Flows of Human Capital
in the Nordic Countries

Project report 1 (STEP Report 10-2003):

**Migration between the Nordic countries:
What do register data tell us about the
knowledge flows?**

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**Migration between the Nordic countries:
What do register data tell us about the knowledge flows?**

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ABSTRACT

The report gives detailed annual statistics of Nordic migration between Denmark, Finland, Norway and Sweden for the period 1988-1998. Some data for Iceland and the Faroe Islands are also included. National register data combining information on individual migration events of persons make up the bulk of the data. The report deals extensively with migration rates, returning rates and staying rates. These are then broken down over a number of personal indicators (age, education etc.) and activity indicators (employment, economic sector etc.). Challenges in dealing with different national data sources are discussed in detail.

These statistics are of interest because migration between the Nordic countries also implies diffusion of knowledge, either as brain drain or as circulation of knowledge. Increased international labour mobility will increase the importance of understanding these mechanisms. Data on education for migrants are not readily available and this currently hampers a full understanding.

These first comprehensive detailed statistics of the flow of human capital between the Nordic countries are the output of a Nordic project which is also dealing with the human capital aspect of job-to-job mobility in the Nordic countries and researcher mobility in particular. 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".

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[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. Research assistant Kenny Friis-Jensen has performed valuable research assistance in the preparation of the present 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.

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[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.

The present report, 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.

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

Mobility of persons across national borders has for long been a high priority research area. A long discussion of the net value of migration has dominated the agenda. Theoretically, there is no clear conclusion on the optimal amount of migration if any. Several studies have tried empirically to validate or calculate the effects of knowledge mobility and knowledge diffusion. The dominating conclusions are that circulation of knowledge embedded in people increases the economic performance, nationally and internally in firms. However, only a few of these studies concern the movements of individuals between countries. Naturally, a continuous net outflow of highly educated innovative individuals reduces a country's long run ability. Beside the immediate costs of educating the persons there is also the future social cost of not having the individuals' contribution to GDP. Similarly, an opposite flow may benefit a country in the long run. These situations can be characterised as lose-win and win-lose situations, where one country gains and another loses.

But, just as in the case of national mobility where individuals may move forth and back increasing the knowledge base both places, the international mobility of individuals may also be a win-win situation. This happens if an individual emigrates and later returns with a greater knowledge stock, experience stock or contact network that can increase the national innovation ability and economic performance. At the same time, the receiving country may get a benefit in the period before the individual returns or moves to a third country. The benefit may for example be the knowledge, network contacts, or other kinds of expertise brought along by the individual. Hence, also the receiving country gains knowledge.

The general difference between the win-lose (knowledge gain), lose-win (knowledge drain) and the win-win situations seems to lie in the distinction between knowledge flows and knowledge circulation. The flow is primarily a one-way movement, as opposed to circulation. This also means that a snapshot of individuals moving across borders is a static picture that has limited information value. Instead, data on returning rates, increase in knowledge, job experience, formal education, family restrictions etc. all would contribute to a clearer picture of what the win-win situation actually consists of. Similarly, the share of migrants with national citizenship[4] may influence this conclusion if they have the highest returning rates among emigrants and the lowest among immigrants, cf. Figure 3 to Figure 9 in Section 6.

The aim of this study is to improve the understanding of the characteristics of Nordic migration, i.e. whether the migration between the Nordic countries is a win-win situation and what the characteristics of the migrants are. Through a comparison of the information collected in national register databases available in several Nordic countries a more detailed empirical picture can be drawn. Hence, an attempt to make an account of the knowledge drain, knowledge gain and knowledge circulation can be achieved with these data through a description of what individuals are doing before emigration according to the sending country's register data and what individuals are doing after immigration according to the receiving country's register data. Although it is currently impossible to follow the single individuals across borders, this linkage through pseudo-individuals is a unique possibility with the register data in the Nordic countries.[5]

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[4] National citizenship is defined as the citizenship of the country in question. For example, when we speak of immigration to Denmark or emigration from Denmark, migrants have national citizenship if they are Danish. Available data do not contain information on citizenship but country of birth, which we use as a proxy for citizenship.
[5] A pseudo-individual is a person type with characteristics that are common in the registers in both the sending and receiving country. These characteristics can be age, gender, education etc.

In the National Innovation Systems of the Nordic countries there are so many structural similarities that they may be characterised as one common NIS area. The Nordic countries have had a common labour market with free mobility of labour for several decades, cf. Pedersen (1996). Historically, the countries have in past centuries been ruled by each other, with Denmark as the largest conqueror. Today, the Nordic Council - in close co-operation with the national governments - co-ordinate co-operation between the Nordic countries. Finland has only recently joined the practical co-operation of the free labour mobility some decades ago. The countries also have languages that are understandable across borders (except Finnish)[6] similar to the German speaking area of Germany, Switzerland and Austria.

The similarities and the ease of mobility between the Nordic countries make them an economically integrated region, which approximately can be compared to for example the Bundesländer in Germany or the States in the US. Similarly, the economic development has been highly correlated in the Nordic countries, so differences in business cycles have been present but small in size. Migration between the Nordic countries may, therefore, not be directly comparable with migration in general between developed and less developed regions like between EU and Africa among others.

Usually, register data can give a full and detailed description of the emigrants with a national citizenship when they leave the country. However, emigrants with any other citizenship usually do not have a full track record in the registers if they for example immigrated to the country a few years earlier. In such a case, the registers would only contain information on these few years and not items as for example educational levels, skills, and work careers prior to immigration. In general the registers will not contain this information for immigrants.[7] Similarly, for national citizens returning to a country, only the information at the time when they emigrated is available. This information might be outdated, i.e. biased downward if they have increased their educational level, but this is not possible to detect in the register databases. However, the use of information from the register databases in all the Nordic countries can give an aggregated answer to the non-available information mentioned above.[8]

With these warnings in mind, the registers can give information on the persons leaving a country and their status at the time of emigration. Combining the information from the register data in two countries, information can be retrieved on the knowledge stock and previous career for immigrants from one country as well as the added knowledge stock and career track for the persons returning or emigrating to that country. In particular, the combination of information from register data in two countries can determine the added knowledge obtained by returning persons, i.e. the knowledge gain of return migration and the increase in the knowledge stock obtained through knowledge circulation.

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[6] A very large fraction of the Finns speak and write Swedish.

[7] The data collected among immigrants only covers information such as age, gender and family status.

[8] It is theoretically possible to merge the registers across countries but data confidentiality rules in the countries prohibit this at the moment. Personal identification numbers in the Nordic countries are not systematically matched. Hence, the story has to be put together as one story told by pieces from two sides, the sending and the receiving country.

2 Definition of migration and other concepts used in this study

The Nordic countries have different rules for registration of migration. Basically, a movement from one country to another is required. However, the period of <u>intended stay</u> in another country before a migration is recorded in the statistical registers differs between the countries. In Denmark and Norway migrants are registered if their intended stay is 6 months or more. In Sweden, Iceland and Finland the intended stay has to be 12 months before it is registered, cf. Grundström (1993). The UN recommends 12 months of intended stay as a common definition of migration.

These differences in the definition of migration will result in relatively higher numbers of migrations recorded in Denmark and Norway compared to the other Nordic countries. Grundström (1993) suggests limiting the migration figures to individuals who actually stay more than 12 months in the receiving country. Using register data from 1989, he makes the migration figures comparable between the Nordic countries and finds that the Danish figures overestimate the 12-month figures for migration by approximately 40 per cent. The corresponding bias is close to 10 per cent for the other Nordic countries. Looking at net migration, the Danish official figures are 30 per cent too high, the Norwegian 60 per cent too high, the Finnish 15 per cent too high and the Swedish 7 per cent too high.

In order to secure comparable statistics on migration, the migration measure need to be defined as a 12-month de facto stay in the country. No matter whether the period of interest covers time before or after 1991, 12 months de facto stay is the best statistical measure to use[9]. The same measure can also be used for migration statistics between the Nordic countries and the rest of the world in order to extend the present analysis with comparable studies. The fact that the register data in the Nordic countries are reported on an annual basis also supports the use of a 12-month rule. Similarly, most countries report migration figures annually. Hence, all figures based on register data and reported in the present analysis are based on year-to-year comparisons. Migration requires that the person leaves or comes into the resident population of a country from one year to the next.

In the present study we define Nordic migration as being migration between two Nordic countries, regardless of the citizenship of the migrants, which could be non-Nordic. Hence, Nordic immigration is defined as immigration from another Nordic country and Nordic emigration as emigration to another Nordic country. We are primarily concerned with Nordic citizens, however, which we occasionally split into national citizens, i.e. citizens of the country in question, usually the country that holds the register data being analysed, and other Nordic, or non-national Nordic citizens, often simply called Nordic for short in tables etc. Foreign citizens, on the other hand, may also include non-Nordic citizens, who, of course, also may migrate between Nordic countries. To the extent possible we have limited the analysis to Nordic citizens. Similarly, when dealing with persons who emigrate and later return to the country from which they first emigrated – which may or may not be the country of their citizenship – we are not necessarily implying that they have stayed in only one country throughout their time away. Finally, when dealing with immigrants returning, they may actually return to another country than the one from which they originally emigrated.

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[9] Grundström (1993) states that the UN recommends the following definitions of immigration: Long-term immigrants: more than 12 months. Short-term immigrants: less than or equal to 12 months.

3   Aggregated migration figures

The total number of persons moving between the Nordic countries is given in the Nordic Statistical Yearbook. Table 1 gives the figures for selected years in the 1990s. The data reflect variations in the national definitions as described above.

Table 1: Registered migrants between the Nordic countries for selected years 1990-98. Absolute numbers (per cent share of total country-specific migration in parentheses).

Receiving country	Immigration year						
	1990	1992	1993	1995	1996	1997	1998
Denmark	12.182 (30)	10.441 (24)	10.658 (25)	12.245 (19)	12.041 (22)	11.504 (23)	11.351 (22)
Greenland	2.398 (96)	. (.)	2.047 (95)	2.182 (96)	2.378 (96)	2.518 (96)	2.349 (96)
Finland	6.571 (48)	3.723 (26)	3.300 (22)	3.895 (32)	4.286 (32)	4.041 (30)	4.523 (32)
Iceland	1.958 (61)	1.893 (63)	1.680 (62)	1.769 (61)	2.261 (61)	2.396 (60)	2.616 (57)
Norway	8.028 (31)	7.497 (28)	7.713 (24)	7.850 (31)	8.635 (33)	11.774 (37)	. (.)
Sweden	18.094 (30)	7.998 (18)	7.150 (12)	8.760 (19)	8.082 (20)	8.113 (18)	9.854 (20)
All Nordic countries	49.231 (35)	31.552 (24)	32.548 (22)	36.701 (25)	37.683 (28)	40.346 (29)	30.693 (27)
Delivering country	**Emigration year**						
	1990	1992	1993	1995	1996	1997	1998
Denmark	10.287 (32)	7.900 (25)	7.613 (24)	9.122 (26)	9.735 (26)	9.707 (25)	10.808 (27)
Greenland	3.687 (99)	. (.)	2.585 (99)	2.663 (99)	2.853 (99)	2.943 (99)	2.907 (99)
Finland	4.464 (69)	3.491 (58)	3.424 (54)	4.041 (45)	4.010 (38)	4.575 (47)	5.150 (48)
Iceland	2.688 (70)	1.621 (51)	1.808 (62)	3.185 (74)	3.079 (75)	2.731 (70)	2.637 (72)
Norway	11.221 (47)	5.394 (32)	4.876 (26)	6.362 (33)	6.210 (30)	6.750 (32)	. (.)
Sweden	15.255 (61)	11.738 (46)	10.975 (37)	11.020 (32)	12.074 (36)	13.965 (36)	14.242 (37)
All Nordic countries	47.602 (52)	30.144 (36)	31.281 (36)	36.393 (37)	37.961 (37)	40.671 (37)	35.744 (39)

Note: Includes all persons moving, regardless of age.
Source: Nordic Statistical Yearbook, 1999.

With few exceptions, large countries rely less on Nordic migration than smaller ones. A large fraction of the persons moving come back a few years later, i.e. return migration, cf. Pedersen (1996) and Section 6.

The difference between the total number of immigrants and emigrants between the Nordic countries in Table 1 also shows that some of the persons are missing either in the immigration account or in the emigration account. Theoretically, the total should be equal but in practice differences up to 1.600 persons per year are found in Table 1[10]. There also seems to be some correlation between the migration numbers and the national business cycle measured by for example the unemployment rate.

The citizenship of immigrants and emigrants is of particular interest. Nordic Statistical Yearbook 1999 shows that more than 50 per cent of all emigrants have a national citizenship. Whether and when they return and what they do while abroad is the key element in the present analysis.

Nordic Statistical Yearbook 1999 also illustrates the distribution of immigrants and emigrants by country for 1998. The figures are referred in Table 2.

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[10] The difference appears to be over 5.000 in 1998. However, Norwegian data are not available for this year, and because net Nordic migration to Norway is large, the real difference should not be very different from other years.

Table 2: Immigration and emigration between the Nordic countries by country, 1998. Absolute numbers (column percentages in parentheses).

Delivering country	Immigration country (measured by receiving country)					
	Denmark	Greenland	Finland	Iceland	Norway	Sweden
Denmark	4.272 (38)	2.183 (93)	342 (8)	1.418 (54)	2.782 (24)	1.927 (20)
Finland	416 (4)	4 (0)	. (.)	58 (2)	1.012 (9)	3.288 (33)
Iceland	1.241 (11)	89 (4)	50 (1)	. (.)	782 (7)	346 (4)
Norway	2.852 (25)	45 (2)	613 (14)	554 (21)	. (.)	4.293 (44)
Sweden	2.570 (23)	28 (1)	3.518 (78)	586 (22)	7.198 (61)	. (.)
All Nordic countries	11.351 (100)	2.349 (100)	4.523 (100)	2.616 (100)	11.774 (100)	9.854 (100)
Receiving country	**Emigration country (measured by delivering country)**					
	Denmark	Greenland	Finland	Iceland	Norway	Sweden
Denmark	3.907 (36)	2.813 (97)	395 (8)	1.301 (49)	2.932 (43)	2.445 (17)
Finland	377 (3)	31 (1)	. (.)	57 (2)	353 (5)	3.472 (24)
Iceland	1.359 (13)	60 (2)	53 (1)	. (.)	408 (6)	560 (4)
Norway	3.117 (29)	18 (1)	1.366 (27)	927 (35)	. (.)	7.765 (55)
Sweden	2.048 (19)	13 (0)	3.336 (65)	352 (13)	3.057 (45)	. (.)
All Nordic countries	10.808 (100)	2.907 (100)	5.150 (100)	2.637 (100)	6.750 (100)	14.242 (100)

Notes: Includes all persons moving, regardless of age. Norway - 1997.
Source: Nordic Statistical Yearbook, 1999.

The non-zero figure of migration between Denmark and Denmark within one year reflects how the Danish migration statistics are defined, as distinct from the other countries. This figure may arise for persons who emigrate and return within the same calendar year. In the other countries, such short time moves would usually not be recorded because an intended stay of at least 12 months would be required to be put on record.

The tables also illustrate that the major mobility patterns across borders are either historically determined, i.e. Iceland and Greenland versus Denmark, or related to short distances, i.e. between neighbouring countries, in combination with business cycle variations, i.e. Finland versus Sweden and Norway versus Sweden.

4 Information on migrants from national register data

A first item to analyse is whether the figures of migration match between the countries when the registers are used for the Nordic countries. Such a quality check validates the results presented later in the report. First, the stock is persons aged 20 to 70 years old. Second, only year-to-year movements count, i.e. the definition recommended by UN is used. Hence, the figures do not and are not intended to equal the absolute figures found in Table 1 and Table 2 although the distributions in per cent are expected to be similar.

Consider the following example. In the Danish register, 182 persons are emigrating to Finland in 1995, 229 are immigrating from Finland. The corresponding figures in Finland, which ideally should mirror the Danish, are 229 and 259 respectively. Hence, the number of 229 persons emigrating from Finland is the same as recorded as immigrating in Denmark. Unfortunately, the number of 182 emigrating from Denmark does not correspond to the 259 immigrating in Finland. Overall, the figures based on legal registrations do not match exactly and the figures do not reveal whether the persons summing to the totals are the same persons on each side of the borders. Hence, the actual figures might be larger than those revealed although they seem to be fairly accurate since there only are few people missing, i.e. disappearing, in the registers.

