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Labour market forecasts and their use: practices in the Scandinavian countries

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WZB

Magnus Lindskog

Labour market forecasts and their use – Practices in the Scandinavian countries

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Abstract

The ongoing restructuring of today's labour markets and the swift changes in occupational structures and skill requirements generate a risk for unbalanced growth in the supply and demand for qualifications. This paper concentrates on the instruments employed in Scandinavia to identify labour market mismatches, understood as shortages of qualifications related to a certain occupation or education group. There are various actors engaged in the forecasting of labour market developments in the individual countries. The public employment services (PES) stand out as the main actor concerning the identification of short-term needs and the characteristics of current mismatches. The PES efforts are primarily carried out on the regional and/or local levels, and the central tools are comprehensive company surveys and ongoing regular contacts with the surrounding society. The information obtained is essential to adjust the focus of labour market training, which has the primary objective to support the employment offices in their efforts to smooth the matching process on the labour market. In all three countries, models have also been developed to project medium- and long-term supply of labour by education groups and demand for labour by branch. A common feature of these models is that they offer thought-provoking mismatch scenarios rather than genuine prognoses of the most probable labour market outcome. To some extent the projections are employed to regulate the education and training dimensions, primarily within higher education. However, the central political strategy in the Scandinavian countries is to provide all individuals with an adequate education offer. Thus, the medium- and long-term projections appear primarily useful for individuals deciding on their career paths, and to highlight situations where there is an obvious conflict between the individuals' demand for education and training and the labour market needs for certain types of skills. Other central aspects of the Scandinavian system include decentralisation, management by objectives, and representation of the social partners in important advisory as well as decision-making bodies at national and regional level.

Zusammenfassung

Die kontinuierlichen Strukturveränderungen an den Arbeitsmärkten führen zu starken Veränderungen in der Beschäftigungsstruktur und den Qualifikationserfordernissen. Unter diesen Bedingungen besteht die Gefahr für Ungleichgewicht im Angebot und in der Nachfrage von Qualifikationen. Das vorliegende Papier fokussiert auf die Instrumente, die in Skandinavien eingesetzt werden, um Mismatch – verstanden als nicht erfüllte Qualifikationserfordernisse, die an eine bestimmte Tätigkeit oder ein bestimmtes Qualifikationsniveau gerichtet sind – zu identifizieren. Es gibt verschiedene Akteure, die an Arbeitsmarktprognosen in den einzelnen skandinavischen Ländern arbeiten. Bezogen auf kurzfristige Prognosen sind die nationalen Arbeitsmarktverwaltungen (PES) mit Abstand die wichtigsten. Die zentralen Werkzeuge der PES sind umfassende statistische Untersuchungen und kontinuierliche Kontakte mit der umgebenden Gesellschaft, die hauptsächlich auf der regionalen und/oder lokalen Ebene durchgeführt werden. Die Prognosen, die auf die Unterstützung der Tätigkeit der Arbeitsämter ausgerichtet sind, beeinflussen den Fokus der beruflichen Aus- und Weiterbildung. In allen drei Ländern sind auch Modelle entwickelt worden, um mittel- und langfristiges Angebot und Nachfrage zu prognostisieren. Eine allgemeine Eigenschaft dieser Modelle ist, dass sie Szenarien anbieten, die wirtschafts- und bildungspolitische Initiativen und Ideen stimulieren sollen, nicht aber als exakte Prognosen der wahrscheinlichsten Entwicklungen auf den Arbeitsmärkten dienen sollen. Dennoch werden die mittel- und langfristigen Prognosen als grobe Orientierung eingesetzt, um die Ausbildungs- und Trainingskapazitäten, hauptsächlich innerhalb der höheren Ausbildung, zu regulieren. Dennoch ist die zentrale politische Strategie in den skandinavischen Ländern, allen Personen ein ausreichendes Ausbildungsangebot anzubieten. So scheinen die Mittel- und langfristigen Projektionen hauptsächlich für Personen geeignet, die Karriereentscheidungen treffen möchten. Außerdem machen sie auf Situationen aufmerksam, in denen es einen offensichtlichen Konflikt zwischen der Ausbildungsnachfrage der Personen und den notwendigen Qualifikationserfordernissen des Arbeitsmarktes gibt. Andere zentrale Aspekte des skandinavischen Systems sind Dezentralisierung, Management by Objectives (MBO), und die Präsenz der Sozialpartner in den wichtigen beratenden und beschlussfassenden Organen auf nationaler und regionaler Ebene.

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Introduction

The future supply of labour has become one of the major challenges of our time, and to some extent, the future is already present. There are already less people entering their working life every year than there are exits into inactivity. Add to this, the ongoing restructuring of labour markets and significant changes in occupational structures and skill requirements. Under such conditions it is perhaps more important and more challenging than ever, to ensure efficient matching between supply and demand for certain qualifications. The reconstruction process in the Scandinavian countries has implied a declining relative demand for low skilled workers and an increase in the share of employees with vocational or higher education. Nevertheless, labour market needs are only partly matched by increasing the supply of labour with a certain *level* of qualification. It is also crucial to analyse matching by *type* of qualification. This paper concentrates on mismatches that arise as a result of unbalanced growth in the supply and demand by type of qualification, understood as competences related to a particular field/occupation rather than broader skills that are more generally required on the labour market. Observable examples of such mismatches could be when shortages and unemployment for workers at the same skill level exists simultaneously. The intention of this report is to present a selection of Scandinavian labour market forecast methods, to discuss their interpretation and information value, and to account briefly for strategies to supply education and training according to the needs of the labour market.

There are various actors, applying a wide array of instruments, engaged in the identification and understanding of potential mismatches in the Scandinavian countries. The first four sections in the paper account for the methods applied by the central actors. It is not the intention to demonstrate the diversity of labour market forecasts but rather to select some of the recent and central instruments and practices, and to highlight their key characteristics. The first section accounts for labour market surveys and short-term forecasts. This is followed by a portrayal of labour market projection models and medium/long-term term forecasts in the second section. Subsequently, section 3 presents brief information highlighting the information available about the characteristics of mismatches. Although, sections 1-3 include brief information about shortages and bottlenecks in the individual countries, the purpose is not so much to delineate future trends on the labour market, as to provide examples of the type of information available. Section 4 turns to the discussion concerning the use of labour market forecasts and the strategies applied within the system of qualification supply to match the labour market needs. This starts with a brief discussion concerning the rationale of labour market forecasts, followed by a short portrayal of the framework within the qualification supply system. The discussion about the use of labour market forecasts, firstly addressing long- and

medium term projections and then short-term surveys, constitutes the core theme of section 4. This discussion is centred around critical aspects of the forecasts and strategies concerning dimensioning qualification supply, understood as regulation of capacity by type of education in relation to other fields and the needs of the labour market. Finally, section 5 sums up the discussion and provides some concluding remarks.

1. Labour market surveys and short-term forecasts

This section is focused on the public employment services (PES) as the main actor engaged in short-term forecasts based on regular surveys and ongoing contacts with organisations and other key actors. It also includes a selection of recent forecast results. The intention of this is twofold: To demonstrate the type and structure of the information, and to provide the reader with some information about current and short-term shortages and bottlenecks in the Scandinavian countries.

1.1 Denmark

The central element of the forecast efforts undertaken within the Danish National Labour Market Authority (AMS) is the regional public employment offices' quarterly visits to 13.200 companies. The majority of the offices have also established 'fixed panels' composed of key actors that are regularly questioned concerning employment outlook expectations, education needs, etc. The forecast results are presented in the 'Labour market report' (*Arbejdsmarkedsredogørelse*), which is a quarterly report published by the AMS. It provides information on current labour market mismatches as well as forecasted developments for the following quarter and the same quarter next year. Furthermore, it contains information about the expected development of employment (increase, unchanged, or decrease) within selected branches (table 1), and calculations of unemployment for the different unemployment insurance groups. The report also offers an overview of current and potential future bottlenecks and other mismatch problems by occupation within selected industry sectors (table 2), as well as different measures taken in response to these problems. The information is based on the judgements of the 14 labour market councils, which in turn are based on the ongoing labour market surveillance carried out on the regional level within the Danish PES system.

Other recent AMS activities include efforts to identify bottleneck problems on the Danish labour market. In 2001, for example, the consulting firm COWI was assigned with the task to carry out a comprehensive survey based on contacts with 4.654 public institutions and 10.584 private companies. The coverage was restricted

to seven public institutions with traditional bottleneck problems, and eleven branches within the private sector. The report presented information about bottlenecks and mismatches in terms of numerical shortages of labour by type of education. The publication also offered information about the causes of the recruitment problems, recruitment channels, and the willingness of the institutions/firms to take a responsibility to tackle the recruitment problems. Six months later, COWI did a more detailed follow-up investigation of the recruitment situation within the construction sector and the health care sector. It was based on telephone interviews with 12 central actors (3 organisations and 9 companies) within the electricity branch and 16 central institutions, municipalities and organisations within the health care sector. The central themes of this report were to identify the problem, find out what the branch organisations are doing to mitigate the problem, and to collect proposals for measures to avoid future bottlenecks.

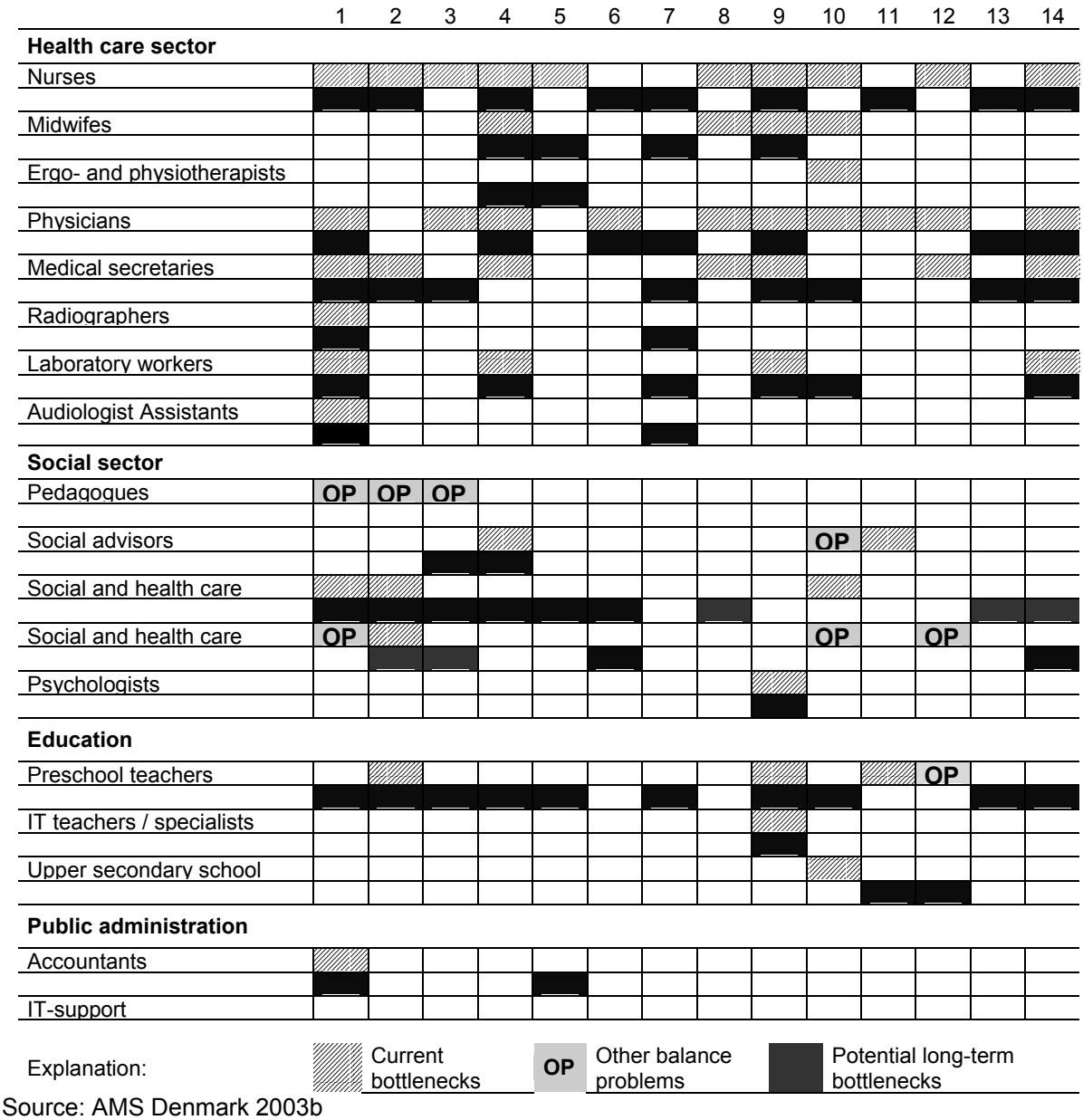
Table 1: The employment expectations by the Danish labour market councils

Branch group	Number of employed Jan 2002	3rd quarter 2003 compared to 3rd quarter 2002			2nd quarter 2004 compared to 2nd quarter 2003		
		Increase	No change	Decrease	Increase	No change	Decrease
Agriculture, forestry, fishery, etc.	99.077	0	30	70	0	33	67
Food	81.104	21	47	32	38	41	21
Textile	14.315	6	48	46	0	79	21
Wood, paper, and graphical	67.136	3	77	20	3	57	40
Mineral oil, chemical, plastic etc.	50.875	5	78	17	48	48	4
Iron and metal	190.825	10	27	63	37	21	42
Furniture, stone, glass, etc.	49.534	0	53	47	0	67	33
Energy, water, natural resources	17.605	26	67	7	26	66	8
Construction	173.301	33	19	48	61	33	6
Wholesale and commission trade	161.894	26	67	7	54	46	0
Retail trail, reparations	254.134	0	83	17	34	66	0
Hotel and restaurant	78.870	30	70	0	30	64	6
Transport	124.247	0	62	38	0	66	34
Post- and telecommunication	54.771	31	49	20	31	32	37
Financing and insurance	75.537	0	68	32	0	68	32
Business service, etc.	300.084	57	43	0	75	20	5
Public administration	156.895	0	63	37	0	24	76
Education	201.245	0	100	0	28	71	1
Health care	150.394	37	44	19	37	44	19
Social institutions	325.330	4	74	22	9	43	48
Renovation, associations, leisure	140.474	0	62	38	0	63	37

Source: AMS Denmark 2003b

The table demonstrates a weighted average of the judgements from the 14 regional Danish labour market councils concerning employment outlooks by branch. *For example:* Councils representing 37 percent of total employment within this sector expect an increase in the sector's employment in the 3rd quarter 2003 compared to the 3rd quarter 2002. Councils representing 44 percent of the health care sector employment are not expecting any change within the sector, and the councils anticipating a decrease in health care sector employment represent 19 percent of total employment in the sector.

Table 2: Overview of bottlenecks and balance problems in the public sector based on the judgements by the Danish labour market councils – 2nd Quarter 2003.



