Flows of Human Capital
in the Nordic Countries

Project report 2 (STEP Report 11-2003):

Mobility of Human Capital – the Nordic Countries, 1988-1998

A project by STEP, The Danish Institute for Studies in Research and Research Policy, Statistics Finland, Statistics Iceland, and Vinnova

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Mobility of human capital – the Nordic countries, 1988-1998

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ABSTRACT

The report gives detailed annual statistics of job-to-job mobility in Denmark, Finland, Norway and Sweden for the period 1988-1998. Complete annual matched employee/employer datasets for the four countries make up the bulk of the data. In order to develop benchmarks for mobility and stylised facts concerning the influence of various background variables, the statistics are broken down over personal attributes such as gender, age, family status and education, and economic variables such as sector and firm size. The report deals thoroughly with the influence of the business cycle on mobility rates.

These statistics are of interest because mobility between firms is a major diffusion mechanism for knowledge in the economy. In order to look at the flow of human capital rather than humans per se, education is chosen as an indicator for formal knowledge and age as an indicator for experience. Working with register data as here (as opposed to surveys with smaller samples) gives major advantages but also some challenges which are addressed.

These first comprehensive detailed statistics of the flow of human capital in job-to-job mobility in the Nordic countries are the output of a Nordic project which is also dealing with researcher mobility in particular and with the flow of human capital between the Nordic countries through migration. The project is jointly undertaken by STEP, The Danish Institute for Studies in Research and Research Policy, Statistics Finland, Statistics Iceland, and Vinnova.

KEYWORDS	ENGLISH	NORWEGIAN
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Foreword and reader's guide[1]

Competence is a key ingredient for innovation and growth. The prosperity of a nation depends on the knowledge, skills and experience that can be put to work in the operation and development of its economic and social life. Research, education of the young, and lifelong learning are being heralded as crucial mechanisms for supplying businesses and the public sector alike with new and updated competence. A growing body of knowledge about these mechanisms is forming an increasingly strong foundation for public policy and private strategy.

The movement of people involves a mechanism of knowledge transfer that is much less understood. When people move between jobs or between social settings, they carry their skills and experience with them to the new firm or region. When a competence meets with a new situation, innovation can occur, so mobility is not only about moving human capital around but also about creating something new in the process. Competence moves with people in a non-trivial way and mobility may be seriously underestimated as a moving force for social and economic development.

However, research and education take place in purpose-built institutions that are highly visible and relatively easy to study for the purpose of policy improvement. Mobility of human capital, on the other hand, is deeply embedded in social and economic institutions whose primary mission is not the moving of human capital, so it is essentially a by-product of other processes and much less visible to the public eye. Thus the understanding of mobility and its contributions (positive and negative) to a country's competence base is merely in its infancy. Briefly put, the research question is still very open: What is the role of mobility in a National Innovation System?

The project "Flows of human capital in the Nordic countries" ("Kompetansestrømmer i Norden") is a small and exploratory step in the quest for understanding the competence aspect of mobility. The project has set out to illuminate issues of

- human capital flows or circulation through the inter-Nordic labour market
- benchmarks and stylised facts of mobility in the Nordic countries (with a particular emphasis on the significance of the business cycle)
- science – industry mobility

all while identifying and addressing the challenges of opening new, large national register databases to international comparative research.

The project was inspired by the Nordic co-operation in the OECD work on National Innovation Systems in the so-called "Focus Group on Human Mobility" in 1997-1998. Research issues of high policy relevance that were addressed included a better understanding of flows of competence embedded in employees changing jobs. The science-industry relation was a particularly hot topic in this respect. The OECD work was in turn based on the newly available "employment files", i.e. matched employer-employee data produced by combining public register databases. These employment files are constructed in different ways in different countries, but all of them contain a common core of data about all individuals in the population above 16 years, the "active population".

[1] This section is common to the three project reports and the two methodological papers and also appears as the introduction to the summary report.

Until recently it was only the four largest Nordic countries that had such employment files available to researchers and statisticians, but recently Belgium has constructed the first time series of this kind using information from the social security system. In most OECD countries the information exists that would make it possible to construct employment files, but different statistical, legal and political traditions have so far blocked the development of such data sets.

The use of these register data for research purposes is still in an early, explorative phase. Because of this, some caveats are in order for interpreting the results. Firstly, the different mechanisms of knowledge transfer definitely complement each other and they probably also interact. Ideally, mobility rates should be seen in conjunction with measures of research, education and lifelong learning. This has not been possible in the present project.

Secondly, the human capital aspect is not the only aspect of mobility. High mobility increases personnel turnover costs for the firms involved. It disrupts teamwork, makes knowledge accumulation difficult, takes key personnel out of projects that are not finished etc. Low mobility might lead to too little circulation of both experience and new ideas and approaches, incurring high opportunity costs. It is therefore of interest to search for optimal ranges of mobility rates rather than to strive for extreme values. Mobility rates below 5 per cent may indicate stagnation and when they get above 25 per cent, things may seem a bit hectic. Even so, we are not in the position to identify a canonical range.

Our hope is that the results from this project will contribute to the development of research and policy on issues related to stocks and flows of human capital and related labour market issues.

The project has been carried out by a consortium with the following partners:

The STEP Group[2], Oslo (lead partner) (Anders Ekeland, Håkon Finne, Svein Olav Nås, Nils Henrik Solum)

The Danish Institute for Studies in Research and Research Policy (AFSK), Århus (Kenny Friis-Jenssen, Ebbe Graversen, Mette Lemming)

Statistics Finland, Helsinki (Mikael Åkerblom, Markku Virtaharju)

Vinnova[3], Stockholm (Adrian Ratkic, Christian Svanfeldt, Jonny Ullström)

Statistics Iceland, Reykjavik (Ómar Harðarson).

Beyond the partners, Statistics Norway, Statistics Sweden and Statistics Denmark have provided register data. The Nordic Industrial Fund has been the main financial source for the project. Additional funding has been provided by The Finnish National Technology Agency, the Research Council of Norway and the participating consortium members.

The project has resulted in a summary report, three detailed reports and two methodological papers, all of which are published in STEP's report series.

Paper 1, the **Classification paper** (Virtaharju and Åkerblom (2003): Measuring mobility, some methodological issues. Oslo: SINTEF STEP), is a paper that accounts for the methods and classifications used in the project. The paper focuses on dealing with register data. Its target audience is interested non-specialists and fellow researchers.

[2] Since 2003-01-01, SINTEF STEP – Centre for Innovation Research.
[3] Until Vinnova's establishment in 2001, the participating analysts belonged to NUTEK.

Paper 2, the **Data source paper** (Harðarson (2003): Some methodological issues using labour force survey data for mobility research. Oslo: SINTEF STEP), discusses the relationships between register data and Labour Force Survey (LFS) data in detail. This discussion is important because while many countries perform LFSs regularly, only Nordic countries have register data available for detailed mobility studies. Iceland is the fifth of the Nordic countries to be constructing a register database for this purpose.

Project report 1, the **Migration report** (Graversen et al. (2003a): Migration between the Nordic countries: What do register data tell us about the knowledge flows? Oslo: SINTEF STEP), gives a comprehensive picture of flows of migration of Nordic citizens between the Nordic countries for the period 1988-1998. It studies migration rates, rates for returning to the country of emigration and rates for staying in the country of immigration. It breaks these figures down by a number of demographic and economic indicators. This report is aimed at researchers, statistics officials, policy makers and others interested in the flow of human capital between the Nordic countries.

The present report, Project report 2, the **Mobility report** (Graversen et al. (2003b): Mobility of human capital – the Nordic countries, 1988-1998. Oslo: SINTEF STEP), compares domestic job-to-job mobility rates in the Nordic countries, broken down over a number of demographic and economic indicators. Particularly important is the verification of procyclical movements in the mobility rates: propensity to change jobs follows the business cycle for most subgroups. The report has produced benchmarks for mobility and stylised facts about influences on mobility rates. This report is aimed at researchers, statistics officials, policy makers and others interested in the flow of human capital between firms.

Project report 3, the **Researcher report** (Ekeland et al. (2003a): Mobility from the research sector in the Nordic countries. Oslo: SINTEF STEP), is a specialised study of domestic job-to-job mobility rates for personnel in the research sector for the period 1988-1998. This topic is of particular interest for the discussion of the function of specialised research institutions in the innovation system, an expansion of the classical science – industry theme. The report is aimed at researchers, statistics officials, policy makers and other interested parties, including strategy developers of the institutions in the research sector.

The reports and papers are rather detailed. The **Summary report** (Ekeland et al. (2003b): Flows of human capital in the Nordic countries 1988-1998. Oslo: SINTEF STEP) summarises the main findings of the three project reports and the two papers and is recommended as the first intake for all readers. It also contains some material not found in any of the other publications but deemed appropriate for a synthesised formulation.

On behalf of all the partners in the project I would like to thank our sponsors, in particular the Nordic Industrial Fund, for this opportunity to contribute to a literature of growing importance through a stimulating and challenging Nordic co-operative effort.

Oslo, June 2003

Anders Ekeland
Project manager

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1 Introduction

1.1 Problem formulation

A significant part of a National Innovation System, NIS, is the knowledge circulation and exchange between workplaces. The Canberra Manual states in the introduction: "Highly skilled resources are essential for the development and diffusion of knowledge and constitute the crucial link between the technological progress and economic growth, social development and environmental well-being" (OECD 1995). One important reason for establishing the Canberra Manual was the need for systematic and comparable measures of the knowledge, c.f. Ekeland (1998). OECD has had an ongoing project on the NIS for several years. The aim is to improve the use of innovation policy instruments in the economies. Creation of improved economic knowledge indicators and improved understanding of knowledge as a driving factor for innovation contribute to this. The present report contributes to the work through a set of benchmarking knowledge flow indicators where unique comparable register data sources are used for the Nordic countries.

Mobility of educated or skilled labour is one of the most obvious mechanisms of knowledge transfer. A typical knowledge carrier is a worker changing jobs.[4] Hence, a common easily identifiable and interpretable indicator of knowledge transfer and well being of the economy is the share of workers moving between workplaces.[5] This can be measured and summarised by mobility rates, i.e. job change rates, for all employed workers, the labour force, and various subgroups of the labour force, among others. A detailed mapping of the types and amounts of mobility rates determines the significance of mobility rates as carrier of knowledge and innovation abilities. As mentioned by Stern et al. (2000), the human stock of innovators or the innovative manpower determines the national innovative capacity. Similarly, the mobility of workers determines how efficiently the innovation capacity is used, a factor which again influences economic growth.

Several studies of employee mobility between workplaces have been done in recent years.[6] The studies typically use matched employer-employee data to determine worker mobility and in some cases also job mobility. Especially data on worker mobility can be generated in several countries since it only requires a representative sample of workers like in for example the Labour Force Survey (LFS). Job mobility is more difficult since it requires an identification of whether a job being filled is a newly established job or whether a job being vacated has actually been closed without rehiring at the workplace. Such information requires more data from the employers, data that are usually not present.[7]

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[4] Knowledge transfers other than labour mobility comprise for example co-operation, temporary exchange and replacements of staff, hiring of experts and consultants, outsourcing, some types of network, buyer-supplier relationships, R&D collaborations, and internal education and upgrading among others, c.f. Nås et al. (1998b).

[5] There is no relationship that tells what the optimal mobility rates are. Common sense tells us that it must not be too small or too large, but what the optimal level actually should be varies according to several of the features treated in the present report.

[6] See, for instance, the survey by Dale-Olsen and Rønningen (2000) for a comprehensive empirical and methodological comparison of Norwegian results with results from a long list of other studies performed in the 1990s, or work by Nås et al. (1998a, 1998b) and Graversen (1998).

[7] For example, Bingley et al. (1999) have access to register data on the entire population for the period 1980 to 1995. However, they cannot identify changes in work positions or whether a hired employee replaces another or takes a new position. Consequently, they define job mobility as a change in the total number of employees at the workplace no matter which internal changes there have been, i.e. upgrading of the work force. Anyway, their method still requires at least a representative sample of establishments.

The main purpose of the present report is to determine the fluctuations in the worker mobility rates over time and between various subgroups. A determination of the fluctuation also gives the average level of mobility, i.e. the benchmark. Hence, a collection of stable and valid benchmarks of mobility rates characterising the Nordic labour markets is the aim of the present report.

The economic conditions, i.e. the business cycle, in the Nordic countries are used to illustrate that some of the mobility rate variations over time can be explained and that it has to be considered when mobility rates are compared. Decomposed mobility rates by various characteristics such as the workers' age, educational level or the workplace size are used to illustrate that comparison of mobility rates highly depends on these characteristics among the populations that are compared. Hence, the report illustrates that micro-based figures can be aggregated to macro figures and related to the business cycle of the economies. The outcome is a list of stylised facts on worker flows, which can be used as a benchmark for labour markets in other countries.

The present report determines and compares worker mobility rates based on matched employer-employee data for the period 1988-98 for the four largest Nordic countries, Denmark, Finland, Norway and Sweden.[8] The decade is characterised by a somewhat parallel business cycle starting negatively and ending positively, c.f. Figure 1 and Figure 2. The full business cycle allows a comparison with the mobility rates of employees on the labour market. According to earlier Danish and Norwegian findings, a procyclical pattern is to be expected in the worker inflows, cf. Bingley et al. (1999), Albæk and Sørensen (1998), Dale-Olsen and Rønningen (2000) and Ekeland (2000).

The present analysis gives a comprehensive picture of the mobility flows on the Nordic labour markets over a decade. Section 1.2 schedules the theoretical arguments for an analysis of worker mobility and for cyclicality in mobility rates. Section 1.3 describes the empirical data and the mobility definitions more carefully. Section 2 compares the business cycle in the Nordic countries for the period of interest and presents it together with the aggregated job-to-job inflow mobility rates from each country. Although levels differ there seems to be a remarkably common business cycle in the Nordic countries. Similarly, the movements in the mobility rates over time follow a common trend in line with the business cycle. Hence, a first indication of a procyclicality in the mobility rates is found in the section.

In Section 3, the decomposed mobility rates for various subgroups are presented and related to expectations and explanations. The distribution of mobility rates over sectors, age, educational level, size of workplace etc. gives a picture of the national cases and the Nordic stylised facts are explicitly spelled out. The results are common Nordic stylised facts such as a decreasing mobility rate by age, an increasing mobility rate by educational level, and a decreasing mobility rate by establishment size. The sectoral differences are more mixed and seem to be somewhat demand driven, c.f. Table 2.

The trends in the data are more formally compared with the business cycle in Section 4 where correlation coefficients between the mobility rate and the business cycle are calculated for each country. The general tendency is again a procyclicality of the mobility rates, c.f. Table 3. In the section a full probabilistic (logistic) model of mobility is also estimated. The model quantifies the business cycle effect as well as the mobility rate differences between the different subgroups

[8] In some years, typically 1988 or 1998, data are missing for some of the participating countries. For example, no data for 1998 are accessible in the Danish case. Even though newer data exist, we have decided that access to newer or more comprehensive data will not be bought in this project.

analysed in Section 3, c.f. Table 4. The empirical model generally confirms the results found in the earlier sections.

Section 5 concludes the report and points at future research areas of interest. The conclusions of the mobility study are summarised in Table 2, Table 3 and Table 4.

1.2 Worker mobility and cyclicality

Mobility rates of employees are closely linked to knowledge exchange and circulation in the economy. The mobility of individuals is a well-defined and comparable measure although it only measures one dimension of knowledge exchange between firms. Firms can also change or increase their knowledge stock by for example internal or external upgrading of the existing work force. Such a knowledge upgrading can afterwards be spread throughout the firm. Other knowledge links, which the firms may use in the knowledge upgrading, are external experts and consultants, co-operation with other firms, and own R&D departments. However, information on this kind of knowledge exchange and tacit knowledge is hard to collect in a comparable way. The similar is the case for the tacit knowledge obtained through internal knowledge exchange. Hence, mobility of individuals is uniquely measurable, comparable and the best indicator for the overall knowledge exchange.

Theoretically, the firms adjust their work force in response to the shocks they face. This may be economic conditions represented by the business cycle or worker related conditions such as the composition of the work force at the establishment level. In a neo-classical world a representative firm optimises its profit due to representative workers and common wage rates. This is obviously not the case in reality. Firms react simultaneously on several fronts, financially, personnel management or input/output corrections. The result may be a simultaneous hiring and firing process on the firm level. The average hiring and firing aggregates to the macro level change in the total number of employees. The important part is that the micro level figures may show job creation as well as job destruction at the same time in the same firm, c.f. Hamermesh et al. (1996). Parts of the observable behaviour can be explained by sector differences, worker characteristics, firm size etc. However, this heterogeneity at the firm level is in stark contrast to the representative firm theory, where only one thing happens, namely the average effect. The present report looks at selected supply and demand factors that explain parts of this heterogeneity through measures of worker flow magnitudes and worker flow cyclicality.

The business cycle is the most often used indicator for the overall well being of the economy. Shifts in the economic conditions in a country influence both the demand behaviour in the firms and also the supply behaviour among the employees. In good periods, firms may hire more and fire less while workers search more and find more new attractive jobs and vice versa in recession periods. Hence, the magnitude, persistence and distribution of the mobility rates are expected to correlate positively with the business cycle, i.e. procyclically. The report analyses whether this empirically is the case in the Nordic countries.

A common stylised fact has been that job destruction is countercyclical and that job creation is procyclical, c.f. Boeri (1996), and that the sum of the two is countercyclical. The explanation is that jobs are easy to destroy and hard to create, so the destruction rate is more volatile than the creation rate giving a countercyclical job reallocation, i.e. mobility rate. However, this may not be the case in the Nordic countries where a large public sector seems to stabilise the employment situation, c.f. Bingley et al. (1999). Similarly, a large part of the studies lying behind these stylised facts have been performed on subsets of the manufacturing sector and some of them have

concerned job mobility, where the net effect or macro effect has been in focus. The gross mobility rates are of much more interest in the present study, since we focus on the knowledge circulation and exchange. Hence, the stylised facts in the previous studies may not describe the actual situation from the knowledge point of view. The present report documents the substantial knowledge transfers (flow of workers) between establishments in the Nordic countries and the size of the cyclical variations in these knowledge transfers.

The ex ante expectations on the cyclicality of the mobility rates are mixed but the argument goes like this: Firms fire less and hires more in good times giving an increasing employment in good times, i.e. countercyclicality plus procyclicality. The employees search more and receive more job offers in good times, i.e. quitting and hiring increase procyclically. However, the firm decision and the employee decision cannot be distinguished, i.e. firing and quitting are indistinguishable events. This set-up is illustrated in Table 1. Table 3 in Section 4 summarises the empirical evidence for the cyclicality of the in- and outflow mobility rates in the Nordic countries.

Table 1: Expected cyclicality of in- and outflow mobility rates.

