EDUCATIONAL AND LABOUR MARKET FORECASTING ACTIVITIES IN THE FEDERAL REPUBLIC OF GERMANY AND AUSTRIA: A SURVEY OF METHODS AND SOME CONCEPTUAL AFTERTHOUGHTS

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I. INTRODUCTION

The choice of analytical tools for decision- and policy-making for education and employment is a matter of ongoing dispute. The manpower requirements approach or combined approaches are often discredited because of their poor forecasting performance reflected in accuracy-tests. On the other hand, the rate-of-return or earnings function approach is different in nature and does not lend itself to such tests because it is seldom used for forecasting.

This debate between the two dominating schools, the input-output/planning and the human capital school (or should one venture to say ideologies) has existed over the last two decades and filled much space in the Anglo-Saxon journals. Surprisingly, the corresponding debate in German speaking countries has not followed this pattern. One could have expected the rate-of-return methods to have been at least considered since these countries have market-economies. Lack of cross-classified data on income and education is one major reason for this path not having been followed. Another reason, and the one which has led to these data not being produced, is reticence in political institutions as well as in some academic circles. German economics of education and labour economics, therefore, digressed from the mainstream. Specific "approaches" have been developed. Their reflection in English journals is very scanty. And, what is not in English journals non est in mundo. This lack is not over-dramatic, the development of these approaches having come to a near standstill by the mid 1970s and human capital-methods gaining a little of the territory lost. Nevertheless, it seems worthwhile to trace the development of the "German" approaches. In undertaking the stock-taking and confronting it with the planning procedures of the institutions and bureaucracies, one matter should be noted in particular. This is the obvious divergence between the preponderant steering-principle pertaining to the economy and the labour markets, namely a mixed market-system, and the overwhelming role of forecasting tools which find their proper place in planned economies. This raises the more fundamental question of whether there is a correspondence of education and labour market forecasting approaches and economic systems. The technicalities of the approaches seldom deal with the problems of the adequate choice, implementation and use of the methods in this respect. Can one advocate, then, something like a scientific progress per se inherent in the methods and approaches? Checking more closely the claims, structures and results of the approaches, one obviously finds many selectivity distortions typical of them. Assuming the non-objectivity of analytical approaches one may, more generally, raise the question of whether one can and should arrive at a mix of approaches which is appropriate to each specific type of economic order and what bearing this may have on the future methodological progress.
II. AN OVERVIEW OF THE INSTITUTIONAL BACKGROUND FOR EDUCATIONAL AND LABOUR MARKET FORECASTING AND POLICY

Forecasting activities are seldom intentionally l'art pour l'art. As a rule forecasts are required and commissioned by public authorities responsible for policy-making. Even independent academic analyses and forecasts have to consider, at least, the availability of research funds. To a certain extent forecasts are therefore an outgrowth and a reflection of the political and economic system in which and for which they are prepared. Even the technicalities of analytical methods can be better understood when confronted with their institutional breeding-ground.

To depict the essential features of an institutional framework or, more generally, a socio-economic order is a formidable task proven by the burgeoning literature on comparative economic systems. For the purpose of this paper it may suffice to glance in rather general terms at the basic institutional characteristics relevant for educational and labour market policies in the Federal Republic of Germany (FRG) and Austria.

Both countries are said to be mixed economic systems to which the label "market economies" is attached with more or less justification. More than a quarter of a century of political development, encompassing government by opposing parties and ideologies, has led to a policy-mix which is all too often contradictory. The field of education and work makes no exception to the impression of the piece-meal character of the system.

1. Education

A backbone, though sometimes a disturbing one, of the organization of the educational system is the constitutional right for all individuals to choose freely an institution of education. Individual freedom is in practice, however, constrained by many factors and often interpreted in peculiar ways. Probably the most important constraint is the predominant public provision of education. The role of private education is negligible. Yet, one has to stress a major exception which is the so-called "dual system" of vocational training. In a sort of a sandwich-system, apprentices receive on-the-job training in the companies and have to follow courses in formal schools. Public provision of education which is with the federal states ("Länder") in the Federal Republic of Germany and with the federal government in Austria entails several consequences. It means above all a detailed legislation regulating the curricula, the finance, the personnel (having the status of civil servants) and the admission criteria for pupils and students. Formulated in another way it means that an educational institution is left with little room for manoeuvre in the fields of educational content,
teaching staff, building, equipment and other facilities. Thus, any effort to adapt to changing social, cultural or economic conditions has to pass through the network of bureaucracy and sometimes even needs legislative amendments.

Other limitations influence the freedom of educational choice. To be sure, education even at the university level is free of charge. Yet, to secure gratuity plus free choice presupposes an adequate supply of educational facilities. This cannot always be ensured. Lack of capacity relative to the demand inevitably implies open or hidden obstacles to admission. Among the more or less hidden entrance barriers to universities some form of queuing-up, especially in the natural sciences, engineering or medicine can be observed. In universities, and in disciplines where demand apparently could not be repressed a tough entrance restriction, known as "numerus clausus", was introduced. This mechanism, which exists only in the Federal Republic of Germany, and which is strongly opposed to in Austria, centrally distributes study-places (cf. A. Flitner 1976). The criteria for students to apply for the places are the grades in the secondary-school-leaving-certificate ("Abitur"). A central agency is in charge of the administrative procedure of this kind of enrolment planning.

Allocating study places is by no means the only reason that the educational system needs a strong administrative body. The network of educational legislation which is closely knit and the public responsibility assumed even for rather detailed concerns of the particular institutions brought about the establishment of impressive ministries at each of the Länder and at the federal level of the Federal Republic of Germany. But even these large organizations encountered limits. Education, being by its very nature a long-term activity, puzzles bureaucratic behaviour which is usually bound to short-term periods. Therefore it is not astonishing to note the gradual building-up of advisory bodies, consultative committees, planning agencies and the like. Only the most important of these in the Federal Republic of Germany are cited below (for more detail see Hüfner, Köhler, Naumann 1977, Hüfner 1977, Mäding 1980).

From the 1950s onwards one can speak of a "... de jure and de facto institutionalization of educational administration and planning in the Federal Republic of Germany ..." (K. Hüfner, H. Köhler and J. Naumann 1977, p. 56). State supervisory control together with the exercice of the cultural sovereignty of the federal states requires a permanent effort of coordination. The body with the most-lasting tradition is the Standing Conference of Ministers of Education and Cultural Affairs of the Länder ("Kultusministerkonferenz", KMK) which was created in 1948. With the aim of a more direct production of planning documents, especially in the area of educational
finance, the Educational Commission (Bildungskommission) was established by the Parliament in 1958. With the problems becoming even more acute at the tertiary level of education a specific advisory organization to the Federal- and the Länder-level was set up in 1957 known as the Science Council (Wissenschaftsrat). Its task is to prepare overall plans and recommendations for the universities and for science. In the same spirit as for the other educational forms the German Educational Council (Bildungs­rat) was formed in 1965. The agreement between the State and the Länder foresaw among other things the development of structural long-term plans both for specific forms and the overall educational system. By the end of the 1960s modifications in the Constitution permitted a certain shift of planning towards the federal government. The federal ministry for education and science enlarged its activities. A federal policy statement (Bildungsbericht 1970) and a programmed document of the Educational Council (the Strukturplan 1970) were published. The stronger will to bridge the political gap between the Länder and the federal government was also reflected in the setting-up in 1970 of another body, the Bund-Länder-Kommission for Educational Planning (BLK). Its duty was to draft planning documents which included the coordination of the educational budgets. Thus, a step towards the implementation of plans had been made. The struggle for a version of the Comprehensive Educational Plan (Bildungsgesamtpland) acceptable to all entities concerned, demonstrates that this endeavour was eventually over-ambitious. In fact, version I took three years for publication (1970 - 1973) and version II was drafted in 1979. At the university level several activities of the Science Council in the 1970s had a more or less similar fate. The framework act for Higher Education (Hochschulrahmengesetz) initiated in 1970s was put to the vote in parliament in 1976, not to speak of the implementation thereafter in the Länder.