As a consequence, whether the net migration is positive or negative is difficult to determine. However, there is such a high agreement in the figures that this can be ascertained with some caution. A more serious problem is the difference between immigration and emigration figures that theoretically should measure the same individuals. Hence, exact numbers may be somewhat misleading. Looking instead at the broader lines in the figures, the migration numbers do lie close to each other. So, with some caveats, the highest number of the two must describe reality best since the probability for too few registrations considerably exceeds the probability for too many registrations. Both migration measures are conservative in the sense that they are probably both measuring too few movements compared to reality. Some persons move without registering their move even though it is mandatory according to the national laws. Only in the cases where the individuals are employed or in connection with the social and educational systems abroad, will they need affirmative registration.

Another deficiency in the register data concerns formal education as Table 3 and Table 4 show.

Table 3: Nordic immigration by educational level and citizenship to selected Nordic countries, 1995. Absolute numbers (column percentages in parentheses).

Receiving country and educational level	Citizenship					
	Danish	Finnish	Icelandic	Norwegian	Swedish	Other Nordic
Denmark						
PhD	2 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
Master and Bachelor	393 (20)	3 (1)	40 (4)	20 (2)	5 (0)	3 (4)
ISCED97 3+4	1.076 (54)	1 (0)	69 (7)	51 (6)	26 (4)	3 (4)
ISCED97 1+2	333 (17)	2 (1)	9 (1)	10 (1)	19 (3)	2 (3)
No information	204 (10)	211 (97)	879 (88)	804 (91)	675 (93)	68 (88)
Total	2.008 (100)	217 (100)	997 (100)	885 (100)	725 (100)	77 (100)
Finland						
PhD	1 (3)	32 (1)	0 (0)	0 (0)	2 (1)	0 (0)
Master	1 (3)	182 (8)	0 (0)	3 (10)	12 (3)	2 (8)
Bachelor	0 (0)	112 (5)	0 (0)	1 (3)	8 (2)	1 (4)
Other tertiary	1 (3)	260 (12)	0 (0)	2 (6)	13 (3)	3 (12)
ISCED97 3+4	2 (6)	855 (39)	2 (17)	3 (10)	84 (22)	0 (0)
No information	30 (86)	758 (34)	10 (83)	22 (71)	263 (69)	20 (77)
Total	35 (100)	2.199 (100)	12 (100)	31 (100)	382 (100)	26 (100)
Norway						
PhD	5 (1)	4 (1)	1 (0)	107 (2)	11 (1)	
Master	46 (6)	11 (3)	10 (3)	678 (12)	42 (3)	
Bachelor	55 (8)	21 (7)	25 (9)	1.052 (19)	150 (11)	
ISCED97 3+4	86 (12)	47 (15)	68 (24)	1.937 (35)	255 (19)	
ISCED97 1+2	66 (9)	25 (8)	30 (10)	510 (9)	53 (4)	
Unknown	454 (64)	211 (66)	153 (53)	1.303 (23)	846 (62)	
Total	712 (100)	319 (100)	287 (100)	5.587 (100)	1.357 (100)	
Sweden						
PhD	0 (0)	7 (0)	3 (1)	3 (0)	109 (2)	
Master	24 (2)	51 (3)	15 (6)	22 (2)	1.177 (21)	
Bachelor	10 (1)	89 (5)	10 (4)	24 (2)	1.036 (19)	
ISCED97 3+4	11 (1)	51 (3)	9 (4)	14 (1)	588 (11)	
ISCED97 1+2	43 (4)	198 (11)	14 (6)	51 (5)	960 (17)	
Unknown	953 (92)	1.441 (78)	194 (79)	901 (89)	1.628 (30)	
Total	1.041 (100)	1.837 (100)	245 (100)	1.015 (100)	5.498 (100)	

Notes: Finland and Sweden - age 20-74. Denmark and Norway - age 20-70.

Other Nordic includes Greenland and the Faroe Islands. In Norway and Sweden, these persons have generally been registered as Danish.

Source: Register data from the Nordic countries.

Table 4: Nordic emigration by educational level and citizenship from selected Nordic countries, 1995. Absolute numbers (column percentages in parentheses).

Delivering country and educational level	Citizenship					
	Danish	Finnish	Icelandic	Norwegian	Swedish	Other Nordic
Denmark						
PhD	2 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Master and Bachelor	402 (22)	2 (1)	23 (6)	27 (5)	6 (2)	0 (0)
ISCED97 3+4	1.019 (56)	6 (4)	18 (4)	29 (5)	13 (3)	3 (3)
ISCED97 1+2	285 (16)	1 (1)	4 (1)	7 (1)	6 (2)	3 (3)
No information	116 (6)	147 (94)	399 (90)	496 (89)	373 (94)	93 (94)
Total	1.824 (100)	156 (100)	444 (100)	559 (100)	398 (100)	99 (100)
Finland						
PhD	0 (0)	40 (2)	1 (6)	0 (0)	0 (0)	0 (0)
Master	0 (0)	317 (13)	0 (0)	0 (0)	5 (3)	1 (3)
Bachelor	1 (3)	120 (5)	0 (0)	0 (0)	4 (2)	0 (0)
Other tertiary	1 (3)	457 (19)	0 (0)	1 (4)	5 (3)	1 (3)
ISCED97 3+4	0 (0)	920 (38)	2 (13)	1 (4)	22 (11)	3 (9)
No information	29 (94)	555 (23)	13 (81)	23 (92)	161 (81)	27 (83)
Total	31 (100)	2.409 (100)	16 (100)	25 (100)	197 (100)	32 (100)
Norway						
PhD	2 (0)	1 (1)	0 (0)	65 (1)	0 (0)	
Master	5 (1)	1 (1)	0 (0)	377 (7)	4 (1)	
Bachelor	10 (1)	6 (4)	1 (1)	633 (11)	16 (3)	
ISCED97 3+4	20 (3)	8 (5)	2 (1)	838 (15)	20 (4)	
ISCED97 1+2	8 (1)	2 (1)	7 (5)	136 (2)	9 (2)	
Unknown	752 (94)	151 (89)	125 (93)	3.726 (65)	521 (91)	
Total	797 (100)	169 (100)	135 (100)	5.775 (100)	570 (100)	
Sweden						
PhD	19 (2)	27 (1)	5 (2)	11 (1)	135 (1)	
Master	149 (14)	263 (13)	60 (23)	150 (10)	2.100 (23)	
Bachelor	84 (8)	175 (9)	31 (12)	150 (10)	1.889 (21)	
ISCED97 3+4	52 (5)	148 (7)	28 (11)	142 (10)	1.121 (12)	
ISCED97 1+2	199 (19)	597 (29)	27 (10)	306 (21)	1.809 (20)	
Unknown	547 (52)	840 (41)	111 (42)	710 (48)	1.999 (22)	
Total	1.050 (100)	2.050 (100)	262 (100)	1.469 (100)	9.053 (100)	

Notes: Finland and sweden - age 20-74. Denmark and Norway - age 20-70.
Other Nordic includes Greenland and the Faroe Islands. In Norway and Sweden, these persons have generally been registered as Danish.
Source: Register data from the Nordic countries.

The educational information is collected only among a country's own citizens. The migration authorities do not ask the migrants about their formal education, so the registers only contain the information if the migrant takes additional educational degrees in the receiving country. Hence, almost all foreign citizenship immigrants are listed with missing information on formal education. This is a severe problem when the registers are used to measure knowledge flows and knowledge accumulation among the migrants. Judging from the data for 1995, the Swedish emigration data are by far the best (typically less than 50 per cent unknown) with Norwegian immigration data trailing (typically 60 per cent unknown). Finnish and Swedish immigration data typically have around 80 per cent unknown educational level and all the emigration data (except the Swedish) plus Danish immigration data typically have 90 per cent unknown. The reason for the low quality is that migrants are not asked about their educational qualifications when they register in another country. The registration in today's world of a new knowledge economy should be extended with this information. The existing information on formal education usually comes from degrees taken nationally and recorded by the educational authorities. Hence, education taken abroad is not necessarily transferred to the national registers, which means that the educational level found in the registers may be severely underestimated. Newly performed surveys among foreigners in

Denmark and in Norway reveal a considerably higher educational level among these persons than expected. However, in the registers they are recorded without any education at all, i.e. at best with missing information on the educational level.

If the data on educational level among the migrants were more detailed and reliable they could constitute a reliable, comparable and useful indicator of the knowledge embedded in individuals moving across borders. For example, a full information collection of the knowledge stock among the migrants could be used to calculate national knowledge accounts for the migrants, giving a more detailed and up to date determination of the country status. Similarly, such information could describe the type of knowledge embedded in the migrants in greater detail, i.e. according to sector or discipline. As it is now, it is impossible to calculate a knowledge account for the net migration in order to see whether it is positive or negative.

Table 3 and Table 4 reveal a considerable migration between the countries, but whether the migration results in any knowledge drain or gain is not possible to determine based on the register data at their present state with a large share of individuals with no information available. However, register data augmented with new collected survey information, i.e. censuses, may increase the information in future analyses. Unfortunately, such an update needs to be continuous in order to keep the quality high. Whether this will happen is doubtful. Another way to attack the problem is instead to focus on the return migration. Although no information is given on the activities performed abroad, i.e. skills obtained etc., the returning rate reveals some information of the knowledge drain or gain discussion. This will be analysed further in Section 6 below.

Information that has always been asked for by the migration authorities is the age of the migrant. As Table 5 and Table 6 show, data on this aspect are complete. Hence register data can at least describe the age profile of the migrants in detail. Compared with the national education profile by age an indication of the knowledge flow can be obtained.

Table 5: Nordic immigration by age and citizenship to selected Nordic countries, 1995. Absolute numbers (column percentages in parentheses).

Receiving country and age	Citizenship					
	Danish	Finnish	Icelandic	Norwegian	Swedish	Other Nordic
Denmark						
20 - 24	451 (23)	42 (19)	310 (31)	379 (43)	199 (27)	12 (16)
25 - 29	421 (21)	62 (29)	284 (29)	197 (22)	164 (23)	13 (17)
30 - 34	367 (18)	46 (21)	161 (16)	110 (13)	118 (16)	25 (32)
35 - 44	405 (20)	38 (18)	173 (17)	113 (13)	115 (16)	13 (17)
45 - 54	234 (12)	23 (11)	59 (6)	60 (7)	81 (11)	12 (16)
55 - 64	93 (5)	4 (2)	7 (1)	15 (2)	31 (4)	2 (3)
65 - 70	23 (1)	2 (1)	2 (0)	6 (1)	16 (2)	0 (0)
Total	1.994 (100)	217 (100)	996 (100)	880 (100)	724 (100)	77 (100)
Finland						
20 - 24	8 (23)	425 (19)	5 (42)	3 (10)	63 (16)	2 (8)
25 - 29	9 (26)	482 (22)	2 (17)	8 (26)	48 (13)	6 (23)
30 - 34	7 (20)	376 (17)	2 (17)	7 (23)	48 (13)	7 (27)
35 - 44	7 (20)	508 (23)	1 (8)	8 (26)	79 (21)	6 (23)
45 - 54	2 (6)	241 (11)	1 (8)	4 (13)	66 (17)	1 (4)
55 - 64	1 (3)	99 (5)	1 (8)	0 (0)	37 (10)	1 (4)
65 - 74	1 (3)	68 (3)	0 (0)	1 (3)	41 (11)	3 (12)
Total	35 (100)	2.199 (100)	12 (100)	31 (100)	382 (100)	26 (100)
Norway						
20 - 24	151 (21)	44 (14)	44 (15)	730 (13)	256 (19)	
25 - 29	157 (22)	98 (31)	79 (28)	1.064 (19)	371 (27)	
30 - 34	155 (22)	58 (18)	63 (22)	1.027 (18)	258 (19)	
35 - 44	158 (22)	74 (23)	71 (25)	1.426 (26)	276 (20)	
45 - 54	69 (10)	34 (11)	25 (9)	871 (16)	151 (11)	
55 - 64	17 (2)	10 (3)	4 (1)	293 (5)	31 (2)	
65 - 70	5 (1)	1 (0)	0 (0)	147 (3)	14 (1)	
Total	712 (100)	319 (100)	286 (100)	5.558 (100)	1.357 (100)	
Sweden						
20 - 24	136 (13)	399 (22)	59 (24)	284 (28)	772 (14)	
25 - 29	225 (22)	405 (22)	51 (21)	268 (26)	930 (17)	
30 - 34	204 (20)	297 (16)	43 (18)	145 (14)	969 (18)	
35 - 44	251 (24)	354 (19)	58 (24)	144 (14)	1.269 (23)	
45 - 54	154 (15)	247 (13)	29 (12)	97 (10)	1.028 (19)	
55 - 64	53 (5)	95 (5)	3 (1)	53 (5)	412 (7)	
65 - 74	18 (2)	40 (2)	2 (1)	24 (2)	118 (2)	
Total	1.041 (100)	1.837 (100)	245 (100)	1.015 (100)	5.498 (100)	

Note: Other Nordic includes Greenland and the Faroe Islands. In Norway and Sweden, these persons have generally been registered as Danish.
Source: Register data from the Nordic countries.

Table 6: Nordic emigration by age and citizenship from selected Nordic countries, 1995.
Absolute numbers (column percentages in parentheses).

Delivering country and age	Citizenship					
	Danish	Finnish	Icelandic	Norwegian	Swedish	Other Nordic
Denmark						
20 - 24	447 (25)	32 (21)	129 (29)	162 (29)	98 (25)	14 (14)
25 - 29	422 (23)	37 (24)	118 (27)	161 (29)	78 (20)	25 (25)
30 - 34	340 (19)	33 (21)	77 (17)	73 (13)	86 (22)	16 (16)
35 - 44	336 (19)	40 (26)	74 (17)	89 (16)	65 (16)	22 (22)
45 - 54	200 (11)	13 (8)	36 (8)	51 (9)	50 (13)	14 (14)
55 - 64	47 (3)	1 (1)	6 (1)	14 (3)	15 (4)	6 (6)
65 - 70	24 (1)	0 (0)	3 (1)	8 (1)	5 (1)	2 (2)
Total	1.816 (100)	156 (100)	443 (100)	558 (100)	397 (100)	99 (100)
Finland						
20 - 24	5 (16)	634 (26)	3 (19)	3 (12)	33 (17)	4 (13)
25 - 29	9 (29)	628 (26)	5 (31)	5 (20)	41 (21)	7 (22)
30 - 34	6 (19)	395 (16)	1 (6)	5 (20)	16 (8)	9 (28)
35 - 44	4 (13)	408 (17)	4 (25)	8 (32)	41 (21)	9 (28)
45 - 54	4 (13)	240 (10)	3 (19)	3 (12)	27 (14)	2 (6)
55 - 64	3 (10)	69 (3)	0 (0)	1 (4)	22 (11)	1 (3)
65 - 74	0 (0)	35 (1)	0 (0)	0 (0)	17 (9)	0 (0)
Total	31 (100)	2.409 (100)	16 (100)	25 (100)	197 (100)	32 (100)
Norway						
20 - 24	127 (16)	17 (10)	22 (16)	963 (17)	77 (14)	
25 - 29	170 (21)	40 (24)	24 (18)	1.303 (23)	152 (27)	
30 - 34	165 (21)	36 (21)	23 (17)	983 (17)	102 (18)	
35 - 44	174 (22)	43 (26)	49 (36)	1.168 (20)	97 (17)	
45 - 54	114 (14)	20 (12)	16 (12)	822 (14)	92 (16)	
55 - 64	34 (4)	8 (5)	0 (0)	353 (6)	29 (5)	
65 - 70	11 (1)	4 (2)	1 (1)	145 (3)	17 (3)	
Total	795 (100)	168 (100)	135 (100)	5.737 (100)	566 (100)	
Sweden						
20 - 24	142 (14)	232 (11)	47 (18)	270 (18)	1.508 (17)	
25 - 29	240 (23)	359 (18)	47 (18)	358 (24)	2.158 (24)	
30 - 34	193 (18)	332 (16)	53 (20)	247 (17)	1.657 (18)	
35 - 44	228 (22)	516 (25)	80 (31)	300 (20)	1.929 (21)	
45 - 54	143 (14)	315 (15)	28 (11)	192 (13)	1.307 (14)	
55 - 64	82 (8)	200 (10)	5 (2)	75 (5)	411 (5)	
65 - 74	22 (2)	96 (5)	2 (1)	27 (2)	83 (1)	
Total	1.050 (100)	2.050 (100)	262 (100)	1.469 (100)	9.053 (100)	

Note: Other Nordic includes Greenland and the Faroe Islands. In Norway and Sweden, these persons have generally been registered as Danish.
Source: Register data from the Nordic countries.

The tables show that the migration decreases with age regardless of citizenship and independently of the direction of migration. Hence, there may be some indications in the data of a knowledge circulation rather than either a knowledge gain or drain effect. The figures indicate that the return migration rates may be of greater importance than the migration rates themselves and that the activities performed while abroad or before going abroad may be the information of interest for the knowledge flow study. A study of the activities performed before the (return) migration may reveal whether the knowledge accounts are positive both ways or not, i.e. a win-win situation.

