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**Technical progress and the employment market in North Rhine-Westphalia. An empirical analysis and forecast (Technischer Fortschritt und Arbeitsmarkt in Nordrhein Westfalen. Eine empirische Analyse und Prognose), German Institute for Economic Research (DIW), Berlin, 1989 (unpublished)**

*Weert Canzler*

**Abstract**

The report "Technical progress and the employment market in North Rhine-Westphalia", like the studies "NRW 2000: Economy, employment, skill levels and new technologies" by the Battelle Institute and "NRW 2020: Microelectronics, employment market and scope for action" by the study Group NRW 2000, was commissioned by the Minister for Labour, Health and Social Affairs of North Rhine-Westphalia in the context of the state government's programme "Man and technology - Social responsibility in technological planning". The German Institute for Economic Research (DIW) has developed prospective quantitative scenarios for the North Rhine-Westphalia from comprehensive empirical data. On the basis of reference scenarios for the Federal Republic and NRW, an all-out technology drive scenario - the innovation scenario - and a socially compatible modernization scenario - the modernization scenario - were developed. The two differ mainly as to the pace of structural change, the impact on employment and the type/volume of state activities. The framework conditions are not coloured by frictions in either of the scenarios. The effects of the internal market on NRW, which still has a strong secondary sector, are judged positive in both cases in keeping with the growth assumptions of the Cecchini Report. NRW can also hope to gain additional benefits from the single market in view of its central geographical position and strong links with the economies of its neighbours. Finally, a successful strategy of socially compatible modernization may be of considerable interest to other industrial regions of Europe (and the world) confronted with similar problems in future.

However, it should be noted that the DIW's quantitative scenarios and the assumed framework conditions are largely an extrapolation of the trends of the 1980s. The study does not consider either wholly new ideas or radical changes in the status quo.

**I Introduction and methods**

**Reasons for the study and objectives**

The report was drawn up for the Minister for Labour, Health and Social Affairs under North Rhine Westphalia's programme "Man and technology - Social responsibility in technical planning". The study objective was "to develop prospective, quantitative scenarios of economic development, with particular emphasis on technological aspects and the impact on the employment market in North Rhine-Westphalia" (2).

## Terms of reference and team composition

The task of the DIW team was to analyse for North Rhine-Westphalia across individual sectors and technologies "the interaction of all factors implicated in the economic process and their impact on production and labour deployment". The DIW therefore considered it "essential to identify the interrelationships between technological change and employment in the specific circumstances of North Rhine-Westphalia in comparison with the development in the Federal Republic as a whole" (2-3).

The team consisted of economists in keeping with the task. Some of the members had participated in the study "The effects of modern technologies on the labour market" (the so-called "metastudy"), carried out by the DIW and other German research institutes in the years 1986 - 1988. The study leader was Wolfgang Kirner, who had already been involved in the 1984 and 1987 DIW studies on the "Prospects for economic development in the Federal Republic of Germany to the year 2000".

## Methods

The economic data in the DIW scenarios stem mainly from the accumulated data and prognoses of the 1984 and 1987 studies on the "Prospects for economic development in the Federal Republic of Germany to the year 2000" and the structural reports prepared by the DIW and other economic research institutes at regular intervals since the 1970s for the Federal Government. These data served as a basis for a reference scenario entitled "The Federal Republic in the year 2000" and a reference scenario for North Rhine-Westphalia. The reference scenarios are characterized by the assumption that "the behaviour patterns and framework conditions currently in evidence continue to apply" (224).

The reference scenarios in particular are of a highly econometric character. Three analytical tools were used:

- The DIW long-term model: an econometric model geared to the macroeconomic cyclical interrelationships between generation, distribution, redistribution and use of income. The macroeconomic players are private households, enterprises and the State in the role of local and regional authorities and social insurance institutions. The DIW long-term model is one of a dozen econometric models for Germany that are constantly updated for analyses and prognoses.
- The FIND model: a sectorally disaggregated econometric model that disregards sectoral and cyclical interrelationships, concentrating instead on sectoral differences in the use of production processes.
- The input-output analysis, based on sectoral allocation in accordance with the accounting system of the Länder and designed to reveal the pattern of mutual relationships between the individual sectors of an economic area.

## II. Content

### Structure and main areas of the study

The study is in eight parts. The first part gives a general description of the effects of new technologies on the economy labour market.