In Austria long-term educational planning is less exposed to federal legislation. Although some autonomy is with the Länder the arena for dispute is the confrontation between the political parties. Conflicts arise in the pre-parliamentarian area as educational matters require a two thirds-majority by constitution. Programming activities nevertheless can be observed. After a large stock-taking and planning exercise initiated and directed by the Educational Investment Program of the OECD in the 1960s (Bundesministerium für Unterricht 1967) several advisory commissions have been created. Of these, only the Commission for Educational Reform (Bildungs­reformkommission) has survived. This deals essentially with matters of internal, pedagogical reforms. For universities, the ministry submits to the parliament every three years an account of its activities and an overview of the developments and the
tasks ahead. Since the beginning of the one-party socialist governing period in 1970 the leading forces have found it more comfortable to commission (or not to commission) analytical and planning documents to which they can pay attention or not, instead of engaging in committee-work.

2. The labour market

In the labour market as in education two apparently conflicting, but in the German-speaking context co-existing, qualities can be detected. On the one hand, there is a faith in the market-forces but on the other, a trust in a thorough bureaucracy. Individuals and firms in principle are free in their decision regarding the labour market. The choice of a profession, of a work place or of the hiring of a person is with few obvious exceptions unconfined. The usual regulations stem from the collective bargaining rules and from controlling unfair or unsocial labour contract practices. Yet, by the mid 1960s the labour exchange offices concerned mainly with the administration of the unemployed were taken by a great upswing. Once more initiated by OECD, the market mechanism had to be supplemented by public promotion efforts: labour promotion acts came into being (Austria 1968, Federal Republic of Germany 1969) and with them a bureaucracy. Above all it has to be underlined that the public labour administration is given the monopoly of placement. No private company aiming at selling job information and placements is legally permitted to do so (although one may note that some services are tolerated). In the Federal Republic of Germany the large Federal Employment Agency (Bundesanstalt für Arbeit) and its regional and local employment offices fulfill the task of information, counselling, orientation and guidance as well as placement. In Austria the same duties are within a similar organization depending directly on the Ministry of Social Affairs. The legally defined competency of this labour market administration provokes no urge to confer with the coordinating and planning bodies. Most of the analytical documents required for long-term labour market policy are being produced within reach of the administration itself. The Bundesanstalt makes use of a large specialized Institute, the Institute of Employment and Occupational Research (Institut für Arbeitsmarkt- und Berufsforschung) being a part of its organization. To a certain extent, the Austrian Federal Ministry bases its labour market policy on the recommendations of an advisory committee (Beirat für Arbeitsmarktpolitik).
III. MAIN DEVELOPMENTS IN THE EDUCATIONAL AND LABOUR MARKET FORECASTING ACTIVITIES

1. Some systematic ordering

In the Federal Republic of Germany virtually dozens of forecasts of the manpower requirements, the educational supply, the whole educational and employment system, specific professions and particular educational (university) fields have been developed. More than half a dozen studies undertook the laborious task of stock-taking, describing and evaluating the forecasts (G. Kühlewind, M. Tessaring 1975, G. Brinkmann et al. 1976, L. Alex and G. Weisshuhn 1980, BMBW 1980, MittAB 3/1980, U. Teichler and B.S. Sanyal 1982, M. Tessaring 1982). These evaluations are not repeated here. The idea is rather to single out some of the more important and more original approaches in order to mark some characteristic stages of methodological progress. The selection is necessarily subjective and does not do justice to a whole range of studies not commented hereafter. It is also of little interest to follow a strict chronological order of presentation. Some systematic ordering seems to serve the purpose better.

A simple classification of human resource forecasting approaches can be presented in the form of a framework of supply and demand (or requirements) as well as quantities and prices. Inserting the names of the approaches leads to the following picture of systematic ordering:
Figure 1: A table of human resources forecasting approaches

<table>
<thead>
<tr>
<th>A. SUPPLY</th>
<th>B. DEMAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 1.1. Individual/social demand approach</td>
<td>B 1.1. Manpower requirements approach</td>
</tr>
<tr>
<td>A 1.2. Absorption approach</td>
<td>B 1.2. Density figures, social indicator concept</td>
</tr>
<tr>
<td>A 1.3. Integration approach</td>
<td>B 1.3. Marxist approaches</td>
</tr>
<tr>
<td>A/B 1.1. Structural models</td>
<td></td>
</tr>
<tr>
<td>A/B 1.2. Flexibility concept</td>
<td></td>
</tr>
<tr>
<td>mobility</td>
<td>substitution</td>
</tr>
<tr>
<td>A/B 1.3. Institutional approaches</td>
<td></td>
</tr>
<tr>
<td>(segmented labour market etc.)</td>
<td></td>
</tr>
<tr>
<td>A/B-1/2.1. Synthetic approaches:</td>
<td></td>
</tr>
<tr>
<td>i) Full labour market models</td>
<td></td>
</tr>
<tr>
<td>ii) Programming, optimization models</td>
<td></td>
</tr>
<tr>
<td>iii) Systems dynamics</td>
<td></td>
</tr>
<tr>
<td>A/B-1/2.2. Non-Walrasian models</td>
<td></td>
</tr>
<tr>
<td>(quantity rationing)</td>
<td></td>
</tr>
<tr>
<td>A/B 2.1. Screening, signalling models</td>
<td></td>
</tr>
<tr>
<td>A 2.3. Earnings functions</td>
<td>B 2. Distribution theories</td>
</tr>
<tr>
<td>A 2.2. Demand for education functions</td>
<td></td>
</tr>
<tr>
<td>A 2.1. Rate of Return approach</td>
<td></td>
</tr>
</tbody>
</table>

(1) Factor quantities

(2) Factor prices
Making use of this classification table as a sifting procedure of the studies elaborated in the Federal Republic of Germany and Austria one arrives at the following rough overview exhibiting the authors' names and the year of publication. The scheme is biased insofar as institutional (segmentation) and human capital analyses which are not at the centre of interest in this survey are more or less neglected. Anonymous studies of coordinating or programming committees (EIP/OECD, KMK, BLK) have also been omitted as have specific studies on occupations.
**Figure 2:** An overview of main human resources forecasting studies in the Federal Republic of Germany and Austria

<table>
<thead>
<tr>
<th>A. SUPPLY</th>
<th>B. DEMAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prognos et al. 1971</td>
<td>Riese et al. 1967</td>
</tr>
<tr>
<td>Gaulke 1972</td>
<td>Jeschek 1973</td>
</tr>
<tr>
<td>v. Weizsäcker et al. 1972</td>
<td></td>
</tr>
<tr>
<td>Matthias 1973</td>
<td></td>
</tr>
<tr>
<td>Weisshuhn 1978</td>
<td></td>
</tr>
</tbody>
</table>

| A/B 1.1. Widmaier et al. 1966 | |
| Battelle 1969 | |
| Alex et al. 1972 | |
| DIW (Hegelheimer, Weisshuhn) 1974 | |
| Prognos (Schröder, Weiding) 1976 | |
| Weisshuhn 1978 | |
| Clement et al. 1980 | |
| A/B 1.2. Battelle (Blum, Frenzel)/IAB 1975 | |
| A/B 1.3. Lutz, Sengenberger 1974 | |
| Sengenberger 1978 | |

| A/B1/2.1. i) Krelle, Fleck, Quinke 1975 |
| Jäger 1980 | |
| Zangl 1977 | |
| Pestel et al. 1978 | |

| A/B 2.1. Teichler 1974 |
| v. Weizsäcker 1975 |

| A 2.3. Weisshuhn, Clement 1982 | |
| Krug 1981 | |

| A 2.1. Schmidt, Baumgarten 1967 |
| Krug 1967 | |
| Weisshuhn 1977 | |
2. Major methodological characteristics
   (a) The basic model in perspective

   From a rather early stage, researchers in the Federal Republic of Germany and in Austria implemented the basic manpower requirements/social demand ("supply") methodology as proposed by the OECD in its "Educational Investment Program" or its "Mediterranean Regional Project". G. Bombach's position papers gave an additional impetus (G. Bombach 1963 and 1965).

   Austria took part in the Educational Investment Program which led to impressive volumes on educational policy and planning (Bundesministerium für Unterricht 1967). In Germany, the first two large studies grew out of the Bombach-school in Basel. One is the fully-fledged regional model of Widmaier for Baden-Württemberg (H.P. Widmaier et al. 1966), the other Riese's forecasting study on requirements of university graduates (H. Riese 1967). These studies have subsequently been followed by a number of research works being concerned with either partial or full-system investigations. One line of development was the perfectioning of the "dominant model" (M. Debeauvais, G. Psacharopoulos 1981, p. 4) in making it more detailed, more fully computerized, subject to sensitivity analysis etc. (see especially Battelle 1969 and Battelle 1975, DIW, Hegelheimer, Weissnhnn 1974, Clement et al. 1980). Other projects tried to extend the basic methodology or, on the contrary, aimed at elaborating alternative approaches.