5 Labour market participation and educational gains for migrants

The previous section analysed how precise the migration measures are when register data are used and compared. These figures validate the quality of these data sources but they do not add anything new to the knowledge regarding the migrants. However, register data contain information that have not previously been applied to migration studies. Register data allow, for example, a complete tracking of the migrants before and after the migration. Hence, a fuller picture of the value added of migration can be drawn. Both initial and added labour market experience as well as the stock and amount of additional education adds to the discussion of knowledge gain, knowledge drain and knowledge circulation from migration. Table 7 and Table 8 and Figure 1 illustrate what occupational and educational status the migrants had the year of emigration. Table 7 shows greater detail wherever possible whereas Table 8 displays data for labour market participation only. Figure 1 displays the same data as Table 8 in graphical form. Table 9 shows the situation one year after emigration. The long-term status five years after immigration (for those immigrants still remaining) is shown in Table 10.

Table 7: Participation in labour market and/or education by citizenship for Nordic emigrants from selected Nordic countries in the year of emigration, 1988-98. Per cent.

Country, participation and citizenship	Emigration year										
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark											
+ job, − study											
Danish	51	46	49	48	50	54	53	53	67	46	
Other Nordic	34	29	28	27	24	24	30	29	31	31	
+ job, + study											
Danish	9	10	11	9	11	9	9	9	7	9	
Other Nordic	2	4	2	3	2	4	3	3	4	8	
− job, + study											
Danish	4	7	6	8	8	7	7	6	9	8	
Other Nordic	13	15	11	13	13	9	10	11	14	17	
− job, − study											
Danish	36	37	34	35	32	31	31	33	48	37	
Other Nordic	50	53	59	58	61	63	58	58	52	43	
Finland											
+ job, − study											
Finnish	54	52	49	45	39	38	36	39	42	43	49
Other Nordic	38	38	37	37	29	30	24	28	27	29	32
+ job, + study											
Finnish	2	2	3	4	4	5	5	4	3	5	5
Other Nordic	0	0	0	1	0	1	1	0	1	0	1
− job, + study											
Finnish	1	2	2	3	3	4	4	4	4	3	2
Other Nordic	0	1	1	1	0	1	1	2	2	2	1
− job, − study											
Finnish	43	44	47	49	55	53	56	53	52	48	44
Other Nordic	62	61	62	62	71	68	74	71	70	69	66

Notes: job means participation in labour market; study means participation in education. + means yes and − means no.
Labour market participation is measured as being employed or not in the first week of November.
Finland - age 20-74. Denmark - age 20-70. Emigration country is missing for 50 per cent of the observations in 1996-97.
Source: Register data from the Nordic countries.

Table 7 shows that approximately half of the emigrants with national citizenship work while 15 to 20 per cent are studying in the year they emigrate. The remaining one-third of the emigrants are

neither employed nor studying. If the employment status the year prior to emigration is used, the employment rate is approximately five percentage points higher. Looking at the smaller group in absolute terms with other Nordic citizenships the percentages are turned around, so a considerable share of these neither work nor study in the receiving country, at least not officially. Hence, a significant fraction of the emigrants carry knowledge with them abroad, supporting the thesis of knowledge drain in emigration. However, as Table 9 and Table 10 show, this is only one part of the story.

Since the Norwegian and Swedish register data that were available for this project do not record whether migrants are studying, we have summarised the share of those working– whether studying or not – of the emigrants from all the countries in question. There is a marked difference between Denmark and Finland on the one hand and Norway on the other. In Norway the share of Nordic emigrants working is on the same level as the Norwegian citizens, whereas in Finland and Denmark the share of Nordic citizens working is considerably lower as Table 8 and Figure 1 (below) illustrate.

Table 8: Labour market participation by citizenship for Nordic emigrants from selected Nordic countries in the year of emigration, 1988-98. Per cent.

Country - Citizenship	Emigration year										
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark - Danish	60	56	60	57	61	63	62	62	74	55	
Denmark - Nordic	36	33	30	30	26	28	33	32	35	39	
Finland - Finnish	56	54	52	49	43	43	41	43	45	48	54
Finland - Nordic	38	38	37	38	29	31	25	28	28	29	33
Norway - Norwegian	56	54	47	47	43	50	56	56	54	59	60
Norway - Nordic	53	48	49	48	49	48	48	52	55	54	53
Sweden - Swedish	53	50	52	56	52	45	42	47	49	49	49
Sweden - Nordic	53	57	62	58	50	41	35	35	34	35	37

Note: Nordic means non-national Nordic.
Source: Register data from the Nordic countries.

The patterns of employment are remarkably different. Denmark has the highest national emigrant employment rate and the lowest non-national emigrant employment rate of all the four countries for most of the decade. In Finland, the difference between the two groups is consistently around 20 percentage points. In Sweden, this difference does not appear until the second half of the decade, and in Norway, there is no systematic difference in employment rate between Nordic emigrants of national and non-national origin. See also Figure 1 for a graphical illustration.
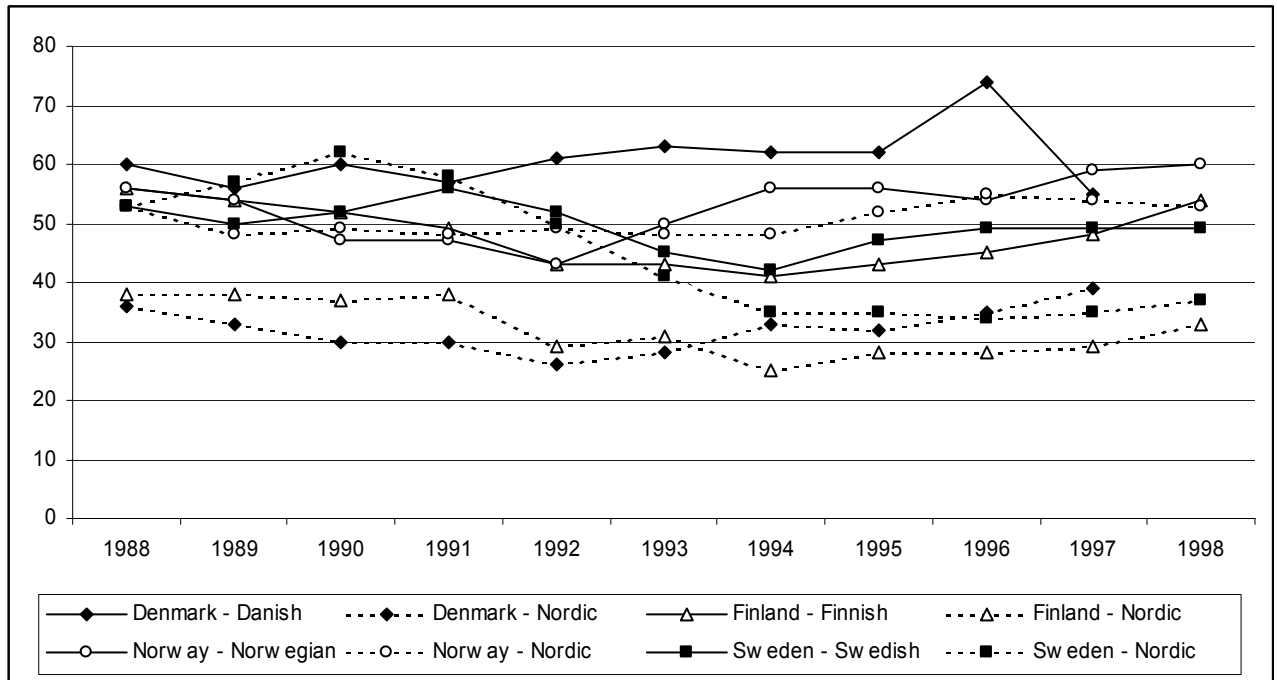
Figure 1: Labour market participation for Nordic emigrants from Nordic countries in the year of emigration, 1988-98. Per cent.

Table 9 shows similarly high proportions of the immigrants engaged in work, study or both the year after immigration. Table 10 shows that these shares are slightly increasing among the immigrants still in the country five years after the immigration year. This is to be expected since these are a selected sample of approximately 50 per cent of the former group, cf. Section 6.

Table 9: Participation in labour market and/or education by citizenship for Nordic immigrants to Nordic countries in the first year after migration, 1988-98. Per cent.

Country, participation and citizenship	Immigration year plus one										
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark											
+ job, – study											
Danish		49	52	45	44	48	50	54	54	58	
Other Nordic		35	38	30	29	31	32	36	40	40	
+ job, + study											
Danish		10	8	6	8	7	8	9	9	8	
Other Nordic		4	4	4	4	3	5	6	7	8	
– job, + study											
Danish		9	8	8	7	7	6	7	7	6	
Other Nordic		15	14	15	15	15	16	15	15	16	
– job, - study											
Danish		33	32	41	42	39	36	30	29	27	
Other Nordic		46	45	50	52	51	48	43	38	36	
Finland											
+ job, – study											
Finnish	70	70	71	66	51	43	38	42	50	53	56
Other Nordic	51	57	52	53	38	28	31	31	43	35	44
+ job, + study											
Finnish	3	3	2	3	3	3	5	6	7	7	6
Other Nordic	3	3	2	1	1	1	2	1	2	1	2
– job, + study											
Finnish	1	1	1	1	2	2	3	3	3	2	2
Other Nordic	0	1	0	1	1	1	3	1	1	1	2
– job, – study											
Finnish	27	26	26	31	44	52	55	48	41	38	37
Other Nordic	46	39	45	46	60	70	64	67	54	62	52
Sweden											
+ job											
Swedish	61	66	60	51	46	39	45	48	47	48	49
Other Nordic	58	71	68	52	40	31	33	34	30	33	36
– job											
Swedish	39	34	40	49	54	61	55	52	53	52	51
Other Nordic	42	29	32	48	60	69	67	66	70	67	64

Notes: job means participation in labour market; study means participation in education. + means yes and – means no.
Labour market participation is measured as being employed or not in the first week of November. The denominator in the rates is corrected for individuals leaving again before one year's duration. The correction increases the + job rates by approximately 10 to 15 percentage points in total.
Finland and Sweden - age 20-74. Denmark - age 20-70.
Source: Register data from the Nordic countries.

National immigrants clearly have a higher employment rate than non-nationals the year after immigration, with a small number of exceptions. Immigrants to Finland and Sweden (but not to Denmark) also have a markedly lower employment rate in the second half of the decade than in the first.

Table 10: Participation in labour market and/or education by citizenship for Nordic immigrants to selected Nordic countries five years after migration, 1992-98. Per cent.

Country	Immigration year plus five													
	1992		1993		1994		1995		1996		1997		1998	
	Nat	Nor	Nat	Nor	Nat	Nor	Nat	Nor	Nat	Nor	Nat	Nor	Nat	Nor
Denmark														
+ job, − study			50	38	52	41	54	42	53	42	55	47		
+ job, + study			8	6	7	7	5	5	7	7	7	6		
− job, + study			6	7	6	9	5	9	6	7	5	8		
− job, − study			35	49	35	43	36	44	34	44	33	39		
Total			100	100	100	100	100	100	100	100	100	100		
Finland														
+ job, − study	61	50	57	57	54	47	57	44	53	43	58	36	47	26
+ job, + study	3	2	2	2	2	2	3	1	4	2	4	1	4	4
− job, + study	1	1	1	1	1	1	1	1	1	0	1	1	3	0
− job, − study	36	47	40	40	43	50	40	55	42	56	38	62	46	70
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Norway														
+ job	58	59	58	60	61	63	62	64	67	67	70	71	71	72
− job	42	41	42	40	39	37	38	36	33	33	30	29	29	28
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Notes: job means participation in labour market; study means participation in education. + means yes and − means no.
Labour market participation is measured as being employed or not in the first week of November. The denominator in the rates is corrected for individuals leaving again before five years duration.
Nat – national citizens; Nor – other Nordic citizens.
Finland - age 20-74. Denmark and Norway - age 20-70.
Source: Register data from the Nordic countries.

Comparison of participation in the labour market at one and five years after immigration is complicated because there are effects both of the cohort (year of migration) and of the general status of the labour market (measurement year). One discernible difference between national and non-national immigrants to Denmark is that the participation of the latter in education is higher than that of the former one year after immigration but not five years after immigration. Put simply, foreigners come to study for a small number of years in Denmark. Another difference is that the studying rate of immigrants to Finland is much lower than that in Denmark – people don't go there to study.

Figure 2 summarises the labour market participation of Nordic immigrants by country of immigration.
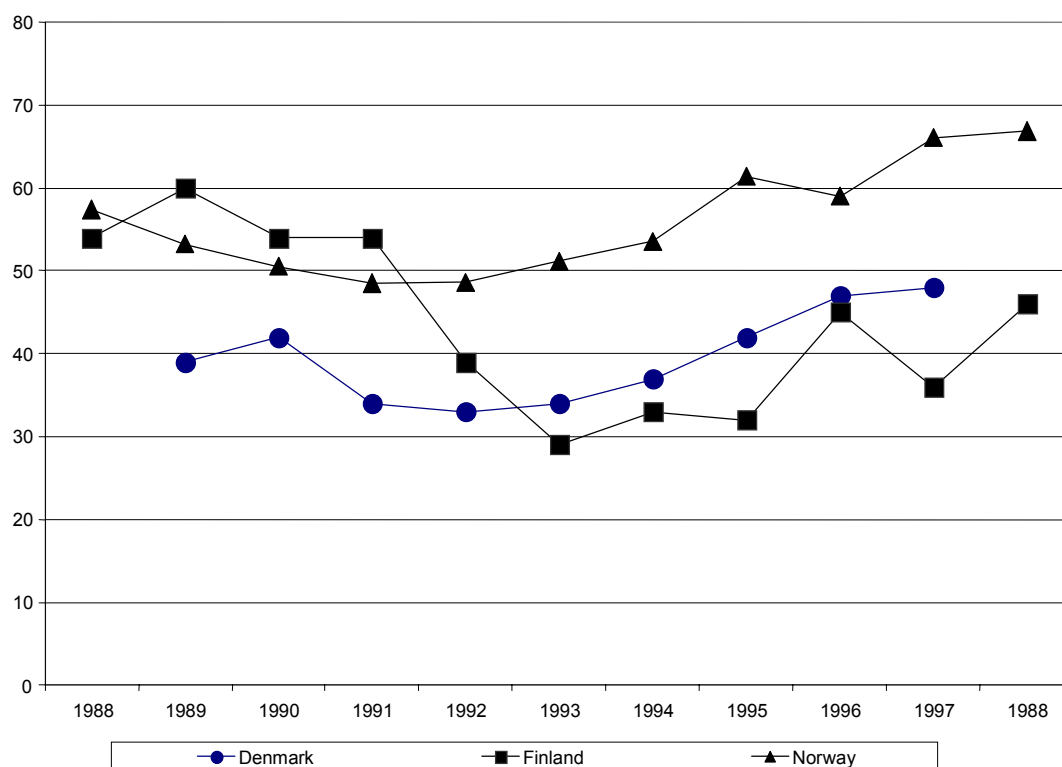
Figure 2: Labour market participation for Nordic immigrants to selected Nordic countries in the first year after migration, 1988-98. Per cent.

As shown in Figure 2, Norway has the highest labour market participation on average for Nordic immigrants, reflecting the greater demand for labour and less unemployment in the period. Finland fell from a high level when the collapse of the Soviet Union made the export markets collapse and unemployment increased rapidly.

An investigation of the knowledge accumulation among the immigrants is difficult to perform using register data. However, a registration of degrees completed during the stay allows a conversion of these to a measure of additional average formal education in years. The measure underestimates the true knowledge accumulation from courses and single exams, which are not registered. These data are shown in Table 11.

Table 11: Additional education for Nordic immigrants to selected Nordic countries during the first five years after their migration, 1988-98. Years.