The second part examines the development of the economy and employment market hitherto in NRW. The importance of innovation in NRW is studied in the third part, with the aid, among other things, of a regional comparison of research and development expenditure. The fourth part studies structural development on the basis of input/output ratios. The fifth and sixth parts of the study are based on the previous structural studies. They develop reference scenarios for the Federal Republic and NRW. The seventh part endeavours to demonstrate the possible effects on the employment market of an all-out technology drive in an innovation scenario. Finally, the eighth part considers the effects on the employment market of a modernization strategy with a social dimension.

Generally speaking, NRW as a constituent state of the Federal Republic has relatively little economic and political leeway. The greatest scope for pursuing an independent line is to be found on the supply side of state policy: "the scope for independent action is greatest on the supply side. The development of a Land is therefore not primarily the result of demand policy measures, but depends on the actions of the agents on the supply side. As a rule, those Länder which can concentrate wholly on sunrise sectors, without the burden of old production structures, have a clear advantage. This is a central problem for a Land such as North Rhine-Westphalia which is still largely characterized by "old" industries."(71) None of the scenarios considers a decoupling option from the German or international trend.

### The reference scenario for the Federal Republic of Germany

On the basis of the situation in 1987, the reference scenario for the development of the German economy to the year 2000 assumes a continuation of the trends of the 1980s. However, this projection has already proved untenable in several key points. For example, contrary to the assumptions of 1987 that there would be a slowing down in external trade and in investments in fixed assets in the first few years of the prognosis period, growth picked up considerably at the end of the '80s

In addition to the development of external trade, the main factors influencing the forecast economic development in the reference scenario are demographic trends and the general direction of economic policy.

It is assumed with regard to external trade that neither the debt problem of the developing countries nor protectionistic trends in international trade policy will lead to crisis situations. The Federal Republic's external trade will be determined chiefly by its performance on quality criteria. Major frictions in respect of the economic development of the Federal Republic's trading partners are excluded, the assumption being a growth in exports in real terms of 3.5 % per annum.

With regard to demographic trends, the DIW assumes that the population in the year 2000 will be 500 000 below that of 1986. However, as the employment rate will probably increase substantially, a constant labour supply can be assumed to the year 2000. There are not expected to be any major changes of a regulative nature affecting overall economic policy. Real growth rates of 3 % per annum are forecast for investments in fixed assets. The reference scenario also assumes that productivity will continue to develop as in the 1980s. There is expected to be fairly substantial structural shift to service sectors with low productivity and low productivity potential. The average working week in the year 2000 is expected to be three hours shorter than in 1989. At the same time, there will be greater flexibility in working hours. The working population in 2000 under the reference scenario will be around 760 000 higher than in 1986, but the number of registered unemployed will continue to stand at around 1.7 million.

### **Reference scenario for North Rhine-Westphalia**

Taking the same framework conditions as for the reference scenario for Germany as a whole, the DIW has attempted with its reference scenario for NRW to make "a careful assessment of the future development prospects in North Rhine-Westphalia in comparison to the Federal Republic as a whole" (294). For this reason, two aspects particularly relevant to NRW are discussed: the impact of the internal market on North Rhine-Westphalia and the framework conditions and prognoses for energy and the coal and steel sector.

According to the DIW, expectations differ as to the impact of the internal market on the economies of the Member States in general and on the economy of NRW in particular. For example, the production sector would benefit from the positive economy-of-scale effects predicted in many studies on the impact of the internal market. The situation of the NRW economy could be regarded as favourable under those conditions, because NRW has a strong secondary sector and only an underdeveloped service sector. A second important and, presumably, positive aspect is its central position. Trade relations with community countries, in particular the neighbouring Benelux countries, are already highly developed. Sectors with particularly brisk trade include chemicals, non-ferrous metals, rubber goods, vehicle construction, office machines, precision engineering/optical instruments, textiles, glass, musical instruments/toys and fine ceramics. On the whole, the prospects for most export-oriented sectors of NRW's industry in the internal market are rated good.