	Phase of business cycle		
	Upturn	Recession	Type of cyclicality
Firm (Demand side)			
Firing	Decrease	Increase	Countercyclical
Hiring	Increase	Decrease	Procyclical
Total employment	Increase	Decrease	Procyclical
Employee (Supply side)			
Separations	Increase	Decrease	Procyclical
Job offers	Increase	Decrease	Procyclical
Total employment	Increase	Decrease	Procyclical

As the case study of Denmark in Table 5 in the Appendix shows, the cyclicality may differ between subgroups on the labour markets. Even though the total employment is procyclical, the ICT sector shows a countercyclicality, meaning an expansion even in the recession period in the early-mid 1990s. Similarly, the sector covering the public sector (which is large in Denmark) also shows a countercyclical pattern meaning that the community service sector has a stabilising employment effect on the economy. Such a result is also found in Bingley et al. (1999). Hence, in a country comparison of mobility rates as indicators for knowledge transfers, a lot of the differences may arise from country specific qualities. Even in a comparison of the Nordic countries, which have a lot in common, institutional set-ups and structural differences need to be included to explain the observed figures.

1.3 Data descriptions and mobility definitions

Longitudinal register databases with unique links between workers and employers over time have been constructed from national register in the Nordic countries. Hence, the data used in the present analyses are already collected for other purposes, so there is no extra report or survey burden on the employers or employees. The LFS data can reveal the same information, but samples are small and some interesting decompositions are not possible due to small sub-sample sizes. The register data can be decomposed in many ways and the only limit is in practice that the decomposition variable must be in some of the registers lying behind the longitudinal register database. For example, background characteristics such as age, education, gender, family types, income, tenure, experience, workplace size, etc. are typically available in the registers.

The mobility rates are found from national register databases. The national register databases are longitudinal and include matched employee and employer data in the first week of November each year. Hence, mobility of an employee is measured as a move between two establishments from November to November in two consecutive years, c.f. Box 1. Since only movements between two consecutive November weeks are used to calculate mobility rates, the rates should be considered lower bounds for the actual labour mobility between workplaces. An unknown part of the employees switch jobs more than once in a one-year period. In the LFS it would be possible to ask for this information. Studies using the LFS usually report lower mobility rates than similar studies using register data, c.f. Åkerblom (1999) and Laafia and Stimpson (2000). This may be partly due to ambiguities in question formulation and response (e.g. whether one has changed enterprise vs. establishment or job vs. occupation). However, a closer methodological scrutiny is required to sort out these discrepancies.

In the main part of the present study only job-to-job inflow mobility rates are used. This means that only employees who had a job one year earlier are used in the analysis. To illustrate the consequences and for comparisons, some figures for the overall inflow rates are shown in the Appendix. The overall inflow mobility rate includes employees who were not employed the previous year, c.f. Box 1.

1. **Inflow mobility**
   - **Job-to-job mobility** is defined as a change of workplace between the previous year and the present, i.e. change between two jobs, MOVERS.
   - **Overall job mobility** is defined as MOVERS and new movements into job from the no-job state, ALL MOVERS = MOVERS + NEWS.
   - **No mobility** is defined as the total number of employees who are employed in the same place both years, STAYERS.

2. **Inflow mobility rate**
   - The **job-to-job inflow mobility rate** is defined as the number of employed movers between two consecutive years divided by the total number of employees who are employed both years, MOVERS / (MOVERS+STAYERS).
   - The **overall inflow mobility rate** is defined as the number of employees not having the same job the previous year divided by the total number of employees this year, ALL MOVERS / (ALL MOVERS + STAYERS).

3. **Inflow and outflow mobility rate**
   - **The job-to-job inflow mobility rate** in year t equals the outflow mobility rate in year t-1, since the number of MOVERS into year t and out of year t-1 are equal and since the stock of STAYERS in year t and year t-1 are equal.
   - The **overall inflow mobility rate** in year t does not equal the outflow mobility rate in year t-1, since the number of NEWS and LEAVERS may be unequal and since the stock of employees (ALL MOVERS + STAYERS) can vary between year t and t-1.

Box 1: Definitions of job mobility terms used in the report.

In the present analysis the mobility rates for the employees are decomposed by several supply and demand characteristics. For presentational reasons only a few are included in the report. The amount of knowledge embodied in an employee is individual but it can be approximated by formal education, job tenure, job experience, and working sector among others. In the report, the knowledge is approximated by education (measured by the ISCED code), by age (highly correlated with tenure and experience), and by working sector (measured by the NACE code). Furthermore, a common demand and supply side variable is included, namely the establishment size measured by the number of employees. Åkerblom (2000) suggests the exact grouping of the employees.

The rationale behind the groupings is the need to identify the significant knowledge carriers from an innovation point of view. In the National Innovation Systems the main emphasis is on the highly qualified employees, since they contribute with the highest innovation potential. This means that an extreme country mobility rate caused by low educated employees is biasing the measure of the actual knowledge flow inherent in the employees moving. Hence, the figures for employees should be decomposed by low and high formal education. The mobility rate is expected to increase by educational level since it is easier for the well educated to find (better) jobs.[9]

Since formal education is not measuring tacit knowledge another decomposition variable is used in the report. As a proxy for job tenure and experience, the age of the employees tell whether the employee is experienced on the labour market. Hence, the older the employee is the more knowledge is transferred by a job change. The labour market theory tells us that the mobility rates are expected to decrease by age since the employees stop searching for better jobs when they have tried enough and have found a satisfying job. Similarly, the job search decreases if family relations become binding, i.e. when mobility costs increase due to real estate ownership, children, spouse job etc. Hence, high mobility rates among youngsters do not necessarily mean a high knowledge transfer in the economy.

Another interesting aspect of the knowledge transfer debate is the knowledge transfer in the highly innovative parts of the economy. In the definitions of the new knowledge economies, these are for example the Information and Communication Technology (ICT) sector, the higher education institutions and the R&D institutes (HEI). For presentational reasons only five sectors are used in the report. The three other groups are the industrial production sectors, the production related service sector and the human-related service sector. Åkerblom (2000) also suggests decomposition in 20 sectors following the five major groups defined above. However, the interesting split between types of knowledge transfers in knowledge intensive or extensive sectors are fully illustrated with five sectors alone.

Finally, the implications of sampling employees in establishments of certain sizes are illustrated by a decomposition of mobility rates for different size groups. Due to better internal recruitment possibilities in larger establishments, to larger growth in small establishments that are more often younger or even newly established, the mobility rate is expected to decrease by size.[10] This means that exclusion of small establishments from the datasets decreases the mobility rates considerably. From a knowledge point of view this is important if the small establishments are less innovative or have less tacit knowledge attached to their employees. Hence, mobility rates among larger establishments may be most important if the moving employees carry more knowledge than corresponding employees in small establishments. The age and education relationship with the establishment size is postponed for later analyses. However, the size effect alone is included in the present report to illustrate its importance.

[9] Both the human capital theory and the search theory explain that mobility increases by educational level. The human capital theory predicts higher mobility among employees with relatively low firm specific capital, i.e. high educated, and low mobility among employees with high firm specific capital, i.e. low educated. The search theory predicts more job offers or higher expected return to job search for the high educated employees, i.e. a higher mobility among the high educated employees.

[10] The theories of selection predict that new firms have a more updated technology and a more efficient work force. Hence they expand faster and have a higher inflow mobility rate. Similarly, the vintage theory predicts that old firms have not updated their technology and work force, so they do not expand anymore. Probably they may even shrink, meaning a lower inflow mobility rate to old firms. This is also called 'Creative destruction' in the new growth theory. IF AND ONLY IF new firms are smaller and old firms are larger the two theories both explain a decreasing mobility rate by establishment size.

2 Job-to-job mobility rates and the business cycle, 1988-98

Two indicators, the unemployment rate and the real growth rate in GDP are used to measure the business cycle in the period.[11] Other measures may be used as long as the correlation between the indicator and the business cycle is high and stable over time. The unemployment rate may have some time lag since quitting, firing and hiring usually happens some time after the changes in the economic environment. This is caused by the fact that firms usually increase the productivity or use natural voluntary job changes etc. in their adjustment process before they actively force job changes. Hence, the GDP growth indicator may show a more updated business cycle compared to the unemployment indicator, i.e. the GDP indicator reveals economical demand side conditions and not immediate labour market conditions. However, the GDP real growth rate may also change due to external factors such as booming oil resources in Norway (and more moderately Denmark). In this case, the GDP contribution from the oil sector may be significant without any influence on the job mobility rate. Similarly, also job mobility may have some time lag compared to the time of change in the business cycle, so the unemployment rate may approximate the change in mobility rate better than the GDP real growth rate will do. If so, there is a time lag between changes in the business cycle and changes in the mobility rates. Figure 1 and Figure 2 show the two measures for the business cycle for the Nordic countries.

For expositional reasons **all figures in the report have different scales** on the left (and right) hand axes. These scales are chosen so that the figures are most easily overviewed and the message in them best expressed.

Box 2: Varying scales on figure axes.

Both the unemployment rate and the GDP real growth rate follow a common trend. Although the country-specific levels are different, the changes are in equal direction with a common shift around 1992-93. The unemployment rate is bell-shaped showing the inverse relationship with the business cycle. Conversely, the GDP real growth rate shows directly the economic climate, i.e. the business cycle. All in all the two figures show a U-formed business cycle in the Nordic countries in the 1990s with the bottom of the recession period lying around 1992-93.

[11] The unemployment rate is found from ILO: Yearbook of Labour Statistics, i.e. based on LFS data. The unemployment rate is expected to correlate negatively with the business cycle, i.e. an increasing unemployment rate indicates a declining business cycle. The GDP is found from OECD: National Accounts. The growth in real GDP is used as the indicator, since the nominal GDP includes inflation as well as level effects. The growth in real GDP is expected to correlate positively with the business cycle.

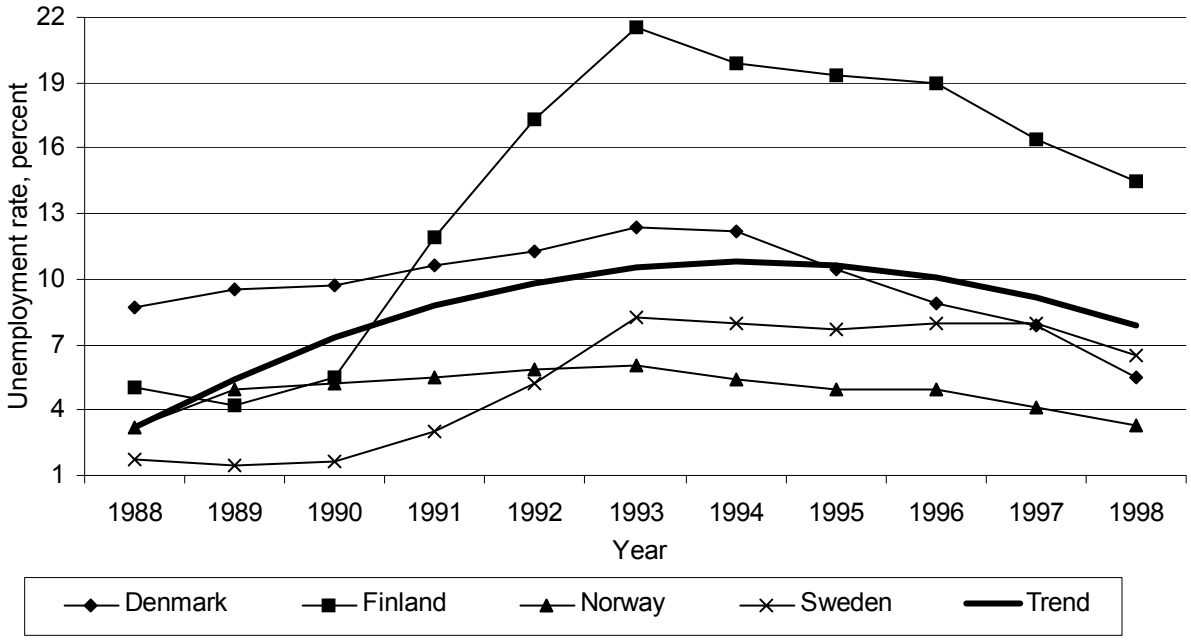

Figure 1: Unemployment rate by country, 1988-98. Per cent.

Source: Statistics Denmark, Statistics Finland and ILO, Yearbook of Labour Statistics.
Note: The trend is fitted by a second order polynomial curve based on a non-weighted average of the national unemployment rates.

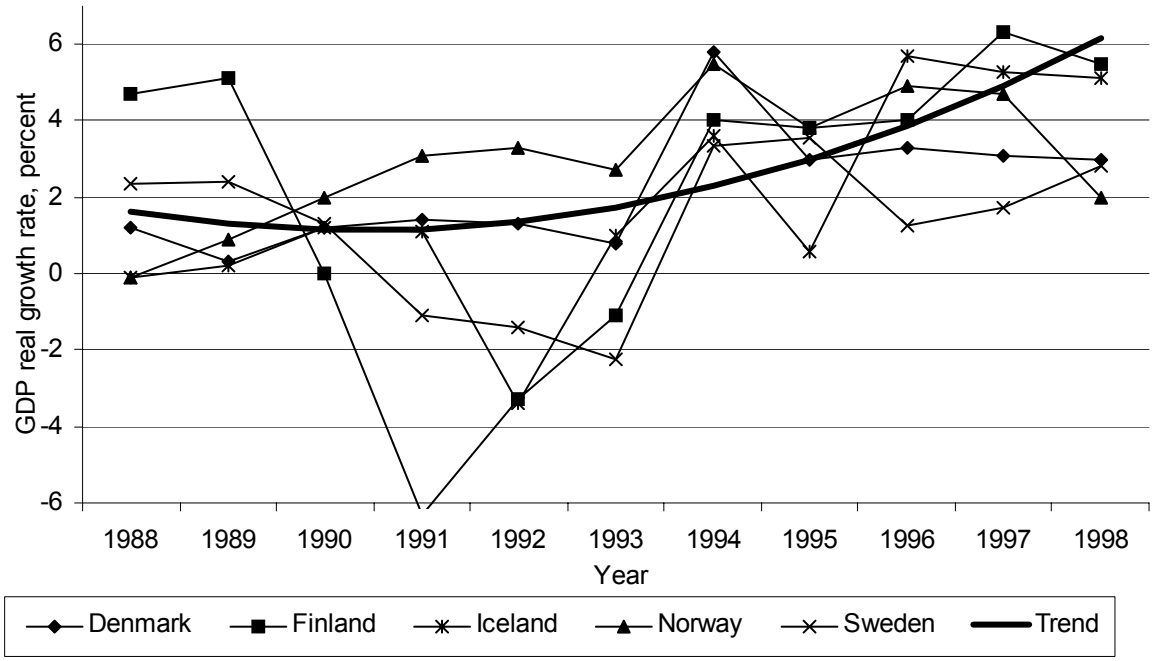

Figure 2: GDP real growth rate by country, 1988-98. Per cent.

Source: Statistics Denmark, Statistics Finland and OECD, National Accounts and Nordic Statistical Yearbook.
Note: The trend rate is fitted by a second order polynomial trend based on a non-weighted average of the national GDP real growth rates.

Figure 3 through Figure 6 show the unemployment rate and the growth in real GDP together with the inflow job-to-job mobility rates for the Nordic countries.[12] Each country is shown separately. The mobility rates for all the countries are shown in Figure 7 in levels and indexed in Figure 8 together with a common second order polynomial trend.

2.1.1 Denmark

Register information for the period 1988-97 is available for Denmark. Hence, Figure 3 shows numbers for this period. Both the unemployment rate and the growth rate in real GDP indicate a shift in business cycle around 1993. Before 1993 the business cycle is negative, after 1993 it is positive. A level shift in the inflow rate between 1993 and 1994 indicates a cyclical mobility rate where the worker mobility rate changes with the business cycle. There is a weak tendency that the hiring and separation process may be procyclical.

Figure 3: Job-to-job inflow mobility rate, unemployment rate and GDP real growth rate in Denmark, 1988-97. Per cent.

Source: Statistics Denmark (Statistisk Tiårsoversigt 1999, 2000) and own data.

2.1.2 Finland

The Finnish data cover the period 1988-98. The period has been characterised by a massive increase in the unemployment rate from 1990 to 1993 and a small decrease hereafter. This is also illustrated by the negative growth rates in real GDP. According to Figure 4, the mobility rates have declined correspondingly, from a high level before 1990 to a low level after 1992. In the end of the period the mobility rates increase slightly. Hence, in Finland there seems to be an especially clear inverse relationship between the unemployment rate and the mobility rates, which demonstrates the business cycle influence on the mobility rates very well.

[12] The job-to-job mobility rates covers inflow mobility of workers employed in year t-1 to employment at a new employer in year t and outflow mobility of workers employed in year t to employment at a new employer in year t+1.

Figure 4: Job-to-job inflow mobility rate, unemployment rate and GDP real growth rate in Finland, 1988-98. Per cent.

Source: Statistics Finland and own data.

2.1.3 Norway

The Norwegian case is less volatile compared with the Finnish data. Also in Norway there seems to be a business cycle with a lower bound around 1993, where the unemployment rate peaks. Unfortunately, the same business cycle is difficult to recognise in the GDP real growth rate. In the first part of the period there is a correlation between the unemployment rate and the mobility rate. This is, however, less clear in the latter part of the period. The Norwegian data on mobility are characterised by a shift between in 1995 and forwards. This is caused by a new way of identifying job mobility at the Statistics Norway. A change in workplace definition seems to be the explanation for this very volatile shift.

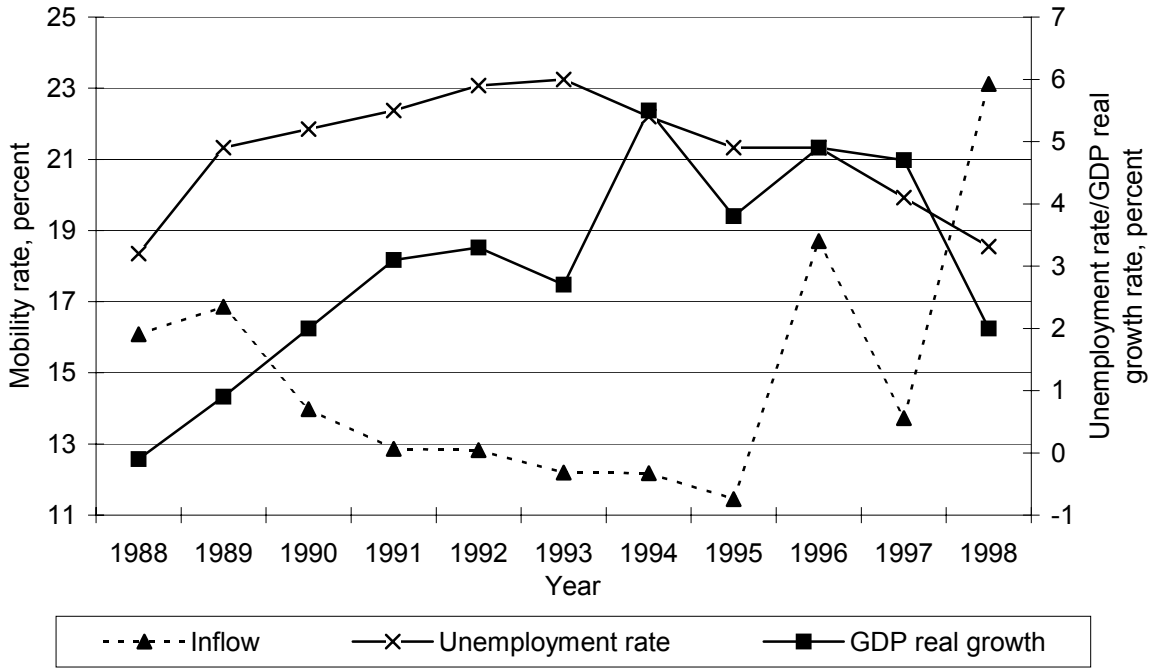

Figure 5: Job-to-job inflow mobility rate, unemployment rate and GDP real growth rate in Norway, 1988-98. Per cent.