Source: AMS Denmark 2003b

The table displays the judgements of the 14 regional labour market councils about current bottlenecks, other balance problems, and potential long-term bottlenecks in their region. The top row for each individual occupation indicates the presence of current bottlenecks or other balance problems, while the lower row indicates potential long-term bottlenecks. *For example:* The top row of the two rows representing the situation for nurses, indicates that all but four Danish regions experience current bottlenecks, and that there are no other balance problems in any of the regions. The lower of the two rows suggests that there are potential long-term bottlenecks in 9 of the 14 regions.

1.2 Norway

Information about short-term qualification needs in Norway is primarily collected through two surveys carried out by Aetat (the Norwegian PES): the 'Company survey' (*Bedriftundersøkelsen*), and the 'Recruitment survey' (*Rekrutteringsundersøkelsen*). The former is an annual survey covering 13.750 firms, which is carried out on county level by Aetat's head and local offices. The size of the selection of small firms (<100 employees) should ensure that it is representative for all industry sectors (2-digit NACE code) in all counties. The objective of the survey is to provide an insight into labour market demand, and to improve the knowledge about short-term qualification needs. The companies are requested to provide information about recruitment problems and how many employees this concern. Based on the answers from these questions, the shortage is calculated for each individual occupation. It is underlined that the answers should not express whether the firms' would have desired to hire more staff if their budget or financial situation had allowed for it. Non-qualified staff can be employed within some occupations, and this is not considered as significant recruitment problems in the survey. The individual firm only reports on labour shortages and not on surplus situations. This implies that, if one firm reports a shortage of ten employees within occupation x, although another firm has a simultaneous surplus of ten employees within the same occupation, the result would still be a shortage of ten employees. Consequently, the figure should not be interpreted as a shortage in the stock of labour within a certain occupation, but as a gross figure of the non-covered labour demand at a certain point in time.

Labour market trends on the national level are presented quarterly in the 'Report about the labour market' (*Rapport om arbeidsmarked*). It includes information about labour market outlooks based on Aetat's 'Company survey', ongoing contacts between Aetat and its clients, and labour market statistics from Statistics Norway (SSB). The information is primarily used by Aetet to improve their services to job seekers and employers. Estimates of labour shortages within firms outside the survey population are based on characteristics of the region, industry sector, and occupation. The figures are weighted in order to account for varying sector size and the over representation of large firms in the selection. More detailed regional trends

are described in the quarterly reports published by the head office in each county. The 'Report about the labour market' also includes two indicators related to employment outlooks. One of them, called the 'Employment barometer' (*Sysselsettningsbarometer*), is defined as: Companies expecting an increase in employment *minus* companies expecting a decrease (percentage). It provides an indication of the firms' optimism during the coming year, without accounting for numerical demand. Consequently, a high figure in the employment barometer is merely an indication of optimism regarding the demand for labour. Aetat's experience with the 'Employment barometer' indicates that firms generally underestimate the limitations of the restrictions imposed by the supply side, which implies that their expectations in general are more positive than the actual employment development. The employment barometer is presented in diagrams demonstrating the firms' employment expectations by industry sector, industry sector sub-groups, and by county on aggregated industry sector level. The other indicator, the 'Rigidity indicator' (*Stramhetsindikatoren),* is defined as the relative shortage of labour i.e. the relationship between the gross labour market shortage and the number of employed by occupation. A high figure indicates a rigid labour market i.e. that companies find it difficult to recruit new personnel. Two types of rigidity indicator tables are presented in the report: one with information by occupation and one with information by industry sector. The denominator is based on the number persons missing according to Aetat's company survey. Next to the rigidity indicator, the shortages by occupation and industry sector are also presented in absolute terms. (See table 3 below)

The table presents information about shortages and labour market rigidities by occupation. It includes a selection of the occupations presented in the report on the labour market (Aetat 2003) i.e. those were the rigidity indicator is equal to or exceeds the value 5. Numerical shortage is displayed in the left column and the right column presents the rigidity indicator. The latter represents the relationship between the gross labour market shortage and the number of employed by occupation. The numerical shortage (which is also the denominator in the rigidity indicator) is based on the number persons missing according to Aetat's company survey. Note that this represents a gross figure i.e. it does not take labour surplus into account. *For example:* There is a gross shortage of 2100 drivers, which corresponds to 13 percent of employed drivers.

Table 3: Shortage and rigidity indicator by occupation based on Aetat's company survey

Occupation	Shortage (number of persons)	Rigidity indicator
Gardeners	1000	37,5
Painters and upholsterers	1300	23,4
Upholsterers (furniture)	450	21,9
Machinery workers	500	18,9
Drivers	2100	13,0
Welders	1200	11,8
Foundry workers	450	11,7
Bakers	300	11,5
Coppersmiths	500	10,6
Masons, etc.	450	9,4
Insurance consultants	700	8,1
Operators within other food products	300	7,8
Gardeners	200	7,3
Operators within plastic	300	7,2
Construction machine operators	950	6,6
Other pedagogic occupations	500	6,5
Chefs	1500	6,4
Plate workers	400	6,2
Plumbers and VVS fitters	1000	6,1
Operators within production, etc.	250	5,8
Carpenter	950	5,6
Paint-shop workers	250	5,3
Hairdressers, etc.	750	5,0

Source: Aetat 2003

The objective of Aetat's 'Recruitment survey' is to map the relationship between supply and demand for labour on different parts of the labour market through analyses of recruitment processes. Firstly, labour market demand is identified through studies of the distribution of registered vacancies[1]. Subsequently, the outcome of the recruitment process for these vacancies is studied in order to identify potential recruitment problems. The matching between the employers' qualification needs and the jobseekers qualifications is subject to special focus in the report, which tries to answer four main questions:

i. What positions are vacant?
ii. Which are the characteristics of the search process to the registered vacancies?
iii. Who is recruited for the registered vacancies?
iv. Which matching problems can be identified in the recruitment process?

[1] In Norway, the PES (Aetat) registers the majority of vacancies related to formal recruitment i.e. vacancies directly reported to Aetet or its web pages, or announced in the press and magazines.

These questions are answered within the framework of labour market clusters defined by the characteristics of industry sectors, occupations and qualification requirements in certain regions. Hence, the labour market can be can be restricted to one or more dimensions where region, branch/occupation, and education level are among the central factors defining a certain part of the labour market. The report also makes an attempt to identify and describe differences between the different parts of the labour market. Information about qualification needs is restricted to the formal education level of the ideal applicant. The matching between supply and demand is based on comparison of these qualifications and those of the person filling the vacancy. This offers a picture of the difference between ideal and real competence (in terms of formal education level).

The 'Recruitment survey' in 2001 (Aetat 2002) was based on questionnaire sent to 3.000[2], of the 87.764 vacancies that were registered by the Aetat during the third quarter of 2001. The seasonal variation was assumed to be small concerning the majority of vacancies, with the exception for the summer period, and concerning a few vacancies for positions normally running for a full year e.g. teacher jobs. This is important to consider when studying the recruitment patterns over time. Shorter vacancies with less than one week's duration were excluded from the selection. The study was also restricted to single vacancy registrations because multiple simultaneous vacancies could imply a blurred link between the survey questions and a particular vacancy. This approach may have implications for the selection and, as a result, the result could be biased. For instance, multiple vacancies tend to be concentrated among certain industries, such as large manufacturing enterprises and seasonal industries e.g. fishery and construction. Consequently, vacancies within such industries could be under represented in the selection, which could have an effect on other variables than industry e.g. type of position and/or duration.

1.3 Sweden

The surveys on short-term labour market needs carried out within the Swedish labour market administration (AMV) comprise annual interviews with around 10.000 employers, carried out at the regional level. This entails special questionnaires to all firms in the region with more than 100 employees. In addition, it covers municipalities, the county councils, and a selection of private firms with more than 5 employees. The questionnaire to the private firms is significantly more detailed and includes questions regarding market trends, capacity utilisation, employment development during the previous year, and judgements regarding the expected development over the forthcoming two years. The employers are requested to separate between employment changes as a result of new recruitment and replacements, during the previous 12 months as well as during the forthcoming 6 and

[2] 63,7 percent of the questionnaires were answered

12 months. The information about the previous 12 months provides the PES offices with information concerning the type of problems experienced when attempting to recruit new personnel, the solution to the problem and its implications. The information about the forthcoming period offers an indication of occupations where the firms plan to employ personnel, the expected number, and what qualifications they require.

The main report by the Swedish National Labour Market Board (AMS) presenting regular short-term forecasts on a national level is called 'Where are the jobs?' (*Var finns jobben?*). It is based on the judgements by the County Labour Boards (LAN) and the public employment offices (Af) concerning occupations represented on their respective regional/local labour markets. These in turn, are based on the surveys carried out within the AMV and informal data collected through ongoing contacts with employers, trade union representatives, and representatives from the enterprise sectors. The demand development and the recruitment situation for a selection of occupations are diagnosed with the employers' expected recruitment needs as a starting point. Subsequently, demand and recruitment are related to the local employment offices' forecast of suitable job seekers and employment forecast for the occupations. The fact that the information on aggregated national level is based on information collected locally and regionally implies that there may be bias in the national results. The half-yearly reports present the expected change in the number of employed by occupation/branch and a shortage index (explained below). They also include information about the trends within labour market training. In addition to the report on the national level, each LAN publishes two regional labour market forecasts per year.

The 'Shortage index' (*Bristindex*) published in 'Where are the jobs?' has been developed by AMS to identify occupations where there is a shortage of suitable applicants. It is a weighted average of the local labour market offices' judgements regarding a certain occupation. The index scale is between 1 and 5, where 1 corresponds to significant excess and 5 significant shortage. The figure for a certain occupation is derived by multiplying the number of employment offices estimating significant excess for a certain occupation by 1, the number of employment offices estimating excess is multiplied by 2, etc. and the sum of the products is then divided by the number of employment offices. In practice, this type of analysis easily leads to under estimations of problems related to excess, which implies that index numbers below 3 are relatively few. The National Labour Market Board classifies occupations with an index equal to or above 4, as a significant shortage in the whole country. Indexes ranging between 3,6 and 3,99 are considered as occupations with significant shortages in parts of the country and shortages or balances in other parts of the country. Occupations in the index interval between 3,2 and 3,59 are characterised by some shortage or balance in most parts of the country. Indexes between 2,8 and 3,19 refer to occupations where there is balance between demand and supply whilst figures below 2,8 indicate an excess of labour.

Table 4: Shortage index based on the judgements of the Swedish local labour market offices

Occupation	Spring 2002	Spring 2001	Spring 2000	Spring 1999
Nurse	4,58	4,63	4,53	4,41
Physicians (general)	4,38	4,46	4,29	3,99
Geriatrics nurse	4,33	4,32	4,30	4,15
School teacher (4-9, maths, Nat.Sc)	4,32	4,45	-	-
District nurse	4,27	4,29	4,15	3,94
School teacher (1-7,maths, Nat.Sc)	4,26	4,38	-	-
Physicians (specialist)	4,19	4,25	4,09	3,90
School teacher (4-9)	4,18	4,32	4,34	4,33
School teacher (4-9, languages)	4,11	4,20	-	-
VVS fitter *	4,11	4,15	3,83	3,63
Emergency nurse	4,11	4,17	4,10	3,90
School teacher (1-7)	4,10	4,22	4,23	4,17
Social secretary/welfare officer	4,08	3,88	3,78	3,55
Dentist	4,07	3,95	3,58	3,21
Preschool teacher	4,07	3,90	3,47	3,43
Special pedagogue	4,07	4,16	4,06	3,83
Upper secondary school teacher (Nat.Sc)	4,02	4,26	4,24	4,17
Pharmacist	4,00	3,98	3,70	3,21
Average **	3,37	3,50	3,36	3,24

* Heating, ventilation , and sanitation

** Includes all occupations in the forecast and not only those included in the table

Source: AMS Sweden 2003b

The table includes a selection of the occupations presented in a table in 'Where are the jobs 2003?' (*Var finns jobben 2003?*). It includes the occupations where the shortage index indicates a significant shortage the whole country (index >3,99) and it is sorted after the index figure from 2002 spring. The shortage index displayed in the table is a weighted average of the judgements by local PES offices' regarding a certain occupation. The index scale is between 1 and 5, where 1 corresponds to "significant excess" and 5 corresponds to "significant shortage". The index is derived by multiplying the number of employment offices estimating significant shortage for a certain occupation by 5, the number of employment offices estimating significant excess for a certain occupation is multiplied by 1, etc. The average index for all occupations is within the interval between 3,2 and 3,59, which is interpreted as occupations characterised by some shortage or balance in most parts of the country. *For example*: The average rating of the employment offices concerning the labour market situations for nurses in spring 2002 was 4,58, which means that the majority estimate a significant shortage.

In the report series 'Labour market outlooks' (*Arbetsmarknadsutsikterna*) the AMS presents an overview situation of the labour market in a general perspective. The reports are published with a six months interval and refer to the outlooks during the following year. They focus on discussions about trends, developments and forecasts for different industry sectors. This comprises detailed information explaining the reasons behind recent trends, the current situation, its consequences, and

responses in terms of labour market programs. In addition to the forecast activities undertaken at regional and local level, 'Labour market outlooks' provides information about other internal AMS studies as well as projections by Statistic Sweden and other actors.

Statistics Sweden (SCB) also undertakes an annual short-term forecast survey, called the 'Labour Market Tendency Survey' (*Arbetskraftsbarometern*). It is a sample survey conducted by means of questionnaires providing information about the labour market situation and the outlook for 77 educational and training categories, of which 56 are higher education programmes. The employers are requested to estimate the supply of applicants (good/balanced/shortage) and to make a judgement about how the number of employed with a particular educational background will change on a one-year and three-year perspective (increase/no change/decrease). On the basis of the answers to the 'Labour Market Tendency Survey' questionnaires, SCB provides a report of the recruitment situation, the share of employers with vacancies, and the demand for labour with a particular educational background (see table 5).

Table 5: Short-term recruitment outlooks based on the 'Labour Market Tendency Survey' by Statistics Sweden

Education group	Supply of applicants				Short term needs			
	Graduates		Experienced		1 year		3 years	
	Good (%)	Shortage (%)	Good (%)	Shortage (%)	Increase (%)	Decrease (%)	Increase (%)	Decrease (%)
Electricity/electronics*	45	41	9	64	27	6	74	6
Building technology*	23	36	1	91	54	3	73	3
Construction	7	49	6	82	46	5	65	9
Manufacturing	3	86	4	94	46	7	55	21
Vehicles / Transport.	7	63	2	90	42	5	54	17
Electricians	20	41	4	84	29	8	52	7
Tele/electronic	16	54	2	69	20	20	54	18
VVS**	9	72	7	87	36	2	57	3
Agriculture / Forestry	3	86	6	80	22	6	44	12
Social workers	12	73	10	76	22	2	33	4
Physicians	3	63	0	95	36	1	46	3
Nurses (general)	3	82	1	92	46	4	57	4
Nurses (specialists)	8	71	7	77	39	3	59	5
Dentists	6	82	2	92	17	8	25	10
Recreation instructors	8	76	7	79	11	4	35	12
Teachers (specialists)								
Teachers***	20	50	6	62	7	7	24	20
Theologians	5	67	6	59	14	2	20	10
Restaurant	12	62	6	84	10	15	51	2
All****	35	38	15	56	23	7	42	10

* Engeneerring graduates, **Heating, ventilation, and sanitation, ***Swedish and social science teachers in grades 1-7, ****Includes all occupations in the forecast and not only those included in the table.