   It must be stressed from the outset that the German debate on the "most suitable" approach was heavily penetrated by ideological considerations, the extent of which surely exceeded that in other countries. It is typical therefore to find the analytical concepts intermingled with statements about social trends or about the need to alter some societal, economic or political tendencies. This makes an evaluation of the intrinsic methodological progress difficult and ambiguous. Difficult, because the conceptual extensions are not always formulated in neat, algebraic terms. Ambiguous, because quite a few studies aimed not so much at increasing the methodological portfolio but at altering policy-makers' views on some developments in education and employment. This instrumental character of analytical studies must always be kept in mind, even when only the technical features are at stake.

   The rest of this paper is organized in the following way: An algebraic formulation of the core of manpower supply and demand forecasts serves as a reference. Then the protective belt (the extensions) of the basic model can more easily be dealt with. Finally, some alternative concepts are presented briefly. This sequence of presentation is followed with regard to full and partial models.
(b) The basic model evaluated:
Core, protective belt and alternatives
(i) A general formulation of a structural model for reference

For the sake of rigour it may be useful to state in the most simple algebraic way the core of a requirement: supply ("structural") model. The use of the frequently quoted tautological "requirements equation" (Blaug 1967) is somewhat misleading as it does not say what matrix operations are involved.

Essentially, a structural model consists of the following equations (superscripts for educational levels are neglected):

Supply:

Educational Flows:

(1) \[ P(t+n) = T \cdot P(t+n-1) + x(t+n) \]

The vector \( P \) of the pupils (students) in a future year \( t+n \) equals the product of the matrix of the school-transition-coefficients \( T \) with the pupils vector one period before plus the vector of the entrants in the school system \( x \).

(2) \[ g(t+n) = G \cdot P(t+n-1) \]

The vector of the graduates \( g \) is given by the multiplication of the matrix of the graduation coefficients \( G \) with the pupil's vector.

(2a) \[ g^O(t+n) = O \cdot g(t+n) \]

The graduates with educational levels are transformed into occupations \( g^O \) with an education/occupation matrix \( O \).

Depreciation of the manpower supply:

(3) \[ g'(t+n) = V \cdot g(t+n-1) + f(t+n) \]

The vector of graduates entering the labour market \( g' \) is the sum of a diagonal matrix \( V \) of depreciation (mortality, disability, emigration etc.) multiplied with the vector of graduates one period earlier and the graduates \( f \) becoming employed now.

For occupations, (2a) leads to

(3a) \[ g^O'(t+n) = V \cdot g^O(t+n-1) + f^O(t+n) \]

Stock of labour force from earlier periods:

(4) \[ r(t+n) = W \cdot r(t+n-1) \]

The vector of people already and still in employment \( r \) is arrived at similarly by multiplying another age-and-skill-specific depreciation matrix \( W \) with the vector of the employed people \( r \) one period before.
Total manpower supply:
\[ s_{(t+n)} = r_{(t+n)} + g'_{(t+n)} \]

The vector of the people seeking employment \( s \) classified by education is the sum of the rest of the stock of already employed persons \( r \) plus the newly graduating people willing to work \( g' \).

Same as (5) except people are classified by occupations.

Demand:
\[ l_{(t+n)} = \frac{1}{\mathbf{P}} \cdot Y_{(t+n)} \]

The vector of employment by sectors \( l \) equals the product of a diagonal matrix of the reciprocal of labour productivity \( \mathbf{P} \) times a vector of value-added by sectors \( Y \).

The demand vector of persons by sector and level of education \( d \) is the multiplication of a "sectoral employment/education matrix" \( E \) with the sectoral labour.

This could be done similarly by occupations:

The demand vector by sector and occupation \( d^0 \) is similarly achieved by making use of a sectoral employment/occupation matrix.

Balance:
\[ s_{(t+n)} - d_{(t+n)} = b_{(t+n)} \]

The difference between the supply and the demand vectors is the balance which would be a zero-vector in the case of full equilibrium.

The balance is made in terms of occupational categories.

With reference to this set of equations some methodological extensions and alternatives of the German-speaking context will be presented.
(ii) Full structural models

Full structural models with a high degree of elaboration are always a very laborious exercise comprising the compilation of a very large data base and necessitating an important computer programming effort. Models satisfying the standards in this respect are therefore scarce. Those coping with these requirements are:

in the Federal Republic of Germany:
- Widmaier et al. 1966
- Battelle 1969
- DIW (Hegelheimer, Weisshuhn) 1974
- Battelle/IAB (Blüm, Frenzel et al.) 1975
- Prognos 1976

in Austria:
- Clement, Ahammer, Kaluza 1980
- Österreichische Akademie der Wissenschaften 1981.

1. To begin with, the models sticking to the core of the "basic model" and their interpretation of the basic methodology will be presented:

- Battelle 1969:
  This was the first comprehensive and disaggregated model of the German educational and employment system and was commissioned by the Ministry of Labour and Social Affairs.
  Target year: 1975/1976
  Statistical basis: Population Census, Microcensus
  Classification: Official standard classification of economic sectors and occupations
  Disaggregation: 35 sectors, 52 occupations
  Calculation: Only computer assisted
  Modules: Demographic input and GNP-forecast from external sources; educational flow; depreciation - and labour market modules fully connected
  Treatment of parameters: Constancy and trend variants, O-matrix: status quo plus informed guess; S-matrix: RAS-method plus trend.
  Balance: b°
  Extensions: no.

- Battelle/IAB (Blüm, Frenzel et al.) 1975:
  Commissioned by the Federal Institute for Labour as a continuation of Battelle 1969
  Target year: 1990
Statistical basis: Several official sources, especially population census 1970
Classification: Official standard classifications
Disaggregation: 34 sectors, 60 occupations, dimension of T-matrix: 65 x 75, 8 graduation levels
Calculation: Fully computer programmed, simulations possible
Modules: Only demography external
Treatment of parameters and variants: I constancy, II trend, III simulation of policy-targets
Balance: $b^0$ for 60 occupations
Extensions: yes; implementation of the "flexibility-approach", see below.

- DIW (Hegelheimer, Weisshuhn) 1974:
  Target year: 1980
  Statistical basis: Official sources but mainly a special 10% sample survey with interviews (72,000 persons)
  Classification: Official standards but more importantly specific systems on skills, occupations, job clusters, mobility patterns etc.
  Disaggregation: 42 sectors, 40 occupations, 12 graduation levels, dimension of O-matrix: 13 x 40
  Calculation: Computer programmed
  Modules: Demography external, educational flow: external but from the same institute (Gaulke 1972), GDP: calculation from the production and final demand side, particular emphasis on skill adjustment and mobility processes
  Treatment of parameters: S-matrix forecast: RAS-method, some trend assumptions
  Balance: $b^0$ for 40 occupations and $b$, consideration of several adjustment mechanisms like trends, mobility, further education and training, changes in work organization
  Extensions: Full range, flexibility, alternative skill-concepts, see below.

- Prognos 1976:
  Study commissioned by the Minister of Education and Science. Adaption and compilation of existing forecasts plus evaluation of possible effects of educational and labour market strategies.
- 15 -

○ Clement, Ahammer, Kaluza 1980:
Comprehensive study of the Austrian educational and economic system, commissioned by a semi-public association.
Target year: 1990
Statistical basis: Official statistics, especially population census, some unpublished
Classification: Dimension of T-matrix: 93 x 93; g aggregated to 5 educational grades, 16 sectors, occupations aggregated to 10 major groups
Calculation: Fully programmed
Modules: Demography and university modules external
Balance: b, b^o
Extensions: particular emphasis on a fully coherent stock/flow concept, econometric functions of labour demand.

○ Österreichische Akademie der Wissenschaften 1981:
Main block of the model commissioned by the Austrian Ministry for Science and Research. Type of model slightly differing from the "basic method". Combination of several autonomous block-models on demography, education, universities, labour market and the economy.
Target year: 2001
Statistical basis: Official statistics, some unpublished
Disaggregation: Different to model blocks; 11 educational grades, no occupations
Calculation: Fully computer programmed
Modules: Fully specified economic model, coordination of the particular blocks with a control model; employment model based on activity rates
Treatment of parameters: Several diverging assumptions including policy-simulation Balance: b
Extensions: Some particular specifications of model-blocks.

