	38%	1.720	108%	828	Green
Periodenergebnis	1.597	35%	1.187	202%	393	Green
Cost-Income-Ratio	72,5%	-2%	73,9%	-17%	89,3%	Yellow
Anzahl Ø Mitarbeiter	35.975	9%	33.056	1%	32.820	Green
			444.86		424.87	Green
Bilanzsumme	608.339	37%	1	5%	9	Green
RoE (Eigenkapitalrentabilität)	11,2%	20%	9,3%	133%	4,0%	Green
RoRaC	18,7%	29%	14,5%	135%	6,2%	Green
Grundsatz I (Solvabilität)	11,1	-11%	12,5	-1%	12,6	Red
Grundsatz II (Liquidität)	1,2	8%	1,1	-8%	1,2	Yellow
Unternehmensrating	1	0%	1	0%	1	Yellow



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 insurance 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 insurance 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



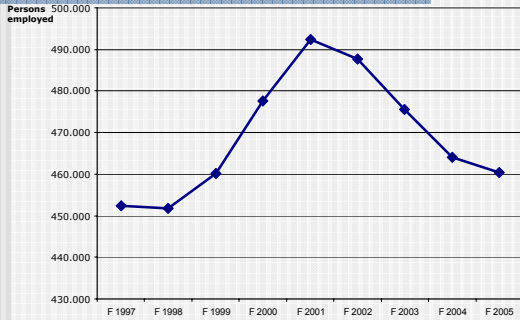
3. Data

- 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

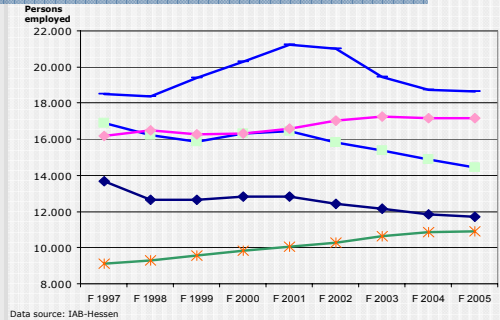
Total Employment (Frankfurt)



19

Examples for Data

Occupational groups (Frankfurt)



20

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

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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

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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

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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.

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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

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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 knew 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.

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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.

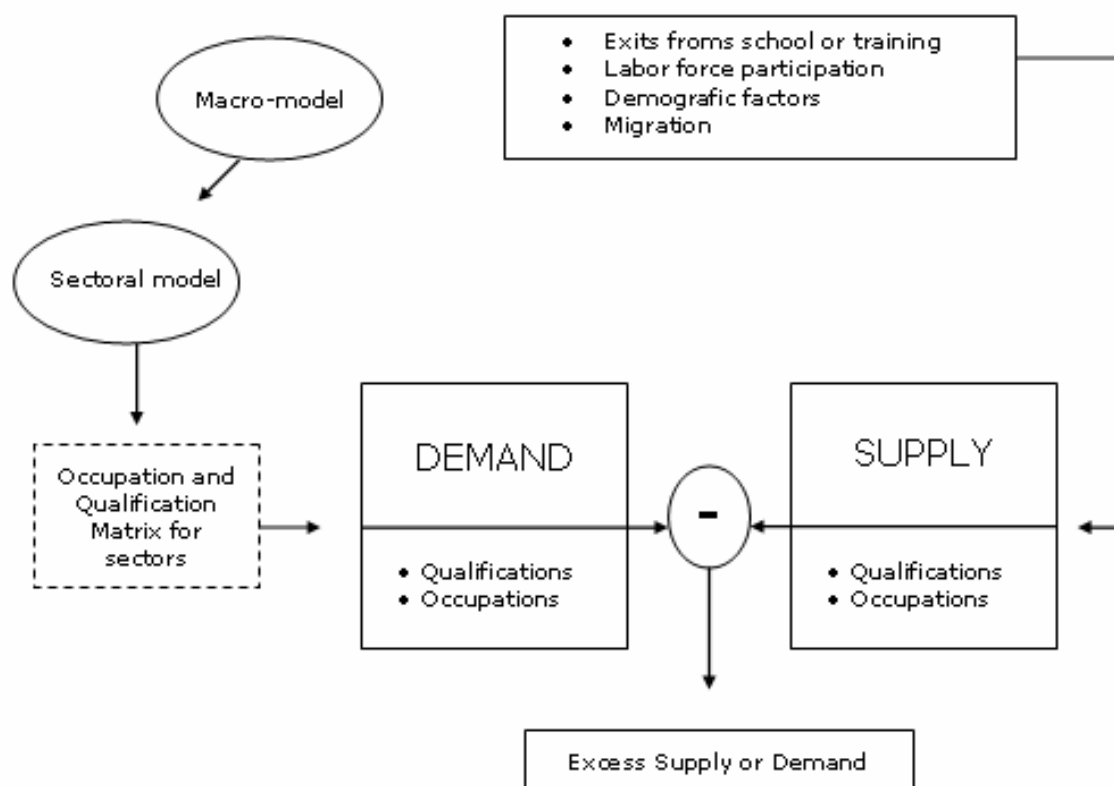
2.5 Existing forecasting models

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, sectoral 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 Recommendations for Next Steps

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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

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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



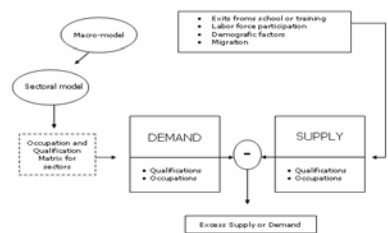
Possible methodology to forecast when to start which educational program

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 H. (2003)



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 examine and uncover new, unusual developments 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.

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