Source: ILO, Yearbook of Labour Statistics, OECD, National Accounts and own data.

2.1.4 Sweden

Also in the Swedish case there is a common trend development between the business cycle indicators and the mobility rate. The Swedish mobility rates before 1991 seem rather high. Also in the Swedish case do we have an impression of procyclicality in the mobility rate.

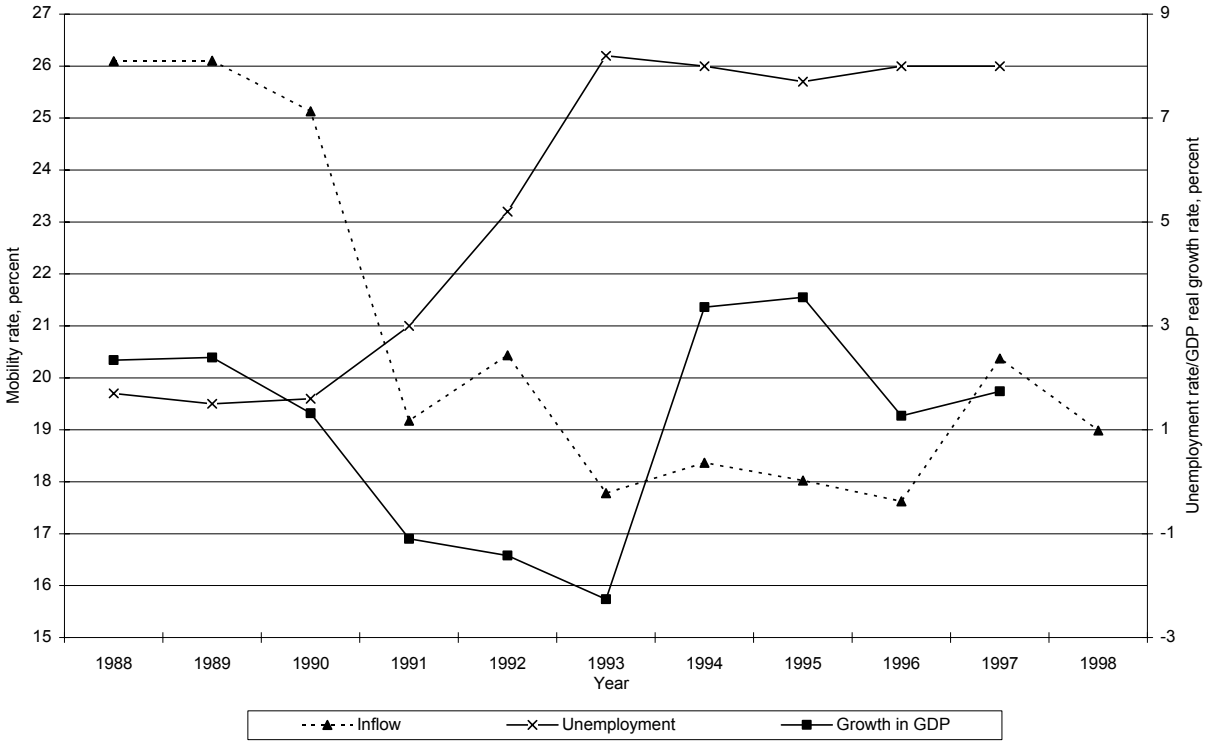

Figure 6: Job-to-job inflow mobility rate, unemployment rate and GDP real growth rate in Sweden, 1988-98. Per cent.

Source: ILO, Yearbook of Labour Statistics, OECD, National Accounts and own data.

2.1.5 General comments

In general, the business cycles in the Nordic countries seem to have the same pattern with a recession until 1993 and a recovery thereafter. However, the strength of the business cycle varies, with the deepest recession in Finland followed by Denmark and Norway. The Finnish data also seem to show the most perfect eye-view correlation between the business cycle indicators and the mobility rates.

Although the level of the inflow mobility rates varies between the Nordic countries as shown in Figure 7, they show a remarkably common development. The levels are different but the development follows some u-formed pattern.[13] Only the Finnish and the Danish data have been corrected for artificial changes in establishments. Such a correction usually decreases the mobility rates by a couple of percentage points. In order to enhance the visibility of the trend, Figure 8 shows the indexed mobility rates for all the countries together with a fitted polynomial trend based on the average of the country mobility rates. The trend shows lowest mobility rate in 1992/93, which fits well together with the observation of lowest recession around 1993.

[13] The Danish and Finnish data have been corrected for artificial changes such as mergers, take over, spin-offs, or split of establishments following a few basic rules. These are for example that the establishment is still the same if only the owner changes, that the establishment is the same if at least 30% of the original employees are still employed the following year etc. See for example Emerek et al. (1990) for further explanations.

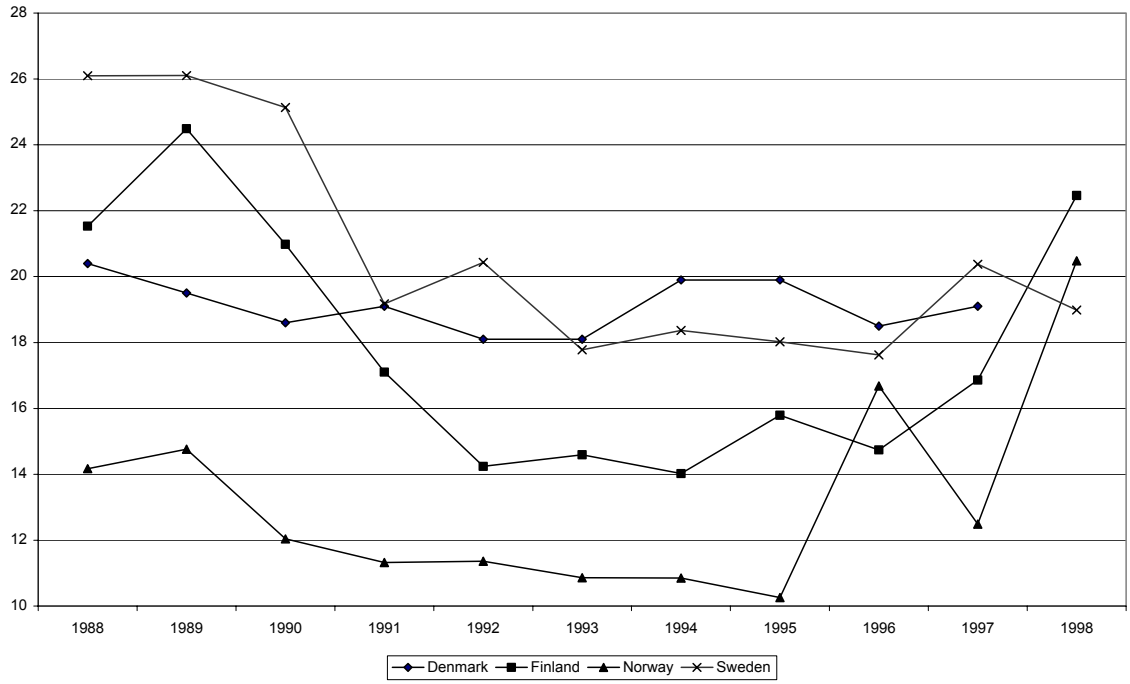

Figure 7: Job-to-job inflow mobility rates by country, 1988-98. Per cent.

Source: Own data.
Note: The volatility in the Norwegian data after 1994 is caused by a change of establishment definition, which influences the mobility rates.

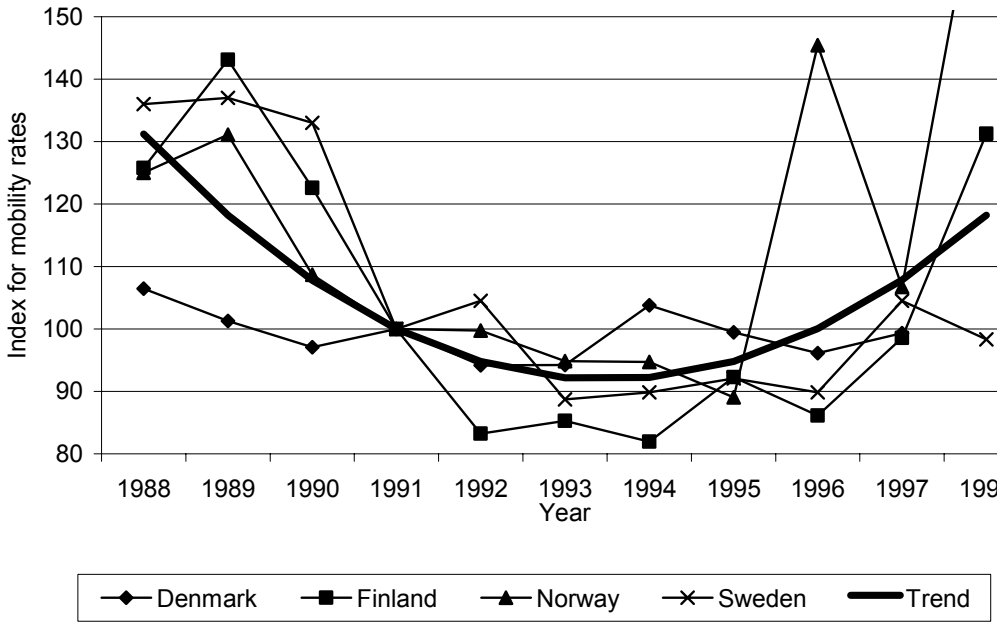

Figure 8: Indexed job-to-job inflow mobility rates by country, 1988-98 (1991=100).

Source: Own data.
Note: The trend rate is fitted by a second order polynomial trend based on a non-weighted average of the national mobility rates. The volatility in the Norwegian data after 1994 is caused by a change of establishment definition, which influences the mobility rate.

3 Decomposed job-to-job inflow mobility rates, 1988-98

Mobility rates for various subgroups can be drawn similar to Figure 3 through Figure 6. This section gives inflow mobility rates for Nordic countries decomposed by various characteristics of the job, the employee or the employer such as sectors, young and old, educational level, and workplace size. The presentation of the mobility rates in the section is grouped by the decomposition variable, so each country is shown consecutively.

3.1 Mobility rates decomposed by sector and age

The first decomposition is inflow mobility rate by five aggregated industrial sectors for young and old employees. The decomposition into young and old employees is based on earlier analyses, see for instance Graversen (2000), where an obvious difference in mobility rate level occurs around the age of 35.[14] As the coefficients for the age dummy variables in Tables 4 and A2 also show, the mobility rates decrease by age with smaller and smaller steps (a decreasing rate, i.e. first half of a u-formed pattern). Hence, especially the youngest have the highest mobility rates while the oldest employees have mobility rates close to or in common with the older employees. The age effect is highly correlated with the corresponding job tenure or job experience measures, i.e. youngsters have lower tenure and experience and vice versa. Hence, decomposition by job tenure or job experience groups will show the same mobility pattern as decomposition by age groups.

The five-sector industrial classification is suggested in Åkerblom (2000) and reflects an increasing interest in innovation and R&D potentiality of the research sector and the information and communication technology sector.[15] Both are vital inputs to the new and expanding knowledge economy. The three other sectors represent the industrial production economy, and the tertiary service sectors decomposed by the product service sectors and the human service sectors respectively. The number of employees in the five sectors differs considerably. In general, the information and communication technology sector, ICT, is smallest while the community service sector is largest.

Figure 9, Figure 11, Figure 13 and Figure 15 show the job-to-job mobility rates for young employees aged 20-34 and Figure 10, Figure 12, Figure 14 and Figure 16 show the job-to-job mobility rates for older employees aged 35-64.

The overall mobility rates for the similar subgroups are shown in Figure 29 through Figure 36 in the Appendix. The job-to-job inflow mobility is a subsample of the overall inflow mobility where the latter also includes newcomers, c.f. Box 1. The overall mobility rate is by definition larger than the job-to-job mobility rate since the relative increase in movers is larger than the relative increase in employees in the latter mobility rate. The differences between the overall mobility rates and the job-to-job mobility rates also indicate which sectors that have a high recruitment of youngsters (e.g. the HEI sector) or which sectors that are shrinking (e.g. agriculture in Finland).

[14] It can be argued from other studies that there should be three age groups, namely 20-29, 30-54 and 55-69 but there exists no commonly used grouping of ages.
[15] Åkerblom (2000) also suggests a corresponding 20-sector classification.

3.1.1 Denmark

In the Danish case, a clear level difference is found between the young and the older employees no matter what sector they work in. Another clear pattern is the highest (lowest) mobility rates for the young (old) employees in the HEI sector. The ICT sector has the lowest mobility rates in the recession period for the youngest increasing to the top in the upturn period. The mobility rate for the oldest in the ICT sector is among the largest in the entire period. Since experience is important in this sector and since it is a growing industry, the result could partly be expected if inexperienced workers are less useful. In between lies the mobility rates for the other sectors. In general, only the youngest seem to be influenced by the business cycle since there is a level shift in 1993 in Figure 9. This is not the case in Figure 10. The ordering of the mobility rates by sectors is not obvious for the youngest. However, this is much clearer for the oldest. The below average mobility rate for the manufacturing sector seems to be general. Hence, this sector hires less often compared to the remaining economy. It may be caused by longer tenure, fewer open positions or shrinking industries. The product services sector presents mobility rates above average for the oldest but not for the youngest. A striking trend seems to be that the mobility rates for the other community services sector are close to the average of the job-to-job mobility rate but above average of the overall mobility rate for the youngest, c.f. Figure 29 in the Appendix. This indicates a higher than average recruitment share in this sector of workers not previously employed.

The overall inflow mobility rates are given in Figure 29 and Figure 30 in the Appendix. Together with Spearman rank correlation coefficients between the mobility rates and the business cycle for the subgroups they are also presented in Table 5. The tendencies are the same as described above.

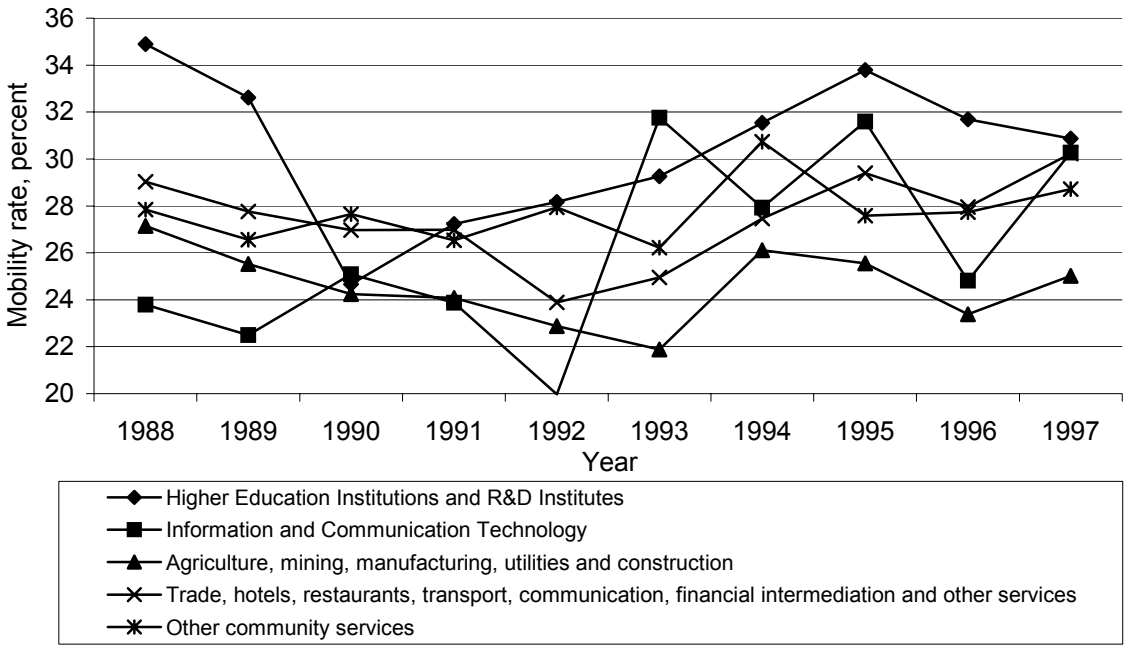

Figure 9: Job-to-job inflow mobility rates by sector for 20-34 year olds in Denmark, 1988-97. Per cent.

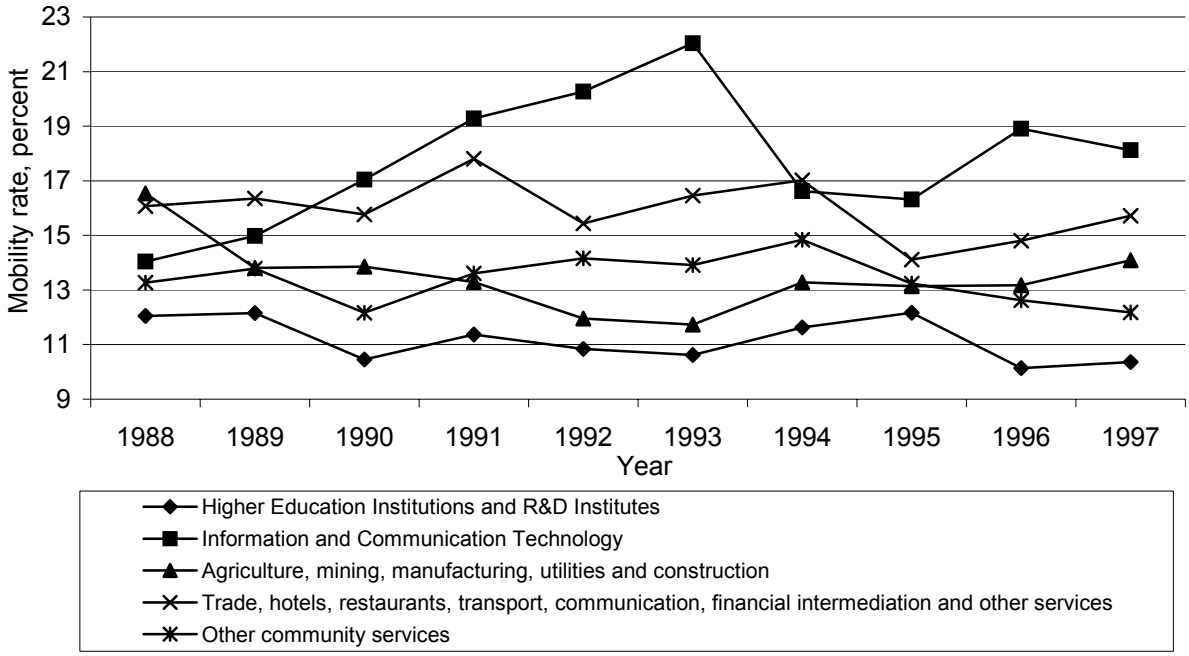

Figure 10: Job-to-job inflow mobility rates by sector for 35-64 year olds in Denmark, 1988-97. Per cent.