Country and time since immigration	Immigration year										
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark											
1 year after		0,076	0,007	0,003	0,011	0,009	0,006	0,004	0,026	0,020	
3 years after		0,091	0,026	0,023	0,056	0,059	0,029	0,043			
5 years after		0,129	0,073	0,069	0,068	0,063					
Finland											
1 year after	0,087	0,080	0,083	0,052	0,071	0,072	0,121	0,120	0,100	0,087	0,051
3 years after	0,241	0,202	0,213	0,183	0,242	0,243	0,330	0,305	0,290		
5 years after	0,352	0,312	0,344	0,339	0,395	0,365	0,466				
Norway											
1 year after	0,159	0,061	0,138	0,259	0,221	0,279	0,343	0,348	0,448	0,589	0,644
3 years after	0,427	0,170	0,209	0,371	0,397	0,503	0,641	0,609	0,743		
5 years after	0,590	0,518	0,506	0,552	0,685	0,698	0,865				
Sweden											
1 year after	0,215	1,633	0,101	0,179	0,257	1,895	0,172	0,312	0,418		
3 years after	1,755	1,824	0,269	1,824	1,973	2,180	0,460				
5 years after	1,873	2,045	0,537	1,980	2,236						

Notes: Years of education is measured according to the definitions of the ISCED-76 code. The re-migrated individuals during the five years reduce the stock of individuals. Missing values have been recoded as ISCED level 2 (9 years of schooling).
Nordic immigrants means non-national Nordic immigrants.
Finland and Sweden - age 20-74. Denmark and Norway - age 20-70.
Source: Register data from the Nordic countries.

The first thing to notice about Table 11 is that there is an increase in the educational level during the first five years after immigration. The second feature to notice is the great variation. In particular, immigrants to Sweden 1989 and 1993 show up as having increased their education by more than a year during their first year of stay. This is clearly incorrect. Even some of the other figures seem too high to be believed.

There are also discrepancies when comparing with other data. In particular, Table 9 and Table 10 show that immigrants to Denmark are much more active in education than immigrants to Finland, whereas Table 11 shows that the educational level of immigrants to Finland increases many times as fast as that of immigrants to Denmark.

There are some statistical problems here. It should be noted that persons with unknown education at the time of immigration have been attributed with 9 years of schooling for the present calculation. Table 3 showed that in 1995, this was typically so for 80 to 90 per cent of non-national immigrants (typically 60 per cent in the case of Norway) and 10 to 30 per cent for national immigrants. Individuals who then complete a tertiary degree will then be credited with 3 years too much additional education (they presumably already had finished secondary education worth 3 years). It should also be noted that the more marked increase in the Norwegian case is probably partly due to the fact that a large ad hoc survey conducted in 1999/2000 registered the real educational level. This was often not registered for the year when they came to Norway, however, but one or even two years later. The rather steep rise in the educational level for several of the cohorts immigrating to Sweden could also be due to inconsistencies in the underlying data.

In addition comes the fact that some of the persons immigrating are emigrating during the next five years. As will be shown below, this will typically be 10 per cent of the national immigrants and 40 to 60 per cent of those of other Nordic origin. There might be a selection bias here, i.e. the

"stayers" have another propensity for taking further education than the "movers", and this might vary between countries. As we have seen in Table 9 and Table 10, foreigners come to Denmark to study for a short period of time but not to Finland. The table shows the difference between the average educational level of those still present after one, three and five years and the full cohort.

However, the figures in Table 11 are positive indicating that the immigrants do increase their knowledge levels. If they return to their original country with this increased knowledge stock, it may be a win-lose situation for this country, i.e. winning by return migration among the emigrants. The educational gain seems to be largest among the immigrants to Sweden and Norway, but the data should be interpreted with extreme caution.

How well educated the emigrants with national citizenship are, is also of interest in the knowledge flow discussion. We have compiled time series data on educational status for male and female emigrants in Table 12. We have included national population data for comparison wherever available.

Table 12: Average length of education by gender in the year of migration for Nordic emigrants with national citizenship from selected Nordic countries, 1987-98. Years. National population averages in italics.

Country and gender	Year											
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark												
Men		11,5	11,9	12,0	12,1	12,2	11,9	11,7	12,0	11,6	11,5	
Women		11,7	12,2	12,5	12,6	12,5	12,2	11,9	12,1	11,5	11,8	
Total		11,6	12,0	12,3	12,4	12,3	12.0	11,8	12,0	11,6	11,6	
		11,1	*11,0*	*11,1*	*11,1*	*11,2*	*11,2*	*11,3*	*11,3*	*11,3*	*11,4*	
Finland												
Men	11,4	11,5	11,6	11,7	11,9	12,3	12,4	12,7	12,8	12,5	12,9	12,9
	11,3	*11,4*	*11,4*	*11,5*	*11,5*	*11,6*	*11,6*	*11,7*	*11,7*	*11,8*	*11,8*	*11,9*
Women	11,9	11,9	12,1	12,1	12,2	12,2	12,7	13,0	13,1	12,9	13,2	13,3
	11,2	*11,3*	*11,3*	*11,4*	*11,4*	*11,5*	*11,6*	*11,7*	*11,7*	*11,8*	*11,9*	*12,0*
Total	11,6	11,7	11,8	11,9	12,0	12,2	12,5	12,9	12,9	12,7	13,0	13,1
	11,3	*11,3*	*11,4*	*11,4*	*11,5*	*11,5*	*11,6*	*11,7*	*11,7*	*11,8*	*11,9*	*11,9*
Norway												
Men	11,7	11,5	11,8	12,3	12,2	12,4	12,3	12,9	13,3	13,4	13,0	12,8
	11,4	*11,4*	*11,5*	*11,5*	*11,6*	*11,6*	*11,7*	*11,8*	*12,2*	*12,2*	*12,2*	*12,2*
Women	11,4	11,3	11,6	11,8	12,1	11,9	12,1	12,3	12,8	12,8	12,4	12,5
	11,1	*11,2*	*11,2*	*11,3*	*11,4*	*11,4*	*11,5*	*11,6*	*12,0*	*12,1*	*12,1*	*12,1*
Total	11,6	11,4	11,7	12,1	12,2	12,2	12,2	12,6	13,0	13,1	12,7	12,7
	11,3	*11,3*	*11,3*	*11,4*	*11,5*	*11,5*	*11,6*	*11,7*	*12,1*	*12,1*	*12,2*	*12,1*
Sweden												
Men		11,7	11,5	11,4	12,0	12,1	12,3	12,3	12,3	12,3	12,3	12,3
Women		11,9	11,6	11,4	11,9	12,0	12,1	12,6	12,5	12,6	12,6	12,5
Total		11,8	11,5	11,4	12,0	12,0	12,2	12,4	12,4	12,4	12,5	12,4

Notes: Length of education is measured according to the definitions of the ISCED-76 code. Missing values have been recoded as ISCED level 2 (9 years of schooling).
Finland and Sweden - age 20-74. Denmark and Norway - age 20-70.
Source: Register data from the Nordic countries.

Table 12 shows that the educational level of national emigrants measured in years is slightly higher for women than for men. It also shows that the educational level among the emigrants is higher than the national average. Hence, they seem to be better educated than the average population. There are a few natural explanations for the observed patterns. First, more skilled men like carpenters and bricklayers move across borders compared to the women where the share of academics is higher. This moves the averages apart. Second, a higher proportion of young adults

move across borders. They are usually better educated than the older generations, which gives the higher than average educational level among the emigrants from all three countries. Hence, Table 12 does not necessarily reveal much about knowledge drain or gain in the emigration. Instead it reveals some underlying structural characteristics among the emigrants. However, controlling for other characteristics in Section 8 reveals that both immigrants and emigrants have a higher education than the average population, again in support of the knowledge circulation argument.

6 Return migration

In this section we will present a series of graphs with the aim of throwing light on the migration returning rates for Denmark, Finland, Norway and Sweden. We look at the returning rates for both citizens of each country and other Nordic citizens living in another Nordic country for a period of time. There will be four graphs in a row showing the same data for each country and a summarising discussion for each set of graphs. The overall picture is one of knowledge circulation, i.e. the returning rates are typically 30 to 40 per cent in Sweden, around 60 per cent in Finland, slightly higher in Denmark and markedly higher in Norway within a ten year period. This is of course not surprising, since persons going abroad to study, or to work in the same company in another Nordic country, plan to return and in most of the cases do so. Still there is a significant share, four out of ten, that do not return within ten years from Denmark and Finland.

Figure 3 to Figure 6 below show the share of national emigrants who return to Denmark, Finland and Norway in the 1990s, with one curve for each cohort.
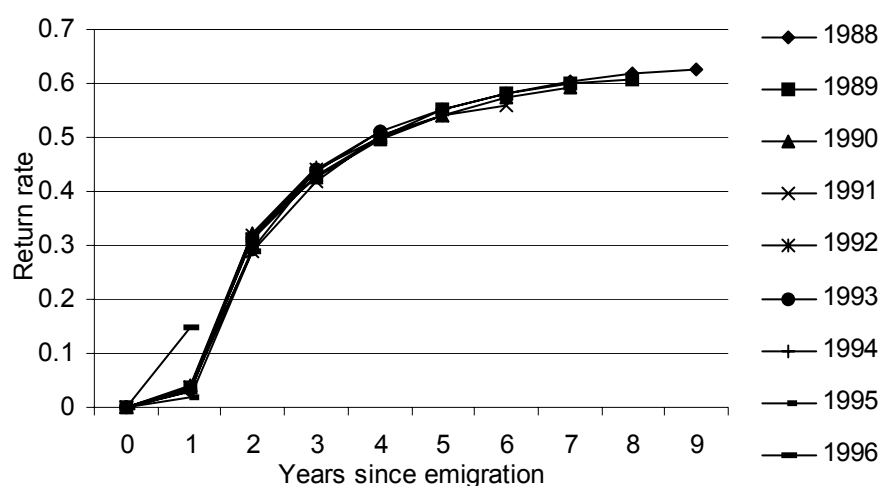

Figure 3: Returning rates to Denmark over time for Danish citizens emigrating 1988-96 from Denmark to all other Nordic countries.
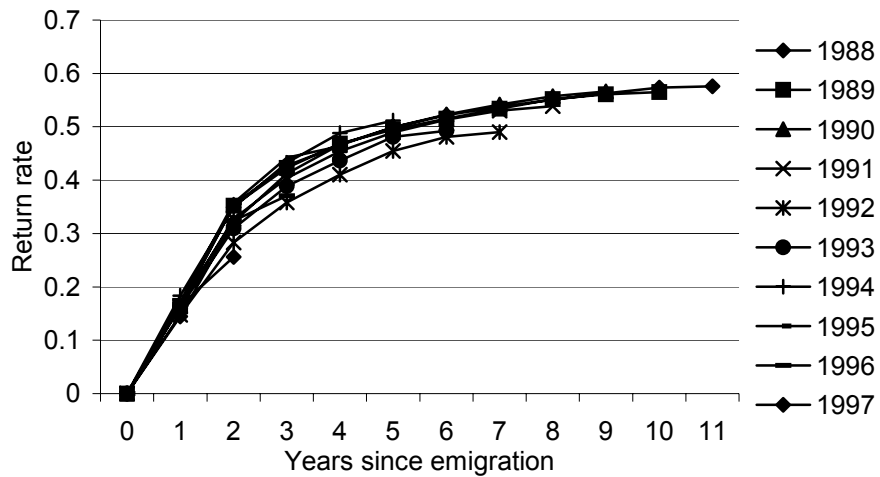
Figure 4: Returning rates to Finland over time for Finnish citizens emigrating 1988-97 from Finland to all other Nordic countries.
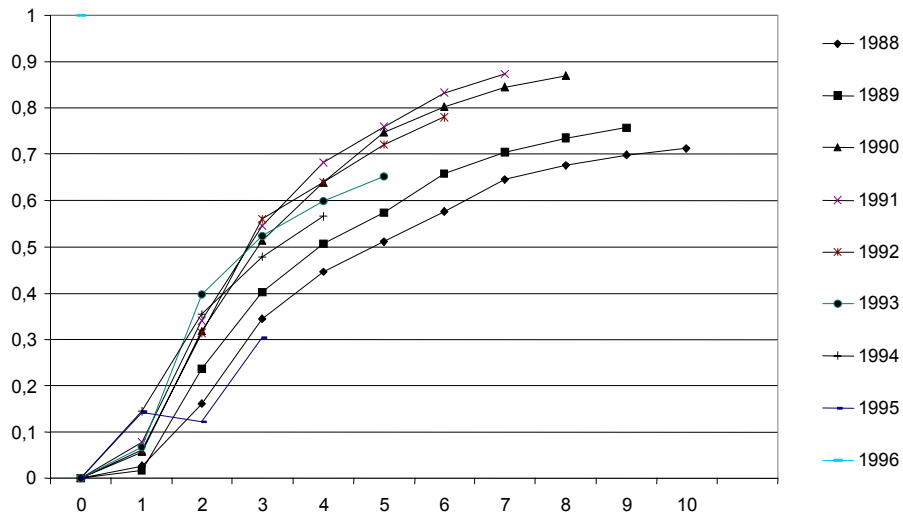

Figure 5: Returning rates to Norway over time for Norwegian citizens emigrating 1988-96 from Norway to all other Nordic countries.
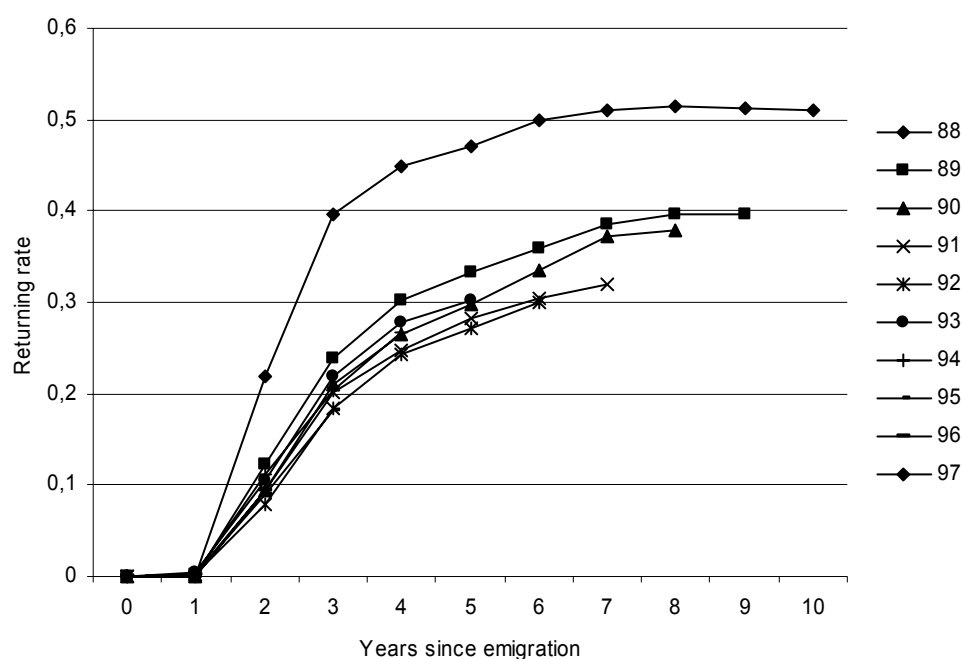
Figure 6: Returning rates to Sweden over time for Swedish citizens emigrating 1988-97 from Sweden to all other Nordic countries.

50 per cent of the national citizens emigrating to the other Nordic countries have returned after 4 years in the case of Denmark and after 5-7 years in Finland. Around 60 per cent have returned after 9-10 years and the curve levels off. Hence the marginal returning rate decreases over time. The return patterns in these two countries seem very stable from one cohort to the next as can be seen from the overlapping curves. The Norwegian picture is somewhat different with a far greater spread between cohorts. The first half of the emigrants return within 3-5 years and the 10 year returning rate is from 70 per cent and upwards. Fewer Swedes return from emigration within 10 years than persons of all other Nordic nationalities.

The fact that a large fraction of the emigrants with national citizenship return after a few years lends support to the knowledge circulation thesis. On the other hand, around 60 per cent of the Swedes and 40 per cent of the Danish and Finnish emigrants have not returned after 10 years. Although some of these may be dead or disappeared from the registers for other reasons, this fact supports the knowledge drain thesis. For Norwegians, the knowledge drain effect is much less pronounced.