2. The discussion of the above models revealed that the "basic methodology" has been frequently overstepped. This was consciously done as it was felt that the core of the method was too exposed to criticism and therefore needed to be surrounded by a protective belt. Major objections are sought to be counterbalanced by developing supplementary concepts. Those few concepts mentioned below apply to both the supply and the demand side. Similar concepts derived from partial models will be dealt with later.
The crucial shortcomings of the basic approach result from:

- the rigidity of the parameters (coefficient matrices for forecasting and conversion of classification purposes)
- the simplified mapping of qualifications expressed only by education and occupation profiles emerging from standard classification schemes and
- the neglect of adjustment mechanisms for equating supply and demand.

Many methodological forays have tried to overcome or, at least, to react to these weak points. Included are mechanical extrapolation techniques making the constant relationship dynamic, the calculation of several alternative computer runs according to extrapolative or political assumptions, the simulation of political scenarios, the introduction of informed guess-estimates and the like.

In the following, just two "concepts" are chosen for a brief description. For their originality they deserve attention. One is the "functional qualification concept" the other the "flexibility concept".

The concept of "functional qualifications" aims at overcoming the all too rigid and past-oriented schemes of standard occupational classifications as well as their simplistic relation to educational grades with the aid of education/occupational matrices. This task inevitably presupposes rich, additional statistical material besides the official data. The special 10%-sample survey of the DIW-study for Berlin (1974) profited from the exceptional opportunity to include such questions. They have been asked particularly in the following areas:

- Size of the firm
- Hierarchical positions of jobs
- Functional areas of activity in the firm (production, marketing ...)
- Type of technology involved with the work (by hand, automised ...)

The statistical characteristics of these groups are then cross-classified with the traditional educational and occupational structures. This leads, firstly, to specific insights about skill patterns, relationships among the several qualification elements and job clusters and, secondly, together with income, retraining, mobility and further education, to the dynamics of qualification, i.e. career networks. Transferring this analytical information into forecasts is another, much more difficult task. In the study cited it has been tackled by extrapolating exogenously some explanatory variables among which the most important are the size of the firms, productivity, investments or capital intensity and, then, by relating them to the respective variables representing qualification. Due to the lack of time-series data this relationship is mostly estimated by cross-section regression.
In terms of the reference model the concept sketched out could be expressed in the following way (cf. also Hegelheimer/Weisshuhn 1971, p. 55 ss.):

**Supply:**

Denoting any functional qualification concept by \( h \), equation (2a) becomes

\[
(2a^+) \quad g_{(t+n)}^h = H \cdot g_{(t+n)}
\]

and

\[
(3a^+) \quad g_{(t+n)}^h = v^h \cdot g_{(t+n)}^h + f_{(t+n)}^h.
\]

The graduates with educational levels are simply transformed into a vector expressing functional categories (hierarchical or functional or technology-related) with an education/function matrix \( H \), i.e. equation \( 2a^+ \) and then written off, i.e. equation \( 3a^+ \).

Likewise for the already active population:

\[
(4a^+) \quad r_{(t+n)}^h = H \cdot r_{(t+n)}
\]

which gives the total supply

\[
(5a^+) \quad s_{(t+n)}^h = g_{(t+n)}^h + r_{(t+n)}^h.
\]

The demand side is a little less trivial:

Firstly, total employment by sector \((1)\) is broken down by size-categories, that is \( l_{i,k} \) for \( i = 1, \ldots, n \) sectors and \( k = 1, \ldots, g \) size-categories. The size-category (or other suitable variables) is then considered as a determining factor for the distribution in absolute terms of functional categories by sector. A simple relationship is specified and estimated by regression:

\[
d_{i,k}^h = f(l_{i,k}),
\]

that is, for any sector \( i \) the distribution of any functional category \( h (h = 1, \ldots, m) \) by size-groups in absolute terms is a function of the total employment by size-groups of this sector. Presupposing the existence of an exogenous forecast of \( l_{i,k} \) one may get an estimate of the people employed in sector \( i \) with the functional category \( h \) and belonging to size-group \( k \), denoted by \( \hat{d}_{i,k}^h \). The sum of all sectoral vectors of functional categories leads to

\[
(7a^+) \quad \hat{d}_{i,k}^h = \sum_{i=1}^{n} \hat{d}_{i,k}^h,
\]

and the balance accordingly is

\[
(8a^+) \quad s_{(t+n)}^h - \hat{d}_{i,k}^h = b_{(t+n)}^h.
\]

In essence, this concept permits us to express discrepancies between supply and demand, not in rigid, limitational categories but in a fuller description of qualifications.
Moreover, it also provides a better understanding of more realistic processes of education, labour and production shaped by skill-patterns, hierarchical work-organization and technological influences.


The concept of flexibility is very broad. It covers all the imprecisions of the labour market and is, therefore, concerned with the varieties of qualifications appearing on the labour markets and the movements of people (and jobs) classified by several criteria. The concept is directed against one major weakness of the core-model which has been presented in the following way: "The supply and demand sides of the labour market are seen as if each was composed of a number (depending on the number of categories selected) of separate, clearly demarcated labour markets, without any cross-fertilisation" (Mertens 1973, p. 1). As this is not the case in reality, watertight discrepancies, emerging at the confrontation of supply and demand, become very problematic. One aspect, therefore, is to detect similarities and overlaps of educational and skill categories. This may pertain both to persons and to job descriptions.

As a consequence, the idea of labour market imbalances becomes somewhat fuzzy. The fuzziness finds, however, limits as substitution is possible only to a certain degree. To the extent that shortages or surpluses persist, become apparent, and are signalled it is most probable that adjustments occur. These adjustments take place in the form of movements of persons and/or redefinitions of jobs. According to the (somewhat unhappy) terminology of the flexibility concept, movements of people (supply-side) are called "mobility" and alterations of jobs (demand-side) are named "substitution". A further distinction is between observed (ex post, realized) and potential (possible) flexibility. Such movements may relate to educational grades, sectors, occupations, status, regions, job families etc. (see also Clement and Kaiser 1976).

A logical consequence for forecasting including flexibility is that the point-forecasts are replaced by interval forecasts. A simple determination of the amount of flexibility-ranges is, however, blurred by several circumstances. First, there is, obviously, the indeterminacy and subjectivity of any skill-standardization scheme. Second, statistical surveys do not allow the attribution of changes in the categories to the supply or demand side. Thus, one is facing the identification problem. Third, efforts to delimit the degree of potential (latent) flexibility are extremely normative. Fourth, observed flexibilities over time are not constant but depend on business cycles, demographic waves etc. Several other points could be added.
To combine the flexibility concept with the basic methodology involves several steps. Simplifying the methodological procedure one may describe it as follows (only the technique of the two models in which the concept has been integrated is sketched out below: the whole research-into-qualification-bulk is neglected. For the former see: DIW, Hegelheimer and Weisshuhn 1971 as well as Battelle - Blüm and Frenzel 1975):

Between two, or more, points in times the moves of persons between jobs, sectors, occupations and functional categories have to be observed. These changes are reflected in interflow- or mobility-matrices. For example, one educational grade attained may lead to several occupations. The kind of matching is expressed in tables exhibiting the concentration coefficients. Thus, there is not one conversion of education into occupations but a number which give a first indication of the range of potential mobility (or substitution possibilities). In a second stage, one has to analyze the movements between the ports-of-entry-occupations and the occupations filled after one period. This observation statistically produces another set of interflow-matrices. Switching from observed mobility-patterns to their extrapolation is, of course, the awkward problem. In the German studies under review no effort has (or could have) been made to include variables explaining mobility. In the absence of income/occupation cross-classifications no substitution elasticities have been calculated. It remains therefore to rely on mechanical procedures or to tolerate the constancy hypotheses when the forecasts are made.

With regard to the reference-model the flexibility concept would be expressed as follows. First, one has to make clear what variant of the concept is in mind. Three possibilities have already been put into practice:

1. The education/occupation relationship is determined.
   This amounts to the calculation of a conversion-matrix of educational grades into occupations or a mobility-matrix of occupations between two points in time. Through these matrices information is gained on potential mobility. Having, for example, evidence on a shortage in occupation x but observing at the same time some surplus in occupation y and assuming a certain similarity between the two occupations (most of the education and training required would have to be similar) may indicate the possibility for some stream of people to flow from y to x.

2. An observed flexibility of the past is transcribed into the future.
   This, evidently, does not lead to interval forecasts. It merely is a point forecast equipped with extrapolated flexibility.