3.1.2 Finland

Also in the Finnish case, there is a clear level difference between the youngsters and the older persons together with a higher volatility for the youngsters. The inflow mobility rates for the older persons are more stable over time for all groups compared to the youngsters. The inflow mobility rate for the ICT as well as the HEI sectors are in the top for both age groups. The lowest mobility rates are found in the manufacturing etc. sector, which seems to be remarkably hard hit by the Finnish recession. The overall inflow mobility rates are given in Figure 31 and Figure 32 in the Appendix.

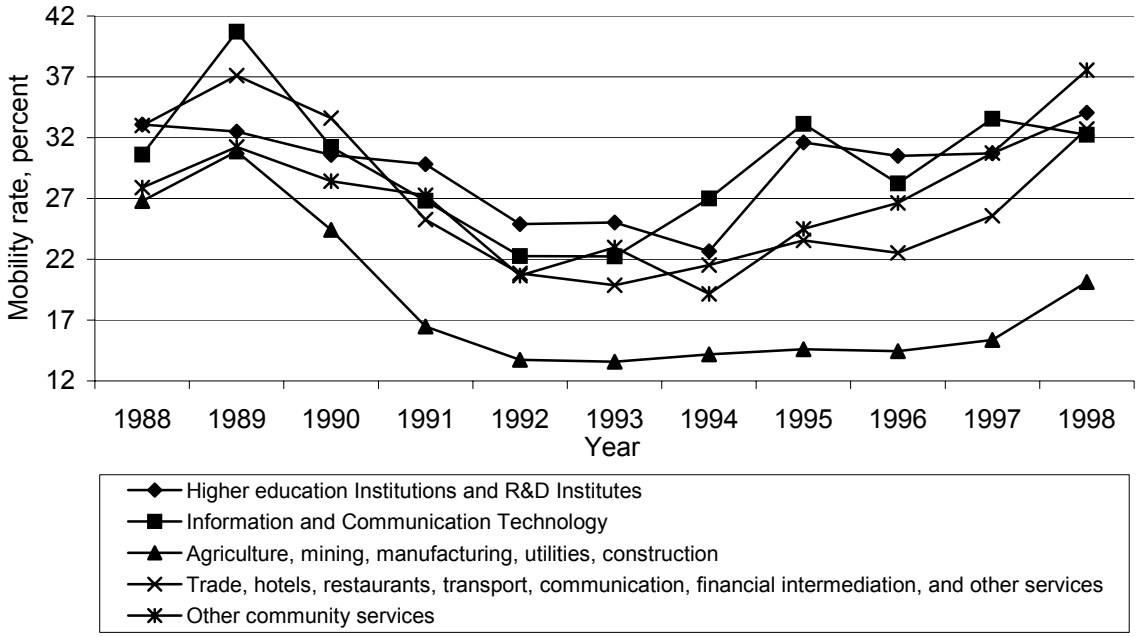

Figure 11: Job-to-job inflow mobility rates by sector for 20-34 year olds in Finland, 1988-98. Per cent.

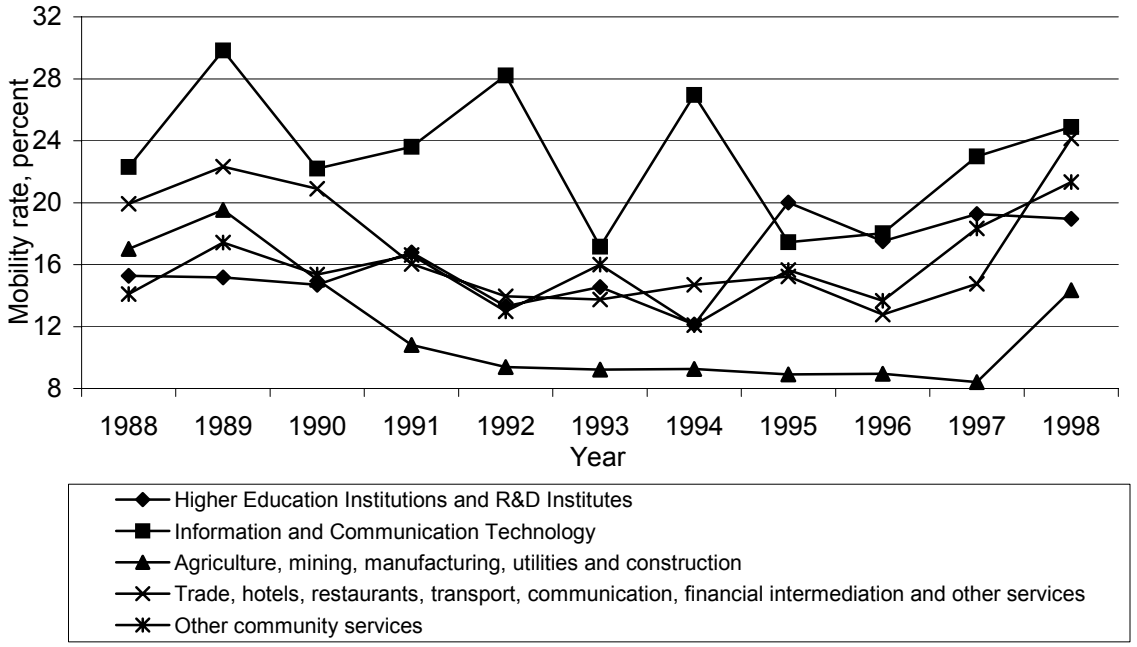

Figure 12: Job-to-job inflow mobility rates by sector for 35-64 year olds in Finland, 1988-98. Per cent.

3.1.3 Norway

Again the age level effect is very clear. The sectoral groups seem to be more equal and similar compared to Denmark and Finland where a larger difference is seen. The ICT sector has very low mobility rate, especially before 1995. Hereafter it increases rapidly. This is opposite the other countries. The HEI sector has lowest rates just as in the other countries. The overall inflow mobility rates are given in Figure 33 and Figure 34 in the Appendix.

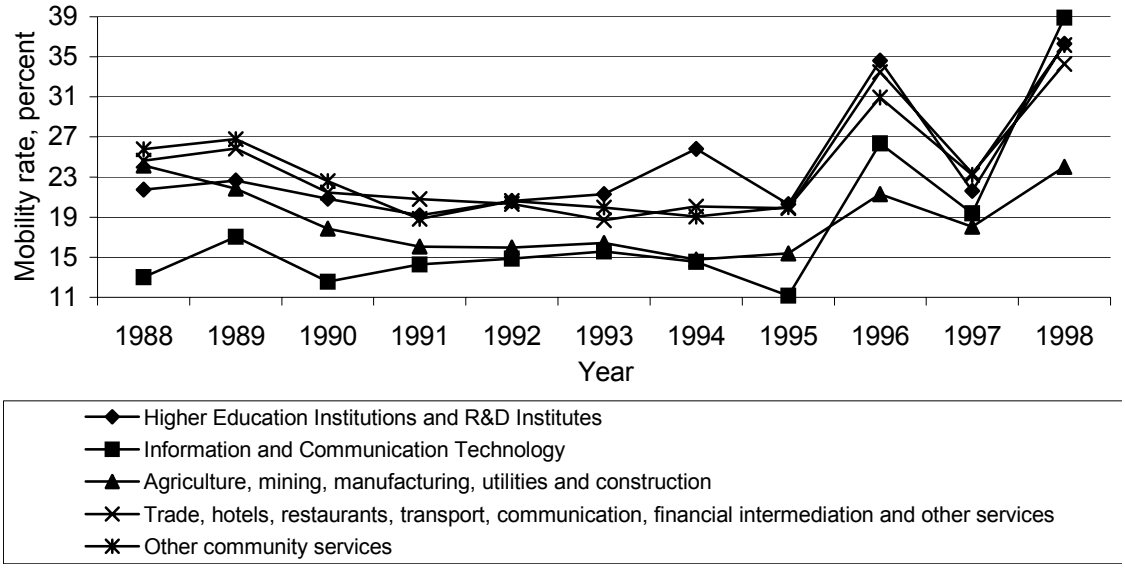

Figure 13: Job-to-job inflow mobility rates by sector for 20-34 year olds in Norway, 1988-98. Per cent.

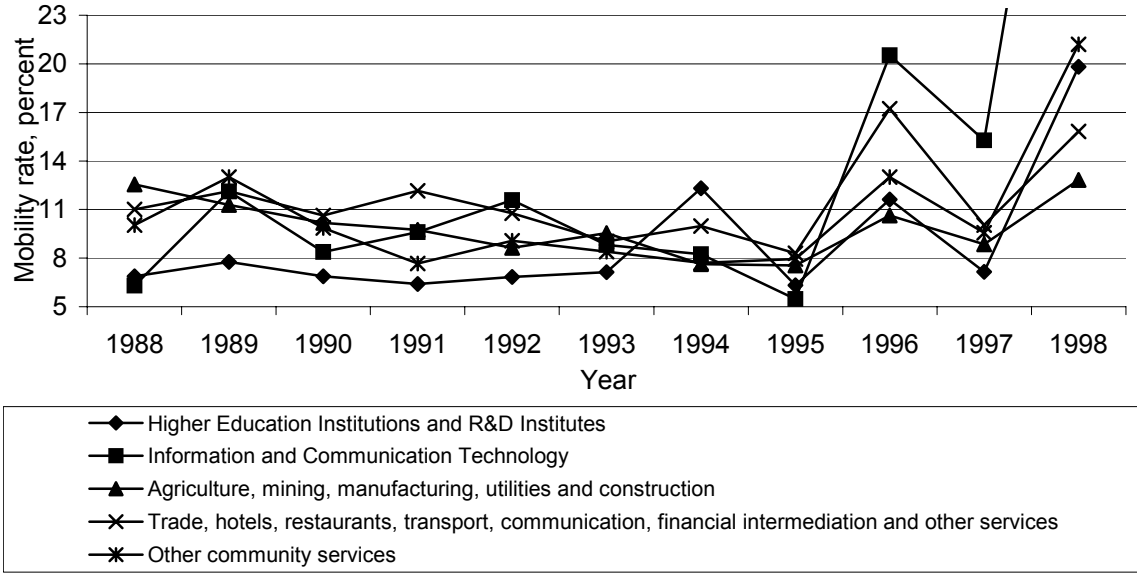

Figure 14: Job-to-job inflow mobility rates by sector for 35-64 year olds in Norway, 1988-98. Per cent.

3.1.4 Sweden

Although the Swedish figures cover a short period, they reveal a similar ordering as in the other Nordic countries. The mobility rates are highest among the youngsters. The inflow is especially high among youngster in the HEI sector and relatively also among olds in the ICT sector. The inflow is in general low to the production sector in the period. The overall inflow mobility rates are given in Figure 35 and Figure 36 in the Appendix.

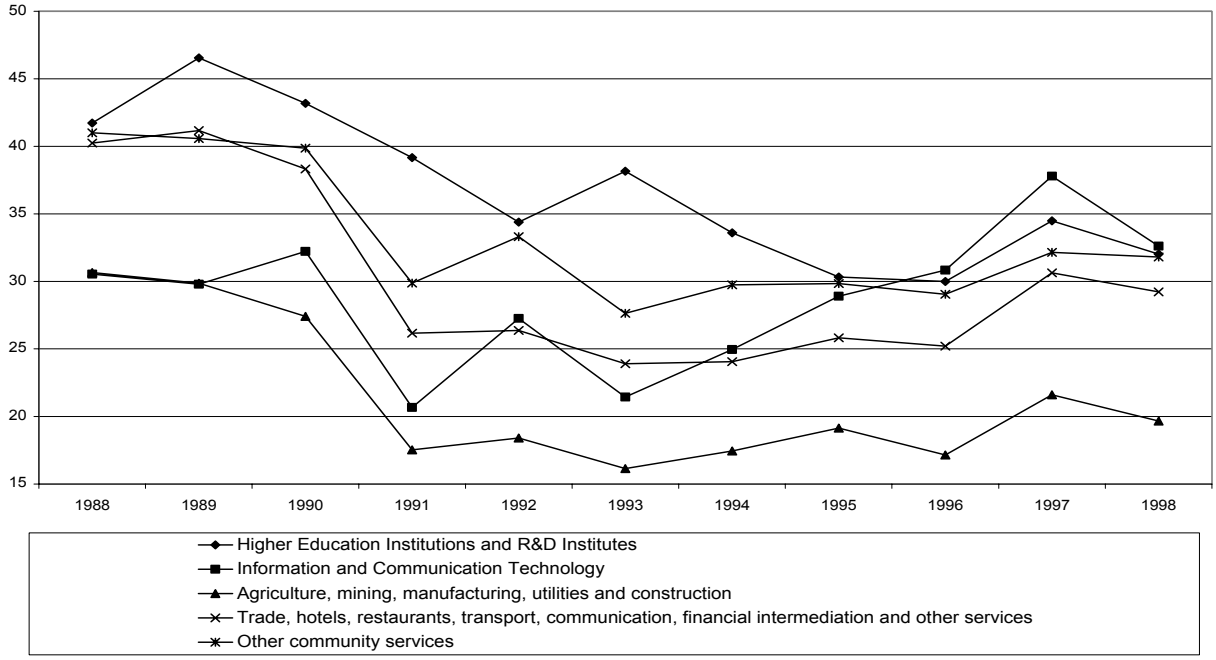

Figure 15: Job-to-job inflow mobility rates by sector for 20-34 year olds in Sweden, 1988-98. Per cent.

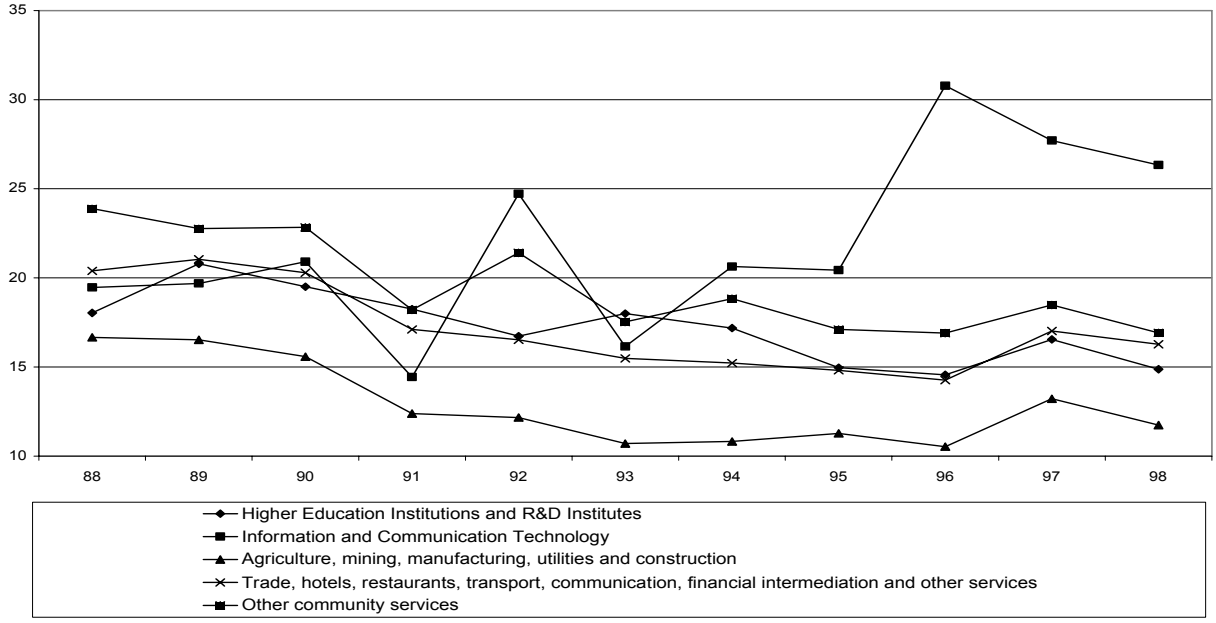

Figure 16: Job-to-job inflow mobility rates by sector for 35-64 year olds in Sweden, 1988-98. Per cent.

3.2 Mobility rates decomposed by educational level and age

Both the search theory and the human capital theory give predictions on the ranking and causes for mobility at different age and education groups. The mobility rates are expected to decrease by age, since both the employer and the employees search for the perfect match. Over time and/or age this match becomes more and more likely to happen. However, at the same time inflow mobility rates may be higher for experienced workers in negative parts of the business cycles. The higher educated have better opportunities to search and find the perfect job offer, so it is also expected that the mobility rates increase with education. This may not be the case if the job market is closed, such as the higher education institutions where only a selected high-educated group of individuals are allowed to work. Similarly, if a sector is shrinking then the inflow mobility rates for the highly educated may be lowest, since they seek and find jobs easier in other sectors. Finally, since the focus here is on job-to-job mobility, the flow from unemployment to job is not included in the mobility rates. If low educated workers more often are unemployed between two jobs, the direct job-to-job mobility rate will be lower for low educated than for high educated workers. Evidence from Graversen (2000) indicates that this may be the case for Denmark at least.

Figure 17 through Figure 20 present job-to-job mobility rates for high and medium-low educated youngsters aged 20-34 and for high and medium-low educated olds aged 35-64.[16] In general, the expected patterns are also found in the country specific figures.

3.2.1 Denmark

Figure 17 shows that higher educated employees have higher job-to-job mobility rates than low educated. The education caused difference in mobility rate is larger for youngsters than for olds. The differences seem to decrease in the upturn period in the late 1990s.

[16] High educated equals ISCED97=5+6, medium-low educated equals ISCED97=1+2+3+4+missing.

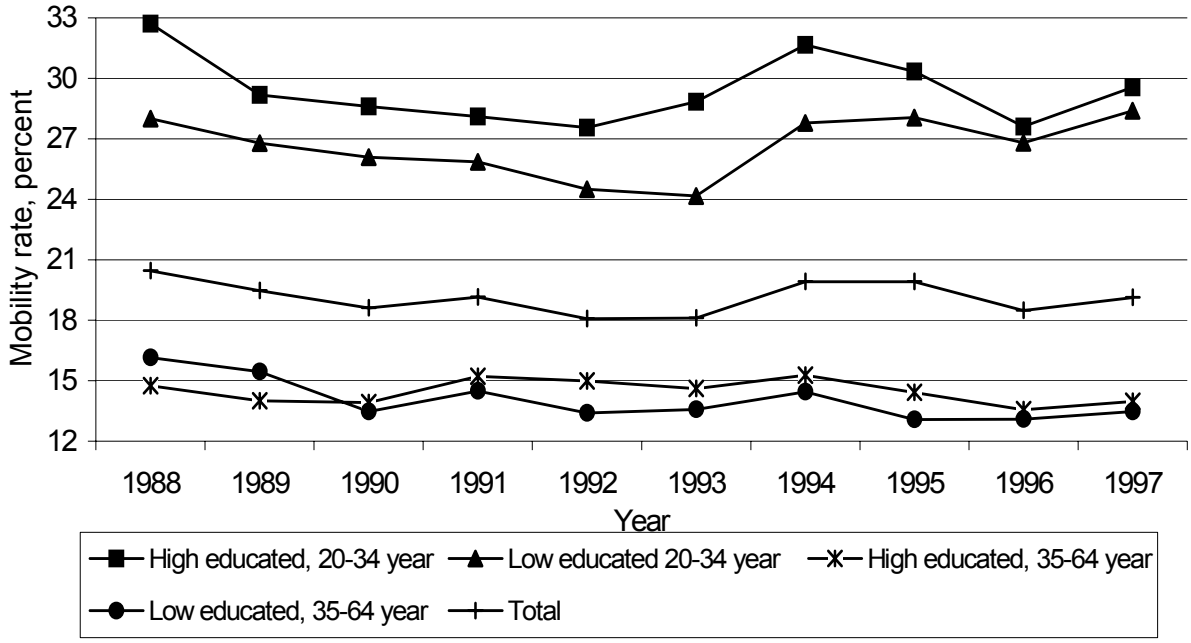

Figure 17: Job-to-job inflow mobility rates by age and educational level in Denmark, 1988-97. Per cent.