Source: SCB 2002

The figures in the table are based on the employers' judgement about how the number of employed with a particular educational background will change on a one-year and three-year perspective. The sample in the table includes a selection of occupations presented in the 'Labour Market Tendency Survey' (Arbetskraftsbarometern) 2002 i.e. cases where the share of employers indicating "shortage" minus the share indicating "good supply" exceeds 20 percentage points. The figures in the first two columns represent the share of employers estimating "good supply" and "shortage" of graduates, and the following two columns include the same information for experienced workers. The four columns on the right side of the table demonstrate the employers' judgements whether their short-term recruitment needs will increase of decrease. *For example:* 45 percent of the employers estimate that there is a good supply of engineering graduates within electricity/electronics (top row) against 41 percent estimating a shortage. Only 9 percent of the employers estimate a good supply of experienced engineering graduates within electricity/electronics against 64 percent estimating a shortage. The short term needs for engineering graduates within electricity/electronics will increase during the coming year according to 27 percent of the employers, and during he next three years according 74 percent. Only 6 percent of the employers expect that the need will decrease, during the next year as well as during the forthcoming three years.

2. Long- and medium-term labour market projection

This section presents a selection of long- and medium-term labour market projection models applied in Scandinavia, and some results from the most recent updates. The objective is to highlight some of the central practices currently employed to identify potential medium- and long-term mismatches. An attempt is also made to delineate what type of information the projections make available.

2.1 Denmark

The Danish Ministry of Education (UVM) and the Institute of local government studies in Denmark (AKF) stand out as central actors engaged in projecting medium- and long-term qualification needs on the Danish labour market. In addition, other Ministries carry out forecasts within their area of responsibility.

The AKF applies a dynamic projection model, where demand for labour by education and the distribution of labour by education among industries are determined endogenously, with overall industry demand and supply by education given exogenously. The supply of labour by type of education is calculated according to a separate supply model, and labour demand by industry sector is based on

projections according to 'The Annual Danish Aggregate Model' (ADAM). This is a macroeconomic model providing a tool for analyses (projections) of the Danish economy, which is also frequently applied by other actors to project labour demand by industry sector in Denmark. Future demand for labour by education is the endogenous variable given information of the initial employment for labour by education in each industry. Through information about the demand for labour of education *i* in industry *j*, $d_{ij}(t)$, and the demand for labour in the *j*th industry, $D_j(t)$, the model form the distribution of the different types of educations in each industry: $c_{ij}(t) = d_{ij}(t) / D_j(t)$. Combining these coefficients (assuming them to be constant over time) with the exogenous demand for labour by industry gives the change in demand for labour by type of education from period t to period t+1:

$\Delta D_i^f(t+1) = \Sigma_j c_{ij}(t) \Delta D_j(t+1)$.

The model further defines: $\Delta S_i^g(t+1) = S_i(t) \frac{S(t+1) - S(t)}{S(t)}$, $\Delta D_i^g(t+1) = D_i(t) \frac{D(t+1) - D(t)}{D(t)}$

and

$\Delta U_i^g(t+1) = \Delta S_i^g(t+1) - \Delta D_i^g(t+1)$

Demand for labour by education is predicted for one period ahead. All variables in the first period (T) are exogenous, while demand for labour in period T+1 is the endogenous variable. The supply of labour by education is assumed exogenous in both periods. Demand for labour by education in period T+1 can be written as:

$D_i(T+1) = D_i(T) + \Delta D_i(T+1)$ [1]

Knowing that $\Delta D_i^f(t+1)$, it is possible to decompose $\Delta D_i(T+1)$ as:

$\Delta D_i(T+1) = \Delta D_i^f(T+1) + \Delta D_i^r(T+1)$ [2]

$\Delta D_i^r(T+1)$ represents the residual change in demand which cannot be attributed to fixed educational coefficients or changes in demand by industry. The variable is determined by the following equation:

$\Delta D_i^r(T+1) = \psi(S_i^{gap}(T+1))$ [3]

s.t. $\Sigma_i D_i^r = 0$, and where

$\Delta S_i^{gap}(T+1) = \Delta S_i(T+1) - \Delta S_i^g(T+1) - (\Delta D_i^f(T+1) - \Delta D_i^g(T+1))$ [4]

Equation [3] should be interpreted as the way in which new demand for labour with education i is created, in excess of what is suggested when assuming educational proportions (c_{ij})to be constant over time. This extra demand is created through a pressure by the surplus supply of the *i*th education of labour. In order to obtain a dynamical model (i.e. to proceed from T+1 to T+2) it is necessary to have information about the demand not only by education, but also by industry. Hence, the model allows c_{ij} to change over time subject to the following conditions:

for all *i*, $\Sigma_j c_{ij}^*(t+1)D_j(t+1) = D_i(t+1)$

for all *j*, $\Sigma_i c_{ij}^*(t+1) = 1$

The basic assumption is that an educational group, which increases (decreases) its employment, in excess of what fixed educational proportions would have yielded, receives (looses) the additional employment in the industries in proportion to the importance of the groups within the industries.[3]

Table 6: Unemployment by type of education, selected years 1996-2010

	1996	1996	2000	2005	2010
	Lab. force	Unemployment (percentage)			
Without vocational qualification, total	909.797	11,3	8,4	7,8	7,7
Upper secondary vocational qualification	1.044.177	6,2	2,9	2,3	2,1
- Business and administration	455.507	6,7	3,1	2,2	1,8
- Iron and metal	206.859	5,8	2,9	2,4	2,1
- Construction	139.059	4,6	0,7	-0,6	-1,1
- Graphic	19.764	11,0	9,2	9,3	9,3
- Service	63.997	8,4	4,3	3,2	3,0
- Food	32.462	6,3	3,6	3,1	2,9
- Health care	71.652	4,8	1,8	1,9	2,2
- Other	54.877	5,1	5,5	6,9	7,5
Short-cycle higher education	177.650	4,5	1,8	1,7	1,9
- Humanities and pedagogic	96.116	4,5	1,5	1,7	2,1
- Technology	44.587	4,0	0,0	-2,1	-2,8
- Health care	13.770	3,2	2,0	0,4	-0,2
- Other	23.177				
Medium-cycle higher education	248.792	3,0	1,0	-0,3	-1,2
- Humanities and pedagogic	94.367	2,8	1,3	-1,0	-1,8
- Social Science	33.249	3,8	0,9	1,1	1,5
- Technology	60.281	5,0	1,7	1,4	1,2
- Health care	60.895	0,7	0,1	-1,6	-3,7
Long-cycle higher education	123.336	3,6	1,1	0,6	0,6
- Humanities and pedagogic	18.787	4,3	1,6	1,6	2,0
- Social Science	37.405	3,9	1,5	1,4	1,9
- Technology	31.416	5,3	1,3	0,4	0,0
- Health care	22.737	0,9	0,0	-3,8	-7,3
- Other	9.238	2,5	0,1	-1,9	-2,6
- Ph.D	3.753	1,8	0,2	0,2	0,6
Total	2.503.752	7,5	4,4	3,6	3,3

Source: Holm. A, Honore' Olsen. T, Groes. N (AKF), 2000

[3] A more detailed description of the model can be found in Groes N, Holm Larsen A, 1994

The table shows a selection of the 84 education groups presented in the most recent update of the AKF model. The figures in the first column represents the labour force by type of education in 1996, and the following four columns show the labour market mismatch (unemployment) by type of education in selected years until 2010. Note that unemployment is allowed to take negative values, which indicates labour shortages. *For example:* There is an expected shortage of health care personnel with medium- and long-cycle higher education qualifications in 2005, and in 2010 there is an expected shortage at all higher education levels.

The projections of supply by type of education by the UVM in 'Education and labour market' (*Uddannelse og Arbejdsmarked*), are based on the so called 'Labour supply model' (*Arbejdsutbudsmodel or AU-model*). The AU-model is a statistical projection model comprising flows within both the education system and the labour force. It covers the part of the population in the age groups 14-69 that are most representative for the relevant flows. All educations in the Danish education nomenclature are included in the model, grouped and reduced to 89 education categories. The fundamental assumption in the model is that future flows can be projected based on historical observations. The model framework defines seven variables to describe individuals or groups of individuals: sex, age, labour market situation, most recent completed education, most recent current education, education status for the most recent current education, and time past since the latest shift in education status. A range of annual transition ratios – based on historical observations – are then used to define the individuals' education/labour market situation. These transition ratios express the probability that an individual with certain characteristics will make a certain transition. The calculation can be divided into three steps: The first step gives the remaining number of individuals after accounting for mortality and emigration. Secondly, the numerical projections of individual transitions are based on transition ratios that are representative for distinct groups of individuals with certain characteristics. This calculation separates between a) transitions for those currently engaged in education and education associated transitions, and b) non-education related transitions. In the third step, new 14 year olds from the population projection are added to the system. The model does not account for political decisions (e.g. planned expansions of public services or increased education capacity) or changes in students' study preferences. It is only based on the relationship between the most recent population projection and the known study patterns (study duration, age, sex, transition patterns, etc.) within the individual education groups.

The table below demonstrates an example of the layout for model output concerning the labour force by education and employment status. The cells in the table would include figures in absolute terms representing a number of persons. N_{ij} is the size of the group of persons with labour market status *i* and education status *j*, while A and U represents the totals by labour market and education status respectively.

Table 7a: Labour force by education and employment status

Education → Employment ↓		No info 0	Ongoing 1	Completed 2	Interrupted 3	Labour force
No info	0	N_{00}	N_{01}	N_{02}	N_{03}	A_0
Employed	1	N_{10}	N_{11}	N_{12}	N_{13}	A_1
Unemployed	2	N_{20}	N_{21}	N_{22}	N_{23}	A_2
Inactive	3	N_{30}	N_{31}	N_{32}	N_{33}	A_3
Education		U_0	U_1	U_2	U_3	Total

Source : Undervisningsministeriet (UVM) 1996

The UVM applies a model called the *Bruttoflex model* for calculation of employment by education group and branch. The model combines exogenous sets of information concerning employment by branch and supply by education, in order to project the future employment share for education *i* in branch *j*. The model also distributes unemployment by education group. The distribution is based on probabilities for persons with education *i* to be employed in branch *j* or to be unemployed. The three tables below demonstrate a simplified picture of the model with three types of education, two branches, and unemployment. The first table represents a matrix including the historical figures that are necessary as starting point (1993 in this example).

Table 7b: Reference matrix

millions of individuals

Year 1993	Branch 1	Branch 2	Unemployed	Total
Education 1	0,2	0,2	0,1	0,5
Education 2	0,7	0,3	0,2	1,2
Education 3	0,4	0,3	0,1	0,8
Total	1,3	0,8	0,4	2,5

Source: Undervisningsministeriet (UVM) 1996

The framework conditions in table 7c are exogenously given by the total supply by education and total employment by branch (the figures in *italics*). The next step is to calculate the distribution by types of education and branches subject to the framework conditions, so that the changes in the distribution between education types in each branch are as small as possible compared to the reference matrix. The results of these calculations are demonstrated in the table below.

Table 7c: Education by branch given total employment by branch (intermediate)

millions of individuals

Year 20xx	Branch 1	Branch 2	Unemployed	Total
Education 1	0,143	0,3	0,05	*0,5*
Education 2	0,571	0,45	0,10	*0,9*
Education 3	0,286	0,45	0,05	*1,0*
Total	*1,0*	*1,2*	*0,2*	*2,4*

Source: Undervisningsministeriet (UVM) 1996

In the matrix above the distribution of education groups by branch sums up to the total branch employment but the totals by type of education are incorrect. Hence, the calculations must continue until the sums over education types (rows) and branches (columns) correspond to the totals given by the framework conditions. These calculations should be carried in out so that the distribution of the individual type education by branch and the distribution of education types within each branch are as close the distribution in the reference matrix as possible. When the calculations are completed the matrix will have the flowing values.

Table 7d: Education by branch given total branch employment and education supply by type

millions of individuals

Year 20xx	Branch 1	Branch 2	Unemployed	Total
Education 1	0,151	0,297	0,052	*0,5*
Education 2	0,470	0,347	0,083	*0,9*
Education 3	0,379	0,556	0,065	*1,0*
Total	*1,0*	*1,2*	*0,2*	*2,4*

Source: Undervisningsministeriet (UVM) 1996

The *Bruttoflex model* calculates the minimal adjustments to match the changes and it is status quo oriented with respect to unemployment distribution by type of education. The utility of the model become visible when one focuses on the individual values in the matrix. Then the model could answer questions such as: What kind of matching is required for education 3 to expand with 25 percent when unemployment is simultaneously halved, in order for individuals with education type 3 benefit from the reduction in unemployment to the same extent as other education groups (all figures according to the example displayed in the tables above). Table 7d gives the answer to this question. It can be seen that the number of employed with education 3 within branch 2, would be almost doubled from 0,3 to 0,556 million persons. Based on knowledge about education 3 and branch 2 one could question whether it is reasonable to assume that branch 2 could expand by 50 percent with such a high share of labour with education type 3, or if it would be better for branch 2 if the future labour force had a larger share of labour with education 2, and a smaller share with education 3.

Labour market projections carried out by the Danish Ministry of education (UVM) have recently been published in 'Education and the labour market' (*Uddannelse of arbejdsmarked*) and 'Education in all directions' (*Uddannlese pa kryds og tværs*), and a new series focusing on sector specific analyses about education and the labour market. 'Education and labour market' presents information about the developments of supply, labour force, and unemployment for selected education groups by sector. The most recent comprehensive study was published in 1996, and it presents projections of the labour force until 2021 and of new candidates until 2010. A smaller report, published in 1999, presents information about supply, labour force and unemployment until 2015, based on the projections from 1996 and updated enrolment figures. The objective of 'Education in all directions' is to provide a comprehensive and updated statistical picture of the Danish formal education system, from primary education, through adult education, to PhD level. The fifth edition of the publication was published in 2003, and it includes projections for the ordinary education system until 2011. Nevertheless, it does not include information about labour market demand, and thus it does not provide any information about potential mismatches or bottlenecks. Since 2003 this report is no longer published in printed form, but as a series of net based articles, each relating to a particular education field. The report series on sector specific analyses by the Ministry of Education has analysed the technology sector and the health care sector. Although these projections provide more detailed information than the other UVM publications, they are still focused on the supply from the Danish formal education system, rather than mismatches and bottlenecks. They present some relatively simple mismatch analyses, where the demand projections are based primarily on demographic developments.