3. Ranges of flexibility are provided for around the supply and demand forecasts without flexibility.
Consideration of flexibility on the supply-side using an interflow-matrix for occupations \( I^0 \) gives an additional equation \( (3a^*) \):

\[
(3a^*) \quad g_{(t+n)}^{o^*} = I^0 \cdot g_{(t+n)}^o.
\]

The vector of graduates entering the labour market allowing for depreciation and mobility (change of the education/occupation or occupation/occupation relationship) is the result of the observed changes (interflow-matrix \( I^0 \)) times the graduates without mobility.

Similarly for \( (4a) \)

\[
(4a^*) \quad r_{(t+n)}^{o^*} = J^0 \cdot r_{(t+n)}^o.
\]

and total supply becomes

\[
(5a^*) \quad s_{(t+n)}^{o^*} = r_{(t+n)}^{o^*} + g_{(t+n)}^{o^*}.
\]

This vector of labour supply by occupations and taking account of changes in occupational mobility is then compared with the respective vector without mobility. Upper and lower boundaries for the supply can thus be determined.

The upper limit would be

\[
s^{o^*}, \quad \text{if} \quad s^{o^*} > s^o, \quad \text{and}
\]

\[
s^o, \quad \text{if} \quad s^{o^*} < s^o.
\]

The lower limit would be

\[
s^{o^*}, \quad \text{if} \quad s^{o^*} < s^o, \quad \text{and}
\]

\[
s^o, \quad \text{if} \quad s^{o^*} > s^o.
\]

An allowance for flexibility ranges on the demand side is usually not formalized as the possible qualitative input of jobs and its alterations over time is not so easy to delimit. Anyhow, had one precise job descriptions on a representative and comparable scale a similar procedure to the above could be applied.

With regard to these (empirically determined) ranges of flexibility one comes up with the conclusion that shortages or surpluses of skill categories are mostly less dramatic than with conventional balances. Whether and how these equilibrating adjustments through flexibility will actually take place in practice remains to be seen.

As this is, admittedly, a most pressing question for policy-making, solutions are being sought. Within the protective belt of the basic methodology only formal hints can be given. It is, nevertheless, interesting to indicate some order of magnitude for \textit{policy-measures} to alleviate likely discrepancies in the otherwise rigid supply and demand balance.
Equation (8) of the balance \( s_{(t+n)} - d_{(t+n)} = b_{(t+n)} \) may also be expressed as (see Hegelheimer, Weisshuhn 1971, p. 65):

\[(8b) \quad Q \cdot s = d.\]

\(Q\) is a "skill acquisition-matrix". The elements of this matrix indicate which proportion of each category offered has to acquire other skills or has to move to the scarce categories. If this matrix were determined one would have some formal indication of the necessary amount of additional further education, retraining and occupational mobility required. As there is, of course, no unique solution since many normative questions need to be settled, it is just one step in another methodological extension.

This concept can still be located in the protective belt although one already deeply enters the policy-making territory. Within the Economic Research Institute in Essen (RWI) several versions of an optimization concept have been elaborated (Köhler and Lamberts 1976, Zangl 1978). The optimization concepts begin where the flexibility concept ends. Observing and extrapolating mobility tells nothing of how to transform potential mobility into real mobility. An explicit algorithm has therefore to be applied to equilibrate or reduce the persisting imbalances. The scope of the concept has been defined as how to determine optimal transition paths from surplus to shortage occupations.

To achieve this aim three ingredients are needed. First, the amount of structural imbalance has to be delineated. The RWI uses the Battelle/IAB study but enlarges the supply and demand confrontation to 251 occupations. Second, a target function has to be stipulated. This says that the number of people to be retrained should be minimized subject to several constraints. These boundary criteria are set in such a way that the degree of similarity among occupations is as high as possible, that the retraining time is as short as possible and, especially, that the income differentials occurring after the change (income lost or gained) are minimal. With the aid of some linear programming (transport) algorithm the problem can be solved. The most serious drawbacks of these procedures are the use of some "foreign" structural models, the way of delineating promising occupations as shortage-occupations of the past (or past oversupply occupations as not future-oriented) and the subjectivity of the constraints. The empirical results of this approach, therefore, have been subject to rather severe criticism in the Federal Republic of Germany.

When, thirdly, coming to the alternatives to the basic model within the context of empirical structural models, just one major research work shall be commented upon. Other alternatives, based on segmentation or human capital concepts are not within the scope of this paper. The work to consider is the econometric model-building in Bonn (Krelle, Fleck, Quinke 1975) which is not only concerned with the conventional models.
for the whole economy but embarks also upon important sub-models of the labour-market and even education. Grosso modo, one would have to reject common parent-hood with a social demand/manpower requirements approach.

Among the characteristic traits of this model-building one has to stress that it is, in principle, always a macro-model, the degree of its disaggregation being, however, rather high. In addition, since it is an econometric exercise it consists, obviously, of behavioural equations which are based upon time-series, it is concerned with several subsystems, more or less closely attached to the central economic model and it is particularly suited for policy-simulation.

This latter aspect led to the first implementation of the "Bonn econometric forecasting model" for education and employment purposes. In 1970/1971 the German Science Council and the Educational Council requested the estimation of the macro-economic effects of an expansion of the educational system as stipulated in several official planning documents. Thus, the model had to address the question of determining the effects on the growth of GDP, the price and wage level, employment, the balance of payment etc. A comprehensive model has been developed consisting of five model-blocks:

- an educational model, consisting of 10 equations per educational level (14 levels) i.e. 140 equations,
- an employment model with 13 equations per educational level, i.e. 52 equations,
- a cost model with 9 equations per educational level, i.e. 63 equations,
- an enlarged version of the economic model comprising 159 equations and
- one input/output block.

These blocks are supplemented by a series of exogenous forecasts.

It goes without saying that even a superficial description would go far beyond the scope of this paper (see Krelle, Fleck, Quinke 1975). The essentials of the model may be described as follows: The specification of the different blocks reflects, as a common feature, sets of behavioural equations. For example, the education model is not of the inflow/outflow type but is based on age-groups, entrance coefficients, average staying-time of pupil/age-groups in school and graduation coefficients. The employment model also distinguishes the new entrants coming from the educational system, proportions of new graduates relative to the respective age-groups and activity and survival rates. Total employment, working hours and the like are part of the central economic model.
The cost-model is essentially concerned with the distribution of public expenditures and transfer payments to the relevant educational receiving agents. They are mostly formulated in a way as to facilitate the introduction of normative equipment and promotion-standards.

The existing central economic model is modified for the present purpose and, in particular, further disaggregated. The empirical results exhibit quite interesting macroeconomic effects according to the several policy-assumptions which have been simulated. From an economics of education point of view one only regrets the significant inconvenience of no detailed perception of the labour market in terms of occupations. This flaw, however, is by far outweighed by the possibility of checking big public programs with their effectiveness.

The most recent development of the econometric research in Bonn with respect to employment is a new model of the labour market (Jäger 1980). It is the most up to date attempt to shape a model making use both of the fresh theoretical achievements in labour supply and demand functions and a sufficient degree of detail as to the occupational categories. It is composed of more than 300 equations. This size defies any short-cut description. Just to raise curiosity one may note the application of user-costs, lagged adaption, putty-clay-technologies, segmented labour markets, job competition and substitution elasticities on the labour demand side. On the supply side the discouraged-worker hypotheses, alternative consumption-maximization calculations and different wage concepts have been tested. The wage equation takes account of the "new microeconomics".

For the sake of completeness one other alternative approach has to be listed. It is an application of systems dynamics to the labour market, education, the economy, the energy-sector and demography in the Federal Republic of Germany (E. Pestel et al. 1978). It is typical for this concept to make sometimes provocative assumptions and to simulate alternative scenarios. This is certainly useful for founding political strategies but may be less so for rigorous analytical purposes.

(iii) Partial models

Some interesting approaches divergent from the basic methodology have been developed not within full but within partial models. They can be considered either as extensions (protective belt) or as alternatives. Models are called partial when they pertain to the supply or the demand side only. Forecasts of particular occupations or educational fields are not included here. Since the core of the basic supply methodology (inflow/outflow technique of SDA) and of the demand concept (MRA) has been already formulated in the reference model, there is no need to come back to it here. We immediately proceed to the extension and to what are thought of as alternative concepts.
1. On the supply side there is a number of studies belonging to the family of individual or social demand approaches which use types of the inflow/outflow technique. Some refinements and extensions may be noted which allow their classification under the protective belt.