The picture changes if we look at the returning rates of non-national emigrants. These are citizens of other Nordic countries who have once emigrated to the country in question, who then move on to either their country of origin or a third Nordic country. As we can see from the following figures, Figure 7 to Figure 10, the return patterns of non-national emigrants are similar to those of national emigrants as shown in Figure 3 to Figure 6, but somewhat less tidy, and the rates are very much lower.
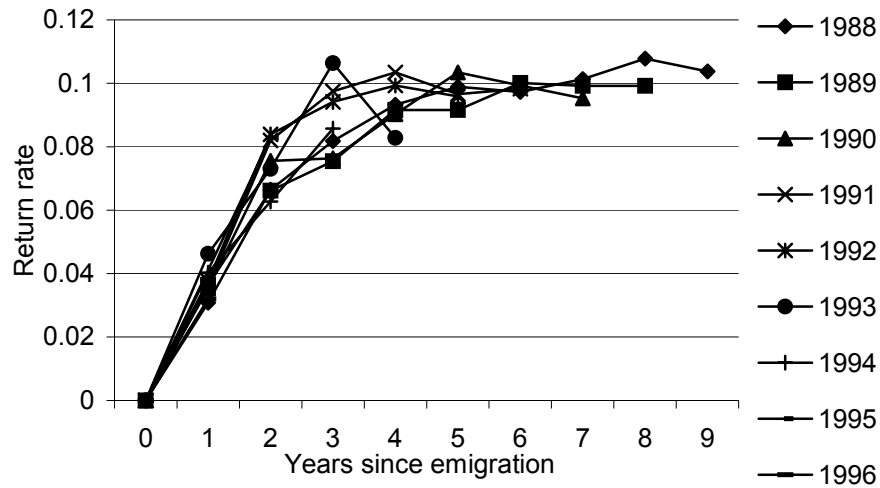
Figure 7: Returning rates to Denmark over time for other Nordic citizens emigrating 1988-96 from Denmark to all other Nordic countries.
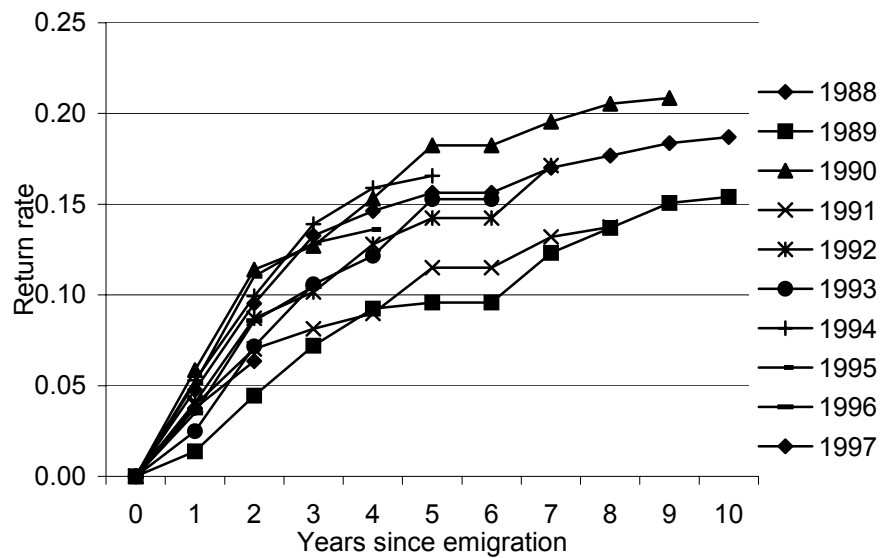

Figure 8: Returning rates to Finland over time for other Nordic citizens emigrating 1988-97 from Finland to all other Nordic countries.
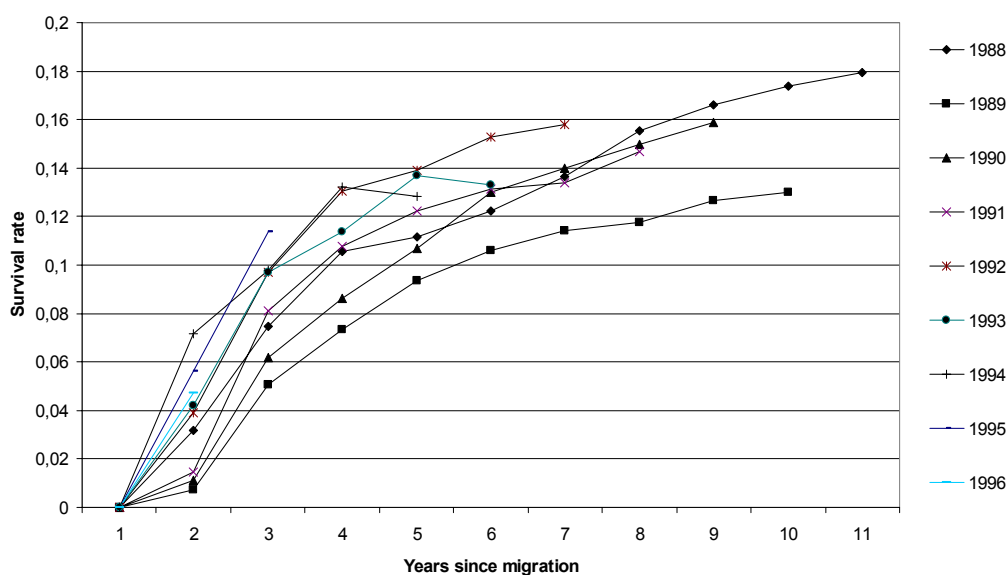
Figure 9: Returning rates to Norway over time for other Nordic citizens emigrating 1988-96 from Norway to all other Nordic countries.

Figure 10: Returning rates to Sweden over time for other Nordic citizens emigrating 1988-96 from Sweden to all other Nordic countries.

Of course, the greatest difference is in absolute levels. Between 10 and 20 per cent of the non-national emigrants migrate once again to the country where they once were immigrants. This is a remarkable figure and it indicates that some of them have established permanent connections in the country to where they originally emigrated. These recurring migrants, although fewer in absolute numbers, may be particularly interesting in terms of knowledge flow and networks, but the data can not tell us very much about these. We don't know, for example, whether many of

them move regularly and then appear in several cohorts, which would support the knowledge circulation thesis. They may also simply have gone "home" for a year and then decided to emigrate permanently.

Again there are differences between the countries. In the case of Denmark, the returning rate stabilises at about 10 per cent after 3-5 years for all cohorts. Sweden has a similar pattern (8 per cent after 5-6 years). The returning rates of non-national Nordic citizens emigrating from Finland increase with time and do not level off as strongly as in the Danish case, with at least one of the cohorts crossing the 20 per cent mark within the first 10 years. However, it could take anywhere between 2 and 7 years to cross the 10 per cent mark. The Norwegian data lie somewhere in between the Danish and the Finnish. If a second emigration takes place, it often has its advantages to emigrate to a country that one already knows from experience. What makes it more attractive to emigrate a second time to Norway or Finland as compared with Denmark and Sweden, even after a long period of time, however, we do not know.

Turning the focus to the immigrants and calculating their staying rate[11] in the receiving country reveals (naturally) inverse patterns of the ones found in the six figures above. This is shown in the figures below, Figure 11 to Figure 14.

Figure 11: Staying rates in Denmark over time for Danish citizens immigrating 1988-96 to Denmark from all other Nordic countries.

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[11] The share of the immigrants staying in the receiving country is called the staying rate.

Figure 12: Staying rates in Finland over time for Finnish citizens immigrating 1988-97 to Finland from all other Nordic countries.

Figure 13: Staying rates in Norway over time for Norwegian citizens immigrating 1988-96 to Norway from all other Nordic countries.
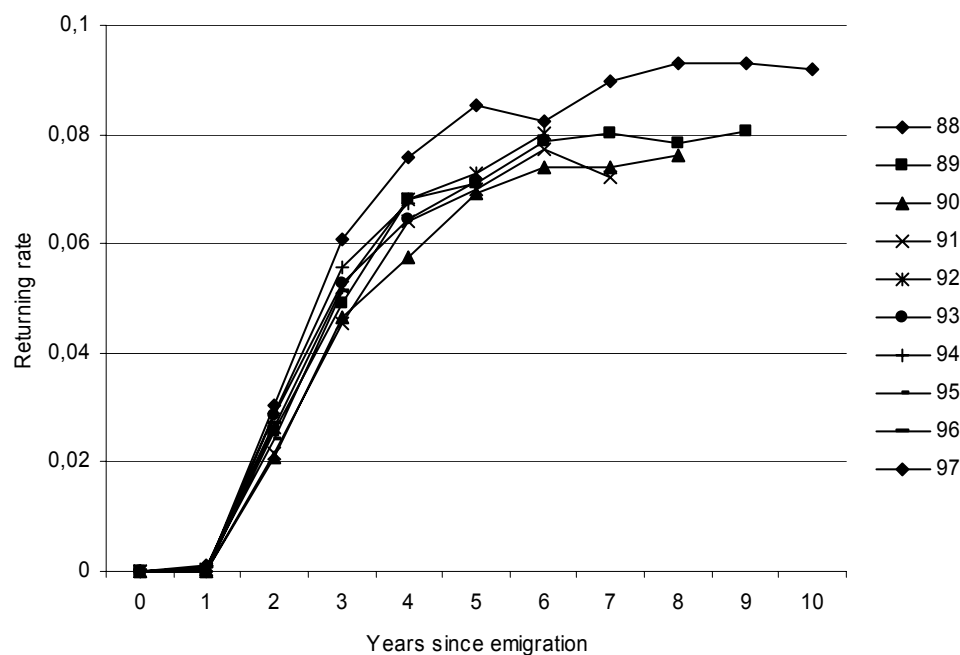
Figure 14: Staying rates in Sweden over time for Swedish citizens immigrating 1988-97 to Sweden from all other Nordic countries.

In Denmark, Finland and Sweden, 10 per cent of the national citizens coming back to their original country leave again within three years from the immigration time, a little less in Denmark than in Finland in the longer run. In Norway, however, it may take 8-10 years or more before the 10 per cent re-emigration mark is reached (except for the 1988 cohort, which is an outlier in many of the other analyses as well).

We will now turn to the staying rates of non-national immigrants, as shown in the following figures, Figure 15 to Figure 18.
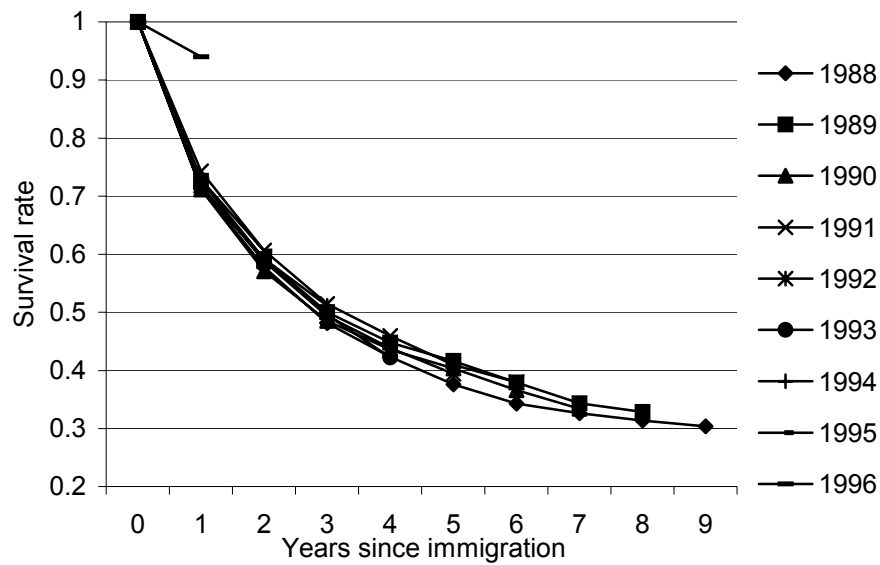
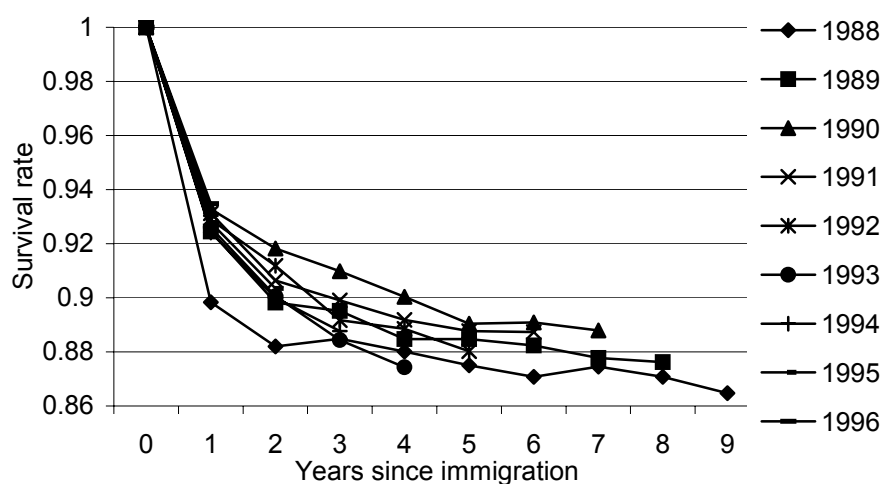**Figure 15: Staying rates in Denmark over time for other Nordic citizens immigrating 1988-96 to Denmark from all other Nordic countries.**
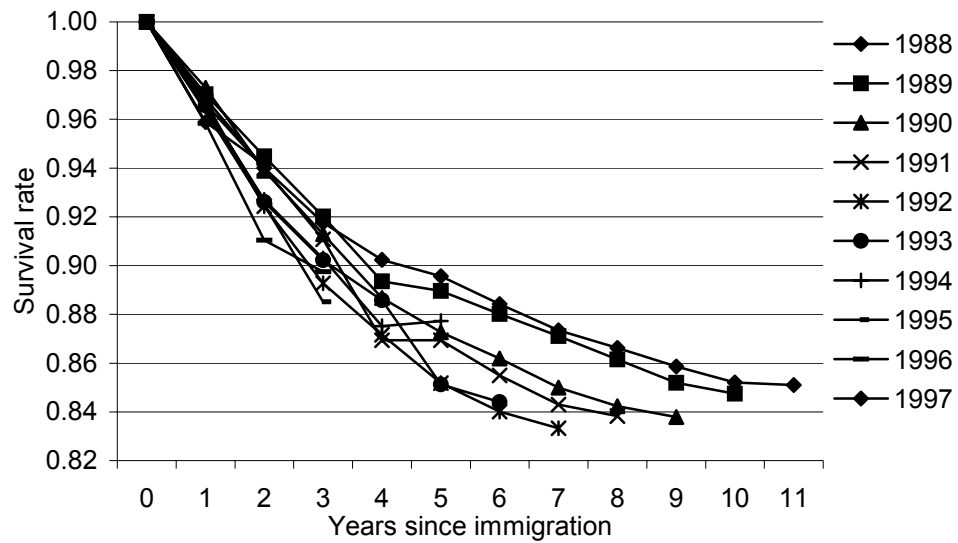

Figure 16: Staying rates in Finland over time for other Nordic citizens immigrating 1988-97 to Finland from all other Nordic countries.
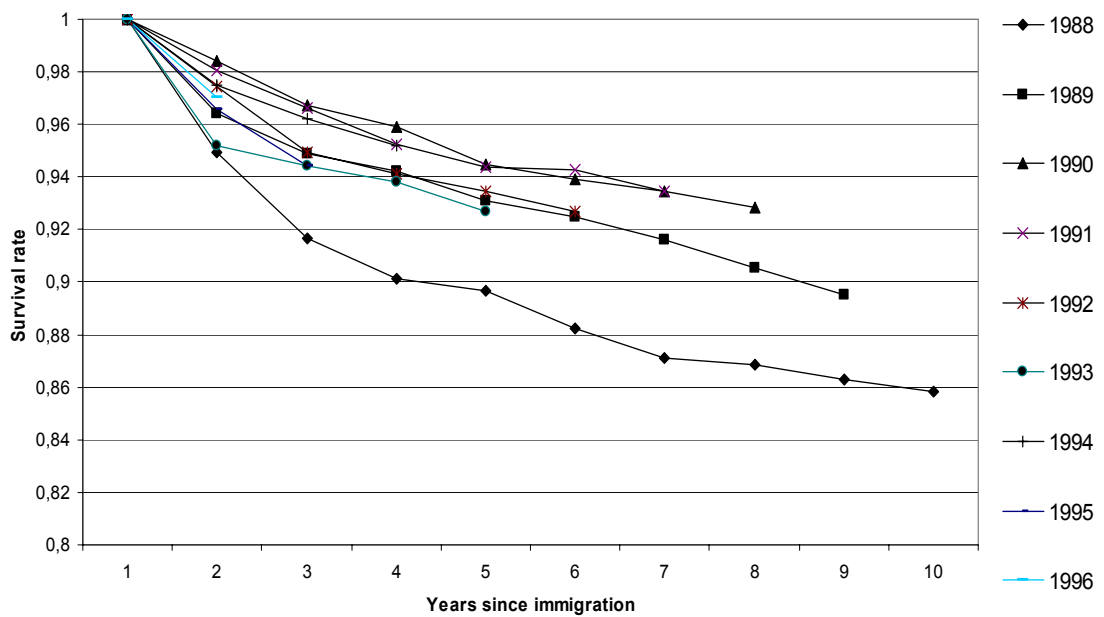
Figure 17: Staying rates in Norway over time for other Nordic citizens immigrating 1988-96 to Norway from all other Nordic countries.
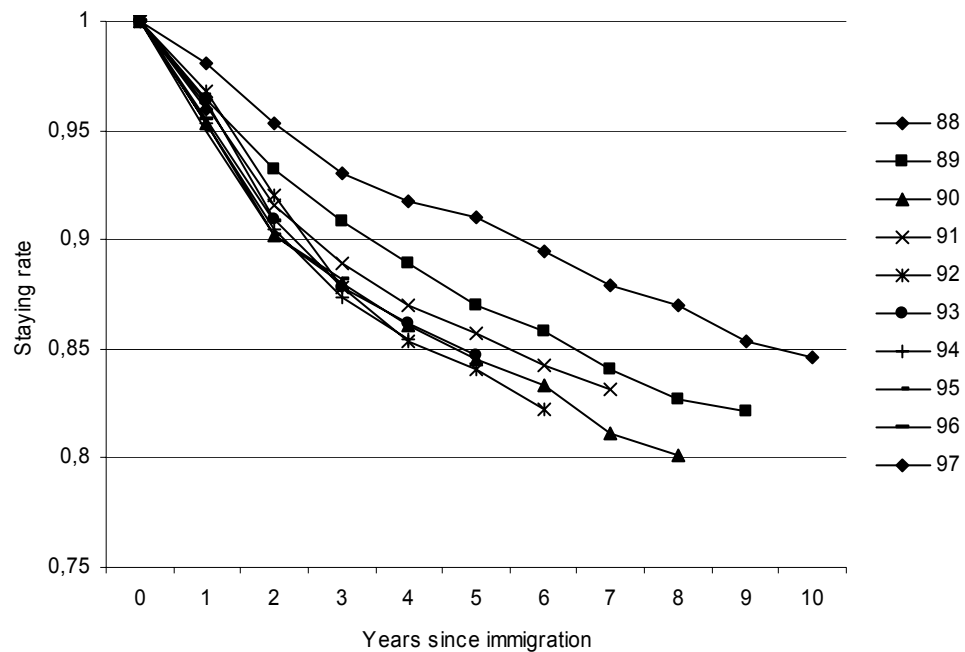

Figure 18: Staying rates in Sweden over time for other Nordic citizens immigrating 1988-97 to Sweden from all other Nordic countries.