The Danish Ministry of Employment (BM) analysed the medium-term development tendencies on the public labour market in a report published in 1999 (BM 1999). The forecast was based on a study carried out by a working group created by three ministries: BM, UVM, and the Ministry of Finance (FM). The objective was to highlight potential recruitment problems and shortages of qualified labour within health care, education, and public administration until 2005 (2010 in certain cases). The starting point for the method was the whole of the labour market, which allowed for identification of transitions between individual branches as well as historical changes in the education level of the labour force. The supply projections included alternative scenarios based on factors such as the expected number of entrants – which in turn were based on demographic developments, political decisions concerning capacity and preferences among the applicants – and historical completion ratios and employment ratios. The elements considered in relation to completion ratios included, among others, duration, change of studies and age, while employment ratios were based on sex, retiring age, etc. Aggregated sector demand was based on the government's growth objectives for 2005. The projection of demand by education group separated between demographical and structural developments. In broad terms, the former is exclusively based on demographic developments without accounting for the level of service, personnel density, etc. The

exception was education groups that were not directly affected by demographic developments, for which there was an assumption that private service demand would have a growth rate of 1 percent. Structural change was based on projections of historical developments in the education structures by branch. A combination of the information on labour demand with the expected demand structures, allowed for calculation of the demand for labour within the public sector by type of education.

Table 8: Supply and demand in the public sector

Occupation and year		Historically based demand	Demographically based demand	Supply towards the public sector
Nurses	2005	64.100	49.300	53.500
	2010	-	50.600	55.400
Physicians	2005	12.900	10.700	11.400
	2010	-	10.900	12.000
Social worker	2005	8.800	7.400	10.800
	2010	-	7.800	12.300
Pedagogues	2005	76.000	61.800	83.200
	2010	-	59.400	91.400
Teachers	2005	73.100	81.800	80.700
(Compulsory school)	2010	-	85.200	85.300
Administration	2005	113.000	104.000	104.200
	2010	-	104.000	97.000
Economy and law	2005	16.700	11.800	17.400
	2010	-	11.800	21.400

Source: Ministry of employment (BM) 1999

The table includes a projection of supply and demand for a selection of occupations within the public sector. The first column displays the individual occupations divided into projections for 2005 and 2010. The second column displays historically based demand i.e. demographically based demand plus the effect of structural changes. The latter is only forecasted until 2005. The figures in the third column correspond to demand expectations based on the demographic development, without accounting for changes in the service level, personnel density, structural changes, etc. The final column shows the supply towards the public sector by occupation. *For example:* There is sufficient supply of nurses towards the public sector to meet the demographical developments without any changes in the service level, personnel density, structural changes, etc. However, accounting for structural changes, the historically based demand for nurses in 2005 is 64.100, which exceeds supply by over 10.000.

Another report, carried out by the Danish Ministry of Finance (FM), has projected the adjustment needs on the public labour market until 2035 (FM 2000). The forecast of the development of public services separated between demographic developments and changes in service standards. During the period until 2005, the latter was based on changes in the expenditure per capita according to existing government objectives. After 2005, the future recruitment situation in the public

sector was projected according to four different scenarios, explained below in figure 1. Subsequently, demand and supply by type of education within the individual branch was projected, based on historical observations. Finally, the recruitment situation by education group (excess or shortage) was calculated according to alternative structural development scenarios.

Figure 1: Alternative scenarios for recruitment within the Danish public sector

Supply	Demand: High (0,5 percent annual service growth after 2005)	Demand: Low (Corresponding to demographic developments after 2005)
High (Corresponding to demographic developments	Scenario 1	Scenario 3
Low (Increasing employment ration 1999-2005)	Scenario 2	Scenario 4

Scenario 1: The total labour supply in the economy follows the demographical development. The demand for labour in the public service sector after 2005 corresponds to demographic developments, plus an annual 0,5 percent increase in the service standard.

Scenario 2: The total labour supply in the economy increases between 1999 and 2005. The demand for labour in the public service sector after 2005 corresponds to demographic developments, plus an annual 0,5 percent increase in the service standard.

Scenario 3: The total labour supply in the economy follows the demographical development. The demand for labour in the public service sector after 2005 corresponds to demographic developments.

Scenario 4: The total labour supply in the economy increases between 1999 and 2005. The demand for labour in the public service sector after 2005 corresponds to demographic developments.

Source: Danish Ministry of Finance (FM) 2000

There are also examples of sector specific medium-term forecasts where Danish ministries have cooperated with external management consultancy. A working group formed by representatives from the UVM, the Ministry of Science technology and Innovation (VTU), the Ministry of Culture (KUM), and branch organisations has analysed competences within media related occupations (VTU 2003) with the objective to provide key branch representatives, the Ministries, and relevant education institutions with fruitful information about the development until 2010. The three central elements of the work were supply analysis, demand analysis, and trend (mismatch) analysis. The supply was projected based on information about flows of employees within the media sector, entrants to media related education and education capacity. The demand projection combines qualitative information from survey data and interviews, with data from Statistics Denmark. PLS Rambøll management consultancy was assigned with the task to carry out the survey among

the media enterprises and to identify the central factors driving labour demand within the branch through interviews with central experts. The mismatch analyses employed this information together with information from the media enterprises about their expectations of the education among the branch employees in 2006. The results were presented as the expected excess/shortage (percentage) by education field until 2010.

A task force headed by the Ministry of Trade and Industry carried out a study of supply and demand for qualifications (education groups) within the bio-health care sector[4] until 2020 (UVM 2002b). The variables taken into account in the supply projections include the labour force composition in the reference year, as well as expectations about future education enrolment/capacity, completion ratios, and employment ratios. The consulting firm Epinion was responsible for the projection of demand. Employment was assumed to increase in accordance with the projections made by the Danish Ministry of Finance until 2010. Based on qualitative information from survey data and interviews, and data from Statistics Denmark, Epinion projected that the bio-health care sector would grow more than the rest of the economy, and that the share of bio-health care educated within the sector would increase. The forecast presented different scenarios of supply, demand, and mismatch (unemployment) expectations by field of education. In addition, the report identified three main categories of future qualification needs that were to be central within the sector: Firstly, a range of technical education competences related to the know-how within the sector. Secondly, an array of broader competences (e.g. IT skills), and thirdly, a variety of social and general competences (e.g. ability to cooperate)

In 2001, supply and demand for labour within the Danish IT-sector until 2010 was subject to a comprehensive analysis by four Danish Ministries[5] (UVM 2000a). The projections of supply were based on data collected from Statistics Denmark and the Ministry of Education. The consulting firm PLS RAMBØLL carried out a study of labour demand, which was primarily based on a combination of telephone interviews and Internet based questionnaires. The demand projections were based partly on qualitative information from this study, and partly on forecasted macroeconomic developments. Two different scenarios described the future need for IT-qualified labour. The report also presented expectations about future qualitative qualification needs within the sector. On the basis of the experiences from the analysis, the government have expressed a desire to cooperate with the IT branch to establish a barometer for the IT labour market in order to allow for closer surveillance of the developments.

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[4] The bio-health care sector comprises enterprises and public actors within the resource area medicine/health care as well as an array of enterprises delivering care services and technology based health care services, e.g. telemedicine.

[5] The ministry of employment, Ministry of Trade and Industry, The Ministry of Information Technology and Research, and the Ministry of Education

2.2 Norway

Statistics Norway (SSB) has developed a general model (AD-MOD) to project labour market supply and demand. This model is structured after SSB's macro economic and demographic models, and thus delineates a picture that is consistent with these models. Furthermore, SSB has developed two specific and more detailed models to project supply and demand for labour in the education sector (LÆRARMOD) and the health care sector (HELSEMOD). This is due to the fact that public priorities have a significant impact on the demand for labour within these sectors. SSB is commissioned to update the projections by the responsible ministries[6] every other year.

The projected supply by type of education in AD-MOD is based on the demographic micro simulation model MOSART. This model is exclusively based on demographic factors while economic factors that have a potential impact on labour force participation for certain groups are not taken into consideration. Nevertheless, such factors are considered in the macro economic model called MODAG, where labour force participation for rough groups by sex and age (but not education) is affected by factors such as unemployment and wage situation. Hence, aggregated labour force supply is projected with the MODAG model while the results from MOSART are used to distribute labour supply among the different education groups. Projections of supply and demand for different types of labour (AD-MOD projections) are published in the SSB journal 'Economic analyses' (*Ökonomiske analyser*). The two most recent projections of this kind was published in 'Economic analyses' 6/2001 (Stølen N M 2001) and 7/1999 (Stølen N M 1999). It is not decided when the next projection according to the AD-MOD will be provided. This is due to changes of the Norwegian education standards and extensive flexibility within the education system, which makes it very difficult to undertake projections of the labour force. The most recent update presented projections of labour supply and demand for a small selection of education groups until 2010. The discussion about potential future mismatches on the labour market was based on diagrams that delineated the development of supply and demand for the selected education groups (see diagrams 1-8). Due to significant insecurities in the projections, no diagrams for the humanities and law were presented. The report also included a projection of the labour force, unemployment, and employment by aggregated industry sectors until 2010. In another report, SSB presented projections of the labour force by occupational attainment until 2030 based on calculations with MOSART (Fredriksen D 1998). This report provided information about projected changes in the educational structures within the labour force, by level as well as by type of education (see table 9).

[6] Ministry of Education and Research for teacher personnel, Ministry of Health and Ministry of Social Affairs for health care personnel, and Ministry of Employment, Ministry of Education and Research, and Ministry of Trade and Industry for more general projections.

Diagrams 1-8: AD-MOD projections of supply and demand developments for selected of labour categories in Norway 1999-2010

Diagram 1

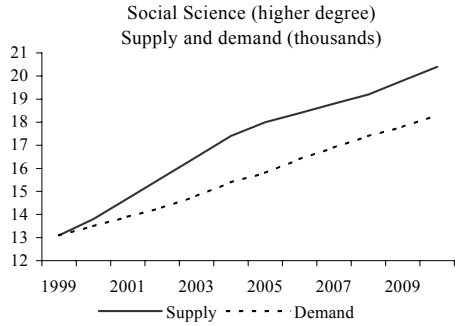


Diagram 2

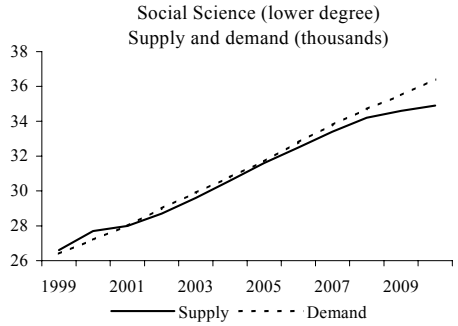
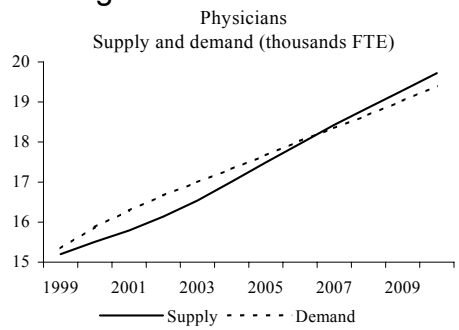


Diagram 3



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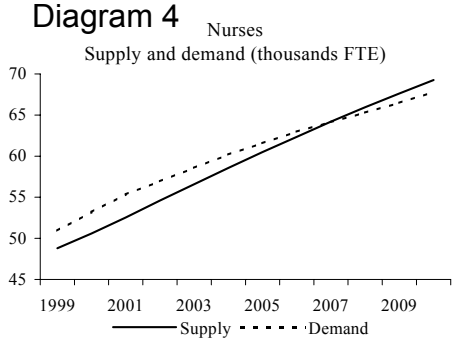


Diagram 5

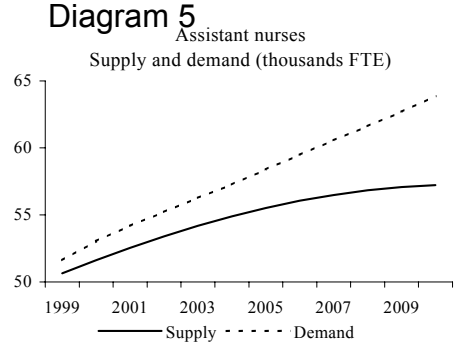


Diagram 6

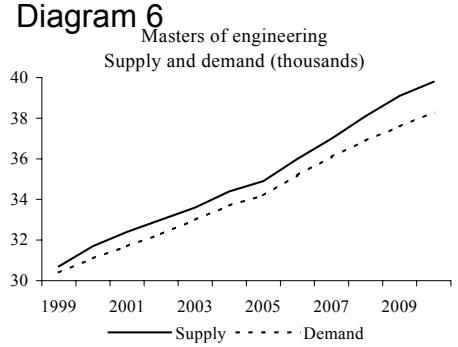


Diagram 7

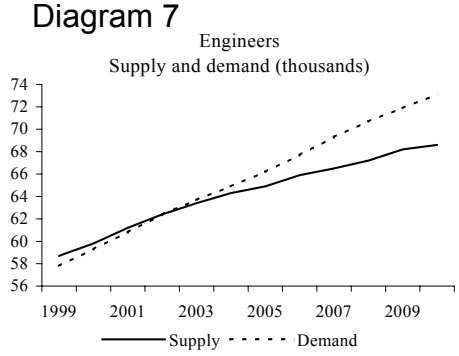
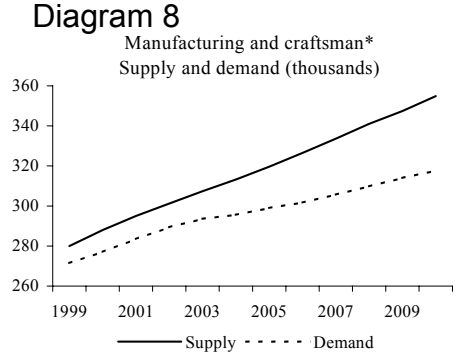


Diagram 8



Source: SSB 2001

Table 9: Labour force by education level based on the micro-simulation model MOSART

	Men		Women	
	1993	2030	1993	2030
	Thousands persons			
All	1166	1314	970	1168
	Percent			
All	100.0	100.0	100.0	100.0
Education level				
Unknown	4,1	4,6	2,9	3,3
Primary school	18,4	6,8	18,7	5,2
Secondary school, 1 year	20,0	8,4	28,2	7,4
- Crafts	10,1	6,1	2,1	1,0
- Economics and administration	3,0	0,6	9,8	2,6
- Others	6,8	1,8	16,4	3,8
Secondary school, 2-3 years	35,6	39,1	28,0	36,8
- Crafts	17,5	21,4	1,5	1,7
- Economics and administration	4,5	3,9	6,9	15,7
- Auxiliary nursing	0,1	0,1	4,5	3,3
- Grammar school	6,3	10,3	8,5	8,4
- Others	7,1	3,4	6,6	7,7
Higher education, 1-4 years	15,5	27,8	20,3	38,6
- Technology	4,2	8,1	0,8	1,7
- Economics and administration	3,1	7,0	3,7	9,9
- Nursing	0,3	0,6	4,7	7,1
- Teaching	3,2	4,6	6,1	11,0
- Others	4,7	7,4	4,9	8,9
Higher education, 5 years and more	6,4	13,3	1,9	8,7
- Technology	2,1	4,8	0,2	1,3
- Natural sciences	1,1	1,6	0,3	1,2
- Law	0,7	1,8	0,3	1,8
- Social sciences	0,5	1,4	0,3	1,7
- Medicine	0,7	0,8	0,3	0,6
- Humanities	0,6	0,9	0,3	1,3
- Others	0,8	2,1	0,2	0,8

Source: Fredriksen D (SSB) 1998

The table presents the distribution of the labour force by type education for men and women in 1993 and 2030. The first column displays different education levels, divided by type of education. The following four columns delineate the distribution of the total labour force by level and type in 1993 and 2030. The 1993 figures correspond to the actual level, and the 2030 values are projected based on the dynamic micro-simulation model MOSART with the perspectives of 1993. *For example:* The share of men with 1-4 years of higher education within the filed of

technology was expected to be almost doubled from 4,2 to 8,1 percent of the total male labour force. The share of women with the same education was expected to be more than doubled from 0,8 to 1,7 percent of the total female labour force.