Beginning with studies applying for the first time the conventional methodology in the Federal Republic of Germany (Widmaier 1960 and Gaulke 1972, for a regional study, Peitz 1969) two major research efforts on modelling the educational system have to be stated.

One is a "dynamic structural model of the educational system in the Federal Republic of Germany" (Prognos, Fides, AFEB 1971). The dimension of the matrix of the school-transition coefficients (T) is roughly 200 x 200 which points to a sensible degree of sophistication. A novel aspect is introduced by the fact that two types of educational structures are modelled. One is the existing organization, the other some normative structure derived from official planning documents. The transition from the existing to the normative structure involves several simulation procedures, faintly comparable to the "-ization problem" in the Tinbergen methodology (Tinbergen and Bos 1965). Further, the models are not restricted to the pupils alone. As in the S.O.M. ("A Simulation Model of the Educational System"-concept (OECD 1970) ) other models are added. It is a capacity-model of the supply and requirements of teachers, teaching hours and building resources and a finance-model.

The second research project is a literally colossal one on quantitative methods of modelling educational systems which has been carried out by the Heidelberg group for empirical educational research under the direction of C. Chr. von Weizsäcker (AFEB). The mathematical, statistical and empirical problems involved, in particular as to the gathering and explanation of the coefficients of the transition-matrix, are described in some 20 volumes of a publication series of AFEB (see for example Freytag, Wagenführ and von Weizsäcker 1972).

2. A handful of studies became known under the heading of the "absorption approach", or "penetration approach". Conceptually - and ideologically - they are conceived as alternatives to the manpower requirement approach. Their basic idea being "supply creates its own demand" they have to be located at the supply side of a classification scheme of forecasting approaches.

The philosophy of the "penetration/absorption approach" which is derived mainly from sociological and policy considerations runs as follows: specific types of (especially highly qualified) graduates having penetrated the employment system are able to provoke innovation and change in technology, management, work-organization etc. As a consequence some hidden demand is revealed and further requirements for these people are enhanced.
This basic "logic" is demonstrated by case-studies. The first covers graduates of the political sciences (Hartung, Nuthmann and Winterhager 1970) for which little effective demand existed even around 1970; the other, graduates in business administration (Matthias 1973). Methodologically the studies rely on surveys of the students graduating. In the case of the political sciences this is extended to the period of 1951 - 1968. The professional career of the freshman is traced with a detailed questionnaire. In fact, an important amount of supply-induced demand has been detected. It was also observed that changes in the institutions or companies in which the graduates were employed took place. Finally, it was confirmed that these groups of graduates, once in office, hired other colleagues. Thus, something like an epidemic process may be affirmed.

In the formal symbols of the reference model the approach deliberately chooses one element of equation

\[ g_{t}^{*} \]

and checks its propagated distribution in the demand vectors by occupation (7a) distributed over several periods, i.e. \[ d_{(t+n)}^{0} \cdot d_{(t+n+1)}^{0} \cdot d_{(t+n+2)}^{0} \ldots \] There are no formalized expectations attached to the way in which this distribution occurs. The results of just a couple of tracer-studies can hardly prove the generality of the hypotheses. It is equally doubtful whether the same results might be reached in a labour market characterized by over-supply and youth unemployment.

Nevertheless, there is no denying that the absorption of graduates is an acute problem. It involves, however, not only a quantity-reasoning but also an analysis of the effect on factor prices. A far-reaching penetration of freshmen would not leave the income situation untouched. It would alter the wage-level specific to skill-groups and the whole income distribution. Hypothetical calculations of this kind are presented in two studies by Weisshuhn 1978 and Weisshuhn and Alex 1980. Under a set of assumptions concerning the growth of the wage-level, a constant distribution of wages and the development of the per-unit-costs the authors arrive at tables showing the hypothetical "macroeconomic absorptive capacity" for various graduates.

Political strategy is an even more preponderant element in the so-called "integration-approach" (Heindlmeyer, Riese et al. 1973). This concept addresses the important shortcoming of relating education and occupation, namely, that it is done in a very conservative way. In fact, it is a case of the "future-like-the-past". This means, in particular, that the academic level of occupations is preconceived by some standards of the past. Thus, the upgrading phenomenon is always a bit of a surprise. Riese and his co-authors advocate an offensive, expansionist strategy of educational policy. The estimation of some absorptive boundaries for graduates on the labour market is not
then relevant but rather the persuasive policy to "academize" occupations to a higher degree. The consequence, then, is quite straightforward. One has to determine the percentage of people holding a degree in a given occupation according to some normative setting of social and political standards. This leads to occupations classified by their academic (or lower grade) density.

Algebraically, the concept amounts to externally inducing changes in the education/occupation matrix. Instead of the matrix \( \mathbf{0} \) of equation (2a) in the reference model, a new matrix is set:

\[
(2a) \quad \mathbf{g}^0_{(t+n)} = \mathbf{\delta} \cdot \mathbf{g}_{(t+n)}.
\]

The approach is mute about the likely consequences on the educational balance. Some crowding-out to the lower educational levels has to be feared.

The main objection to this approach is that it is always extremely debatable what are "relevant occupations" from a society's point of view. Moreover, the forecasting of these feed back to the political strategy as well as to the capacity to finance such an expansion.

3. On the demand side the rigid MRA-methodology has never been followed closely. Even the pioneering studies of Steindl in Austria (1967) and Riese (1967) in Germany are good examples of how to tune forecasts with the capacity of "informed guesses". In the framework of partial forecasts, only one alternative concept has to be mentioned if the true alternatives of the challenging segmented labour market or marxist approaches are again neglected.

In 1971 Widmaier and collaborators developed a concept labelled as the "indicator approach" in the German economics of education literature. The idea of this concept stems from some criticism raised against the derivation of labour demand from sectoral product times productivity: first, production and productivity are said to be insufficient explanatory factors and second, the equation is tautological, if a stochastic term is not included.

In the indicator concept more complex dependencies are specified. The requirement of labour classified by educational grades is made a function of a range of variables which are inspired by the high tide of the social indicator movement. Among the more important are: population by age groups, GNP, sectoral GNP, sectoral employment, labour productivity, number of cars, hospital beds, kilometers of roads and proportion of agricultural surface. In all, 34 independent variables are distinguished, 45 educational grades (mostly higher education), 6 sectors and 115 regional entities. The lack of time-series data for the estimation of these functions is by-passed by regressing across regions. One may note that the representativity of the coefficients may be doubted for the whole of the Federal Republic of Germany.
Algebraically, the equation is simply:

(6) \[ I^e = a_0 + a_1 x_1 + a_2 x_2 + \ldots + a_m x_m. \]

Employment by educational grade \((I^e)\) is a function of \(m\) variables estimated statistically across 115 regions.

(iv) Summary remark on other approaches
The studies surveyed or commented on above constitute, also according to other surveys, the bulk of human resources forecasting activities. What has not been covered is a host of analyses relating to particular occupations or educational grades. Also some major forecasting/planning exercises of the federal States (e.g. Baden-Wurttemberg) are not included. Another connected area, the research on the qualification side of manpower, which is very much in fashion is dealt with in a separate paper (see U. Teichler, working paper for this conference).

The systematic overview of forecasting studies shows a number of other publications. They seem to emerge in fields other than the traditional ones. The application and development of the traditional methods appear to have suffered a certain fatigue after 1976. Sometimes they are just annexed by the routine work of bureaucratic or counselling institutions. On the other hand, one may expect an increase in partial studies on internal or segmented labour markets which are quite often related to the qualification-research. Screening hypotheses or, in the German context, the approach of the "distribution of status", also find their way into the sociological literature. The actual disadvantage of these forays is that their degree of quantification is limited. The whole field of human capital studies is also in progress. They deserve, however, a survey on their own (see Clement, Tessaring, Weisshuhn 1980).
IV. CONCEPTUAL AFTERTHOUGHTS

Looking back at the last two decades of education and labour market forecasting activities in the German speaking context one gets the impression that the process of institution-building and the recourse to analytical methods happened somewhat accidentally. This is all the more disturbing as bureaucrats and policy-makers are always in search of greater scientific backing for their decisions. Equally, researchers engage from time to time in some stock-taking of the analytical concepts available and try to assess the methodological progress or the superiority of one method over another. Strangely enough, despite a common interest, the twain hardly meet. Obviously, there must be some hidden impediments or scrambling in the co-operation of policy-makers and researchers. Some, not yet very refined comments are made below inspired by the German/Austrian experience.