The figures show that 50 per cent of non-national Nordic immigrants leave Denmark within 3 years and 70 per cent within a 10-year period. In Sweden, the corresponding figures are 50 per cent within 4-7 years and 70 per cent as a distant possibility. The staying rates in the cases of Finland and Norway are much higher, 75 to 85 per cent after three years and approaching 50 per cent only within a 10-year period. (The 1988 cohort in Norway deviates from this otherwise very consistent pattern.)

Another interesting aspect of the returning mobility is the differences in level between the citizens of the different Nordic countries. This is shown in the remaining figures of this section for the year 1988, where the returning rates and the staying rates are split by citizenship for the cases of Denmark, Finland, Norway and Sweden, respectively.
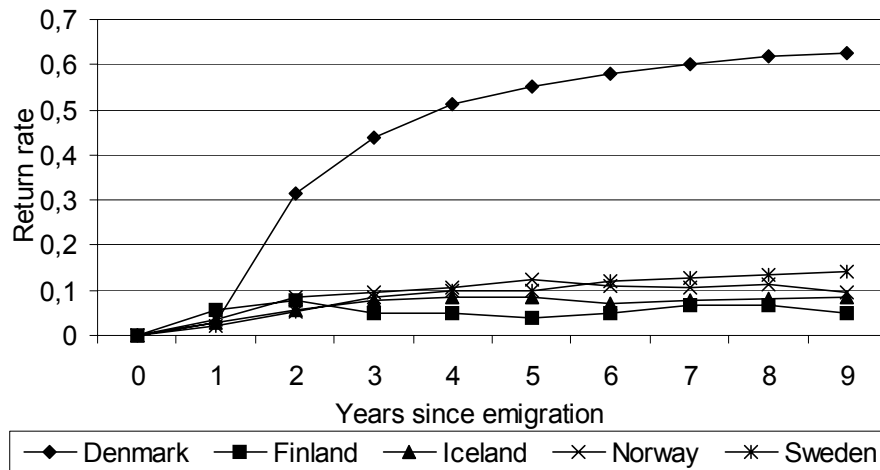
Figure 19: Returning rates to Denmark over time for Nordic citizens emigrating 1988 from Denmark to all other Nordic countries, by citizenship.
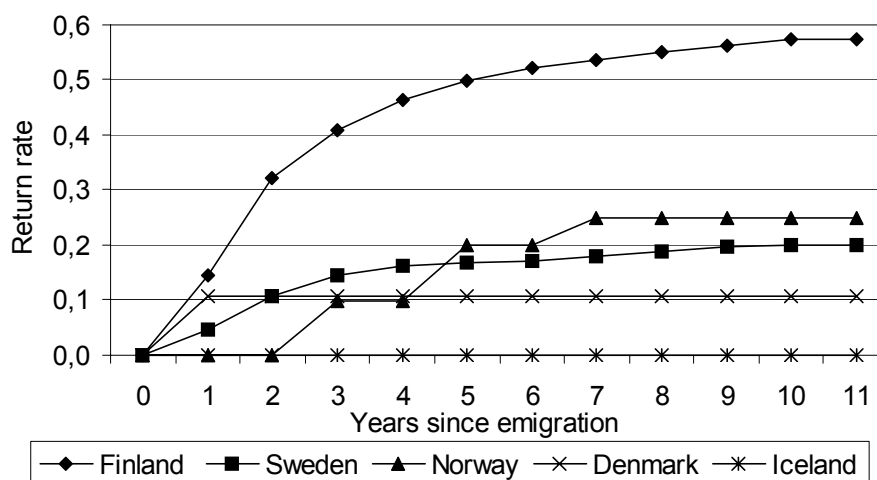
Figure 20: Returning rates to Finland over time for Nordic citizens emigrating 1988 from Finland to all other Nordic countries, by citizenship.
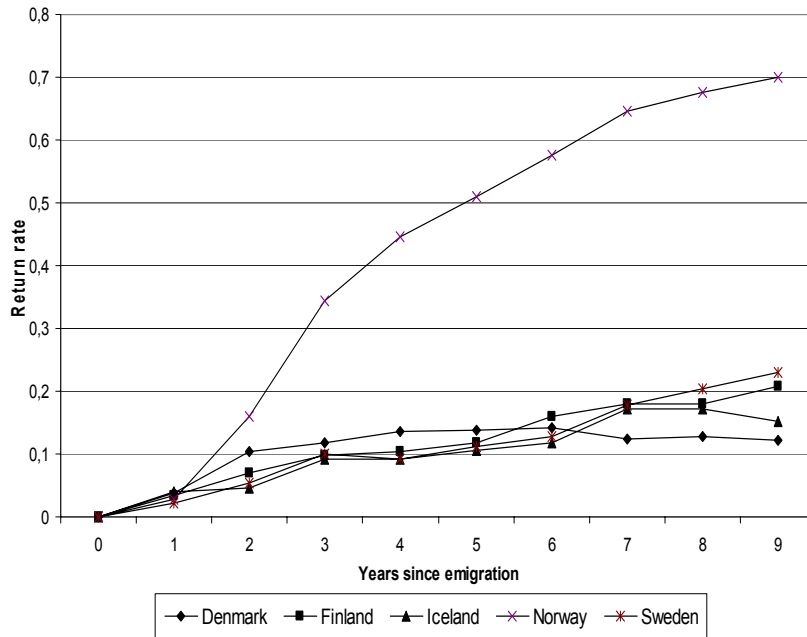
Figure 21: Returning rates to Norway over time for Nordic citizens emigrating 1988 from Norway to all other Nordic countries, by citizenship.
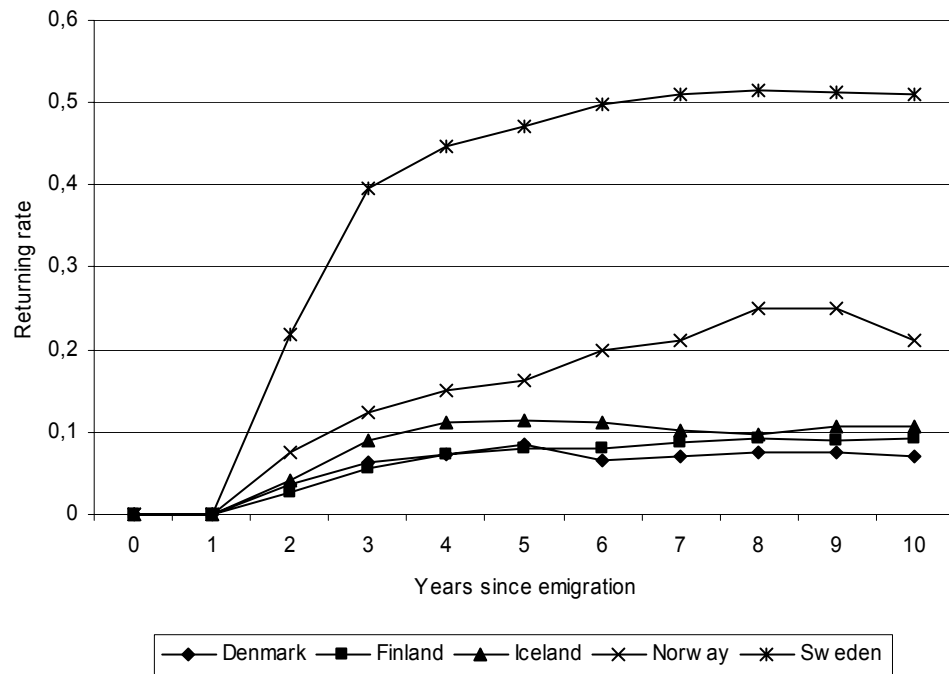
**Figure 22: Returning rates to Sweden over time for Nordic citizens emigrating 1988 from Sweden to all other Nordic countries, by citizenship.**
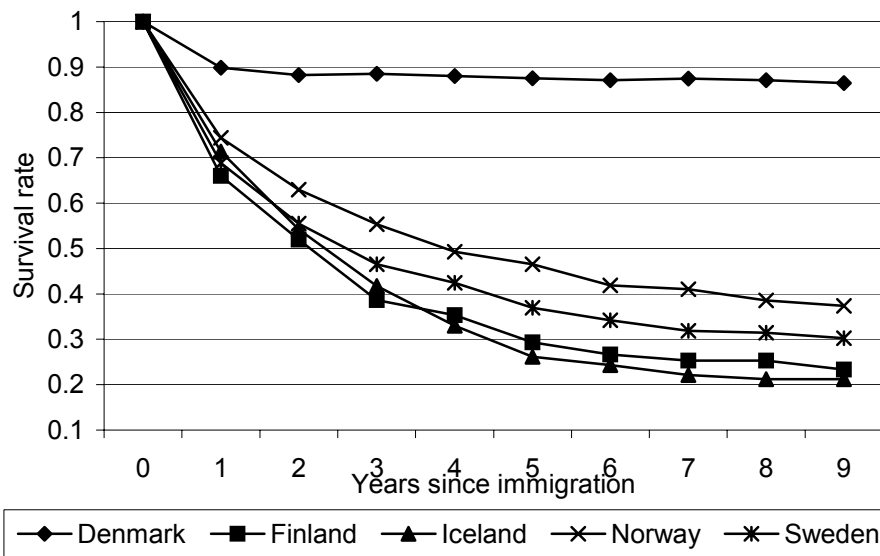
Figure 23: Staying rates in Denmark over time for Nordic citizens immigrating 1988 to Denmark from all other Nordic countries, by citizenship.
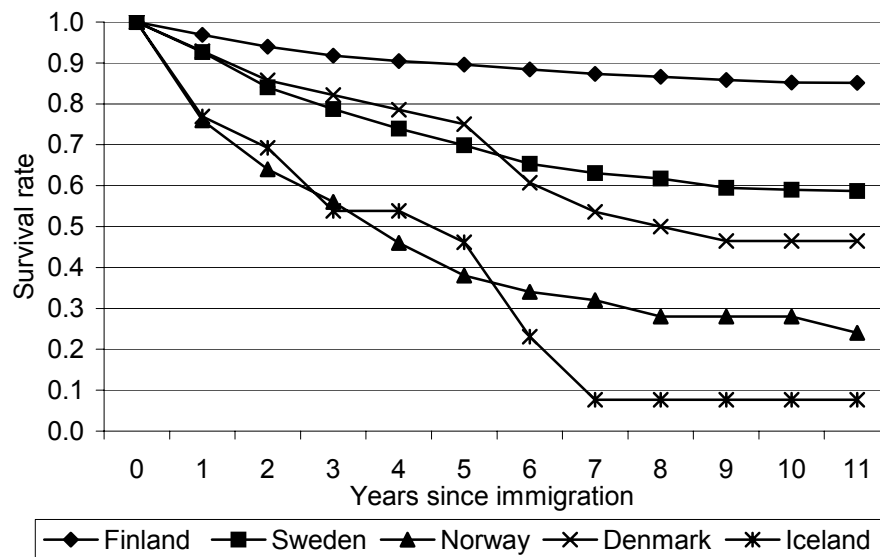
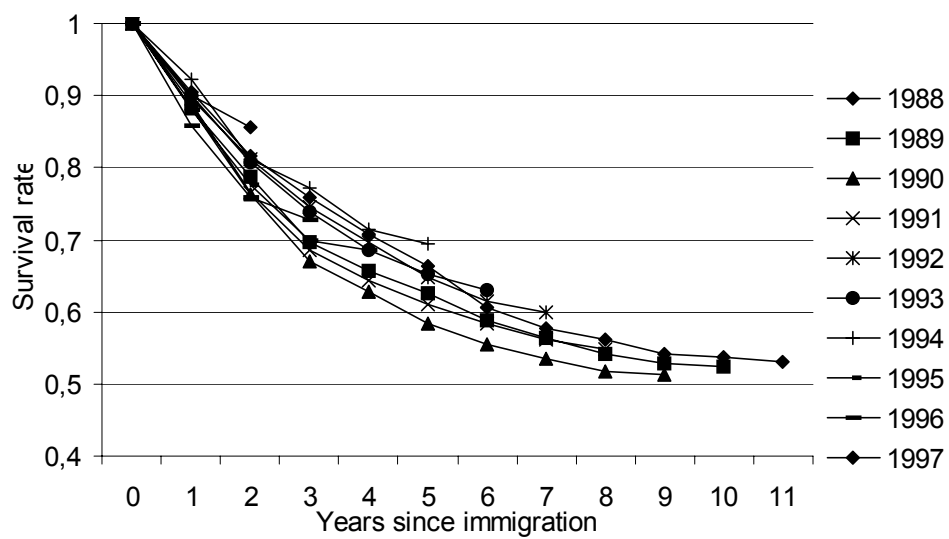**Figure 24: Staying rates in Finland over time for Nordic citizens immigrating 1988 to Finland from all other Nordic countries, by citizenship.**