3.2.2 Finland

The Finnish case also shows that higher educated youngsters have the highest job-to-job mobility rate and low educated olds have the lowest rate. The education caused difference in mobility rate seems to widen over time. Hence, it seems like especially the low educated employees are hid harder by a recession and that they recover more slowly.

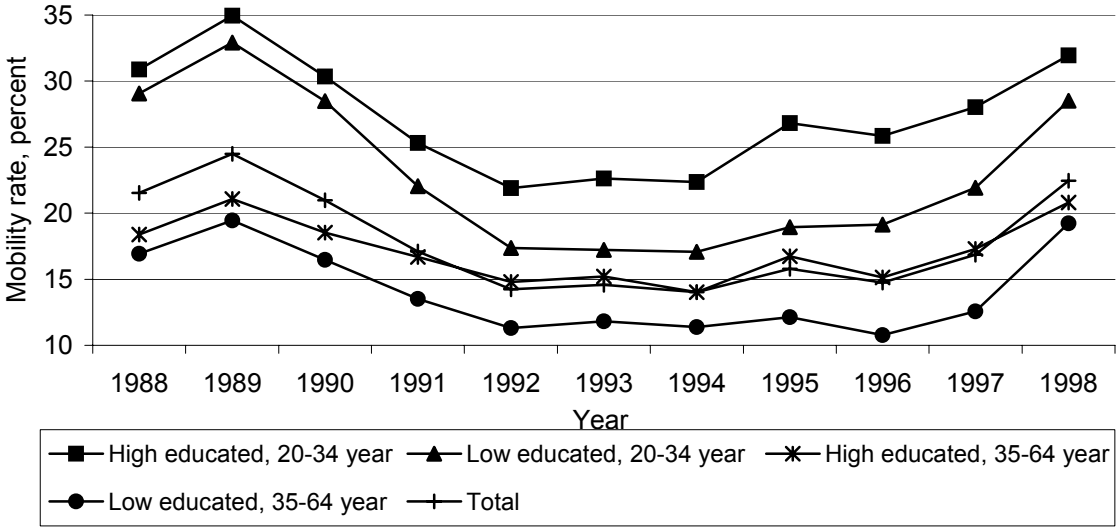

Figure 18: Job-to-job inflow mobility rates by age and educational level in Finland, 1988-98. Per cent.

3.2.3 Norway

The Norwegian case also illustrates the point that highly educated employees have the highest mobility rates. This is the case both for youngsters and olds. The educational difference is very persistent over time with an indication of being largest around the bottom of the business cycle around 1993-94.

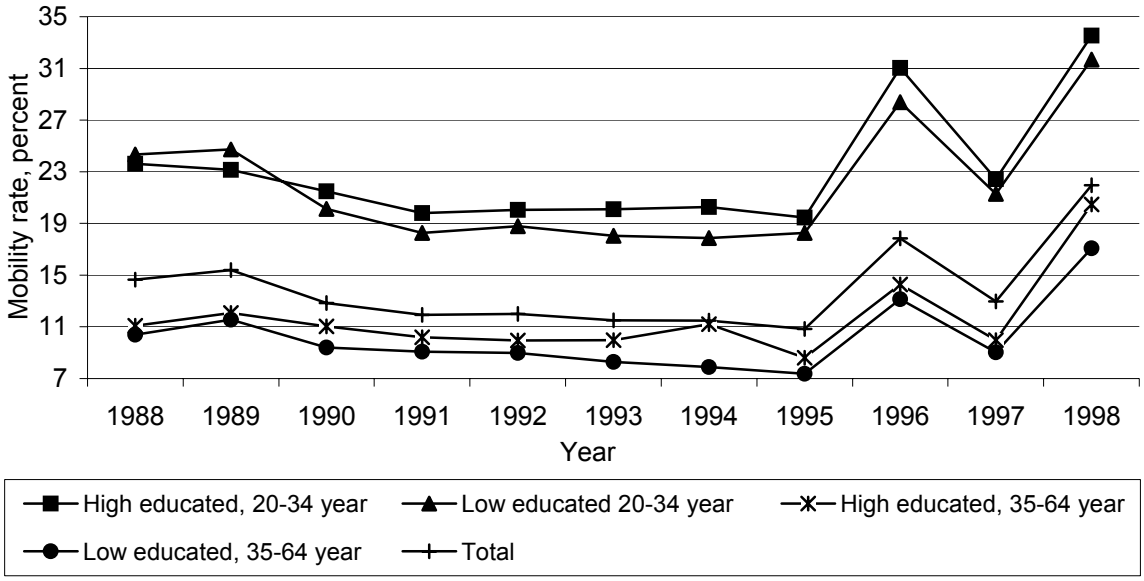

Figure 19: Job-to-job inflow mobility rates by age and educational level in Norway, 1988-98. Per cent.

3.2.4 Sweden

Also in Sweden the inflow mobility rates are highest among the high-educated employees. Even though there is a clear educational effect, the age effect also seems to dominate in Sweden. Hence, well-educated employees have easier access to new jobs, i.e. their net benefit of a job switch is more often positive, but again the search intensity among the youngster is so large that it results in more job changes in itself.

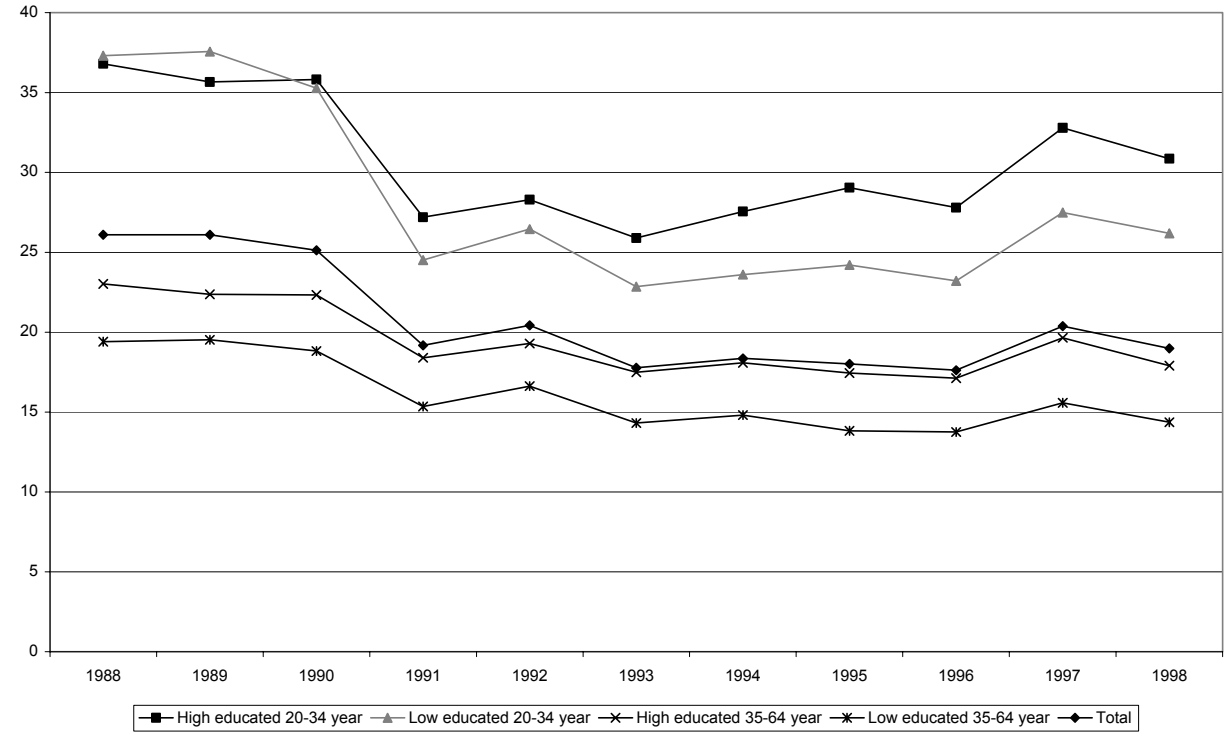

Figure 20: Job-to-job inflow mobility rates by age and educational level in Sweden, 1988-98. Per cent.

3.3 Mobility rates decomposed by detailed educational levels[17]

As mentioned in Section 1.3, the educational level of the employees is expected to influence the mobility rates positively in most cases. However, for some minor subgroups this may not be the case although, on average, the differences caused by the subgroups may equal out. Less educated employees have lower start up costs but lower incomes. Hence, they may be easy to replace but difficult to attract with the given wages, i.e. the sum of high and low mobility rates. Similarly, the low educated have less to offer a new employer, so their successful search activity may be low, i.e. low mobility rates. The opposite may well be the case for the high educated. For them the employer may pay more to keep the expertise since they are difficult to replace. On the other hand, the employees have a lot to offer a new employer, so the mobility rates may be high.

In recessions, the inflow of low educated employees may be reduced since recessions reduce the demand for products more than the demand for services and R&D. Vice versa, the inflow of low educated employees may increase in upturn when the production sectors expand. For the high-educated employees, it is expected that the mobility rates are less production-influenced and more stable over time. Hence the mobility rates may be less stable over time for the low educated compared to the high educated. Figure 21 through Figure 24 show the inflow mobility rates for the Nordic countries decomposed by four educational levels, c.f. Footnote 17, defined by the ISCED97 coding.

[17] The educational levels are split into PhD's (ISCED97=6), high educated (ISCED97=5), medium educated (ISCED97=3+4) and low educated (ISCED97=1+2+missing).

3.3.1 Denmark

Figure 21 shows the mobility rates over time for four groups defined by educational levels in the ISCED97 standard. The expectations can to a certain degree be found in the figure. The high and medium educated employees have an equal weakly U-formed pattern over time. This indicates a weak business cycle effect of some degree. The case for the low educated employees is harder. The level is considerably lower than the other groups, but there does not seem to be any business cycle fluctuation. The PhDs have a high mobility rate except for the years 1993-94.

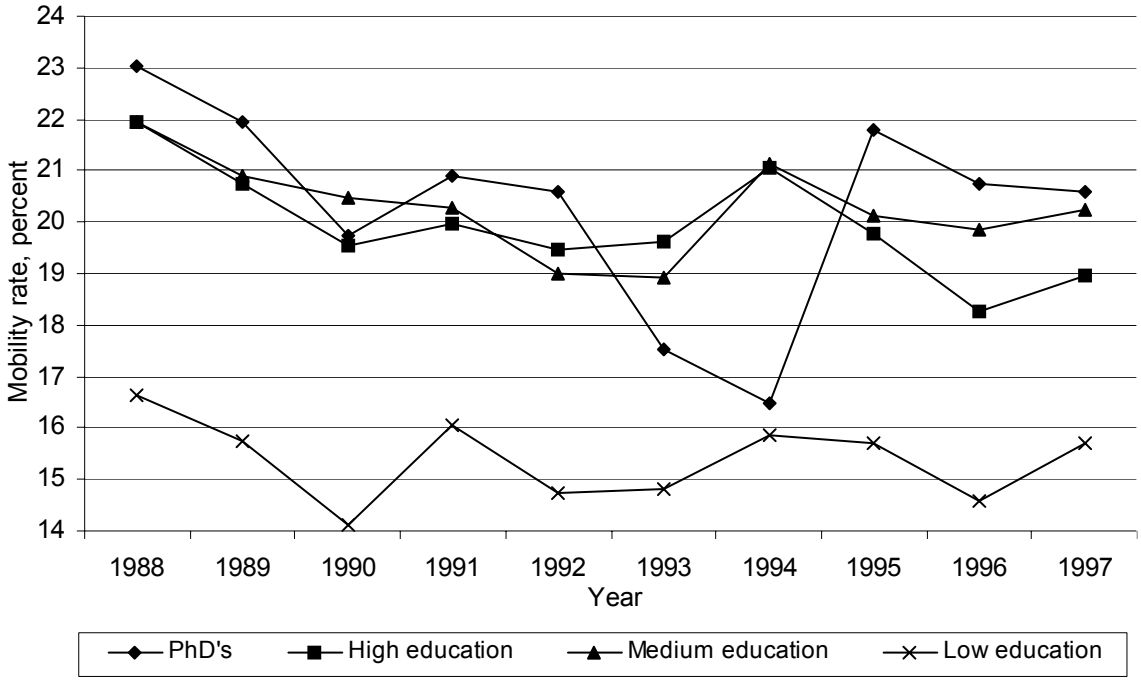

Figure 21: Job-to-job inflow mobility rates by educational level in Denmark, 1988-97. Per cent.

3.3.2 Finland

The pattern is clearly that the recession in Finland decreased the mobility rates no matter which educational level the employees have. However, the higher the education the easier it seems to recover. The decrease is parallel but the increase is postponed for the low educated.

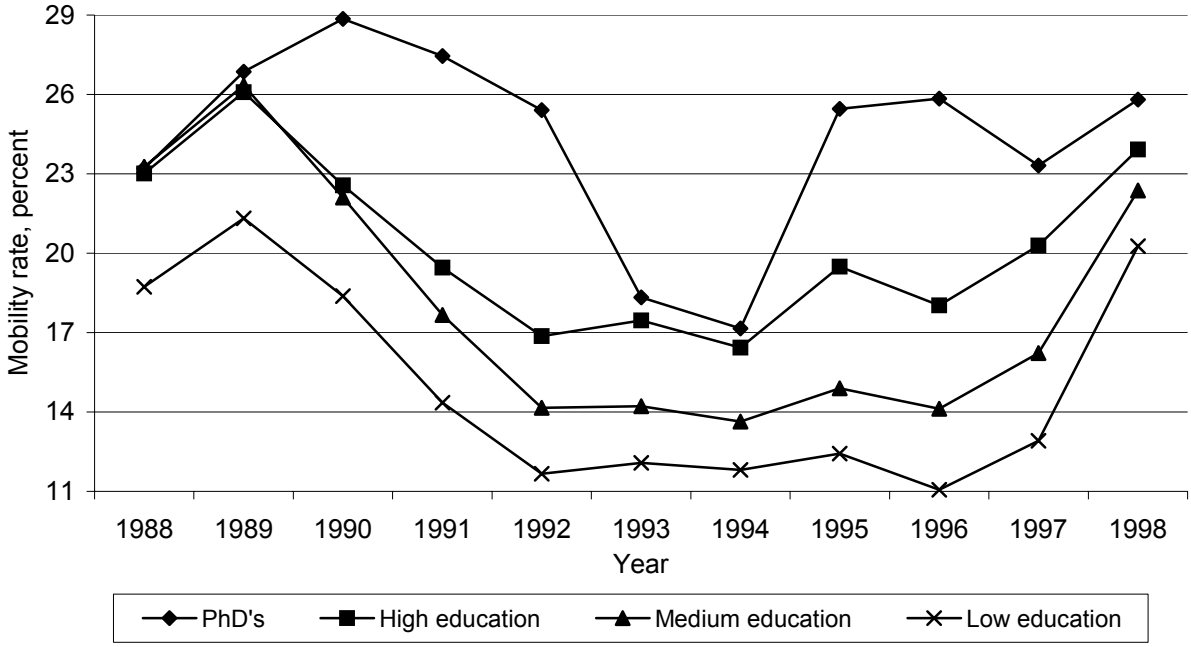

Figure 22: Job-to-job inflow mobility rates by educational level in Finland, 1988-98. Per cent.

3.3.3 Norway

In Norway the ordering of the low, medium and high educated is clearly that the mobility rates increase in the educational level. Figure 23 also shows that the volatility is highest for the low educated. Hence, the mobility of low educated decreases most in recession periods and recover most slowly in upturn periods. Also in Norway, the PhDs have an extreme pattern with a high volatility but with a less clear link to the business cycle.

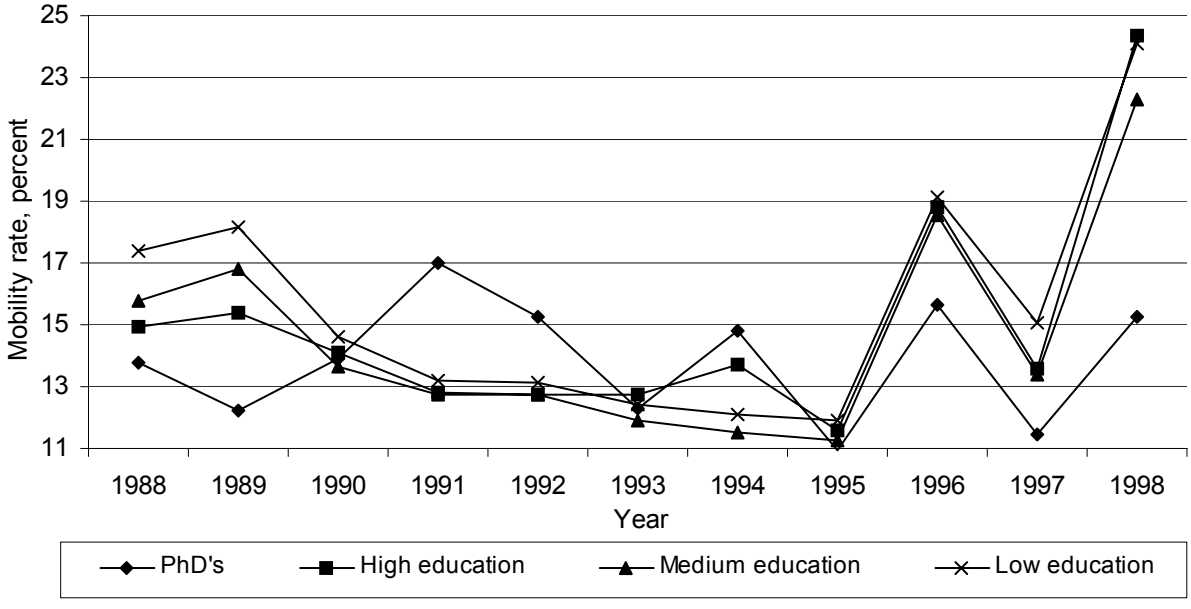

Figure 23: Job-to-job inflow mobility rates by educational level in Norway, 1988-98. Per cent.

3.3.4 Sweden

The mobility rates increase with education to a certain degree in Sweden. There may be some bell-shaped pattern, since the medium educated has the highest rate and PhD's and low educated has the lowest rates. Hence, the knowledge transfers are most significant among the medium-high educated employees.