HELSEMOD calculations consist of separate projections for 19 individual and 2 aggregated education groups. The working age population with a given education in the reference year (t-1) is the starting point for the calculations of the supply projections, which are based on demographic development. New supply of candidates by type education, sex, and age until next year ($K_{u,k,a,t}$) is based on the number of students entering education in Norway (s) years earlier ($SN_{u,t-s}$) and the examination ratio by type of education (FN_u). The model also includes supply from educations outside Norway ($SU_{u,t-s} * FU_u$) but this figure is put to zero for most of the educations.

$$K_{u,k,a,t} = \frac{(SN_{u,t-s} * FN_u + SU_{u,t-s} * FU_u)\, SN_{u,k,a-s,t_b}}{\sum_{k=1}^{2} \sum_{(a-s)=17}^{74} SN_{u,k,a,t-s}} \qquad [1]$$

In the next step, the model calculates remaining persons by sex and age until year t ($B_{k,a,t}$) after accounting for mortality rates ($D_{k,a,t}$)

$$B_{u,k,a,t} = B_{u,k,a-1,t-1} * (1 - D_{k,a,t}) + K_{u,k,a,t} \qquad [2]$$

The resulting number of (projected) persons is multiplied by the observed employment ratios by education, sex and age ($Y_{u,k,a}$), and by the average share of Full Time Equivalent ($A_{u,k,a}$). The parameter (μ) could be applied to include a relative or constant increase or reduction in the labour supply.

$$T_{u,k,a,t} = B_{u,k,a,t} * Y_{u,k,a} * A_{u,k,a} * \mu \qquad [3]$$

Finally, the supply (FTE) is summed up in order to get the aggregated number of FTE by education in year t.

$$T_{u,t} = \sum_{K=1}^{2} \sum_{a=17}^{74} T_{u,k,a,t} \qquad [4]$$

The starting point for the demand projections is the demand for a given education group within a certain activity area. Demand is defined as the sum of the employed by education group and activity sector in the base year (B_{u,r,t_0}) and the estimated level of non-covered needs (V_{u,r,t_0}), expressed as the number of FTE employees. The two factors driving the changes in demand are demographic development and economic growth. Firstly, relative growth in the number of users ($\alpha_{r,\,t}$) within activity area *r* during the time period t_0-t is calculated, based on the number of residents ($L_{k,ag,t}$) in year t and the number of users per resident ($M_{r,k,ag,t}$) in the observation year (t_b) by sex (k) and age group (ag).

$$\alpha_{r,t} = \frac{\sum_{K=1}^{2}\sum_{ag=1}^{n_r}(L_{k,ag,t} * M_{r,,k,ag,t_b})}{\sum_{k=1}^{2}\sum_{ag=1}^{n_r}(L_{k,ag,t_0} * M_{r,k,ag,t_b})} \quad [5]$$

The growth of the health care sector (relative the size of the population) during the year t_j (β_{t_j}) is assumed to equal GDP per capita growth i.e. GDP growth (γ_{t_j}) minus population growth (δ_{t_j}).

$$\beta_{tj} = \gamma_{tj} - \delta_{tj} \quad [6a]$$

The model also includes a possibility to modify the growth within a certain activity area by multiplying GDP per capita growth by a factor (f_r).

$$\beta'_{r,tj} = \beta_{tj} * f_r \quad [6b]$$

Demand (E) for persons with education *u* in activity area *r* in year *t*, where there is no information about certain planned personnel expansions, is defined as:

$$E_{u,r,t} = (B_{u,r,t_0} + V_{u,r,t_0}) * \prod_{t_j=t_0+1}^{t_r}(1+\beta'_{r,tj}) * \alpha_{r,t} * \theta_{r,t} \quad [7a]$$

where $\theta_{r,t}$ represents a set of parameters, specified for each year and activity area, that can be applied to modify growth rate in relation to the calculated impacts of growth in GDP and population.

Demand (E) for persons with education *u* in activity area *r* in year *t*, where there are information about certain planned personnel expansions (and $t<t_r$) is defined as:

$$E_{u,r,t} = B_{u,r,t_0} + V_{u,r,t_0} + \sum_{t_j=t_0+1}^{t} R_{u,r,t_j} \quad [7b]$$

where R_{u,r,t_j} is the planned increase personnel with education *u* within activity area *r* in year t_j.

Demand (E) for persons with education *u* in activity area *r* in year *t*, where there are information about certain planned personnel expansions (and $t>t_r$) is defined as:

$$E_{u,r,t} = (B_{u,r,t_0} + V_{u,r,t_0} + \sum_{t_j=t_0+1}^{t} R_{u,r,t_j}) * \prod_{t_j=t_0+1}^{t_r}(1+\beta'_{r,tj}) * \alpha_{r,t} * \theta_{r,t} \quad [7c]$$

Finally, summing up over the activity areas, provides the aggregated demand in terms of FTE employees in year t:

$$E_{u,t} = \sum_{r=1}^{17} E_{u,r,t} \quad [8]$$

The most recent update of HELSEMOD included projections until 2020 (SSB 2002). The calculations for the 19+2 education groups were presented in table form (see below) including the projected supply and demand between 1999 and 2020, according to three scenarios with alternative completion ratios and economic growth developments. It is possible that there will be an updated projection of HELSEMOD during 2004.Table 10: The labour market for health care personnel based on

HELSEMOD calculations

Education	Supply 1999	Balance between supply and demand 2020		
		High	Medium	Low
Upper secondary education				
Occupational therapist assistants	2.561	3.979	3.124	2.333
Nursing/caring assistants	50.653	-14.213	-24.337	-31.218
Health and dental care secretaries	4.237	3.959	2886	1.918
Other health care education	2.266	96	-257	-553
College education				
Child care pedagogues	3.547	7.603	6.315	5.448
Bio engineers	3.658	780	118	-333
Ergo therapists	1.540	-325	-560	-983
Physiotherapists	6.375	12.493	1.756	1.077
District nurses	2.412	-755	-1.011	-1.243
Midwife	1.667	71	-214	-432
Radiographers	1.247	1.733	1.155	919
Dispenser	786	401	285	188
Social studies graduates	5.229	7.947	6.435	5.189
Nurses (health care)	48.796	4.986	-2.762	-8.041
Dental nurses	704	265	178	94
Nurses (social care)	4.795	4.636	2.415	1.187
Other health care education	3.430	-1.832	-2.162	-2.409
University education				
Pharmacists	1.088	727	546	395
Physicians	15.203	777	-1.021	-2.436
Psychologists	3.318	571	92	-298
Dentists	4.023	-1.858	-2.290	-2.620

Source: SSB 2002

The results selected in the table displays the projected balance between supply and demand by type of health care education. In the supply projections M (medium) represents the average completion ratio during the late 1990s, while H (high) and L (low) correspond to ratios somewhat above/below this level. On the demand side of the model, the three alternatives correspond to different assumptions concerning economic growth, with the medium alternative representing growth during 1999-2000. The figures in the second column represents demand according to scenario L minus supply in scenario L, the second column the balance between demand and supply in scenario M, etc. *For example:* In the “high” scenario there is a projected

excess of 777 physicians, while in the “low” scenario, there is a shortage of 2436 physicians.

LÆRARMOD separates between 4 different teacher categories: preschool teachers, general teachers, vocational teachers (*faglärare*), and university educated within a pedagogic field. Special teachers are not considered in the model, as the Ministry of Education and Research were currently not interested in projections of this category. Although data on a more detailed level is available, it is not used for more detailed analyses, which is partly due to unreliable information about future education capacity and demand developments. There is no official documentation of the LÆRARMOD model framework but it has the same structure as HELSOMOD. Information about part time/full time employment from the register for employees is merged with the information on average weekly working time by category of employees in the LFS. In this way the number of FTE can be calculated. The most recent update of LÆRARMOD[7] was based on the information about the employment of teachers in the register of employees during the fourth quarter of 2000, and the projection horizon was 2015. The presentation of the results was restricted to three teacher categories: preschool teachers, general teachers, and teachers with a one-year practical-pedagogic education. The calculations were presented in diagram form similar to those presented in diagrams 1-8 (AD-MOD). They delineated alternative scenarios (low and high), and separated between demand due to demographic and economic factors (low and high GDP growth). The economic factor assumed that future per capita growth would increase teacher resources i.e. the number of FTE teachers per pupil. In addition, the calculations took into account factors such as planned political actions and the need to replace non-qualified teachers. Due to significant substitution potentials between the teacher categories, the report also made an aggregated projection for all of them. Where the projection indicated that supply would exceed demand, the model did not account for the probability of new graduates being unemployed or employed outside their field of education.

2.3 Sweden

Statistics Sweden (SCB) and the Swedish National Labour Market Administration (AMV) are public authorities assigned with the task to carry out labour market projections. The aim of the SCB projections is to calculate the balance between demand and supply of labour and to highlight potential imbalances by type of education. In contrast, the starting point in the qualification need studies by AMV is the supply and demand for qualifications by type of occupation, and the overall purpose is to promote economic growth and prevent unemployment.

SCB’s long-term projection model calculates the development of stocks by education group during the next two decades. The model separates between

[7] Published as an annex in a report to the Storting in March 2002 (UFD 2001-2002)

demand and supply calculations. The supply model starts with the population's education year *t* by sex and age group (1). Subsequently, this is multiplied by the survival probaba2ilities by sex, age, and education (2) in order to calculate the survivors in year *t+1* by education structure in *t* broken down by sex, age, and education (3). Then the number of examinations during year t+1 by type of education in year *t* (4) is added to survivors in year *t+1* (3) and, simultaneously they are subtracted from the type of education they had in year *t*. The result gives the population's education 2001 broken down by sex, age, and education (5). This is multiplied by the employment ratios in year *t+1* (6) which gives the labour market supply in year *t+1* by sex, age, and education (7)

1. The population's education year
2. Survival probability Survivors
3. Survivors in *t+1* by education structure
4. Examinations from education
5. Net immigration
6. The population's education
7. Assumptions of employment ratio
8. Labour market supply

The demand for different education groups starts with a population and labour force survey (1). This gives the total number of employed by age group and sex. Subsequently, the economic trend is calculated (2). The private sector development is mainly based on econometric models, which in turn, are based on assumptions about total employment, global trade developments, Sweden's exports shares, and productivity development by industry sector, etc. Demographic development and assumptions about personnel density are the components driving public sector demand for labour. The result from the calculations in steps (1) and (2) provides the number of employed by industry sector (3). Total employment is one of the preconditions for these calculations i.e. they are not based on judgements of demand for labour by industry sector. Consequently, the allocation of employed by industry sector is optimal, given a total number of employed. Then assumptions are made regarding the changes of the education structures by industry sector based on historical patterns (4), which provides the basis for the calculation of the education structure by industry sector (5). The development of qualification requirements within a certain industry sector is based on historical changes in the education structure by industry sector[8]. The model provides the labour market demand by type of education during the next 20 years (6).

1. Population and labour force survey
2. Economic trend
3. Employment by industry sector

[8] A new occupation register is being developed that will allow for identification on education groups by occupation.

4. Structural changes
5. Education structure by industry sector
6. Labour market demand by type of education

Table 11: Supply and demand in year 2020 based on projections by Statistics Sweden

(thousands)

Education	Supply	Demand 2020		Excess/Shortage			
		A	B	A	B	A (%)	B (%)
General education							
Folk- and compulsory education	450,9	0	367,5	450,9	83,4	-	23
Upper secondary education	2247,2	2448,4	2303,5	-201,2	-56,3	-8	-2
Higher education	1745,4	1833,3	1603,2	-87,9	142,2	-5	9
Pedagogical education							
Upper secondary education	3,3	3,4	3,0	-0,1	0,3	-3	10
Post-upper secondary education							
- Pre-school teachers	57,9	112,6	99,8	-54,7	-41,9	-49	-42
- Recreation pedagogues	21,7	29,1	24,1	-7,4	-2,4	-25	-10
- Vocational teachers	9,6	22,2	21,2	-12,6	-11,6	-57	-55
Economics and Social Science education							
Upper secondary education							
- Economists	74,5	130,1	133,0	-55,6	-58,5	-43	-44
- Trade and administration	233,0	221,4	256,8	11,6	-23,8	5	-9
Post-upper secondary education							
- Economists	130,2	98,7	81,4	31,5	48,8	32	60
- Soc./Behavioural Science	30,3	36,1	34,5	-5,8	-4,2	-16	-12
Natural Science							
Upper secondary school	18,1	14,4	12,9	3,7	5,2	26	40
Post upper secondary education							
- Natural science, etc. (without a degree)	48,6	55,8	40,4	-7,2	8,2	-13	20
- Programmers/system analysts	56,8	34,7	33,7	22,1	23,1	64	69
Technology and manufacturing							
Upper secondary education							
- Technology programme (2-3 years)	22,0	62,5	89,1	-40,5	-67,1	-65	-75
- Construction	125,6	145,5	127,5	-19,9	-1,9	-14	-1
Master degrees							
- Road and water	17,8	19,9	17,7	-2,1	0,1	-11	1
- Machinery, etc.	53,4	37,5	34,4	15,9	19,0	42	55
Health care							
Upper secondary education							
- Child care and recreation	79,6	115,7	99,5	-36,1	-19,9	-31	-20
- Caring	134,9	344,5	307,0	-209,6	-172,1	-61	-56
Post upper secondary education							
- Bio-mechanic analysts	7,4	15,6	15,3	-8,2	-7,9	-53	-52
- Physicians	28,1	39,9	39,7	-11,8	-11,6	-30	-29
- Nurses	116,8	156,7	141,5	-39,9	-24,7	-25	-17
- Social workers	30,7	43,0	35,6	-12,3	-4,9	-29	-14
Hotel and restaurant	103,1	75,4	65,8	27,7	37,3	37	57

Source: SCB 2002b

The model distinguishes between sex and seven age groups. The employed are divided into 40 industry sectors for which assumptions are made regarding the distribution between close to 100 education groups. The outcome is presented as supply and demand for slightly more than 50 of them. The projections are published in 'Trends and forecasts' (*Trender och prognoser*), which has been published by SCB, on assignment from the Government, every third year since 1972. The purpose is to provide an overview of the demographic development and the trends of education and the labour market through a presentation of detailed projections of labour market supply, demand and the mismatch between them (excess/shortage). The most recent 'Trends and forecasts' projected the labour market until 2020 (SCB 2002b).