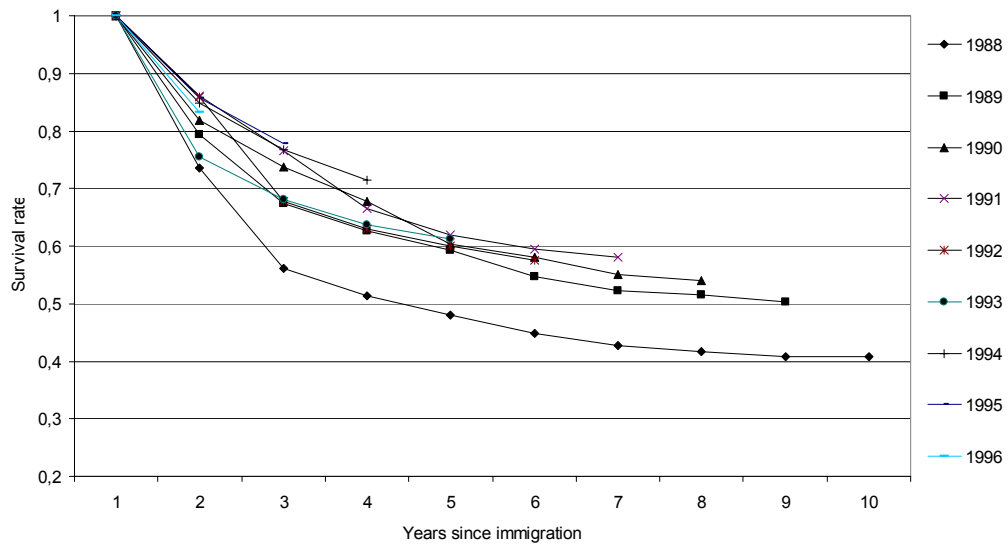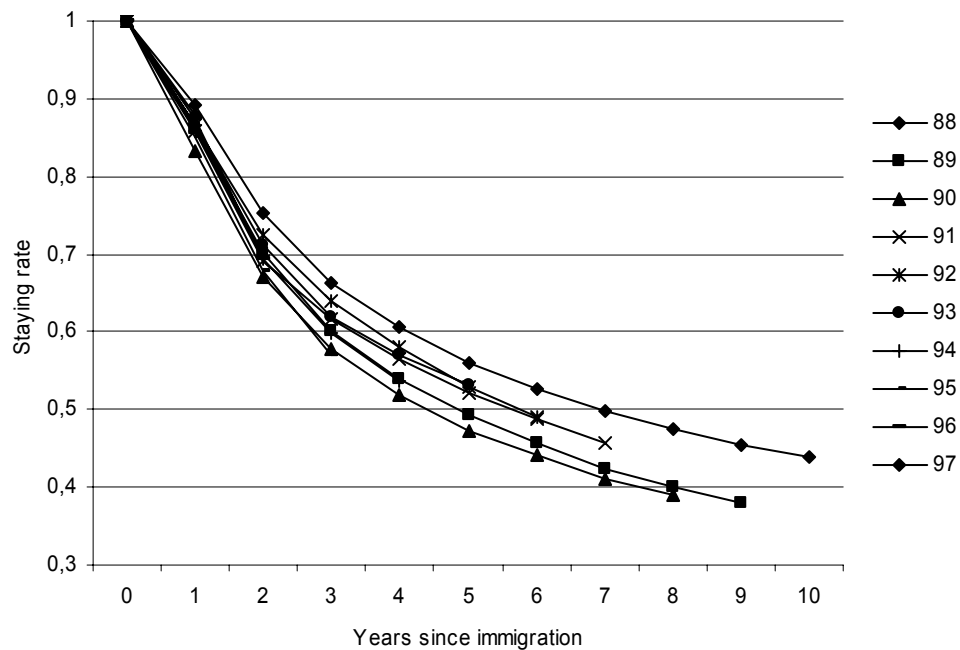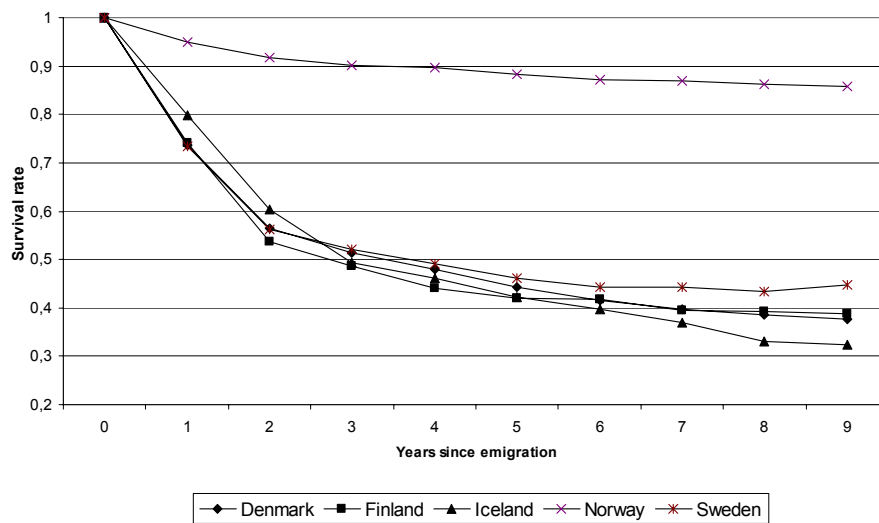**Figure 25: Staying rates in Norway over time for Nordic citizens immigrating 1988 to Norway from all other Nordic countries, by citizenship.**
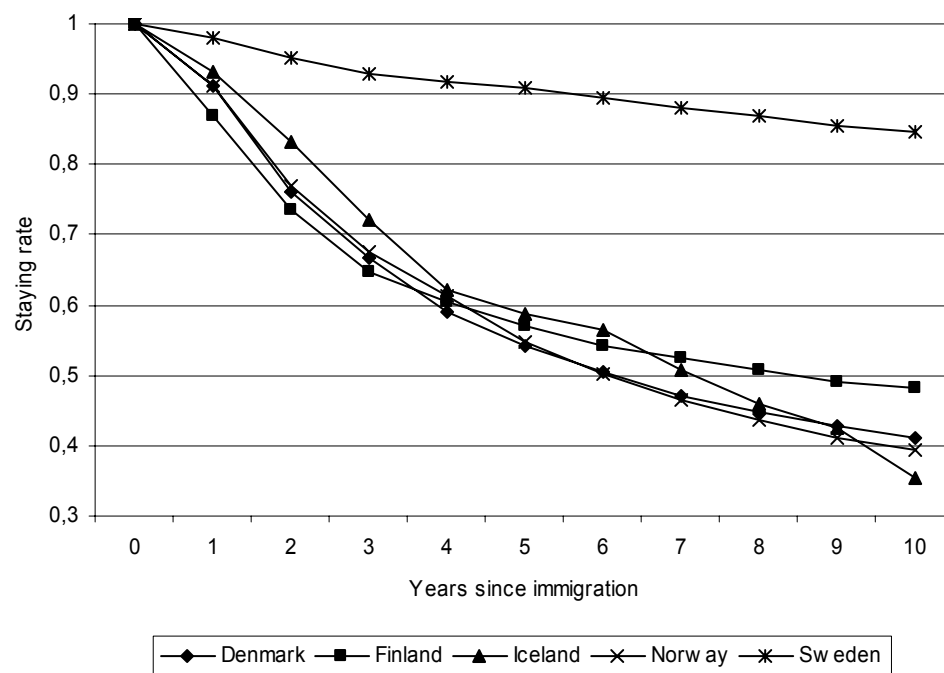
Figure 26: Staying rates in Sweden over time for Nordic citizens immigrating 1988 to Sweden from all other Nordic countries, by citizenship.

We have already seen the great differences in returning rates and staying rates between national and other citizens, reflecting a higher propensity to stay in, or return to, one's country of origin. Other patterns also appear, largely historically dependent patterns in the mobility rates. For example, Norwegians leaving Denmark have the highest returning rate among the other Nordic nationalities as shown in Figure 19. Similarly, the Norwegians have the lowest returning rate after immigration to Denmark as shown in Figure 23 (this corresponds to the highest staying rate). Iceland and Finland have the lowest rates in both these cases.

For Finland the country specific differences are far more pronounced. Citizens from the two neighbour countries Norway and Sweden have the highest returning rates back to Finland whereas Swedes and Danes have the highest staying rates when they immigrate to Finland, in the latter cases 45-60 per cent after 10 years, which is remarkably high.

In the case of Norway, there are also differences in returning and staying rates but the differences partly change direction from the short to the medium and long terms. Other graphs above suggest that 1988 may be an atypical cohort for Norway and we refrain from interpreting the changing differences in the case of Norway.

In Sweden, the staying rates are similar to those in Denmark.

Hence, the cross border mobility rates are highly influenced by historical and cultural dependencies. It seems easier to move across borders and stay there to a neighbouring country or if there are historical ties like between Iceland and Denmark, cf. also Table 1.

7 Some barriers to migration

A more detailed picture of the migrants comes from an analysis where the behaviour of the migrants is compared to non-migrating persons in Table 13, and in an analysis in Table 14 and Table 15 of how family status influences the migration probability, i.e. becomes a barrier. The differences in Table 13 show in which sectors the dynamics of the migration are changing and where migration is becoming a trend. For example, the dynamics of the information and communication technology sector are of high political interest these days.

In the Finnish and Danish data, there is one variable for being employed and one variable for being studying. This allows for four different states of occupation. The data do not distinguish between those who are students with a side job or primarily employees engaged in part time study. The Norwegian and the Swedish data only distinguish between being employed or not.

Table 13: Sectoral distribution of population and Nordic migration for selected Nordic countries for persons studying or employed, 1995. Absolute numbers (column percentages in parentheses).

Country and sector	Emigration		Immigration		Population	
	Studying	Employed	Studying	Employed	Studying	Employed
Denmark						
Higher education institutions and R&D institutes	14 (3)	36 (3)	19 (2)	38 (2)	6.280 (2)	27.616 (1)
Information and communication technology	2 (0)	35 (2)	4 (1)	29 (1)	3.735 (1)	32.564 (2)
Agriculture, mining, manufacturing, utilities and construction	33 (7)	321 (22)	59 (7)	438 (23)	33.447 (12)	600.036 (29)
Trade, hotels, restaurants, transport, financial, other services	103 (22)	597 (41)	147 (19)	726 (37)	74.448 (27)	647.773 (31)
Other community services	79 (16)	451 (31)	152 (19)	711 (37)	71.585 (26)	758.760 (37)
No sector or missing	248 (52)	0 (0)	413 (52)	0 (0)	84.455 (31)	418 (0)
Total	479 (100)	1.440 (100)	794 (100)	1.942 (100)	273.950 (100)	2.067.167 (100)
Finland						
Higher education institutions and R&D institutes	56 (10)	124 (12)	22 (6)	108 (13)	18.653 (4)	143.512 (8)
Information and communication technology	0 (0)	11 (1)	1 (0)	13 (2)	2.643 (1)	30.323 (2)
Agriculture, mining, manufacturing, utilities and construction	56 (10)	208 (20)	14 (4)	188 (23)	20.031 (4)	637.527 (34)
Trade, hotels, restaurants, transport, financial, other services	74 (13)	340 (33)	31 (9)	286 (35)	35.051 (8)	583.007 (31)
Other community services	60 (10)	249 (25)	14 (4)	161 (20)	24.395 (5)	465.544 (24)
No sector or missing	331 (57)	84 (8)	257 (76)	51 (6)	347.932 (78)	42.140 (2)
Total	577 (100)	1.016 (100)	339 (100)	807 (100)	448.705 (100)	1.902.053 (100)
Norway						
Higher education institutions and R&D institutes		21 (2)		37 (2)		29.696 (2)
Information and communication technology		12 (1)		25 (2)		31.631 (2)
Agriculture, mining, manufacturing, utilities and construction		181 (20)		347 (21)		527.122 (27)
Trade, hotels, restaurants, transport, financial, other services		222 (25)		416 (25)		546.347 (28)
Other community services		454 (51)		800 (48)		756.901 (39)
No sector or missing		2 (0)		39 (2)		54.254 (3)
Total		892 (100)		1.664 (100)		1.945.951 (100)
Sweden						
Higher education institutions and R&D institutes		696 (10)		605 (10)		290.046 (8)
Information and communication technology		674 (9)		585 (9)		117.170 (3)
Agriculture, mining, manufacturing, utilities and construction		1.424 (20)		1.270 (21)		1.063.849 (28)
Trade, hotels, restaurants, transport, financial, other services		1.754 (25)		1.619 (26)		929.275 (24)
Other community services		2.356 (33)		1.885 (30)		1.349.627 (35)
No sector or missing		199 (3)		225 (4)		100.870 (3)
Total		7.103 (100)		6.189 (100)		3.850.837 (100)

Notes: Finland and Sweden - age 20-74. Denmark and Norway - age 20-70.
Sectors are measured in the emigration year for emigrants and in the year after immigration for immigrants.
Source: Register data from the Nordic countries

Table 13 reveals that Finland and Sweden have a relatively much larger HEI[12] sector than the two other countries and that this sector accounts for an even higher share of the total migration. Denmark has the smallest HEI sector of the four but a higher propensity in that sector for migration than Norway. The migration in the ICT sector is so small in absolute numbers that one may wonder whether there is a Nordic labour market in this sector at all. The only exception is Sweden; however, only about one in ten ICT immigrants or emigrants are accounted for in the register data from the other Nordic countries. Of course, since we are following pseudo-individuals, this may reflect people changing sector of employment through migration. The primary and secondary sectors have a much lower share of the migrants than of the total population in all four countries. In the service sectors, the picture is mixed.

Hence, among both working immigrants and emigrants there is no indication of a higher than average knowledge and ability transfer. In fact, the high-level knowledge sectors are underrepresented. Instead, the private service sector dominates, a sector where also unskilled persons can be employed for shorter or longer periods. These tendencies indicate a circulation of persons, not necessarily including circulation knowledge based on higher education.

Looking at the persons in education, the Danish figures indicate that only close to 50 per cent of the migrating students have employment as opposed to 70 per cent in the total student population. HEI is the only sector where student employees have a higher than average probability for emigration, probably linked to them studying abroad as long term exchange students. However, the absolute numbers are very small. Still, this possibility supports the win-win situation where the returning person will return with upgraded qualifications.

The Finnish figures reveal quite another story although the conclusion regarding the national pay-off is the same. In Finland, only 22 per cent of the students are employed while they are students. However, among the emigrants the share is 43 per cent, similar to the Danish case. Among the immigrating students only 24 per cent are simultaneously working – comparable to the average for all students in Finland. Despite the differences between the Danish and Finnish figures the numbers still indicate a possible win-win situation also for Finland.

The trend that a large fraction of the people migrating is young people (skilled or in education) raises the question of barriers arising from family composition. Are singles more mobile than married and cohabiting people compared to their population shares? If so, family is a barrier for the cross border mobility. Table 14 and Table 15 show the distribution of migrants by marital status.

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[12] HEI: Higher education institutions; here also including R&D institutions.

Table 14: Marital status by citizenship for Nordic emigrants from selected Nordic countries, 1987-98. Per cent.

Country, citizenship and marital status		Year of emigration											
		1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark													
National	Single		65	65	69	66	68	65	66	67	71	65	
	Married		21	18	16	19	17	18	18	20	16	17	
	Cohabiting		14	16	15	15	15	17	16	13	13	18	
Nordic	Single		52	56	53	56	65	60	62	61	57	52	
	Married		28	25	25	26	18	22	22	18	20	22	
	Cohabiting		21	19	22	18	17	18	17	20	23	26	
Finland													
National	Single	56	56	58	57	58	59	53	53	56	51	57	58
	Married	33	33	31	32	31	28	32	32	30	35	30	29
	Divorced	9	10	10	11	10	12	13	13	13	13	12	11
	Widowed	1	1	1	1	1	1	2	1	1	1	1	1
Nordic	Single	39	42	43	48	44	42	44	45	51	44	53	53
	Married	44	44	40	37	41	40	37	36	35	40	32	31
	Divorced	14	13	14	11	13	15	17	16	13	14	13	13
	Widowed	3	2	2	3	2	3	2	3	1	2	2	3
Norway													
National	Single	43	41	52	52	46	47	48	51	50	50	49	
	Married	43	45	35	36	42	41	40	37	39	38	40	
	Divorced	12	12	12	11	11	11	10	11	10	11	10	
	Widowed	1	1	1	1	1	1	1	1	1	1	1	
Nordic	Single	59	61	65	60	57	58	61	64	55	60	61	
	Married	29	29	24	28	30	29	26	24	33	30	29	
	Divorced	11	10	11	11	12	12	12	11	11	10	9	
	Widowed	1	0	0	1	1	1	1	1	1	1	1	

Note: Finland - age 20-74. Denmark and Norway - age 20-70.
Source: Register data from the Nordic countries.

Table 15: Marital status by citizenship for Nordic immigrants to selected Nordic countries, 1987-98. Per cent.

Country, citizenship and marital status		Year of immigration											
		1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark													
National	Single		66	65	65	61	59	61	60	62	61	60	
	Married		17	17	18	21	25	22	23	23	21	23	
	Cohabiting		17	18	17	18	16	17	17	16	18	17	
Nordic	Single		54	52	52	50	52	60	56	56	55	57	
	Married		23	23	24	27	25	19	20	19	19	20	
	Cohabiting		24	25	24	23	23	22	24	25	26	24	
Finland													
National	Single	63	63	63	63	60	56	59	58	57	64	63	62
	Married	25	25	26	26	28	31	30	30	31	25	26	25
	Divorced	11	11	11	11	11	12	11	12	11	11	10	11
	Widowed	1	1	1	1	1	1	1	1	1	1	1	1
Nordic	Single	45	45	46	49	50	47	41	42	46	50	46	47
	Married	35	43	37	37	33	37	42	39	38	37	36	38
	Divorced	18	11	15	13	17	14	15	17	14	11	16	14
	Widowed	3	2	3	1	1	3	2	3	3	2	2	1
Norway													
National	Single	36	37	37	43	44	40	39	39	39	41	41	42
	Married	54	53	52	46	45	49	49	50	48	47	48	47
	Divorced	8	9	9	10	10	10	11	10	12	11	10	10
	Widowed	1	1	1	1	1	1	1	1	1	1	1	1
Nordic	Single	64	64	62	58	59	59	61	59	60	62	64	64
	Married	24	24	26	29	28	29	28	31	30	27	26	26
	Divorced	12	11	12	12	12	11	11	9	10	11	9	9
	Widowed	1	1	1	1	1	1	0	0	1	0	0	0

Note: Finland - age 20-74. Denmark and Norway - age 20-70.
Nordic means non-national Nordic.
Source: Register data from the Nordic countries.