The energy industry and coal and steel have traditionally had a key role in NRW. The DIW assumes cutbacks and restructuring in both sectors, but particularly in coal and steel. Energy consumption is forecast to rise by an average of 0.5 % to the year 2000. Total coal sales can be expected to decline by a quarter in view of the expected cuts in subsidies to coal mining and low growth in electricity consumption. While the DIW researchers also expect production in the iron and steel industry to decline, they nevertheless assume an increase in value-added per tonne.

There are differences in the overall picture for the processing industry compared with the country as a whole. The chemicals and mineral oil industry, for example, are in a compa-

ratively good position, while mechanical engineering and the motor industry fall short of the national average. The national projections for electrotechnical goods, plastics processing and rubber goods were also considered valid for NRW

The growth lag in the tertiary sector compared with the country as a whole, which was particularly marked in the 1980s, will be significantly reduced.

By contrast, productivity in the processing industry will drop below the national average. However, the differences will be less than 1 percentage point.

The difference between NRW and Germany as a whole with regard to the effects of production on employment are considerable: "a growth in employment of around 300 000 is expected in the other Länder, while in NRW the numbers of employed are expected to decline by over 50 000 by the year 2000". (356)

There is expected to be a larger decrease in population than in the country as a whole. The population loss in the Ruhr, the industrial centre of NRW, will be particularly great at 7 %. On the whole, however, the reference scenario for NRW does not differ radically from that for the Federal Republic.

#### **Innovation scenario: the effects of an all-out technology drive on the employment market.**

The objective of the innovation scenario is to quantify activities in the field of innovation and technological change which go beyond those assumed in the reference scenario. It investigates productivity and the impact on prices and incomes, as well as the relationships between technological change and investment and the effects of technological change on international competitiveness. Significant effects are expected with regard to productivity in particular: "it is assumed in the innovation scenario that vigorous innovation activity will add 0.7 percentage points to the average annual growth rate of productivity on an hourly basis in the economy as a whole between 1987 and 2000. Productivity will thus be 10 % higher in the year 2000 in the innovation scenario compared with the reference scenario".(419) Investments, real income and private demand will also be well above the assumed investment level of the reference scenario with lower inflation rates. Finally, employment will not increase as much as in the reference scenario, because the rationalization effects of higher productivity will be greater despite a much larger increase in production activity.

The DIW assumes in the innovation scenario that there will be a decline in employment in manufacturing, inspection/supervision, transport and clerical activities. By contrast, there will be an increase in maintenance/repair, trade, consultancy, research/technology and education/care professions.

Such shifts in relative importance will have an effect on the required qualifications. Job content and training will change, the proportion of college and university graduates in the overall workforce will increase and approach the level of the rest of the country.

### **Scenario of a socially responsible modernization strategy**

While the technology drive of the innovation scenario would lead to faster growth rates than the reference scenario, it would have zero or adverse effects on employment owing to productivity gains. The purpose of a socially responsible modernization strategy, on the other hand, is "to identify opportunities which could be used in order to ensure that technological advances are not made at the expense of other social objectives".(472) Apart from the employment/unemployment aspect, the following areas are important in the modernization scenario with a social dimension:

- "- higher expenditure on infrastructure and environmental protection;
- greater use of potential flexibility in labour deployment;
- a different development course in the service sector, with the result that both public and private services achieve higher production and employment shares than in the other scenarios." (473)

More investment both by private enterprise and local and regional authorities are as much a part of the strategy for socially compatible modernization as comprehensive flanking re-training and further training measures. Infrastructure deficiencies in sectors such as effluent treatment and transport are important areas for environmental protection investment by the public authorities.

The modernization scenario envisages the following general economic effects compared with the reference and innovation scenario: "in the case of a comprehensive modernization strategy, gross domestic product in real terms will grow 0.2 percentage points faster per annum than in the case of a concentrated technology drive in the entrepreneurial sector, compared with the reference scenario, the average annual growth rate will be 0.8 percentage points higher. At the same time the overall productivity gain on an hourly basis will also increase by 0.2 percentage points compared with the innovation scenario owing to further reductions in working hours and faster growth. However, the productivity gain per employed person will be around 0.3 percentage points per annum lower than in the innovation scenario. This means that the average annual increase in the numbers employed will be 0.5 percentage points higher". (507)

The researchers conclude that the socially compatible modernization strategy would have significant additional positive effects on employment which, however, cannot be assigned to individual sectors. Several conditions need to be met if, as is basically considered possible, the growth lag between NRW and the rest of Germany is to be reduced: firstly, there is an urgent need for "improved framework conditions for state and local action at the level of the Länder" (510) and in particular a reform of the fiscal adjustment mechanism and of local authority to finances and, secondly, demand in both the private and public sectors needs to be shifted toward services. In addition more flexible working hours and more part-time jobs are of great importance, as this could in particular raise the proportion of women in the labour force, which is still extremely low compared with the national average.