The table 11 plays a selection of education group in SCB's long-term projection of supply and demand for labour until year 2020. The first column displays projected supply, and the following two columns show the demand projected according to two alternative scenarios. In alternative A the education structure was assumed to develop at the same rate as during the 1990s, and in alternative B the rate was assumed to develop at half of this pace. The four columns to the right show the excess shortage, first in absolute numbers, and then as a percentage of total demand. *For example:* The supply of nurses with post-upper secondary education qualifications in 2020 is expected to be 116,8 thousand persons, while there was an expected demand for between 156,7 (scenario A) and 141,5 (scenario A) thousand nurses. This corresponded to a shortage in the range between 39,9 and 24,7 thousand nurses, which represented between 25 and 17 percent of total demand in the two scenarios.

A complimentary projection model, also developed by SCB, delineates labour market flows during the next 8 years. The main difference compared to the long-term projection model is that it calculates recruitment needs (flows) rather than total supply and demand (stocks). Recruitment need by branch equals the sum of the number of persons needed to replace leavers and to adjust for the net employment change within the branch. The calculations are based on exogenously given assumptions about the future number of workers divided into 42 branches. Leavers are estimated on the basis of risks (probabilities) for exits into retirement, early retirement and education, by age, sex and (rough) education level. Yearly stocks are corrected for by leaving and recruited labour. The calculation gives the yearly recruitment needs by branch, divided into 94 education groups, although the results are reported for only 50 of them. In the final step recruitment needs are compared to the outflows from education. In order to make this comparison more meaningful, the available labour reserve for each education group is reported next to recruitment needs and outflows. In cases where the recruitment needs plus retirements from the labour reserve are greater than the outflows from education there is a decrease in the labour reserve and vice versa. The flows within the labour market are not considered in the model. They are assumed to net out, which implies that the result by education group could be biased. Another assumption in the model is that the flows from employment to inactivity (other than retirement or early retirement) equal

the flows from these groups into employment. These medium-term projections are published in 'Education and the demand for labour' (*Utbildning och efterfrågan på arbetskraft*), which come out when 'Trends and forecasts' does not come out. It was published for the fist time in 1999 and the second edition came out 2001. As in 'Trends and forecasts' the main outcome is a detailed judgement of the labour market situation for 50 educational groups. The most recent 'Education and the demand for labour' projected the labour market until 2008. (SCB 2001)

Table 12: Outflow and recruitment need by type of education until 2008 based on projections by Statistics Sweden

(thousands)

Education	Employed 1998	Outflow			Recruitment need			Balance 2008
		99-03	04-08	Sum	99-03	04-08	Sum	
General education								
Folk- and compulsory	778,6	72,8	67,6	140,4	73,9	60,1	133,9	72,1
Upper secondary	229,8	102,1	96,9	199,1	85,2	69,7	154,8	60,9
Pedagogical education								
Recreation pedagogues	17,0	3,0	3,1	6,1	5,3	5,8	11,1	-4,7
Pre-school teachers	67,8	6,9	6,6	13,5	15,0	20,2	35,3	-20,8
Subject teachers	34,0	4,9	6,8	11,6	4,3	3,7	8,0	3,9
Vocational teachers	17,2	1,5	1,7	3,1	5,0	4,6	9,6	-6,2
Economics and Social Science education								
Trade / Administration	275,0	37,0	33,1	70,2	48,0	39,0	87,0	-0,2
Lawyers	20,8	5,1	4,6	9,7	6,6	6,6	13,2	-3,0
Social workers	24,1	4,3	5,1	9,4	6,3	6,9	13,2	-3,4
Technology and Natural Science								
Upper secondary								
- Technology	118,2	12,7	12,1	24,8	19,1	14,7	33,9	-5,6
- Construction	72,2	10,4	12,2	22,6	19,2	13,0	32,2	-1,9
- Manufacturing	119,7	11,9	8,8	20,7	20,4	15,2	35,6	-2,5
- Engineers	81,3	3,9	3,6	7,5	12,8	9,9	22,8	-13,3
Master degrees								
- Electronics, etc.	20,7	7,4	8,0	15,4	10,0	8,5	18,5	-3,0
- Machinery, etc.	18,8	5,6	6,0	11,7	9,0	7,4	16,4	-4,6
Natural Scientist	23,8	7,5	8,2	15,7	7,4	6,8	14,2	2,1
Engineering graduates	18,3	13,6	14,2	27,7	14,8	11,8	26,6	1,7
Transport and communication								
Upper secondary	53,5	2,2	1,8	4,1	6,5	4,7	11,2	-4,4
Higher education	9,4	2,2	2,5	4,7	0,8	0,5	1,3	3,5
Health care								
Caring education	187,7	28,1	25,3	53,5	51,0	50,7	101,7	-42,5
Physician	29,1	3,5	3,4	7,0	6,7	7,3	14,0	-6,8
Nurse	95,5	22,4	25,8	48,2	35,3	38,3	73,5	-24,3
Dentist	8,2	0,7	0,7	1,4	1,1	1,2	2,3	-0,7
Hotel and restaurant	45,1	22,7	24,8	47,4	14,2	11,3	25,5	26,3
All*	3849,2	777,0	769,9	1546,9	919,7	786,7	1706,4	64,4

* Includes all education groups in the forecast and not only those included in the table.

Source: SCB 2001

The table displays a selection of education group in SCB's medium-term projection of supply and demand for labour until 2008. The first column lines up education groups on different levels within diverse fields. In the second column the figures for the total number of employed in 1998 are presented. The next three columns display the outflow from education and training 1999 to 2003, 2004-2008, and 1999-2008. Recruitment need during the same time period is presented according to the same breakdown in the following three columns. The final column shows the labour market balance 2008, taking into account the existing labour market reserve. *For example:* The calculated total outflow of individuals with caring education during the period between 1999 and 2008 was 53.500, while the recruitment need during the same period was 101.700 individuals. This corresponded to a shortage of 42.500 individuals with caring education in 2008.

In 2002 the AMS introduced a new publication series, focusing on analyses of future supply trends (currently until 2015) within selected occupations or branches where staff shortages have been identified. So far three sectors have been addressed: health care, construction, and teaching. The intention is to continue with other occupations/branches where indications of labour shortages are visible. The forecasts are based on assumptions about labour market flows (based on current flow structures) and employment trends. Labour market policy programmes are not included in the analyses as it is considered outside the scope of labour market policy to provide education/training correcting for long-term supply shortages. The material for the reports are collected from Statistics Sweden, the local PES offices, the AMS labour market statistics on jobseekers, the national institute for education, and complimented by interviews with branch organisations and employers.

3. Characteristics of mismatches

The variations in the forecasts in terms of different methods, different level of detail, dissimilar scope, varying time horizons, etc, make it a difficult task to delineate a common and general trend for the Scandinavian countries. However, the indications of current and/or future shortages within a range of public sector occupations, in particular within health care, childcare and teaching, appear unambiguous. There are also indications of shortages for specific professional qualifications, such as certain categories of skilled manual workers, in all three countries. Yet it is outside the scope of this paper to provide an employment trend study or mismatch analysis. The focus is on forecast methods and the types of information available about labour market mismatches. This brief section provides some extractions of the information available about the characteristics of current mismatches and recruitment problems with the

objective to present a brief overview of the availability of relevant information that is complimentary to the forecasts.[9]

The report analysing bottlenecks on the Danish labour market by the Danish AMS (AMS Denmark 2002b) revealed that half of the public institutions with a current recruit need, managed to match their vacancies without problem, while almost every forth failed to recruit the personnel they desired. In the private sector, less than half of the firms with vacancies managed to recruit someone with the desired qualifications without any problems, and one out of every five firms were unable to fill their vacancy. Both private and public enterprises in Denmark stated that their recruitment problems were primarily related to lack of professional qualifications. The private firms also highlighted the lack of relevant experience, while the public sector enterprises experienced that their wage level imposed an obstacle to attract jobseekers with adequate qualifications. The majority of the non-matched vacancies in the public sector required higher education qualifications, compared to one fifth of the non-filled vacancies in the private sector. The majority of the non-matched vacancies in the private sector required specific professional qualifications.

The Norwegian 'Recruitment survey' (Aetat 2001) revealed that three out of five filled vacancies were matched by someone with the ideal education level. The most significant mismatches (understood as vacancies filled by jobseekers without the desired formal education requirements) were those requiring vocational upper secondary education. Persons with a lower level of education filled over one third of these places. The best matching was found regarding vacancies requiring higher or post-higher education. On the other hand, this was also where the highest share of non-filled vacancies due to lack of qualified applications were found. It was also shown that mismatch problems decreased with increased work experience requirements. Looking at the recruitment situation by sector it was revealed that the largest share of non-filled vacancies due to lack of qualified applicants in Norway was found within the construction sector while the highest mismatches were found within hotel and restaurant and retail trade. However, the indicator on vacancy duration suggests that the high share of mismatches in the hotel and restaurant business might be a result of the relatively urgent need for labour. Central sectors such as health care services, teaching and manufacturing did not diverge significantly from other sectors in terms of non-filled vacancies and mismatches.

The report 'Labour market outlooks' (AMS Sweden 2003) revealed that approximately one fourth of the private companies in Sweden had high personnel utilisation i.e. they could not increase production and sales without recruiting more staff. More than one third of remaining firms would need to recruit personnel in order to increase their activities with more than 10 percent, and less than one fifth of the companies had significant available resources *i.e.* they had the capacity to increase

[9] This information is exclusively based on AMS (2002) 'Undersøkelse af flaskehalse på det danske arbejdsmarked 2001 (DK), AMS (2003) 'Arbetsmarknadsutsikterna 2003' (S), Aetat (2002) Rekrutteringsundersökelsen 2001 (Aetat Rapport n2 2, nov 2002) (N)

activities more than 20 percent without new recruitment. The highest personnel capacity utilisation was found within the construction sector. In broad terms, private companies in Sweden did not experience any significant recruitment problems. However, it appeared somewhat more difficult to recruit labour with desired work experience than with adequate education qualifications. It was also revealed that work experience requirement was more frequently reduced than education requirements as a response to recruitment problems; over one fourth of all companies with recruitment difficulties lowered their experience requirements compared to less than one sixth lowering the education requirements. The main exception to the relatively small recruitment problems in the private sector was the construction sector. In the public sector, over 90 percent of the Swedish municipalities experienced problems in recruiting staff with adequate education and close to two thirds had difficulties finding experienced labour. Although most of the municipalities found an acceptable solution to their problems, it took longer than desired and, in most situations, the qualification requirements – mainly the education requirements – were lowered.

4. The use of labour market forecasts

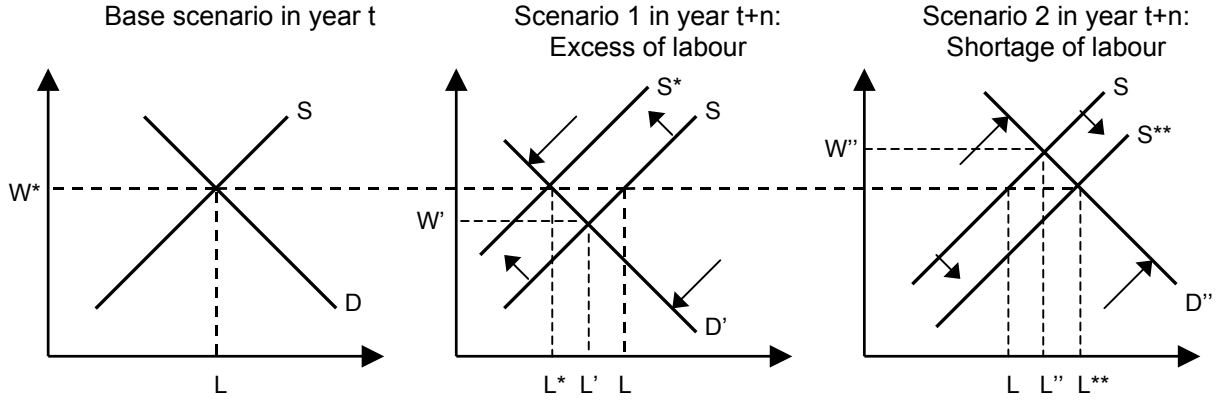
In a broad social perspective, knowledge, skills, and competencies are important because of their contributions to society in terms of strengthening democracy, social cohesion, justice and equality.[10] This report concentrates on skills and competences from an economic growth perspective, where competences of individuals are seen as important because they contribute to boost productivity and competitiveness through the supply of skills that match the needs of the labour market. Economic theory suggests that, given certain market conditions, price adjustment will eventually erase mismatches and bring the market back into equilibrium without external interference. The purpose of this report, however, is not to describe the labour market adjustment process. Instead it is focused on one small part of this process, namely the strategies to adjust the supply of education and training according to the needs of the labour market.

The three diagrams below represent the supply and demand for labour with a certain type of qualification (Qi) in year t, and two different scenarios in t+n. The figure demonstrates the situation that would occur in t+1 given the same education/training dimensions as in year t. In scenario 1, the forecasted demand for Qi is D', which would result in an *ex ante* excess of labour equal to the distance between L*L. A shift in supply from S towards S* would mitigate the impacts in terms of (short-term) relative unemployment and wage decrease for labour with this type qualifications. In addition it would open for an increase in the supply of workers with

[10] See OECD (2001) for a review of studies on the non-economic benefits of education.

qualifications needed on the labour market. In scenario 2 the forecasted demand for Qi is D'', which would result in an *ex ante* shortage of labour represented by L**L. Success in the public efforts to shift supply from S to S** would imply a long-run equilibrium where the number of workers with qualification Qi is L** at wage level W*, while market adjustment mechanisms would clear the market at wage level W'' with a supply of L'' workers. Note that, although there is no shift in the supply curve, movements along the curve still calls for adjustment in supply, if market mechanisms should bring the market into a new equilibrium without the presence of mismatches.

Figure 2: Meeting qualification needs through supply adjustment



4.1 The framework of qualification supply

The regulatory mechanisms within the public qualification system in the Scandinavian countries are characterised by decentralisation, management by objectives (MBO), *Taxameterstyrning* and collaboration with the surrounding society. Decentralisation has implied that considerable responsibility and decision-making authority has been delegated from the central government to county authorities and municipalities. For instance, the responsibility for education at the upper secondary level, for the young as well as for adults, and labour market policies rests with the county authorities or the municipalities. The State is, however, generally responsible for higher education at universities and university colleges. MBO provides the individual education/training institutions with extensive freedom and flexibility as the content of the instruction is generally the responsibility of the local school, with the involvement of the surrounding society. *Taxameterstyrning* is a mechanism that is particularly representative for the Danish system (thereof the use of the Danish term), which implies that a public authority pays the service provider, assigned to perform certain activities, per unit. This could be an incentive for education and training providers to provide programmes with high recruitment potentials. Collaboration with the

surrounding society in the Scandinavian system is primarily collaboration the social partners. They have representatives in important advisory and decision-making bodies at national and regional level, and thus large influence on vocational training throughout the system of qualification supply. Another aspect of the contacts with the surrounding society is the mutual partnerships between individual education institutions and, primarily local, enterprises. There is a trend towards an increase of such collaboration throughout the education system in all the three Scandinavian countries.