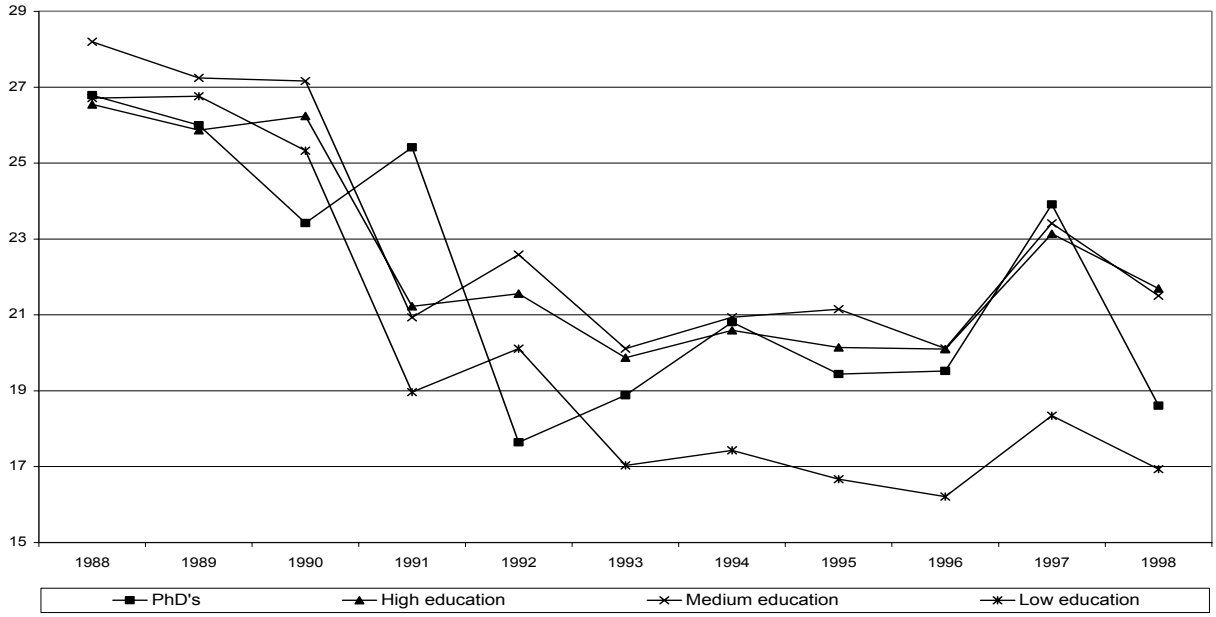

Figure 24: Job-to-job inflow mobility rates by educational level in Sweden, 1988-98. Per cent.

3.4 Mobility rates decomposed by establishment size[18]

Another well estimated stylised fact in the literature is that the larger workplaces have a higher internal recruitment and therefore have smaller inflow mobility rates from other workplaces. Figure 25 to Figure 28 present mobility rates by workplace size for the Nordic countries following a common decomposition in age groups used by Eurostat and EU among others. The figures show a U-formed tendency, such that the inflow mobility rates are high for small and very large workplaces and smaller for medium size workplaces.

The mobility rate is calculated as the total number of movers over the total number of employees, so the fact that the change of 1 employee counts percentagewise more for small establishments than for large ones does not matter here.

The size difference may be caused by several other factors. One is the larger possibility for internal recruitment mentioned above. Another are establishments that increases in size will usually have a higher inflow mobility rate. It may be the case for small establishments that they have a higher growth rate counted by employees. A third reason may be that new firms usually start as small firms where all the employees count as inflow mobility the first year. A fourth reason may be that small establishments are easier to merge, buy, move or radically change in other ways. This again creates possibilities for higher mobility rates among small establishments.

[18] The workplace size is calculated as the total number of employees in the first week of November.

3.4.1 Denmark

There seems to be a clear decreasing inflow mobility rate depending on the workplace size in Denmark. The small workplaces clearly have the highest mobility rates followed by the medium small workplaces. The medium and large workplaces have the lowest mobility rates, although a clear ranking of these is difficult. The average mobility rates lies a little below the rates for the medium-small workplaces. All groups have a weak U-formed mobility rate over time, which indicates that all workplaces independent of size are influenced by the business cycle. An exception may be the very large workplaces where the U-form is questionable.

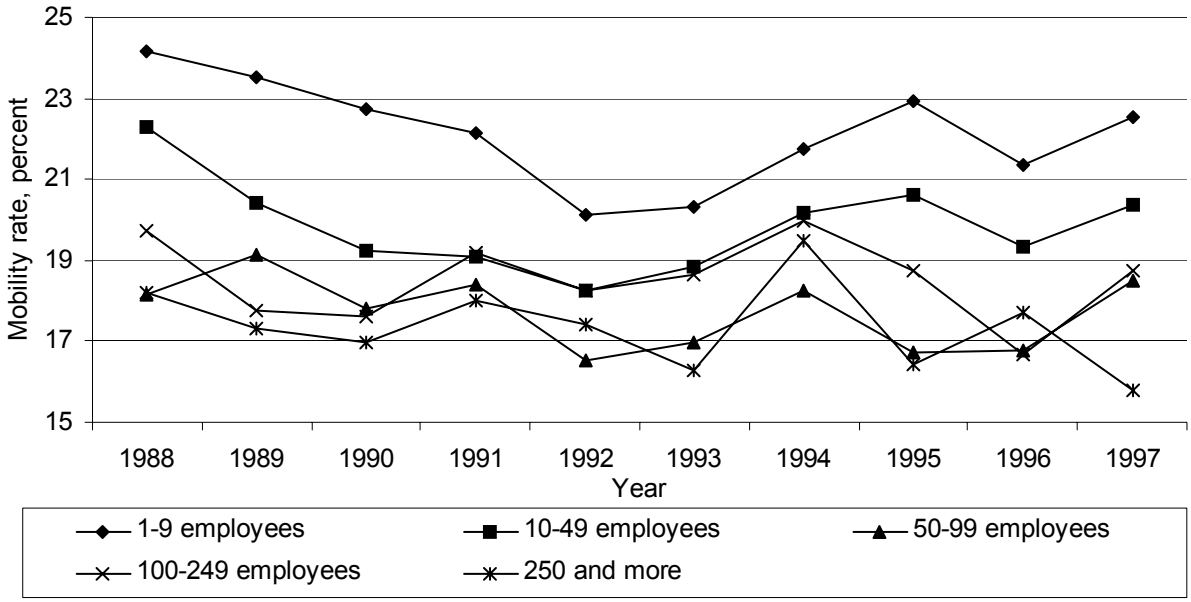

Figure 25: Job-to-job inflow mobility rates by establishment size in Denmark, 1988-97. Per cent.

3.4.2 Finland

Also in the Finnish case there are decreasing mobility rates the larger the firms are. However, the differences between the group averages are smaller than in the Danish case. Again the business cycle effect dominates clearly over the period.

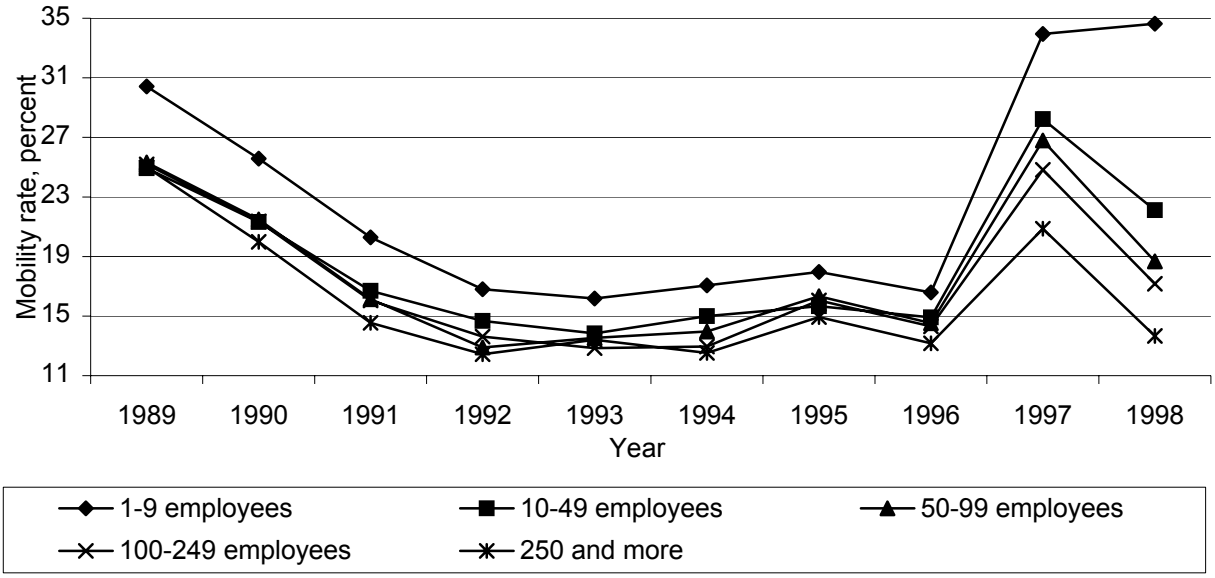

Figure 26: Job-to-job inflow mobility rates by establishment size in Finland, 1989-98. Per cent.

3.4.3 Norway

The ranking of workplace sizes by the mobility rates is as expected. The larger the workplace the lower the mobility rates. All groups have a weak u-formed pattern indicating that all groups are influenced by the business cycle.

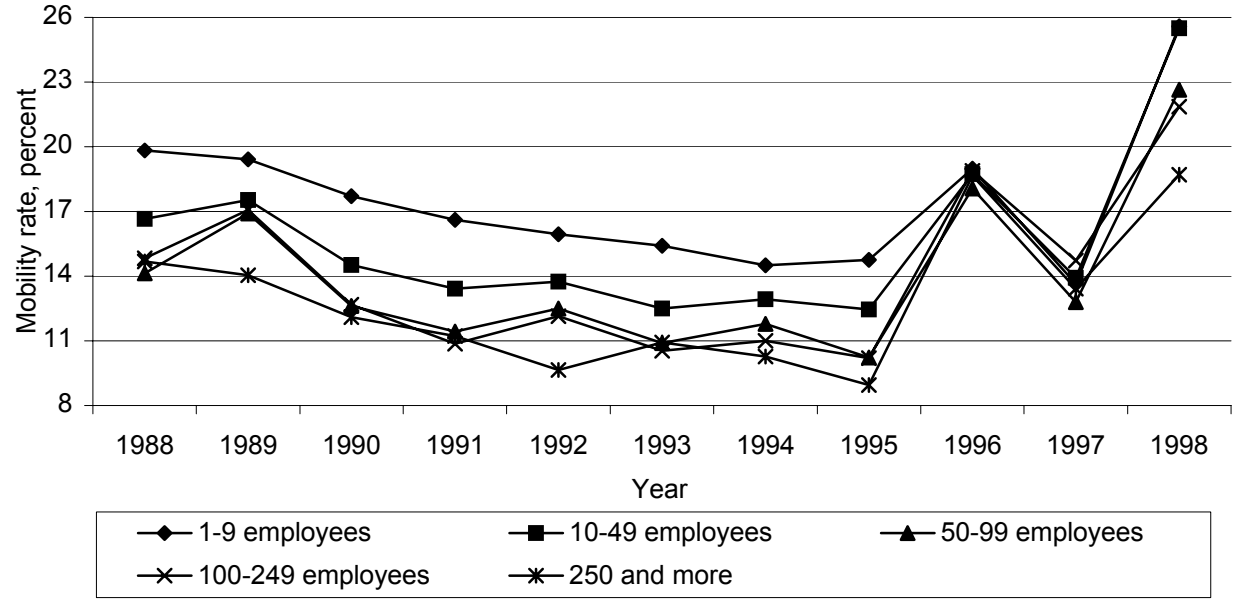

Figure 27: Job-to-job inflow mobility rates by establishment size in Norway, 1988-98. Per cent.

3.4.4 Sweden

The ordering of the mobility rates according to establishment size in the Swedish case is both clearer and not so clear as in the other countries. Except from the employees in the smallest establishments, the ordering is very clear. The larger the establishment the lower is the inflow mobility rate. Contrary to the other Nordic countries the mobility rate for the employees in small establishments is only second highest in Sweden.

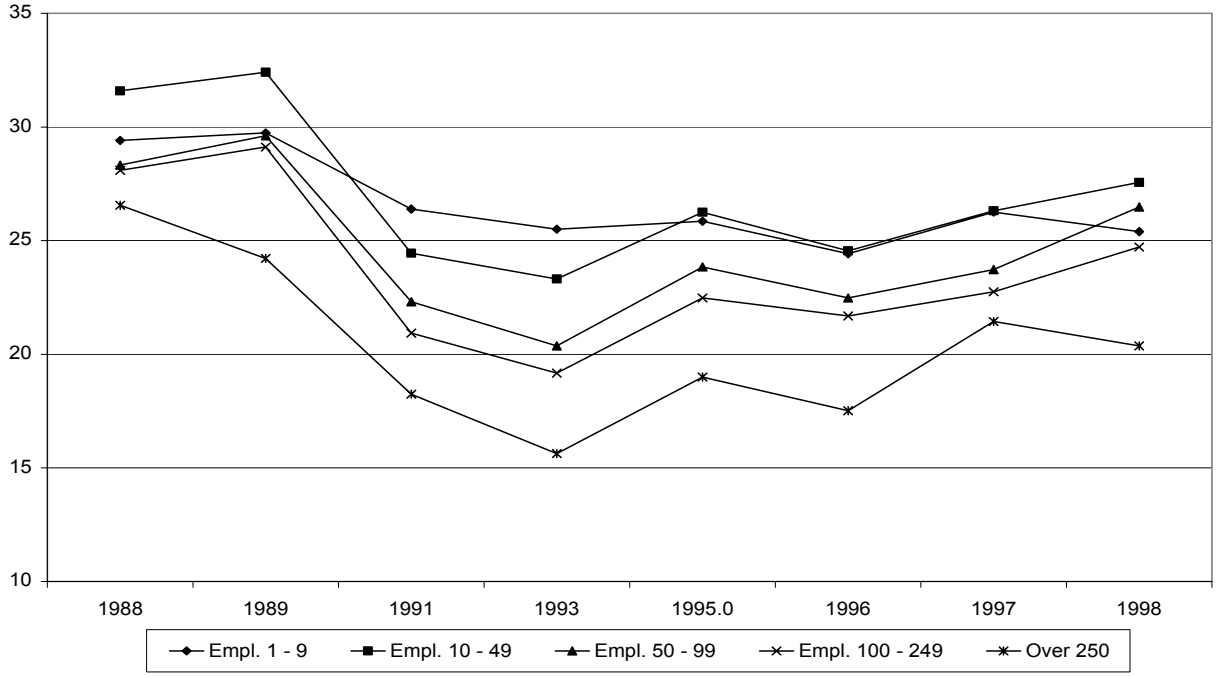

Figure 28: Job-to-job inflow mobility rates by establishment size in Sweden, 1988-98. Per cent.

3.5 Tendencies and trends in the Nordic mobility rates

Figure 9 through Figure 28 show varying levels in the mobility rates depending on country, sector, age and educational level of the worker, and the establishment size. The chosen inflow mobility rate definition also influences the conclusions, c.f. Figure 29 through Figure 36 in the Appendix and Graversen (2000). The chosen job-to-job mobility rates are lower than for example the overall mobility rates shown in the Appendix figures.

However, it is still possible to extract some very clear tendencies and trends based on the figures in Section 4. These conclusions or summaries are given in Table 2. There seem to be some stylised facts for the Nordic countries. The inflow job-to-job mobility rates fluctuate procyclically with the business cycle in the respective countries. Similarly, the theoretical expectations that mobility decreases with age and workplace size and increases with educational levels seem to be fulfilled. The sectoral differences are less clear.

Table 2: Trends in job-to-job inflow mobility rates by background characteristics for the Nordic countries. Based on an eye-view analysis of Figure 9 through Figure 28.

Background characteristics	Tendency and trend in the ordering and cyclicality
Sector	The sector effect is not clear. The HEI sector seems to have low mobility rates, the ICT sector seems to have high rates. In between it seems to matter for the mobility rates whether the sectors are shrinking (agriculture) or expanding (trade) The business cycle matters, most volatile for the youngsters, least volatile for the HEI and the ICT sectors
Age	The age effect is very dominating. The mobility rates decrease in all Nordic countries by age The business cycle matters for all age groups although apparently most volatile for the youngsters
Education	The educational effect is also clear. The mobility rates increase with higher educational level The business cycle matters for all groups although apparently most volatile for the low educated
Workplace size	The workplace size matters clearly. The mobility rates decrease the larger the workplace A business cycle effect is seen for all groups apparently most volatile for small workplaces

4 Evidence on cyclicality of mobility rates

Whether the mobility rates are procyclical or countercyclical is also interesting from a policy point of view. The possibility to select different policies for different groups at different times is highly recommended especially in the new knowledge economies. Several theoretical studies have tried to build a model for the connection between the business cycle and the mobility rates. Unfortunately, the models can predict procyclicality as well as countercyclicality depending on the chosen model. Hence, an empirical study in order to find stylised facts is needed to determine the dominating direction, which may change between subgroups, c.f. Graversen (2000).

In the report, we use two general measures as indicators for the business cycle, namely the inverse unemployment rate and the GDP real growth rate. The unemployment is high when the business cycle is low and vice versa so the inverse unemployment rate follows the business cycle directly. The GDP real growth rate indicates similarly the business cycle conditions each year. The correlation between these two measures and the mobility rates then determines whether the mobility is pro- or countercyclical in relation to the business cycle. In this section the correlation is found in two ways. First, a non-parametric correlation between the inflow job-to-job mobility rates and the national unemployment rate and GDP real growth rate respectively, c.f. Figure 3 through Figure 6. These results are shown in Table 3. Second, a parametric logistic model that allows a control for other background characteristics are used. The results are shown in Table 4.

The first part in Table 3 shows a consistent pro-cyclicality in the Nordic countries regarding the inflow as well as the outflow job-to-job mobility rates when the unemployment indicator is used. The cyclicality is most clear in the Finnish and Norwegian case. Unfortunately, the procyclicality is less clear when the correlation between the mobility rate and the GDP real growth rate is used. The outcomes go from clear procyclicality in Finland over weak procyclicality in Denmark to clear countercyclicality in Norway. However, in general, the procyclicality of the inflow job-to-job mobility rates must be said to dominate.

Table 3: Cyclicality of job-to-job mobility rates in the Nordic countries. Correlation coefficients in parentheses.[19]

Business cycle indicator	Worker inflow	Worker outflow
Unemployment rate		
Denmark	Procyclical (–0,27)	Procyclical (-0,27)
Finland	Procyclical (-0,86)	Procyclical (-0,66)
Iceland	-	-
Norway	Procyclical (-0,62)	Procyclical (-0,84)
Sweden	Procyclical (-0,32)	Procyclical (-0,59)
GDP real growth rate		
Denmark	Procyclical (0,01)	Procyclical (0,47)
Finland	Procyclical (0,50)	Procyclical (0,88)
Iceland	-	-
Norway	Countercyclical (-0,44)	Countercyclical (-0,19)
Sweden	Procyclical (0,64)	Procyclical (0,49)

Note: Table 5 in the Appendix shows similar correlation coefficients for several subgroups for Denmark.