The distribution of migrants by marital status is remarkably stable over time, so there does not seem to be any significant changes in the composition although the share of single emigrants (but not single immigrants) in Finland increases slightly in the period. The tables do not tell whether the shares are higher than population averages, i.e. whether for example the marital status is a barrier that decreases the migration propensity. However, Table 16 in Section 8 reveals that especially singles have a significant higher than average mobility, indicating that family obligations is a barrier, even when corrected for age differences (because married people are older and older people have a lower migration rate).

8 An empirical model of migration propensities and years before return migration

An empirical model for cross border mobility of individuals allows a simultaneous treatment of explanatory variables, i.e. it allows a quantified determination of the differences in migration propensities. We have applied such a model to the Danish data. Table 16 gives estimation results from a logistic probability model for a sample of the entire population pooled over all years. The model estimates the probability of migration and determines differences depending on observed characteristics among the individuals. The table also reports the results of estimating a model of the years from migration until return migration happens for the sample of migrants in 1988. An OLS model is estimated, but it does not allow a correct treatment of the migrants staying abroad for 10 or more years. Due to the 10-year observation window, these individuals' returning year is unobservable. A right-censored model corrects for this, estimating the upper-censored individuals as a point probability. This is the Tobit model in Table 16. Correcting for the unobserved return year changes the estimation results considerably.

Table 16: Estimation model for the Nordic immigration and emigration probability in the period 1988-97 and time (years) before return migration for the 1988-cohort in Denmark.

Explanatory variable	Immigration			Emigration		
	Probability 1988-97	Years from 1988 before return migration		Probability 1988-97	Years from 1988 before return migration	
	Logit	OLS regression	Tobit regression	Logit	OLS regression	Tobit regression
Unemployment rate	0,066*			-0,031*		
Constant	-3,662*	8,684*	11,694*	-3,329*	7,740*	11,667*
Citizenship						
Danish citizen	-1,690*	1,913*	3,636*	-1,300*	-2,646*	-5,561*
Other	-	-	-		-	-
Gender						
Male	-0,012*	-0,559*	-1,226*	0,054*	-0,293*	-0,496*
Female	-	-	-	-	-	-
Marital status						
Single	0,271*	-0,368*	-0,810*	0,817*	-0,238*	-0,406*
Cohabiting	-0,086*	0,029	0,009	0,146*	-0,425*	-0,812*
Married	-	-	-	-	-	-
Children						
# Children aged 0-17	-0,540*	-0,181	-0,198	-0,386*	-0,020	-0,013
# Children squared	0,061*	0,059	0,082	0,040*	-0,009	-0,021
Age group						
19 years	0,901*	-0,273	-0,382	0,315*	-2,070*	-2,751*
20 - 24 years	0,510*	-0,216	-0,303	0,356*	-1,032*	-1,567*
25 - 29 years	0,118*	-0,179	-0,237	0,198*	-0,257*	-0,398*
30 - 34 years	-	-	-	-	-	-
35 - 44 years	-0,514*	0,247	0,439	-0,423*	-0,006	-0,098
45 - 54 years	-1,170*	0,324	0,493	-1,063*	-0,147	-0,426
55 - 64 years	-1,810*	0,768*	0,354	-1,765*	0,413	0,591
65 - 74 years	-2,869*	-2,530*	-4,115*	-2,553*	2,576*	8,530*
Educational level						
ISCED97 1 + 2	-1,785*	-0,892*	-1,933*	-1,563*	0,379*	0,730*
ISCED97 3 + 4	-0,765*	-0,217	-0,352	-0,776*	0,384*	0,717*
Bachelor or Master	-	-	-	-	-	-
PhD	0,951*	-2,897*	-6,810*	0,708*	4,415	30,051
No information	0,569*	-2,579*	-4,378*	0,289*	1,270*	2,707*
Sectoral group						
HEI and R&D	0,530*	0,384	0,898	0,761*	0,908*	1,958*
ICT	0,041	-0,816	-1,804	0,560*	-0,164	-0,343
Trade, hotels etc.	0,123*	0,178	0,620*	0,243*	0,066	0,053
Community services	0,010	-0,270	-0,077	0,078*	0,111	0,147
No information	1,172*	-0,964*	-1,174*	0,665*	0,029	0,002
Manufacturing etc.	-	-	-	-	-	-
Employment						
Employed	0,073*	-0,427	-0,129	0,023*	-0,046	-0,054
Not employed	-	-	-	-	-	-
Studying						
Studying	-0,435*	-0,347*	-0,729*	-0,041*	0,195	0,341
Not studying	-	-	-	-	-	-
Number of observations	37.441.101	3.689	3.689	37.441.101	5.090	5.090
Normal scale parameter			5,047			4,718
$R^2_{adj.}$	0,409	0,332		0,242	0,234	

Note: The characteristics of the reference person for the dummy variables are indicated by – in the table. [*] indicates statistical significance at a 10 per cent level.
Source: Register data from the Nordic countries.

The probability model reveals that the immigration probability increases when the unemployment rate increases, i.e. when the business cycle decreases, and that the emigration probability increases when the unemployment rate decreases, i.e. when the business cycle increases. This indicates that there is no push effect in the emigration from Denmark and no pull effect in the immigration to Denmark. In fact, the opposite effects are significant. These findings are in contrast with the conventional belief in the area that push and pull effects are highly dominating among the migration motives. However, Pedersen (1996) did only find weak evidence of such push/pull effects in a study of the economic incentives to migrate, i.e. wage differentials and unemployment differences.

A weakness in the present results is, however, that only the Danish business cycle is included in the regressions. The business cycle in the sending or receiving country could be different dominating the Danish business cycle such that the foreign push or pull effects explains the observed migration rates. Even though we have previously argued that the national business cycles in the Nordic countries largely run in parallel, small differences could still have a certain impact.

The probability model also reveals that a minority of the population migrate (negative constant), that Danish citizens have a lower migration probability than other Nordic citizens, that men have a higher emigration probability and a slightly lower immigration probability than women, that singles and cohabiting persons have a higher migration probability than the married (except cohabiting immigrants), that having children decreases the migration probability, that the migration probability decreases with age and increases with educational levels, that being in education decreases the migration rates as opposed to being employed which increases it. Finally, being employed in the ICT sector increases the emigration probability; employment in the HEI sector increases the migration probability in general. So does employment in the private or public service sectors.

Hence, the findings in using the probability model all support the indications found in the empirical investigations of single aspects presented in the earlier sections, namely that the migrating persons are well-educated single young adults and that the net flow may be close to zero, i.e. knowledge circulation instead of drain or gain. This supports the thesis of a win-win outcome of migration. However, the probability models only predicts around 40 per cent of the immigration incidents and 24 per cent of the emigration incidents correctly using the observed characteristics in the models reported in columns one and four of Table 16.

Estimating the years from 1988 before migrants return is also reported in Table 16. The results using the two estimation techniques both give the same signs of the effects. Hence, the direction of how the characteristics influence the length of stay is correct in both models and can be generalised. However, using the Tobit methods gives statistically corrected size of the estimated coefficients, which is important if not only the direction but also the number of years before return is to be predicted.

The Tobit model reveals that an average person immigrating to Denmark in 1988 leaves again after 11 years, similarly emigrants from 1988 also return after 11 years on average. Being a Danish citizen increases the time of stay by 4 years for immigrants and decreases it by 6 years for emigrants.

Male immigrants stay one year shorter than female immigrants, male emigrants return half a year earlier than female emigrants. Similarly being single reduces the years as migrant, although not significantly among the emigrants. Cohabiting decreases the years significantly among emigrants

but not among immigrants, all compared to married migrants. Children reduce the years of migration but not significantly.

There is a tendency that the migration time increases with age. However, the effect is only significant among young emigrants. Pensioners emigrate longer and immigrate shorter periods. However, this result is most likely due to an unknown and unidentifiable share of this age group dying when they are abroad.[13]

The educational differences among migrants do not significantly influence the length of the migration period before return, and even the tendencies are mixed. Working sector at the time of migration does not reveal significant information on the time for return. Neither does work at all although the tendency is negative on migration length. However, immigrants in education leave faster than other immigrants. The opposite is the case among emigrants although not significant.

Hence, the time before return migration reveals the expected patterns, that single well-educated young adults return faster than the average migrant. This supports the knowledge circulation thesis and indicates that there seems not to be any trend in who and why the permanent migrants are selected, at least not among the background characteristics used in this analysis.

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[13] Since only migration incidents are recorded, death is not recorded as terminating the stay of a migrant. For our study, which has a time window of about 10 years, this results in a stronger over-estimation of length of stay for the oldest age groups.

9 Conclusion

Human capital mobility across national borders is a high priority policy item due to the potential knowledge drain or knowledge gain from migrants. A discussion of the net value of migration has not concluded anything clear except in the theoretical literature, which predicts gains as well as losses depending on the theoretical set-up and the country type investigated. Just as in the national mobility study cases where individuals may move forth and back increasing the knowledge base both places, the international mobility of individuals may also be win-win cases. This happens if an individual emigrates and later returns with a greater knowledge stock, experience stock or contact network that can increase the national innovation ability and economic performance. At the same time, the receiving country may get a benefit in the period before the individual returns. The benefit may for example be the knowledge, network contacts, or other kinds of expertise brought along by the individual. Hence, also the receiving country wins knowledge even if the individual returns after some time. However, only empirical studies can give valid answers to whether the migration is a win-win, win-lose or lose-win situation. The present report investigates how register data can be used to give answers and indications of the country specific outcomes from migration.

The general difference between the win-lose (knowledge gain), lose-win (knowledge drain) and the win-win situations seems to lie in the distinction between knowledge flows and knowledge circulation. The flow is primarily a one-way movement, as opposed to circulation. This also means that a snapshot of individuals moving across borders is a static picture that has limited real information value. Instead, returning rates, knowledge increase, job experience, formal education, family restrictions etc. all contribute to a clearer picture of what the win-win situation actually consists of. Similarly, the share of migrants with national citizenship may influence this conclusion if they have the highest returning rates among emigrants and the lowest among immigrants.

The present project has drawn on register data in Denmark, Finland, Norway and Sweden and the analysis is limited to Nordic migration, which for these four countries typically makes up 20 to 30 per cent of their immigration and 25 to 50 per cent of their emigration. Although this accounts for somewhere between 80 and 90 per cent of the total Nordic migration, it means that the situation of Iceland and the other Nordic island regions (Greenland, Faroe Islands, etc) is not within the scope of this analysis. For these regions, the Nordic migration typically accounts for 60 to 100 per cent of their total migration. Only migration spell lasting more than 12 months are included in the analysis.

Using the registers to determine a simple thing such as the number of migrants gives different although comparable answers when emigrants from one country are compared to immigrants in the receiving country. It also confirms that the migrants are a minority compared with the population. Unfortunately, from a knowledge point of view a disastrous amount of the migrants have missing information on their formal education. This is especially the case among the migrants with foreign citizenship. However, looking at the distribution of emigrants and immigrants by education (if known) and age indicates that the two groups have similar characteristics, i.e. look alike. Hence, a first indication of knowledge circulation rather than gain or drain is a near thought.

Looking at the labour market and educational participation for the migrants reveals that a large fraction works prior to emigration and the year after immigration. A lower share is studying (although data are missing in Norway and Sweden on this point). The working ratio is higher

among national than foreign citizens. This indicates that a considerable flow of work experience or on-the-job experience is present in the migration between the countries. It also indicates a flow of students across the borders. Calculating the educational level among the migrants reveals that they are slightly better educated than the average population and that the immigrants increase their educational level during their stay in the receiving country (in the first five years after immigration). However, these facts are highly correlated to the fact that young adults are better educated (and more often still in education) and have a higher migration probability. Hence, a second indication of knowledge circulation on a significant level and of a significant size is present.

An analysis of the return migration probability reveals that a large fraction of the migrants return after a short period of time, i.e. that the migration is temporary. 50 per cent of national emigrants return within 3 to 7 years (except to Sweden, where it takes 6 years or significantly longer for the first 50 per cent to return). Similarly the staying rate among immigrants from the other Nordic countries displays an inverse picture of the returning rate for the emigrants, high for the national citizens, low for the other Nordic citizens. However, the differences between the countries are quite visible. Let us use as a benchmark the time elapsed where 50 per cent of the non-national immigrants have returned and the rest are still staying on. This benchmark is 3 years in Denmark, 4 to 7 years (depending on cohort) in Sweden, 5 years or much longer in Norway and 9 years or much longer in Finland. Also noteworthy is the fact that 10 to 20 per cent are recurring migrants: they emigrate from their country of origin, then immigrate back to that country, and then re-emigrate again.

An analysis of migration according to sector of employment reveals that among those employed, the migrants work more often than the average population in the sectors requiring medium or low level skills, i.e. service jobs etc., but the picture is mixed. In countries with a large HEI sector, both the immigration and emigration numbers in this sector are even higher, indicating greater circulation of knowledge. Researcher mobility is the topic of another report of the present project.

However, these findings may also be influenced by the larger fraction of young adults migrating. Family barriers also seem to be significant. At least, a higher proportion of singles than in the population migrate compared to married and cohabiting migrants. Hence, it seems like there is a higher fixed cost of migration among the latter group.

Collecting all the indices in an empirical estimation model that takes the various explanations into account in a simultaneous set-up concludes the report. The model is only estimated on Danish data for the 1988 cohorts of emigrants and immigrants. The estimation shows that there is no economic push effect in the emigration from Denmark and no economic pull effect in the immigration to Denmark.

It also shows that a minority of the population migrate (negative constant), that Danish citizens have a lower migration probability to/from Denmark than other Nordic citizens, that men have a higher emigration probability than women (no gender difference in the immigration probability), that singles and cohabiting have a higher migration probability than the married, that the presence of children in the family decreases the migration probability, that the migration probability decreases with age and increases with educational levels, that being in education increases the migration rates as opposed to being employed, which does not matter. Finally, being employed in the ICT sector increases the emigration probability and employment in the research sector increases the migration probability in general. Similar conclusion can be drawn if the individuals are employed in the private or public service sectors.

Hence, the findings using the probability model all support the indications found in the empirical investigations of the single aspects presented in the earlier sections, namely that the migrating people are well-educated single young adults and that the net flow may be close to zero, i.e. knowledge circulation instead of drain or gain. This supports the thesis of a win-win outcome of Nordic migration.

Estimating the years from 1988 before migrants return reveals that an average person immigrating to Denmark in 1988 leaves again after 11 years, similarly emigrants from 1988 also return after 11 years on average. Being a Danish citizen increases or decreases the stay by 4 and 6 years respectively. Male immigrants stay less time than female immigrants, male emigrants return earlier than female emigrants. Similarly being single or cohabiting reduces the time as migrant. Having children also reduce the years of migration. There is a tendency that the migration time increases with age.

Hence, the years before return migration reveals the expected patterns, that single well-educated young adults return faster than the average migrant. This supports the knowledge circulation thesis and indicates that there seems not to be any trend in who and why the permanent migrants are selected, at least not in the used background characteristics.

The use of register data has proved possible in an analysis of the knowledge stock imbedded in migration of humans. Although there are areas of no or partly missing information, the register data also give a lot of other information. With the registers available at least in the four largest Nordic countries, migration studies are possible over a long period following individuals without needs of continuous surveys. Hence, the data allow for comparable studies among countries resulting in long run conclusions.

The present study reveals that the migration results in knowledge circulation, i.e. knowledge transfer, accumulation and circulation, rather than in knowledge gain or knowledge drain for the four Nordic countries in this study.

The register data could be investigated further in the future in order to reveal whether for example firm mobility, firm closure, inter- and intra-firm mobility, whether family members are followers or not for the migration decision. However, such border crossing registers are not available yet. Today's Nordic registers are separate although a common Nordic register database for research could be generated if the will was present. At the moment laws protecting the citizens prevent the creation of such a database.

Future collection of educational information among immigrants would make it considerably easier to calculate whether the net migration results in knowledge loss or gains for a country. The register data in the Nordic countries are full of information except regarding the knowledge or education of immigrants. This could and should be included.

The Nordic countries are a special case with labour markets and economies that are closely connected. This results in low economic incentives for migration among these countries. However, between other countries with larger differences economic incentives may dominate more showing significant pull or push effects. Even though the Nordic countries are a historically integrated area the register data have not been able to show a region which uses labour and knowledge in a flexible manner depending on macro based economic indicators, probably because the Nordic countries in this respect constitute one single region.

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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.