4.2 Using long- and medium term projections

The medium- and long-term balance between labour market needs and qualification supply is generally the responsibility of the ordinary education system i.e. upper secondary education, adult education, and higher education. Before turning to the use of labour market forecasts, it is interesting to draw attention to some of the core characteristics of these education forms in terms of structure and function within the system of qualification supply. Concerning upper secondary education, high transition ratios to higher education make preparation for such studies a central task in all the Scandinavian countries. Accordingly, the proportion of general subjects has increased on the behalf of specialisation, and even vocational education programmes, although aiming to ensure the labour market a supply of vocationally skilled staff, now provide relatively broad basic education. This emphasis on a core curriculum in vocational programmes is not only an adjustment to the growing needs for knowledge and skills in working life but also a platform for lifelong learning and further studies at higher education level.

In broad terms, adult education in Scandinavia is comparable with ordinary education levels, but different from these in terms of organisation and contents. For example, it should be possible for the individual to participate in while still performing the daily work. Adult education also offers opportunities to take part in continued training that build on some years of professional experience. Nevertheless, examples of education forms where there is a direct link between programme contents and the needs of the labour market, such as the Swedish Advanced Vocational Training, which is new form of adult education on post-upper secondary school level, are exceptions to the rule.

The institutions within the ordinary higher education system in the Scandinavian are grouped into two different sectors: the college sector and the university sector. To some extent this corresponds to a distinction between the university sector and the more professionally oriented higher education sector. However, ordinary higher education at universities and colleges have been harmonised and most programmes are today structured as three-year bachelor's courses, followed by postgraduate training (master). It is probably more fruitful to distinguish between different forms of higher education based on objectives, duration and admission requirements. There are education forms aimed both for those with

some years of occupational experience and for students leaving upper secondary level.

It can rightfully be argued that the influence of economic arguments on the regulation of capacity by type of education, in proportion to other fields, according the needs of the labour market and student demand, has been relatively week in the Scandinavian countries. The central political strategy has rather focused on expansion of education in order to provide all individuals with an adequate education offer. What use are then labour market forecasts? The perhaps most obvious answer, is that they provide guidance to individuals when deciding on their career paths. Although, the importance of labour market forecast for young people's choice of education is ambiguous, they are still an important part of the total information supply. To the extent that student demand are related to employment opportunities, and thus the needs of the labour market, labour market forecasts could also be employed by education planners to supply an adequate number of places by type of education. Another important aspect of labour market forecasts is to highlight situations where there is an obvious conflict between the individuals' demand for education and training and the labour market needs for certain types of skills. How are then forecasts interpreted and used by education planners to avoid labour market mismatches due to non-optimal education dimensions? This is a difficult question to answer as the array of different parameters that influence the authorities' views concerning what should be understood as optimal education dimensions.

Several critical aspects of the long-term projections relate to the uncertainty of long-term labour market developments. The labour demand by branch is often characterised by swift changes, due to altered macroeconomic conditions, unforeseen political decisions, etc. Furthermore, it is probably even more complex to predict the changes in the education structures within the individual branches/occupations. The medium- and long-term demand projections entail an array of assumptions concerning the need for labour by type of qualification. These are essentially based on historical observations, and their relevance for future trends is debated. In addition, historical observations can normally only capture actual changes in education structures, while identification of trends describing desired and/or required qualification needs is generally impractical. In other words, historical observations of changes in education structures conceal certain types of labour market mismatches i.e. situations where the desired/required qualifications for a certain vacancy do not correspond to the qualifications of the person filling that vacancy. Another concern is the fact that the demand for projections can diverge significantly from one year to another. The supply side of the long-term projections is probably less volatile than the demand side. This is partly due to that all the projection models accounted for in this paper assume supply to be unaffected by changes in demand. In fact, it is only the two Danish models that include a link between supply and demand developments, and while demand is endogenous, supply is exogenous in both of them. There are, however, examples of relatively significant variations in supply related to structural changes on the labour market, in the wage/benefit relationship, or within the social security system. Another commonly

raised problem on the supply side is that the general trend among university and university college students where students tend to choose courses according to their own interests is not reflected in the models, which are generally too strongly focused on traditional programme structures. Likewise, the projection models are criticised for not accounting properly for new types of education, or that several types of education can be utilised within different areas. Other highlighted problems on the supply side include matters such as precedence in situations of combined education, highest achieved education versus most recent education, inclusion versus exclusion of non-completed education, etc.

The debate concerning the use of medium- and long-term projections in Scandinavia is primarily linked to dimensioning issues within higher education. In Denmark, admission to higher education has traditionally been subject to regulations for several educations, but it has become more flexible during the last few years. Generally, short-cycle higher education in Denmark is, with very few exceptions, not subject to any dimensioning. Concerning medium-cycle higher education, however, a range of educations is dimensioned with respect to unity costs, capacity of internship places, the degree of specialisation, and the labour market situation. The Ministry of Education has also introduced economic sanctions for short and long-cycle higher education institutions in relation to excessively dimensioned education. This implies that an institution does not receive compensation according to the *Taxameter* principle for registrations exceeding a given dimensioning. The main principle for the dimensioning of university education, however, is that the universities decide themselves, how many places they will offer, and whether there is a sufficient amount of qualified applicants in order for a specific course to be provided.

The overall objective for the dimensioning of higher education in Norway during the past ten years has been to offer as many applicants as possible an opportunity to study, modified by expected shortages within specific fields. The purpose of this strategy is twofold: partly to meet individual demand and partly to match the labour market demand for highly qualified labour force. The Ministry of Education defines aggregated numerical objectives and capacity for certain educations, in a way that there is a ongoing balance between the applicants' preferences and the need for specialised labour. With the recent quality reform in Norway, the principle to meet the demands of the applicants has been further strengthened in that the institutions have been given fortified incentives to steer their capacity according to the demand of the applicants. The students freedom of choice is, however, somewhat restricted by the financial framework defining the number of places for which the institutions receive compensation. In broad terms, dimensioning and priorities is part of the institutions' own administration and universities as well as colleges are authorised to establish and shut down courses at an undergraduate level without governmental approval. Nevertheless, there are a few national objectives defining professional studies towards occupations such as engineers, teachers, physicians, nurses, physiotherapists, etc. These objectives appear, to a large extent, to be based on SSB calculations, although relevance only has been one of many factors considered. Despite scepticism about the possibility of predicting the

need for different types of graduates in the future, such estimates have been used for distributing resources between institutions and fields of learning to some extent. When the number of study places has been expanded, labour market needs have been considered. Government has, however, been very reluctant to reduce the capacity in specific programmes, except in the case of grants to specific programmes abroad. (Smeby and Brandt 2001)

Even though the Norwegian government has been reluctant to instruct institutions about how education should be more relevant for the economy, there are some exceptions. It has been considered important, for example, to develop programmes relevant for new industry and business related to the oil sector, to develop research and competence for environmental protection and to increase the number of engineers on a university level. Another feature that stands out somewhat in comparison with the other Scandinavian countries is that qualified personnel educated outside Norway have been viewed as an important factor contributing to the technological, economic and social development of the country. Generous grants have been given to students studying professional subjects like medicine, engineering and business administration. Financially stimulating students to enrol in specific programmes abroad has been a way to increase the proportion of students in courses with perceived high economic relevance. (Smeby and Brandt 2001)

The general aim for higher education in Sweden is that it should correspond to the needs of the labour market as well as the demands of the students. In practice, the composition of programs and courses within higher education, as well as their capacity in terms of quantities, is the result of a rather complex process based on Government objectives, judgements of student demands by the individual higher education institutions, and on the students' choices among the available programmes and single subject courses. Objectives with respect to the minimum number of full time equivalent (FTE) students as a whole and for the lowest number of FTE students in the science and technology areas are set out for each fiscal year. The purpose is to steer education supply towards the fields of technology and natural science. The education assignment may also stipulate that the number of FTE students must increase or diminish in certain subject areas compared to the preceding three-year period. There is a maximum funding, which defines the highest aggregate compensation for FTE students and annual performance equivalents permitted for the fiscal year. There are also a few graduation targets for certain fields, which are selected for labour market (professional degrees) or education policy reasons (masters' degrees). In 2000 there were five graduation targets referring to the number of i) master's degrees, ii) engineers and architects, iii) pharmacist, iv) upper secondary school teachers, and v) compulsory school teachers for grades 4-9. These objectives, set by the Ministry of Education and Science, are normally based on forecasts by the Ministry's analysis department, which makes forecasts in co-operation with the Swedish National Agency for higher education (HSV) and SCB. The allocation of objectives between individual universities and university colleges is based on national rather than regional qualification needs. The decisive factors include student demand, education capacity, regional policies, the demand situation

at different universities and university colleges, promoting new university colleges, etc.

4.3 Using short-term surveys

The precision of survey based (short-term) forecasts is perhaps less controversial than that of (long-term) projections. However, there are still several critical aspects related to the interpretation of the results, and some of them are highlighted in the forecast. One of the problems raised, relates to that employers often are unable to express their future needs, in particular with numerical precision. Concerning the employers' expectations of future employment outlooks, it has also been revealed that they sometimes underestimate the restrictions imposed by labour shortages. Another aspect concerning the interpretation and use of surveys among employers, relates to the understanding of concepts such as 'shortage' and 'mismatch'. The ideal candidate from the employers' perspective may be overqualified from the point of view of the society as a whole. In addition, even if employers express difficulties to attract the right applicants, this does not necessarily imply a shortage of this type of labour. It could also relate to wage/benefit level, working conditions, short hiring procedure (due to e.g. urgent demand), seasonal work, etc. The other way around, internal mismatches and/or the use of substitute workers might conceal shortages for certain types of labour.

Labour market surveys are generally too short-term oriented for education planning within the ordinary education system. From a planning perspective they are more useful within the more flexible framework of labour market training. In all the Scandinavian countries, labour market training is primarily designed to support the employment offices. Within this framework, which provides a direct link between labour market supply and demand side efforts, the training has an explicit the objective to improve the efficiency of finding jobs for the unemployed and reducing the mismatches on the job market. In this aspect, the labour market surveys carried out by the PES, in combination with ongoing and in-depth contacts with companies, are central instruments in the identification of qualification needs in Scandinavia. On the supply side, contacts with jobseekers and comprehensive analyses of the qualifications of the unemployed mitigate problems related to "invented" shortages as a result of exaggerated qualification requirements. This should ensure that form, scope, and structure of labour market measures are adjusted according to the labour market situation.

In contrast to the general education system, the task of labour market training is primarily to qualify workers to match current or short-term labour market needs. It has a central role for ensuring that the employed (at risk) as well as the unemployed population on the labour market are able to keep up with technological and social development. The flexibility in terms of contents is another characteristic that normally separate labour market training from general adult education. Nevertheless,

it is not always straightforward to distinguish between adult education/training and labour market training in the Scandinavian countries. Labour market training in Denmark (AMU training courses) has a triple aim: to maintain and improve vocational skills, to solve short-term restructuring and adaptation problems, and to contribute to a long-term general lift in the qualifications on the labour market. The vocational AMU programmes do, however, generally provide qualifications that are directly targeted at one or several sectors and trades. In Norway, some of the labour market training courses (AMO) lead to a trade and journeyman's, or other formal, certificate. Others provide specific skills and an updating of qualifications to meet urgent needs in the local labour market. In appropriate cases, however, AMO is provided at primary or secondary level, and it is also possible to attend courses within ordinary higher education. In Sweden, the main common features of Labour market training (AMU) are strong vocational focus and a direct link to the public employment service but it can also be provided within the regular education system.

Other training measures employed to combat bottlenecks in Denmark include 'supplementary training for the employed' and 'training for the unemployed'. The former includes training of non-vocationally qualified labour or further training of vocationally qualified labour, sometimes as a part of a job rotation project. The latter comprises the promotion of vocational mobility through retraining a person to a different vocational field, further training of skills within a certain field, and/or training of non-qualified labour. The Norwegian measure called In-service training (BIO) is directly targeted towards the enterprises' need for skills. It is meant to contribute to training in relation to structural changes and recruitment in small and medium-sized enterprises. In Sweden, the AMS pursues a pilot project with labour market training for the employed with the aim to supply the labour market need for qualification in areas where there are potential risks for staff shortages.[11] This can be made through increased qualifications within the frame for the current occupation or through a change of jobs. The main target group is persons with foreign higher education qualifications who are overqualified for their current occupation. Job rotation i.e. training leave for an employee and recruitment of a person replacing the employee on leave, is another measure employed to tackle labour shortages in all the Scandinavian countries.

The purpose of enterprise-adapted courses (VTP) in Denmark is to meet special vocational training needs in individual enterprises, with a view to enhancing the qualifications of persons employed or assured of a job in the enterprise within the field covered by the training. VTP covers a training need in firms, which is not covered in full by AMU qualifying courses or combined training programmes. The enterprise itself pays for part of the training, and the participants receive reduced training allowances. Competence development for employees in Denmark and Sweden is also partly provided within the framework of the European Social Fund

[11] The County labour boards and the regional competence committees defined the fields of training based on demand situation, supply situation, quality insurance of the education, aims and expected results

(ESF) Objective 3, which aims at strengthening of labour market analysis and anticipation of future qualification needs of the labour force as well as stimulation and systematising of training, competence development and new forms of work organisation to improve the flexibility of employees. Several ministries, with the Ministry of Trade and Industry (NHD) as the major actor, administer business-oriented competence enhancement measures in Norway.

In addition to training measures, the PESs in the individual countries employ a wide range of other labour market interventions to tackle labour market mismatches and facilitate the matching process. Some of the activities in this aspect include dissemination of information, vocational and occupational guidance services, and job brokerage. A central characteristic in the dissemination of information in the Scandinavian countries is the powerful self-service tools for matching purposes on the Internet. AMS in Denmark has taken recent measures to develop online self-service tools in order to facilitate electronic contact between the various actors on the labour market. A new national website with 14 regional sites (www.jobnet.dk) for all jobseekers and employers was introduced in 2002. The year before, the AMS in Denmark also introduced a public job bank to ensure maximal visibility of public jobs (www.job-i-staten.dk). In Norway, Aetat's new website (www.aetat.no), with tailor made information for various user groups, is the busiest meeting place for job seekers and employers in Norway. All posts advertised in Norwegian newspapers are recorded in the database for vacant posts on this site. In addition, job seekers can make good use of one of several online guidance programmes. In Sweden there is an online service offering a wide panorama of the job market at both national and regional levels (www.ams.se). The website also presents the 30 occupational categories where demand is currently highest. In addition there is information on education paths, structural changes, internationalisation, labour demand, staff shortages, future qualification needs, etc for 500 occupations.