### III Consequences for the European Community

The scenarios of all-out innovation and modernization with a social dimension concern the land of North Rhine-Westphalia. However, they represent development paths which could have validity for Europe as a whole or for other industrial areas. In keeping with the Cecchini Report, the scenarios described assume that completion of the internal market will boost growth. NRW has a central position in the single market in view of its economic weight and export orientation as well as its geographical position.

The simulated socially responsible modernization strategy can perhaps serve as a guide for Community policy or for the other Member States. In particular the stepping up of environmental protection activities and reskilling measures underpinning the continuing dissemination of new technologies are an essential part of a pioneer modernization policy.

#### Evaluation

The qualitative scenarios and prognoses for the development of the German economy are essentially based on projections of the data from the late '70s and the '80s. The limited validity of projections of economic data became evident for the key indicator of gross domestic product only a few years after the prognoses were made.

The assumed international and political framework conditions are also basically those of the 1980s with minor adjustments. Radical changes, such as those caused by the upheavals in the countries of eastern Europe, are not even contemplated in the discussion of the future international context.

The DIW study is somewhat disappointing as regards the political recommendations for action. Potential employment opportunities in NRW are to be opened up above all in the present deficit areas of personal and other services through increased environmental protection measures and long overdue investment in infrastructure and housing construction. The DIW recommendations therefore abide by the standard compensatory economic strategies. No radically new ideas or theories are developed.

Finally, the DIW strategy of socially responsible modernization also regards environmental protection merely in terms of instruments. However, a modernization policy truly geared to the global ecological challenges must devise solutions based on the requirements of conservation of resources, prevention of emissions and environment friendly production.

## APPENDIX

### List of Recent Futures Studies and Projects in the Federal Republic of Germany

Last entrance: December 1989

ALTVATER, ELMAR/BAETHGE MARTIN (ed.), Arbeit 2000 - Über die Zukunft der Arbeitsgesellschaft, Hamburg, 1985

ARGE NRW 2000, NRW 2020 - Mikroelektronik, Arbeitsmarkt und Gestaltungsmöglichkeiten, Projekt im Rahmen des Programms: Sozialverträgliche Technikgestaltung des Landes Nordrhein-Westfalen (unpublished)

B.A.T. FREIZEITS-FORSCHUNGSINSTITUT, Horst W. Opaschowski, Projektstudie: Wie leben wir nach dem Jahr 2000? - Szenarien über die Zukunft von Arbeit und Freizeit vom B.A.T Freizeit-Forschungsinstitut, 2nd edition, Hamburg, 1988

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BATTELLE-INSTITUT E.V., NRW 2000 - Wirtschaft, Qualifikation und neue Techniken. Erarbeitung alternativer Szenarien und Gestaltungsvarianten gesellschaftlicher Entwicklung, Projekt im Rahmen des Programms: Sozialverträgliche Technikgestaltung des Landes Nordrhein-Westfalen (unpublished)

BECHMANN, ARMIN, Landbau-Wende - Gesunde Landwirtschaft - Gesunde Ernährung, Frankfurt/M, 1987

BRÖDNER, PETER, Fabrik 2000 - Alternative Entwicklungspfade in die Zukunft der Fabrik, Berlin, 1985

BUND FÜR UMWELT UNND NATURSCHUTZ DEUTSCHLAND BUND (ed.), Umweltbilanz - Die ökologische Lage der Bundesrepublik, Hamburg, 1988

BUNDESMINISTER FÜR FORSCHUNG UND TECHNOLOGIE, Zukunftskonzept Informationstechnik, Bonn, June 1989

BÜHL, L. WALTER, Eine Zukunft für Deutschland - Grundlinien der technologischen, gesellschaftlichen und politischen Entwicklung, München, 1985

DAIMLER-BENZ AG - FORSCHUNGSGRUPPE BERLIN, Führt der Weg von der Industriegesellschaft in die Freizeitgesellschaft? - Aspekte veränderter Freizeitaktivitäten - erstellt von Reske, Joachim, Berlin, August 1988