[19] The Spearman rank correlation coefficient is used in this section since the non-parametric rank correlation best fit the conditions required for inference studies on the correlation between two measures with no clear distributional assumptions. However, due to the short time period of data, ten years, it is difficult to find significant rank correlations from the empirical data. A ten-percent significance level requires a correlation coefficient of at least 0,56.

4.1 Cyclicality evidence from a logistic probability model of mobility

Another way to determine whether the mobility rates are pro- or countercyclical is to estimate a logistic model on the mobility of employees. For simplicity, a model where the time series data are pooled is used in the report. This procedure sometimes gives too narrow confidence intervals for estimates. In our case, using large register databases, this should not be a major problem. The sign and significance of the coefficient for the unemployment variable or the GDP real growth variable determines the cyclicality trend. Table 4 shows the estimation results for the Nordic countries. The unemployment rate is used directly in the estimations. Hence, a negative parameter estimate to the unemployment variable indicates procyclicality. So does a positive parameter estimate to the GDP real growth rate. The parameter estimates for the background variables correspond very well to the pictures drawn in Figure 9 through Figure 28 in Section 4. Especially the age variables explain a large part of the mobility variation in Table 4. Generally, the ordering found in the Figures are revealed and quantified in the empirical model estimation.

The choice of explanatory variables is determined by a wish to create comparable and reliable variables that can be used in other countries using for example the LFS. A study of the specification choice is given for the Danish case in Table 6 in the Appendix.

4.1.1 Denmark

The procyclicality is confirmed in Table 4. Both indicators come out significant and reliable. The coefficient to the unemployment rate indicates that a 0,5 per cent decrease in the unemployment rate will increase the mobility rate with one per cent. A 2,1 per cent increase in the GDP real growth rate will give the same effect.

Table 6 in the Appendix refers some alternative specifications of the estimation model. The parameter estimates for the included variables in Table 4 seem to be very stable although especially the inclusion of married and cohabiting statuses lowers the educational parameters significantly. In Table 6, both low and medium educated employees have significantly lower mobility rates than high educated. This is not the case in Table 4. The inclusion of a few extra explanatory variables in Table 6 only increases the model fit marginally. Hence, the model specification in Table 4 is valid for an analysis of business cycle variations in mobility rates.

4.1.2 Finland

Also in the Finnish case, the procyclicality of the mobility rates are confirmed no matter which of the two indicators is used. The coefficients indicate that a 2,9 per cent decrease in the unemployment rate or a 2,1 per cent increase in the GDP real growth rate will increase the mobility rate by one per cent. The coefficients for the other background variables confirm the findings in Table 2.

4.1.3 Norway

The coefficients for the business cycle indicators reveal the same as in Table 3, namely procyclicality when the unemployment rate is used and countercyclicality when the GDP real

growth rate is used. Moreover, the parameter estimates are very high indicating that the mobility rates will increase by approximately 20 or 5 per cent when the unemployment or GDP indicator decreases one per cent respectively. Hence, the estimation results in Table 4 indicate large reactions in mixed directions in the Norwegian case.

4.1.4 Sweden

Also in the Swedish case, the model estimates procyclicality when the unemployment rate is used and countercyclicality when the GDP real growth rate is used. Again, the parameter estimates are very high indicating that the mobility rates will increase by approximately 14 or 6 percent when the unemployment or GDP indicator decreases one percent respectively. Hence, the estimation results in Table 4 indicate large cyclicality reactions in mixed directions.

4.1.5 General tendencies

The general tendency is that the male mobility rate is equal to or higher than the female mobility rate, that the mobility rate is highest among the youngest, that the mobility rate increases with educational level and that the mobility rate decreases with workplace size. The sectoral differences are more mixed but seem to favour the HEI, ICT and service sectors and disfavour the production sector. Especially the age group variables explain a large fraction of the mobility rate variation. More than two thirds of the prediction power in Table 4 is derived from the age group variables.

Table 4: Logistic model of job-to-job inflow mobility of employees in the Nordic countries.

	Denmark		Finland		Norway		Sweden	
Constant	-1,545	-1,643	-1,165	-1,573	-0,807	-1,607	-0,781	-1,654
Unemployment rate	-0,005*		-0,029		-0,196		-0,136	
GDP real growth rate		0,021*		0,021		-0,045		-0,062
Gender								
Male	0,186*	0,185*	0,016	0,009	-0,007	-0,005	0,077	0,076
Age group								
20-24 years	1,184*	1,186*	0,904	0,934	1,102	1,095	1,138	1,131
25-29 years	0,668*	0,667*	0,532	0,546	0,678	0,678	0,634	0,631
30-34 years	0,320*	0,320*	0,244	0,244	0,333	0,335	0,337	0,338
45-54 years	-0,334*	-0,337*	-0,192	-0,218	-0,333	-0,321	-0,280	-0,279
55-64 years	-0,604*	-0,606*	-0,441	-0,451	-0,763	-0,756	-0,540	-0,537
65- years	-0,486*	-0,485*	-0,595	-0,600	-1,080	-1,093	-0,317	-0,318
Educational level								
Low	-0,040*	-0,039*	-0,295	-0,272	-0,066	-0,086	-0,285	-0,288
Medium	0,006*	0,006*	-0,172	-0,171	-0,243	-0,25	-0,192	-0,189
PhD	0,182*	0,175*	0,357	0,354	0,292	0,303	0,108	0,108
Sectoral group								
HEI and R&D	0,149*	0,149*	0,335	0,316	0,026	0,021	0,468	0,462
ICT	0,197*	0,200*	0,725	0,690	0,266	0,260	0,790	0,790
Trade, hotels etc.	0,159*	0,159*	0,407	0,394	0,196	0,194	0,509	0,505
Community services	0,243*	0,242*	0,392	0,372	0,207	0,209	0,600	0,594
Workplace size								
10-49 employees	-0,158*	-0,158*	-0,162	-0,175	-0,091	-0,089	-0,014	-0,014
50-99 employees	-0,219*	-0,220*	-0,174	-0,186	-0,156	-0,155	-0,109	-0,109
100-249 employees	-0,166*	-0,167*	-0,181	-0,190	-0,172	-0,172	-0,156	-0,156
250- employees	-0,279*	-0,277*	-0,283	-0,298	-0,311	-0,314	-0,346	-0,349
Share of correct prediction	0,639	0,639	0,622	0,616	0,548	0,550	0,531	0,531
Cyclicality	Pro	Pro	Pro	Pro	Pro	Counter	Pro	Counter
Mobile share	20,7		17,7		14,4		18,0	
Observations per year	2.062.643		17.811.225		16.536.522		14.475.622	
Number of years	10		11		11		4	

Note: The cyclicality trend is measured by unemployment rate or the GDP real growth rate. * means significance at least at a 1 per cent level. No * are given for Finland, Norway and Sweden since the sample equals the population. The reference individual (or excluded categories) is a woman, aged 35-44, high educated, and employed in the manufacturing etc. sector at a workplace with 1-9 employees.

5 Conclusion

The present report gives trends and illustrates differences in the inflow job-to-job mobility rates for the Nordic countries. The mobility rates are based on the unique linked employee employer register data available in these countries. Although other ways of knowledge exchange exist, the mobility of employees between establishments is viewed as a vital knowledge carrier in the economy. Hence, a benchmark and explanation of the optimal mobility rate that secures economic growth is the aim of the report. At the same time, the report illustrates that such a benchmark highly depends on the business cycle, i.e. economic conditions, and the group of employees or firms under consideration. Several supply and demand characteristics such as employee age, employee education, and establishment size influence the inflow job-to-job mobility rates to the establishments.

The comparison of the Nordic countries confirms a long list of similarities. Although the levels differ between the countries, tendencies are equal and similar. The Nordic countries seem all to have had the deepest recession around 1993, where the mobility rates also was lowest. Hence, in general a procyclicality in the inflow job-to-job mobility rate was found. Among the common results was also that the mobility rate decreases with age, increases with formal education and decreases with establishment size. The research sectors and the Information and Communication Technology sectors have high inflow mobility rates among the young but low rates among the elders especially in the research sector (which includes universities).

The report reveals that the knowledge flows in the Nordic countries are of a remarkable size and that there are only few signs of binding rigidities in the labour markets. From an innovative point of view it is worrying that the Higher Education Institutions sector has such a low inflow mobility rate among the elders but it is partly caused by the job structures at these institutions. From the knowledge transfer point of view it is important to notice that the knowledge embodied in the employees changing jobs vary considerably. Hence, high mobility rates in the economy do not necessarily imply high knowledge transfers. A decomposition of the mobility rates by background variables is necessary before such equality can be confirmed.

Longer time series of data will naturally improve and validate the conclusions drawn in the present report. Ten years of data is not a long period for analyses of business cycle influences and mobility rate stability over time. This is, however, a project for future research when longer series of data become more easily available.

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Appendix

A.1 Overall inflow mobility rates by age group and sector for the Nordic countries

A.1.1 Denmark

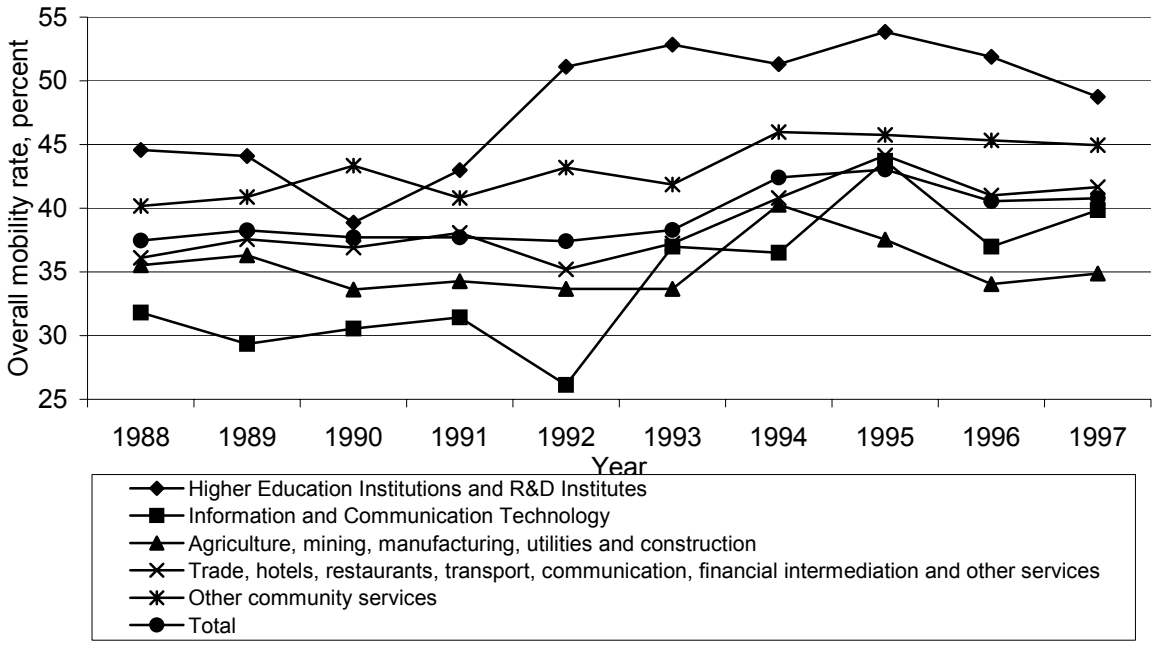

Figure 29: Overall inflow mobility rates by sector for 20-34 year olds in Denmark, 1988-97. Per cent.

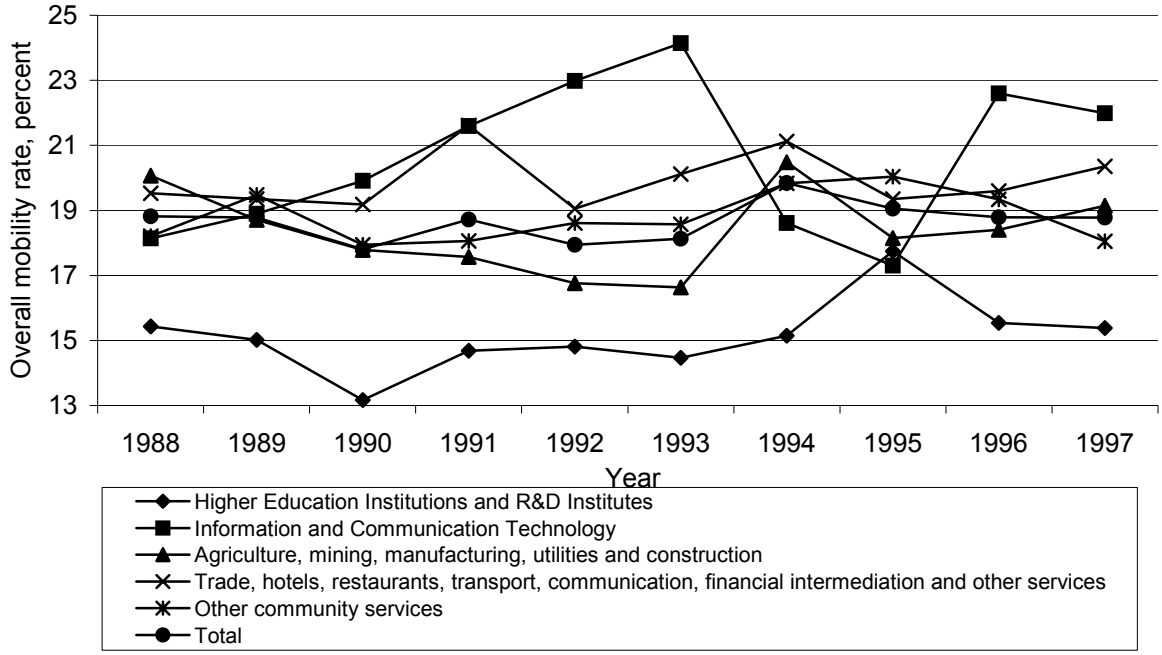

Figure 30: Overall inflow mobility rates by sector for 35-64 year olds in Denmark, 1988-97. Per cent.

A.1.2 Finland

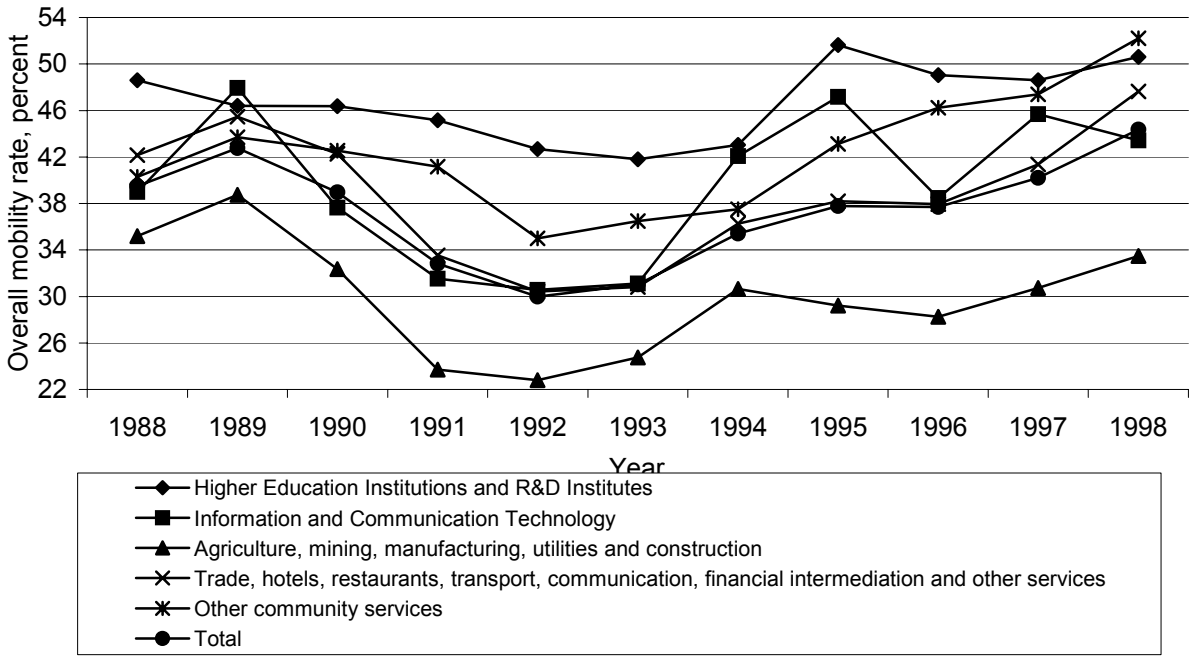

Figure 31: Overall inflow mobility rates by sector for 20-34 year olds in Finland, 1988-98. Per cent.

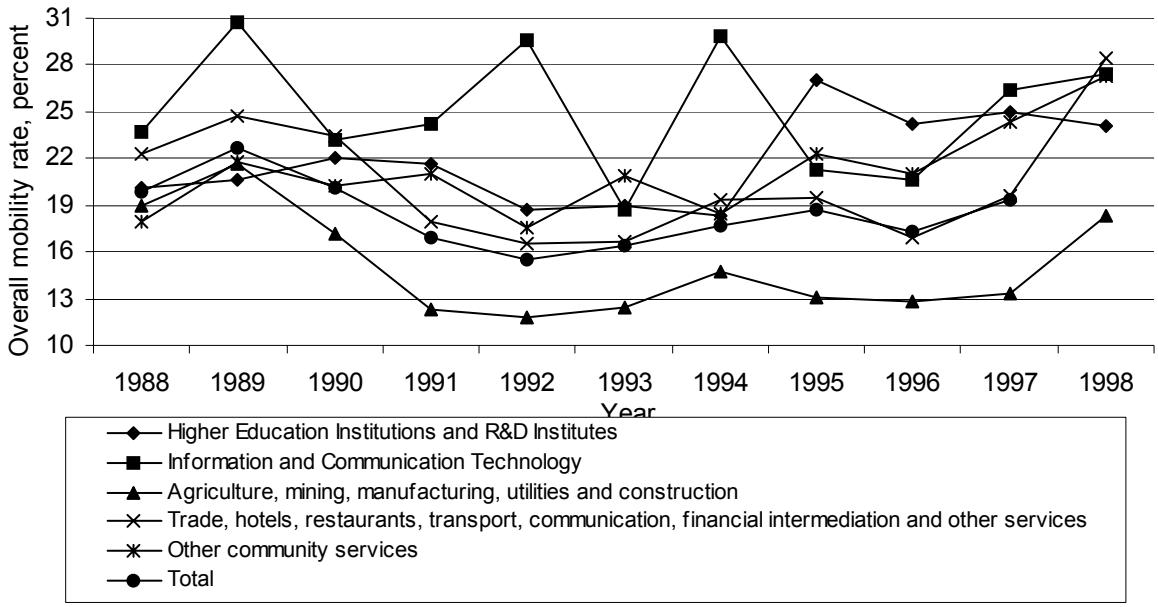

Figure 32:Overall inflow mobility rates by sector for 35-64 year olds in Finland, 1988-98. Per cent.