1. Policy-making and analysis in education and work: Two unconnected fields?

The United States of America with its decentralized and partly private educational system as well as largely free labour-markets is certainly a good example for the adequacy of human capital/rate-of-return-approaches. In the same way the German Democratic Republic or the USSR are countries well-suited for the application of the input-output and manpower requirements approach-concept. In a simplified way the Federal Republic of Germany and Austria are attributed to the pattern of (mixed) market economies. This raises the question as to what extent educational and labour market planning, and their analytical foundations, can and should play a role.

As already hinted in the chapter on the institutional background, the interaction of institutions, economic agents, different co-ordinating mechanisms and, thus, the behaviour of the education and employment system is a strange mixture. The provision of education is closely tied to the control of public policy and administered by bureaucracies. Reaction to market signals is impossible (because of the intrinsic legal foundation) or undesired. Cost/return considerations are the exception. The demand for education on the other hand is expressed by the individuals. Education is freely available with the exception of capacity-bottlenecks in which case public authorities intervene by the allocation of places (numerus clausus). The supply of and demand for jobs is overwhelmingly geared to a free labour-market.

The situation may thus be depicted in the following simplified way:
Thus several coordinating systems overlap. "In other words, the "educational markets' are subject to full governmental (Länder) control, which means that the so-called free-market adjustment mechanisms governing most of the economic sector (including a substantial number of labour-markets) have to be substituted by administrative decision-making and planning" (Hüfner, Köhler, Naumann 1977, p. 57 n). How complicated the situation is in practice can be demonstrated by exhibiting the interpenetration of competencies in the field of public authorities alone. (Table 1)

Strictly speaking, such a system is close to a circulus vitiosus. For its very raison d'être the state badly needs forecasts in order to fulfil its task of providing timely finance, teachers, buildings, student-support schemes, the opening of specific educational disciplines as well as curricula and the like. The decisions presuppose, directly or indirectly, forecasts of the labour market. Since this domain is exempt of state control this amounts to predicting the behavioural pattern of firms' individual decisions. These are, in turn, to a certain extent dependent on the state's policy which influences markedly the supply of graduates. The circumstances are even worse when the firms claim that the output of graduates should be geared to the occupational needs of the economy. In this case the firms want their proper actions predicted.

It is no surprise that this system is subject to acute imbalances in the labour market. This necessitates adjustment mechanisms beyond the clearing-capacity of the market. Retraining, further education and mobility-promotion measures have to enter the scene.

Three principal actions could improve this contradictory state of affairs:

(a) Plan the labour market. Forecasts would then become to a large extent self-fulfilling. Whether an efficiency criterion of state activities exists remains to be seen.
Table 1. Federal Republic of Germany - The Distribution of Competences in the Field of Educational Administration

<table>
<thead>
<tr>
<th>Part of the Educational system</th>
<th>Level</th>
<th>Bund</th>
<th>Länder</th>
<th>Gemeinden (Communities)</th>
<th>Institutions/Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary education:</td>
<td></td>
<td></td>
<td></td>
<td>Kindergarten (rooms, personnel, general rules of performance, supervision)</td>
<td></td>
</tr>
<tr>
<td>Primary education:</td>
<td></td>
<td></td>
<td></td>
<td>&quot;Internal school matters&quot; (like curricula teaching staff (hiring allocation, etc.), supervision in matters of content, disciplinary and procedural matters, implementation of transfers, support schemes and grants)</td>
<td>&quot;External school matters&quot; (buildings, maintenance, non-teaching staff) student transport, counselling, student support schemes</td>
</tr>
<tr>
<td>Lower secondary education</td>
<td></td>
<td></td>
<td></td>
<td>Internal management (limited autonomy), (with regard to vocational education: individual firms and representative bodies of the various sectors and branches have formal rights of participation in the decision-making making process)</td>
<td></td>
</tr>
<tr>
<td>Higher secondary education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tertiary education:</td>
<td></td>
<td></td>
<td></td>
<td>student support schemes</td>
<td>Autonomous management within the limits of the law, admissions (partly indirectly via central numerus clausus administration)</td>
</tr>
<tr>
<td>Further education:</td>
<td>Own institutions/organizations (for instance: Federal Academy for Public Administration)</td>
<td>Own institutions/organizations (for instance: further education (or teachers), implementation of support schemes)</td>
<td>Peoples' High Schools (Evening Schools): rooms, personnel, general rules of performance, supervision</td>
<td>Planning of programmes, hiring of (non-permanent) staff, internal administration and management</td>
<td></td>
</tr>
</tbody>
</table>

Source: K. Höfner, Towards a reappraisal of educational planning, Paris 1978, p. 15
(b) Make the educational administration freer. Increasing its capacity to react to market changes would lower the need to rely on forecasts. Whether long-term aims are to be secured is a question to debate.

(c) Improve the forecasts. This is an issue addressed in the next subsection.

2. On evaluating forecasts

When faced with competing methodologies for forecasting the question of whether some approaches and techniques are superior to others seems legitimate. The question is by no means trivial and, in the end, leads to epistemological considerations.

On what does the choice of an analytical tool or a forecasting method depend?

Three kinds of replies have been put forward:

(i) the explanatory power,
(ii) the forecasting accuracy and
(iii) the "relevance".

It is easy to make destructive comments on any of these assessment criteria.

(i) Most econometricians would probably agree that with some "flair" quite conflicting theoretical hypotheses could be geared to explain satisfactorily one and the same reality just by aptly re-specifying the functions. For example, a Mincerian earnings function "explains" 10% to over 60% of the earnings variance. Screening concepts do not perform much worse. A segmented labour concept may realise similar proportions. Also functions based on heredity sometimes claim to possess the adequate specification. Thus, since comparable degrees of explanatory power may be derived from very different theories one may question whether one is able to perceive the "real" reality at all or whether one is bound to what is seen through the looking-glass of concepts.

(ii) The main objection raised against accuracy-tests of forecasts in the social sciences is the well-known issue of self-dynamics. The manpower approach is a good example. By its very construction, which is nothing but a closed set of preconceived definitions, it is not able to assess its explanatory power in the real world. Notwithstanding, its forecasting performance is, despite all the tiring criticism, not worse than most other approaches. May it be that, to a certain extent, policy-decisions have been shaped somewhat in conformity to the forecasted one? In other words, the forecasting accuracy of a method may be a very ambiguous test as long as the feed-back cannot be sufficiently evaluated or, even more so, when forecasts are deliberately implemented as instruments.

(iii) To test the "relevance" of a concept is a very appealing, yet obscure, idea. "Relevance" may be measured by "... what assumptions should have appeared or what considerations should have been taken into account while the forecast was made, but in
fact have been neglected" (Debeauvais, Psacharopoulos 1981, p. 17). Approaching more closely common language usage "relevance" may be associated with the usefulness of the analyses and forecasts for the policy-maker or other consumers of forecasts. In this case the information needs and the responsiveness are at stake. For example, to a large public authority, it may be of little relevance to have analyses of the reactions of individuals to income differentials in the framework of, say, an occupational choice function. On the other hand, the information content of macroeconomic labour market imbalances is likely to be equally restricted from the perspective of the individual. This is to say, there may exist a sort of system's "adequacy-criterion" for forecasts which expresses the latter's relationship to the recipient agent or institution. This leads to the conclusion that the specific institutional setting together with adequate decision-making processes has to be connected with the types of analyses and forecasts. This point merits some more comment.

3. **Matching economic systems and forecasting concepts**

It is a basic understanding of system's theory that the functioning and efficiency of any system depends on the information flow therein. In this way the structure of a system (e.g. centrally controlled or self-adaptive) determines the kind of signals which make it work. Looking back at the different generations of education and labour market forecasting approaches, with a slight dose of mischief, one may wonder whether it was not the other way round. Was it not the OECD-propaganda for the manpower approach which made the member governments feel guilty and enhanced the creation of many planning committees or advisory commissions? Thus, the existence or creation of a method may trigger a process of institution-setting. If there is some truth in this insinuation, how is the superiority or progress of methods to be evaluated? Obviously, "scientific" methods would degenerate to instruments. Assessments would then have to be made with regard to political preference functions but not in connexion with methodological progress.

However, one should probably not overstrain the above described possibility. It is a chicken and egg problem whether

- the institutional choice (Weisbrod 1979) depends on information (signals, forecast) available or
- whether information is produced according to the needs expressed by institutions.

Rigorous answers to this puzzle may be given only in ideal-theoretic systems. A Paretian system, for example, would only need endogenous information, signalling rates of substitution and transformation via the respective prices.