DEUTSCHE SHELL AG, Grenzen der Motorisierung in Sicht - Shell-Prognose des PKW-Bestandes bis zum Jahr 2010, Hamburg, September 1989

DEUTSCHER BUNDESTAG (ed.), Bericht der Enquete-Kommission "Einschätzung und Bewertung von Technikfolgen; Gestaltung von Rahmenbedingungen der technischen Entwicklung", gemäß Beschluß des Deutschen Bundestages vom 14.3.1985 - Zur Institutionalisierung einer Beratungskapazität für Technikfolgen-Abschätzung- und Bewertung beim Deutschen Bundestag -, BT-Drs. 10/5844, Bonn 14.7.1987

DEUTSCHER BUNDESTAG (ed.), Chancen und Risiken der Gentechnologie - Der Bericht der Enquete-Kommission "Chancen und Risiken der Gentechnologie" des 10. Deutschen Bundestages, Bonn, 1987

DEUTSCHER BUNDESTAG (ed.), Schutz der Erdatmosphäre - Eine internationale Herausforderung - , Zwischenbericht der Enquete-Kommission des 11. Deutschen Bundestages "Vorsorge zum Schutz der Erdatmosphäre", Bonn, 1988

DEUTSCHES INSTITUT FÜR WIRTSCHAFTSFORSCHUNG (DIW), NRW 2000 - Wirtschaft, Beschäftigung, Qualifikation und neue Techniken, Projekt im Rahmen des Programms: Sozialverträgliche Technikgestaltung des Landes Nordrhein-Westfalen (unpublished)

DEUTSCHES INSTITUT FÜR WIRTSCHAFTSFORSCHUNG (DIW), Perspektiven der wirtschaftlichen Entwicklung in der Bundesrepublik Deutschland bis zum Jahr 2000, DIW-Wochenbericht 25/87, bearbeitet von Blazejczak, Jürgen/Kirchner, W./Krupp, Hans-Jürgen, Berlin, 1987

FORSCHUNGSSTELLE FÜR GESELLSCHAFTLICHE ENTWICKLUNGEN AN DER UNIVERSITÄT MANNHEIM, Projekt-Endbericht: "Trends und Schwerpunkte in der Zukunftsforschung unter besonderer Berücksichtigung der Entwicklungsoptionen für die Bundesrepublik Deutschland", bearbeitet von Widmaier, Ulrich u.a., erstellt im Auftrag des Bundesministeriums für Forschung und Technologie, Mannheim, no date

FORUM ZUKUNFT, Hesse, Joachim Jens/Zöpel, Christoph (eds), 4 volumes:

- vol 1: Zukunft und staatliche Verantwortung, Baden-Baden, 1987
- vol 2: Neuorganisation der Zeit, Baden-Baden, 1988
- vol 3: Zukunftswissen und Bildungsperspektiven, Baden-Baden, 1988
- vol 4: Zukunftsoptionen - Technikentwicklung in der Wissenschafts- und Risikogesellschaft, Baden-Baden, 1989

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- vol 1: Umweltschutz zwischen Reparatur und realer Utopie - Wege aus der Bedrohung, Köln, 1988
- vol 2: Arbeit und Gesellschaft solidarisch gestalten - Die Zukunft der sozialstaatlichen Demokratie, Köln, 1988
- vol 3: Soziales Wirtschaften durch solidarisches Handeln - Wirtschaftspolitische Alternativen, Köln, 1988
- vol 4: Technologieentwicklung und Techniksteuerung - Für die soziale Gestaltung von Arbeit und Technik, Köln, 1988
- vol 5: Ältere Menschen im Sozialstaat - Für eine solidarische Sozialpolitik, Köln, 1988
- vol 6: Tarifpolitik im Strukturwandel - Arbeitsverfassung und industrielle Demokratie, Köln, 1988

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Deutschland und einigen ausgewählten Ländern (3 volumes), edited by Burmeister, Klaus/Canzler, Weert/Dunkelmann, Henning/Kreibich, Rolf, erstellt im Auftrag des Ministers für Stadtentwicklung, Wohnen und Verkehr des Landes Nordrhein-Westfalen, Berlin, 1989

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