A.1.3 Norway

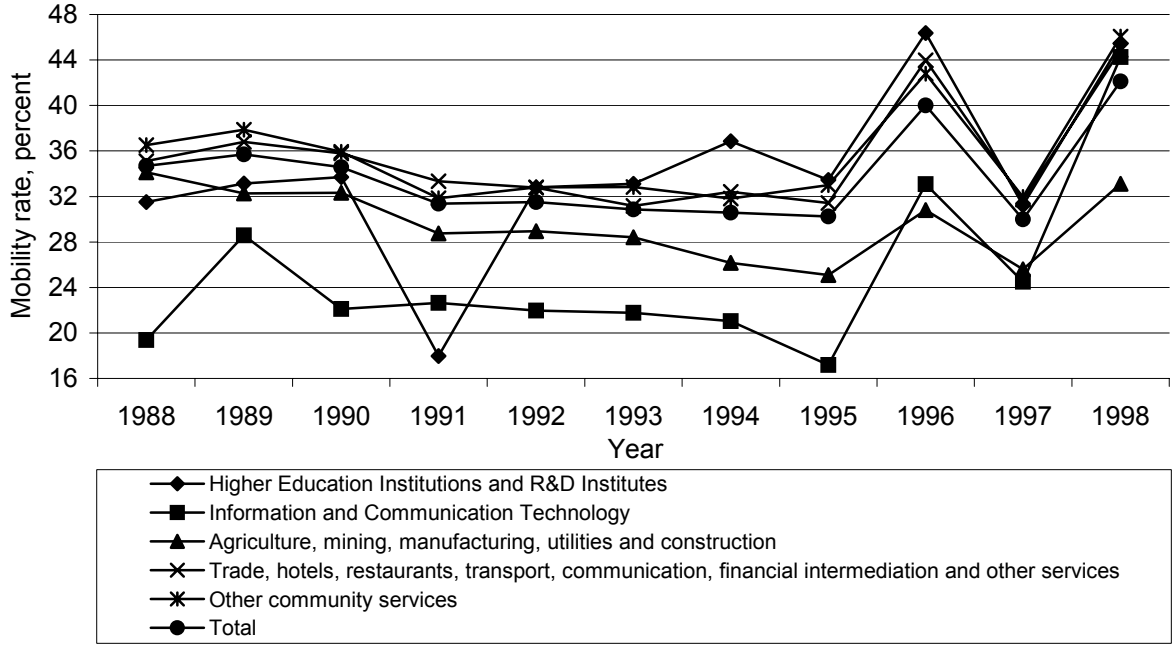

Figure 33: Overall inflow mobility rates by sector for 20-34 year olds in Norway, 1988-98. Per cent.

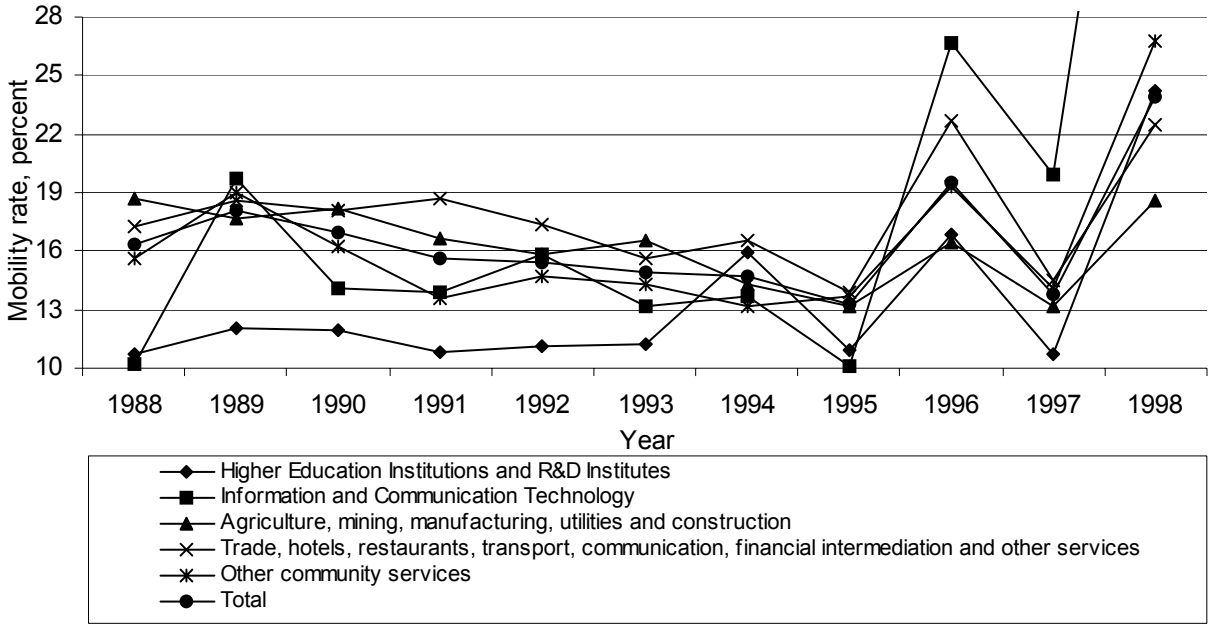

Figure 34: Overall inflow mobility rates by sector for 35-64 year olds in Norway, 1988-98. Per cent.

A.1.4 Sweden

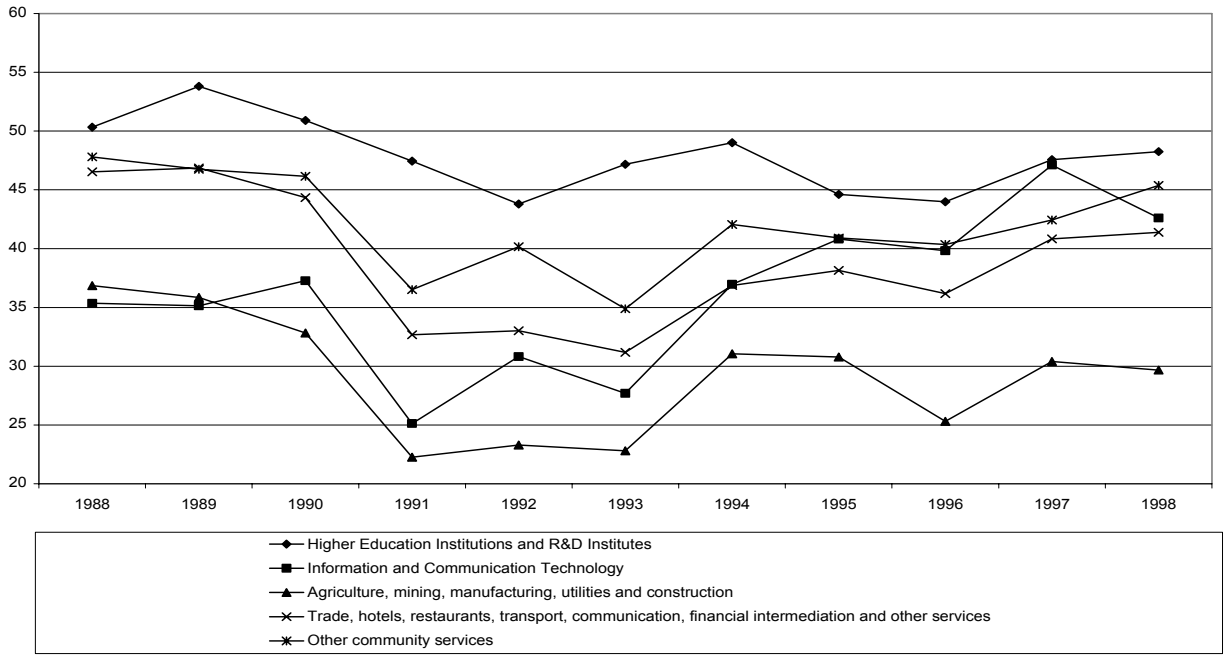

Figure 35: Overall inflow mobility rates by sector for 20-34 year olds in Sweden, 1988-98. Per cent.

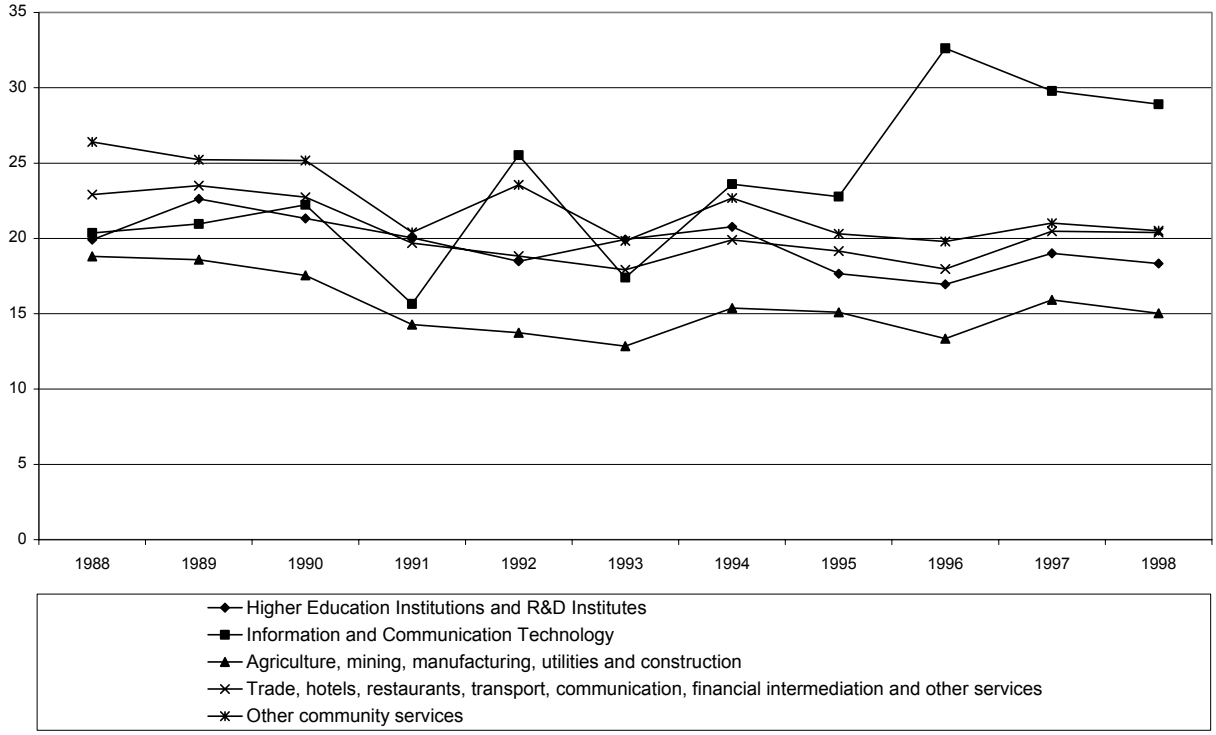

Figure 36: Overall inflow mobility rates by sector for 35-64 year olds in Sweden, 1988-98. Per cent.

A.2Case study Denmark

A.2.1 Cyclicality evidence decomposed by various characteristics

Table 5: Cyclicality of job-to-job mobility rates in Denmark distributed by various characteristics. (Spearman rank correlation coefficients between inverse unemployment rate and mobility rate in parenthesis.)

Group characteristics	Worker inflow (hires)	Worker outflow (separations)
5 sectors by age groups – Job-to-job mobility		
Age 20-34		
Higher Education Institutions and R&D Institutes	Pro (0,41)	Pro 0,10)
Information and Communication Technology	Counter (-0,21)	Counter (-0,30)
Agriculture, mining, manufacturing, utilities and construction	Pro (0,38)	Counter (-0,13)
Trade, hotels, restaurants, transport, financial intermediation, other services	Pro (0,75)	Pro (0,26)
Other community services	Pro (0,27)	Pro (0,01)
Total	**Pro (0,66)**	**Pro (0,25)**
Age 35-64		
Higher Education Institutions and R&D Institutes	Counter (-0,18)	Counter (-0,02)
Information and Communication Technology	Counter (-0,50)	Counter (-0,05)
Agriculture, mining, manufacturing, utilities and construction	Pro (0,76)	Pro (0,02)
Trade, hotels, restaurants, transport, financial intermediation, other services	Counter (-0,41)	Pro (0,39)
Other community services	Counter (-0,72)	Pro (0,39)
Total	**Counter (-0,20)**	**Pro (0,28)**
Age and education groups – Job-to-job mobility		
Age 20-34		
High educated	Pro (0,21)	Counter (-0,28)
Low educated	Pro (0,66)	Pro (0,26)
Age 35-64		
High educated	Counter (-0,61)	Counter (-0,16)
Low educated	Pro (0,03)	Pro (0,39)
Total	**Pro (0,30)**	**Pro (0,31)**
Educational level – Job-to-job mobility		
ISCED 1-2	Pro (0,04)	Pro (0,32)
ISCED 3-4	Pro (0,35)	Pro (0,33)
ISCED 5	Counter (-0,18)	Counter (-0,27)
ISCED 6	Pro (0,61)	Pro (0,37)
Total	**Pro (0,27)**	**Pro (0,27)**
Establishment size – Job-to-job mobility		
1-9 employees	Pro (0,58)	Pro (0,25)
10-49 employees	Pro (0,62)	Pro (0,36)
50-99 employees	Pro (0,35)	Pro (0,10)
100-249 employees	Pro (0,01)	Pro (0,19)
More than 250 employees	Counter (-0,12)	Pro (0,27)
Total	**Pro (0,27)**	**Pro (0,27)**
5 sectors by age groups - Overall mobility		
Age 20-34		
Higher Education Institutions and R&D Institutes	Counter (-0,32)	Counter (-0,33)
Information and Communication Technology	Pro (0,20)	Pro (0,01)
Agriculture, mining, manufacturing, utilities and construction	Pro (0,13)	Counter (-0,53)
Trade, hotels, restaurants, transport, financial intermediation, other services	Pro (0,21)	Pro (0,12)
Other community services	Counter (-0,13)	Counter (-0,04)
Total	**Counter (-0,01)**	**Counter (-0,28)**
Age 35-64		
Higher Education Institutions and R&D Institutes	Pro (0,49)	Counter (-0,43)
Information and Communication Technology	Counter (-0,25)	Pro (0,05)
Agriculture, mining, manufacturing, utilities and construction	Pro (0,53)	Counter (-0,26)
Trade, hotels, restaurants, transport, financial intermediation, other services	Counter (-0,08)	Counter (-0,15)
Other community services	Counter (-0,31)	Pro (0,01)
Total	**Pro (0,20)**	**Counter (-0,47)**

The figures in Table 5 indicate a general procyclicality in the job-to-job inflow mobility rates as mentioned in Table 3. However, subgroups such as the ICT sector employees, age group 35-64, and high educated employees show a countercyclicality pattern so certain subgroups show the opposite behaviour compared to the average country measure on mobility. Hence, the cyclicality of mobility rates heavily depends on characteristics of the employees and employers in the labour market where the employees work.

A.2.2 Sensitivity analysis of model specifications for the logistic mobility model

Table 6: Job-to-job inflow mobility of employees in Denmark. Cyclicality trend measured by unemployment rate and GDP real growth rate. Selected specifications.

Explanatory variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Unemployment rate	-0,006			-0,008		
GDP real growth rate		0,021			0,022	
Constant	-1,235	-1,338	-1,351	2,041	1,932	1,915
Gender						
Female	-	-	-	-	-	-
Male	0,172	0,171	0,171	0,171	0,170	0,171
Marital status						
Single	-	-	-	-	-	-
Married	-0,228	-0,226	-0,227	-0,190	-0,188	-0,189
Cohabiting	-0,110	-0,111	-0,111	-0,102	-0,102	-0,102
Age group						
20-24 years	1,087	1,090	1,088			
25-29 years	0,615	0,615	0,616			
30-34 years	0,304	0,304	0,304			
35-44 years	-	-	-			
45-54 years	-0,321	-0,324	-0,322			
55-64 years	-0,595	-0,597	-0,596			
65- years	-0,507	-0,505	-0,507			
Age				-0,123	-0,124	-0,124
Age2				0,001	0,001	0,001
Educational level						
Low	-0,154	-0,155	-0,158	-0,150	-0,151	-0,153
Medium	-0,153	-0,155	-0,155	-0,164	-0,166	-0,166
High	-	-	-	-	-	-
PhD's	0,111	0,104	0,108	0,107	0,100	0,103
Sectoral group						
HEI and R&D	0,075	0,074	0,073	0,092	0,091	0,091
ICT	0,180	0,183	0,182	0,178	0,181	0,180
Manufacturing etc.	-	-	-	-	-	-
Trade, hotels etc.	0,150	0,150	0,150	0,155	0,155	0,155
Community services	0,222	0,222	0,222	0,232	0,231	0,232
Workplace size						
1-9 employees	-	-	-	-	-	-
10-49 employees	-0,159	-0,160	-0,160	-0,159	-0,160	-0,160
50-99 employees	-0,227	-0,227	-0,227	-0,224	-0,224	-0,224
100-249 employees	-0,174	-0,178	-0,175	-0,168	-0,170	-0,169
250- employees	-0,296	-0,294	-0,296	-0,293	-0,291	-0,292
Year dummies	No	No	Yes	No	No	Yes
Share of correct predictions	0,643	0,643	0,643	0,648	0,648	0,648
Cyclicality	Pro	Pro		Pro	Pro	

Note: All parameters are significant at least at a 1 per cent level. The reference individual (or excluded categories) marked with '–' in the table is a single woman, (aged 35-44, not in model 4-6) high educated, and employed in the manufacturing etc. sector at a workplace with 1-9 employees. The estimations are based on 20.626.428 observations in a pooled data set covering ten years.

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STEP-gruppen ble etablert i 1991 for å forsyne beslutningstakere med forskning knyttet til alle sider ved innovasjon og teknologisk endring, med særlig vekt på forholdet mellom innovasjon, økonomisk vekst og de samfunnsmessige omgivelser. Basis for gruppens arbeid er erkjennelsen av at utviklingen innen vitenskap og teknologi er fundamental for økonomisk vekst. Det gjenstår likevel mange uløste problemer omkring hvordan prosessen med vitenskapelig og teknologisk endring forløper, og hvordan denne prosessen får samfunnsmessige og økonomiske konsekvenser. Forståelse av denne prosessen er av stor betydning for utformingen og iverksettelsen av forsknings-, teknologi- og innovasjonspolitikken. Forskningen i STEP-gruppen er derfor sentrert omkring historiske, økonomiske, sosiologiske og organisatoriske spørsmål som er relevante for de brede feltene innovasjonspolitikk og økonomisk vekst. Fra 1. januar 2003 er STEP – Senter for innovasjonsforskning en del av SINTEF Teknologiledelse.

The STEP-group was established in 1991 to support policy-makers with research on all aspects of innovation and technological change, with particular emphasis on the relationships between innovation, economic growth and the social context. The basis of the group's work is the recognition that science, technology and innovation are fundamental to economic growth; yet there remain many unresolved problems about how the processes of scientific and technological change actually occur, and about how they have social and economic impacts. Resolving such problems is central to the formation and implementation of science, technology and innovation policy. The research of the STEP group centres on historical, economic, social and organisational issues relevant for broad fields of innovation policy and economic growth. As of January 1st 2003, STEP – Centre for Innovation Research is part of SINTEF Industrial Management.