Today's labour market is characterises by ongoing restructuring and significant changes in occupational structures and skill requirements, choices of education and vocational training are more complex than ever, and the alternatives are numerous. This requires comprehensive guidance comprising the wide variety of options on the education market as well as the labour market. There are several examples of initiatives tackling this situation in the Scandinavian countries. Since it would be unfeasible to provide a fair overview within the scope of this paper, these efforts are exemplified by one practice in each country. In Denmark, there is a new cross-sectional guidance centre under the Ministry of Education providing information about further education, and employment to youth and adults. The guidance will be provided regionally in cooperation between youth education institutions, further education institutions, and the public employment offices. *Infoteket* is a Swedish information and guidance centre for education and employment, which is run by the public employment services and the administration for higher education in order to promote the development of labour. Counselling and guidance measures were intensified in Norway during the 1990s to bring both teachers and school counsellors

up to date with the new options available as a result of the educational systems' reforms.

There are several examples of intensive brokerage including special brokerage and recruitment initiatives, such as vocational guidance services in relation to training and/or brokerage for specified occupational categories. Examples of other initiatives in Denmark include recruitment promotion of women, elderly or ethnic minorities, and promotion to establish adult apprenticeship. Norway stands out as a user international brokerage (labour import). From 1998 until today nearly 1800 health personnel, from different countries in and outside EU/EEA, have completed language course and started working in Norway. Due to recent declines in demand for health personnel in Norway, Aetat will focus only on language courses for German dentists during 2004. As a result of the shortage of construction workers in Norway, and the excess in Germany, Aetat has also organised two recruitment events for construction workers in Germany during the past two years. A recent Swedish brokerage incentive is the pilot measure to provide mobility allowances for weekly commuting. The allowance is restricted to unemployed finding a job in regions experiencing labour shortages, and who have an occupation characterised by high unemployment in their home community.

5. Summary and concluding remarks

This paper has discussed a number of central elements related to the identification of qualification needs and their use. The intention has been to present a selection of the instruments applied in the Scandinavian countries, to discuss their information value, and to account briefly for strategies to supply education and training according to the needs of the labour market. The report started with a depiction of some of the central instruments employed to ensure availability of regularly updated information about current and short-term qualification needs and bottlenecks on the labour market. This is an area where, in all the three countries, the PES stands out as the central actor. The main instruments are the regular surveys with a comprehensive selection of representative firms, and extensive ongoing contacts with the surrounding society. Based on this information, the PES in the individual countries provides regular reports about labour market developments and short-term labour market forecasts. The information spectrum in these reports is comprehensive, but this paper has focused on expectations about future developments. The forecasts are sometimes based directly on the employers' answers to the questionnaires – e.g. 'Report on the Labour market' by the Norwegian PES and 'The labour market tendency survey' by Statistics Sweden. This implies that they provide the "raw" expectations of the employers. In other reports, the forecasts express the judgements of the PES, which in turn, are based on evaluation of the information from the surveys as well as from ongoing contacts with the surrounding society. This is the case in 'Labour market

report' by the Danish PES and 'Where are the jobs?' by the Swedish PES. In broad terms, labour market surveys offer valuable indications about the level of mismatches in individual occupations and branches and expectations whether the situation is expected to improve or become worse. However, critical voices call attention to that employers often are unable to express their future needs, and that concepts such as 'shortages' and 'mismatches' are subject to varying interpretation. In addition, short-term forecasts generally come short of accounting properly for demographical developments, flows within and from the education system, and macroeconomic trends. Moreover, it is generally agreed that the short-term perspective is insufficient to be of any significant assistance for education planners within the relatively rigid framework characterising the general education system. This brings us to another complimentary tool, which is applied to identify medium- and long-term of qualification needs: supply and demand projections based on historical observations and econometric models.

A common feature of the supply calculations in all the projection models, accounted for in this paper, is the assumption that future flows can be projected based on historical observations. This implies that they are unaltered by future demand developments. This is one of the reasons why the long-term projections must be interpreted as what would be necessary, given certain assumptions and objectives, in terms of adjusting supply, rather than the most probable development. The models do, however, generally take political decisions about (planned) future capacity adjustments into account in the supply calculations by increasing/decreasing the supply expectations according to the adjustments. Turning to the calculations of demand, the perhaps most critical assumption relate to the development of the qualification structure in the individual branches (considering the macroeconomic models to be outside the framework of the models). To date there does not seem to be any consensus concerning what factors are behind the development of the qualification structure. A common method is to base the projection of structural changes on historical data, often in combination with qualitative judgments about the relevance of the past for future trends. Here it is perhaps interesting to separate projections aiming to identify mismatches in the broad sense, from those aiming to project unemployment and unfilled vacancies. The former could be represented by the long-term projection models accounted for in Norway and Sweden, where supply and demand are calculated separately. This implies that demand represents scenarios where there is an optimal distribution of qualifications, given certain assumptions concerning structural changes in the demand for qualifications by branch. The two Danish models presented in the paper could exemplify the latter, where structural changes in the demand for qualifications by branch are subject to exogenously given supply by type of education. These models do not merely identify mismatches based on optimal distribution of qualifications, but they also account for the effects a certain exogenously given supply could have on the composition of qualification types within the individual branches.

Adequate long-term projections require access to reliable reference information on relevant stocks and flows on the labour market as well as the

education market. Although this paper only provides some examples of sources of such information (see Annex 1), it can be rightfully argued that all the Scandinavian countries have rich reference information. There are comprehensive registers and surveys that allow for identification of historical labour market supply and demand trends. However, the wide spectrum of mismatches can not be identified through mere observations concerning actual historical developments of education/training supply, actual changes in the education structures by branch/occupation, and unemployment. Likewise, historical data do not offer genuine information concerning the decisive factors behind changes in individuals' choices of education, or why education structures by branch change. Observable examples of mismatches on the education market are when courses with vacant places do not correspond to the needs of the employers and/or young people's aspirations, and when the capacity at courses providing skills demanded on the labour market is less than the number of qualified applications. On the labour market, mismatches become visible when unemployed skilled workers and a shortage of skilled workers can be found simultaneously, but also when employees carry out tasks that do not match their qualifications. The information collected by the PES through surveys and ongoing contacts with employers, in particular that focused on the characteristics of qualification needs and mismatches, could play a central role to ensure adequate assumptions concerning future supply and demand developments in the projection models. It is also crucial to have comprehensive information about the individual branches, political objectives, international developments, etc. when interpreting the forecasts e.g. to answer questions whether the developments are reasonable and desired. In the Scandinavian countries the social partners as well as other representatives from the surrounding society are engaged, not only in the identification, but also in the interpretation process.

There is no doubt that it is a difficult task to anticipate long-term qualification needs on today's dynamic labour market. No method offers forecasts that provide education planners with precise information about the appropriate number of persons with the right mixture of skills. However, this is not necessarily a reason to put all hopes of better matching to more flexibility through more generic skills and academic forms of education. Society has a need for clear conceptions about the way educational needs will develop in the long run, as long as the level of ambition is not too high. Adjustments of education dimensions are not restricted to situations when students' demand does not match the needs of the labour market. Ongoing adjustments are also necessary to respond to changes in student demand. In this respect, labour market forecasts could be seen as a necessary compliment to market factors in the complex adjustment mechanism.

Other central factors to consider in the adjustment mechanism are the extensive decentralisation, the *Taxameter* system, and the MBO system that provide individual education and training providers with far-reaching freedom to provide courses of their own choice. Decentralised administration of educational and training increases regional/local potentials to adjust education supply in accordance with the dynamics of the local market, and 'taxameter' system could be an incentive for the

institutions to offer programmes and courses with high recruitment potentials. The MBO system opens for collaboration and partnership with the surrounding society pave way for tailor made study programmes. This type of co-operation with the surrounding society opens for opportunities to provide targeted training programmes in direct response to enterprise specific needs.

The projections models applied in the Scandinavian countries are not genuine prognoses of the most probable labour market situation. They are scenarios of possible and thought-provoking developments, which imply that they are useful, although not correct. Generally, the outcomes also account for alternative scenarios. On the demand side these scenarios can correspond to different macroeconomic developments, political objectives, changes in education structures, etc. and on the supply side to different developments in terms of demography, employment ratio, completion ratio, etc. Complemented by knowledge about individual branches and individual types of education, this should be useful to plan for a numerical distribution of places by type of education, in a way that mitigates future labour market mismatches. Some long-term projections provide the user with relatively detailed information for a large amount of education groups e.g. the two Swedish models. Other models, such as the Norwegian LÆRARMOD, calculate mismatches on a highly aggregated level. The more detailed the presentation of the outcomes, the more flexibility there is for interpretation. Nevertheless, with blurred profession identities, complex and rapidly changing demand for qualifications, etc. the benefits of detailed presentation of the forecasts could be questioned, at least concerning some of the education groups.

There is an array of different parameters that influence the authorities' views concerning what are optimal education dimensions. In broad term, however, it is students' demand that is the central decisive factor for the dimensioning of education and training places in all the Scandinavian countries. Adjustment of education dimensions according to the needs of the labour market is restricted to situations when students' demand is incapable to match the labour market needs for certain types of skills, and then mainly in relation to certain forms of higher/further education and labour market training. Within higher education, for example, there are examples of supply regulations for some education types towards certain professions in all the three countries. The link between short-term forecasts and labour market training is more straightforward i.e. within the PES there is a direct link between labour market supply and demand side efforts. In contrast to the general education system, the task of labour market training is primarily to qualify workers to match current or short-term labour market needs. Its flexible framework allows for swift changes should provide the unemployed as well as the employed (at risk) with skills that enable them to keep up with the technological development.

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Swedish Ministry of Industry, Employment, and Communication	naring.regeringen.se
Swedish National Labour Market Administration	www.ams.se

Abbreviations

AAD Norwegian Ministry of Labour and Government Administration

AAE Danish Advanced adult education

AEI Swedish Adult Education Initiative

Aetat Norwegian National Labour Market Authority

Af Public Employment Offices in Denmark and Sweden

AKF Institute of local government studies – Denmark

AKU Labour Force Survey (same acronym in all the Scandinavian countries)

AMO Labour market training in Norway

AMS National Labour Market Authority (same acronym in Denmark and Sweden)

AMU Labour market (adult vocational) training in Sweden and Denmark

AMV Swedish Labour Market Administration

AVE Swedish Advanced Vocational Education

BAE Danish Basic adult education

BIO In-service training measure in Norway

BM Danish Ministry of Employment

Dst Statistics Denmark

ESF European Social Fund

EUD Danish Vocational upper secondary education and training

EUD Danish vocational education and training

FTE Full-time equivalent

HF Danish Higher preparatory examination

HHX Danish Higher commercial examination course

HSV Swedish National Agency for Higher Education

HTX Danish Higher technical examination course

KUF Norwegian Ministry of Education, Research, and Church Affairs

KUM Danish Ministry of Culture

KVU Danish short-cycle higher education courses

LFS Labour Force Survey

MVU Danish medium-cycle higher education courses

NAE National Agency for Education in Sweden

NHD Trade and Industry

PES Public Employment Services
SCB Statistics Sweden
SOU Reports of the Government Commissions in Sweden
SSB Statistics Norway
UFD Norwegian Ministry of Education and Research
UFD Norwegian Ministry of Education and Research
UVM Danish Ministry of Education
VTP Enterprise-adapted training courses in Denmark
VTU Danish Ministry of Science Technology and Innovation
VVU Danish further adult education

Annex 1: Reference statistics

This annex provides brief information about reference information – divided into register data and survey data – in table format. The contents of the two tables serve as examples of relevant and interesting sources of information related to supply and demand of qualifications by type of skills, in addition to the surveys accounted for in section 1. The information is not exclusive. There are, for example, several additional sources to consult concerning flows to and from individual forms of education and training, individuals registered by the PES and participants in labour market measures. The reference data within the individual countries are sometimes interlinked and more than one of the data sources presented below might provide partly overlapping information.

Table A1: Register based reference data

Country/Institution	Name (English)	Purpose/Contents	Years
Denmark			
Dst	Register based labour force statistics – RAS	Description of the Danish population's attachment to the labour market.	1981-2000
Dst	ATP-employment statistics	The statistics show the quarterly changes in the number of full-time employees analysed by industry as well as sector.	1978-
Dst	The Population's Unemployment	The purpose of the statistics is to monitor the unemployed population according to their industry, education and income.	? -2002
Dst	Development in the education system	Description of the changes in the education system during the past 10 years: the population's education level, choices, attainment, etc.	1982/83-
Dst	The education system	Information about the number of persons entering, participating, and exiting a full-time education in the ordinary education system	1975-
Dst	Education and employment of the population	The statistics describe the level of education. This is linked to the registered based labour force statistics, which offers information about the relation between education and employment situation.	1974-
Dst	Integrated database for labour market research (IDA)	IDA provides a link between individuals and enterprises. This allows for individuals to be described through information about the characteristics of the enterprises where they are employed, and vice versa.	1980-1999
Norway			
SSB	Register based employment statistics	Employment and industry sector distribution on detailed regional level	1983-
SSB	National education database	The database includes all individual based education statistics from completed compulsory school to PhD studies	1970-
Sweden			
SCB	Register based labour market statistics – RAMS	Annual information about employment, commuting, industry sector structure, personnel structure at work places, and to highlight developments and flows on the labour market from a longitudinal perspective.	1985-2000
SCB	The population's education	The statistics describe the highest level of education of the population in Sweden	1985-
SCB	The population's participation in education	The register provides the basis for statistics describing the population's participation in the regular education system.	1992-
SCB	Longitude register for education and labour market statistics	LUCAS describes activity after education, entrance and establishment on the labour market for students having completed different levels and types of education.	1990-1999

Table A2: Survey based reference data

Country/Institution	Name (English)	Frequency	Population	Type of information/Coverage
Denmark				
Dst	Labour force survey	Quarterly	15.600 individuals	Labour market developments and information on the situation for different groups on the labour market
Norway				
SSB	Labour force survey	Quarterly	24.000 individuals	Labour market developments and information on the situation for different groups on the labour market
NIFU	Graduate survey	Every second year	All higher degree graduates plus a selection of graduates from certain fields	Entrance into the labour market 1/2 year after graduating from higher education
NIFU	Targeted graduate surveys	Every second year	Selection of graduates from certain fields	Information about entrance into the labour market for certain higher education graduates
Sweden				
SCB	Trend statistics on vacancies	Monthly	25.000 work places	Labour market demand in terms of filled and non-filled job openings
SCB	Short-term employment statistics	Monthly	25.300 work places	Changes in the number of employed by detailed industry sector and personnel turnover.
SCB	Labour force survey	Monthly	22.000 individuals	Labour market developments and information on the situation for different groups on the labour market
SCB	Staff training statistics	Half-yearly	13.000 individuals	Amount and contents of staff training during the past six months
SCB	Entering the labour market	Every second year	13.000 individuals	Entrance into the labour market three years after leaving upper secondary and higher education

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