Fully planned systems have only to seek information on material imbalances.
In the real world pragmatism may be necessary. To begin with, it is certainly practical to describe the respective type (s) of existing orders. With regard to labour markets this may lead to a series of configurations ranging across classical, segmented, planned etc. labour markets (Kerr 1954). For the well-functioning of any part of this intersected labour market a special mix of information (signals and forecasts) may be needed. Efforts should be made to supply the economic agents and institutions at all levels with the kind of information they are built to react to. Only at a later stage has a political choice to be made whether the existing system is agreeable or should be improved (incrementally) or altered (in a revolutionary way). This is the familiar marginal versus total conditions trade-off in welfare economics. The crucial decision remains with the policy and the idea of assistance and progress of methods per se is of no help.

Switching from these abstract and general assertions to some concrete concepts one should examine the methods with regard to their degree of explanatory and predictive power as well as their systems-relevance. As already indicated, when surveying the implementation of methods for advisory purposes up to now one feels that the choice of methods was often heavily influenced by scientific fashion. Since institutions and information are claimed to match, this fashion may be quite misleading or even harmful. Take the case of a human capital inspired demand for education function. Advocates of this approach are eager to "prove" the suitability of this method in very different socio-economic environments. Yet, even high coefficients of determination prove little. The specification may be ill-adapted when the situation to be explained is characterized by public provision of facilities, some public control of entrance, predominance of consumption preferences of new-entrants etc. In a similar vein, even M. Blaug asserts: "To give the human capital research programme a run for its money, we must go to such open-door systems of higher education as exist only in the United States, Japan and the Philippines" (M. Blaug 1977, p. 35). A statement which can be equally well applied with regard to the opposite planning methods and their adequate background of systems.

Similar or even more serious objections may be raised against the manpower requirements methodology. How are labour markets characterized in reality? According to different configurations one may observe:

- areas where people and firms react on factor prices and marginal productivity differentials,
- areas where wages are inflexible and quantity-reactions precede price-reactions as a consequence of which imbalances probably spill over to commodity-markets,
- areas where people are pressed into certain segments of the labour market which they cannot leave easily,
- areas where the wage-mechanism is said to exist but, in fact, is distorted by all kind of political intervention,
- areas where people preach the efficiency-principle and the acceptance of market forces but in reality seek contracts similar to the safe status of civil servants.

One may wonder to what extent some manpower methodology or other concepts reflect these real world conditions.

All this is to say that methods should be able, above all, to catch real world-behaviour including the existence of institutions. In a second step, after having analytically prepared the ground this would open the way to "pattern prediction of behaviour" in the sense of von Hayek. Fortunately, the behaviour of people is only very seldom restricted in such a tight way that it would be possible to deterministically predict a single number manpower balance.
BIBLIOGRAPHY


ALEX, L., WEISSHUHN, G., Ökonomie der Bildung und des Arbeitsmarktes, Schriften zur Berufsbildungsforschung 59, Hannover 1980

BATTELLE-INSTITUT, Quantitative und qualitative Vorausschau auf dem Arbeitsmarkt der Bundesrepublik Deutschland mit Hilfe eines Strukturmodell, Frankfurt/M. 1969

BLAUG, M., Approaches to Educational Planning, in: The Economic Journal, June 1967

BLÜM, A., FRENZEL, U., Quantitative und qualitative Vorausschau auf den Arbeitsmarkt der Bundesrepublik Deutschland, Beitrag 8.1, 8.2, Nürnberg 1975


BOMBACH, G., Forecasting requirements for Highly Qualified Manpower as Basis of Educational Policy, OECD, Paris 1965

BRINKMANN, G., et al., Bildungsoekonomik und Hochschulplanung, Darmstadt 1976

BRINKMANN, G., Ökonomie der Arbeit, Stuttgart 1981

BUNDESMINISTERIUM FÜR BILDUNG UND WISSENSCHAFT, Stand, Entwicklung und Ergebnisse der Prognoseforschung zum künftigen Arbeitskräfte- und Qualifikationsbedarf. Bonn 1980

CLEMENT, W., KAISER, M., The integration of adult education within a framework of permanent education, Council for cultural co-operation, Strasbourg 1976

CLEMENT, W., TESSARING, M., WEISSHUHN, G., Qualifikations- und Einkommensstrukturen im Lichte der Beschäftigtenstatistik der Bundesanstalt für Arbeit, in : MittAB 1980, Heft 1

CLEMENT, W., AHAMMER, P.F., KALUZA, A., Bildungsexpansion und Arbeitsmarkt, Wien 1980


FLITNER, A., Der numerus clausus und seine Folgen: Auswirkungen auf die Schule, die Schüler, die Bildungspolitik - Analyse und Gegenvorschläge. Stuttgart 1976


HEGELHEIMER, A., WEISSHUHN, G., Ausbildungsqualifikation und Arbeitsmarkt, DIW-Beiträge zur Strukturforschung, Heft 29, Berlin 1974


HUISKEN, F., Zur Kritik bürgerlicher Didaktik und Bildungsökonomie, München 1972

INSTITUT FÜR SOZIOÖKONOMISCHE ENTWICKLUNGSFORSCHUNG DER ÖSTERREICHISCHEN AKADEMIE DER WISSENSCHAFTEN, Analyse und Simulation des sekundären und postsekundären Bildungswesens in Österreich, Wien 1981

JÄGER, W., Die Struktur des Arbeitsmarktes in der BRD, Düsseldorf 1980

JESCHEK, W., Projektionen der Qualifikationsstruktur des Arbeitskräftebedarfs in den Wirtschaftsbereichen der BRD bis 1985, Berlin 1973


KÜHLEWIND, G., TESSARING, M., Argumente für und gegen eine beschäftigungsorientierte Bildungspolitik, Schriften der Kommission für wirtschaftlichen und sozialen Wandel, Band 69, Göttingen 1975


KRELE, W., FLECK, M., QUINKE, H., Gesamtwirtschaftliche Auswirkungen einer Ausweitung des Bildungssystems, Tübingen 1975

KRUG, W., Quantitative Beziehungen zwischen materiellem und immateriellem Kapital. Jahrbücher für Nationalökonomie und Statistik, Bd. 180, 1967


LUTZ, B., SENGENBERGER, W., Arbeitsmarktstrukturen und öffentliche Arbeitsmarktpolitik. Schriften der Kommission für wirtschaftlichen und sozialen Wandel, Bd. 29, Göttingen 1974


MERTENS, D., Survey of research on occupational flexibility, Committee for out-of-school education and cultural development, Strasbourg 1973


PROGNOS AG, FIDES Treuhandvereinigung, ARBEITSGRUPPE für empirische Bildungsforschung, Dynamisches Strukturmodell für das Bildungswesen der Bundesrepublik Deutschland, Forschungsauftrag des Bundesministers für Bildung und Wissenschaft, 4 Bd., Basel/Zürich/Heidelberg 1971

PROGNOS AG. (Schröder, D., Weidig, I.), Potentielle strukturelle Ungleichgewichte zwischen Bildungs- und Beschäftigungssystem in der Bundesrepublik Deutschland bis zum Jahre 1990, Basel 1976

RIESE, H., Die Entwicklung des Bedarfs an Hochschulabsolventen in der Bundesrepublik Deutschland, Wiesbaden 1967

SCHMIDT, K.-D., BAUMGARTEN, P., Berufliche Ausbildung und Einkommen, in : A.E. Ott (Hrsg.), Theoretische und empirische Beiträge zur Wirtschaftsforschung, Tübingen 1967, s. 155 ff.


TINBERGEN, J., BOS, H.C., A planning model for the educational requirements of economic development, in : Econometric models of education, OECD 1965

WEISBROD, B.A., Economics of institutional choice, mimeo, Madison, Wisc. 1980

WEISSHUHN, G., Sozioökonomische Analyse von Bildungs- und Ausbildungsaktivitäten, Berlin 1977

WEISSHUHN, G., Beschäftigungschancen und Qualifikation, Frankfurt/New York 1978


WIDMAIER, H.P., et al., Hochqualifizierte Arbeitskräfte in der Bundesrepublik Deutschland bis 1980, Bundesministerium für Bildung und Wissenschaft (ed.), Bergisch Gladbach 1971

WISSENSCHAFTLICHE ABTEILUNG DES BUNDESMINISTERIUMS FÜR UNTERRICHT, Bildungsplanung in Österreich, Bd. 1, Bildungsplanung und Wirtschaftswachstum, Wien, München 1967
