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94

Signe Jauhiainen

Studies on Human Capital Flows and Spatial Labour Markets

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ABSTRACT

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This thesis examines human capital flows and spatial labour markets in Finland. Four empirical studies investigate the determinants of location decisions, the spatial distribution of human capital, and the labour market outcomes at the individual and family levels. The empirical studies are preceded by an introductory chapter that describes the regional and individual aspects of human capital, and summarises the main findings.

Chapters 2 and 3 focus on the distribution of human capital across regions of Finland. In particular, the location decisions of students, recent university graduates, and highly educated couples are studied. Chapters 4 and 5 examine whether mobility and spatial concentration are advantageous for individuals and families. Finnish micro-level data – more precisely, a seven per cent random sample drawn from the Finnish 2001 census – are used in these empirical studies. The data comprise detailed information on education, work, and family, observed annually from 1987 to 2004. Microeconometric methods are used in the empirical analyses.

The results on university students and graduates presented in Chapter 2 affirm that a prior history of migration strongly predicts migration at a later date. In the Helsinki metropolitan area, university students and graduates are significantly less mobile than in other university regions. The results of Chapter 3 show that the probability of spatial concentration increases when both spouses are highly educated. In Chapter 4, the findings on family migration indicate that higher education increases the probability of migration, whereas employment decreases it. In addition, families in which both spouses contribute equally to the household income are the least mobile. Migration has a positive effect on household income growth. The results of Chapter 5 show that the risk of overeducation varies among regions. In fact, living in a large regional labour market decreases the probability of overeducation in men and women.

Keywords: human capital, regions, labour markers, migration, higher education

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Hyvinkää, October 2010

Signe Jauhiainen

CONTENTS

CHAPTER 1
INTRODUCTION

Abstract

This introduction presents the framework of this thesis. Here, human capital is viewed from individual and regional perspectives. In addition, previously existing empirical evidence on migration and the spatial distribution of human capital are surveyed. The regional distribution of human capital across Finland is also described and discussed. Finally, this chapter summarises the aims, methods, and main results of this research.

1 Introduction

The research presented in this thesis sought to examine human capital flows and spatial labour markets in Finland. The thesis is comprised of an introduction and four essays on the determinants of location decisions, the spatial distribution of human capital, and the labour market outcomes at the individual and family level.

Human capital is the key concept used in this thesis, and it is viewed from the individual and regional perspectives. Figure 1, below, presents the essential concepts and illustrates the framework of this thesis. Human capital consists of the knowledge and experience that increase an individual's future earnings. Individuals can acquire human capital, for example, by investing in education. Investments in human capital generate returns, such as better employment opportunities and higher wage. Since human capital and its spillover effects increase the productivity of workers, it is an essential factor in economic growth at the regional level. The externalities of human capital are the most intense in locations where human capital is concentrated.

As human capital is bound to individuals, migration eventually redistributes it across regions. Individuals make migration decisions in order to optimise their future welfare. These individual re-location decisions and regional human capital stock and flow are linked through the migration process. The significance of human capital for regional economic growth constitutes the main motivation for examining location decisions and labour market outcomes at the individual level.

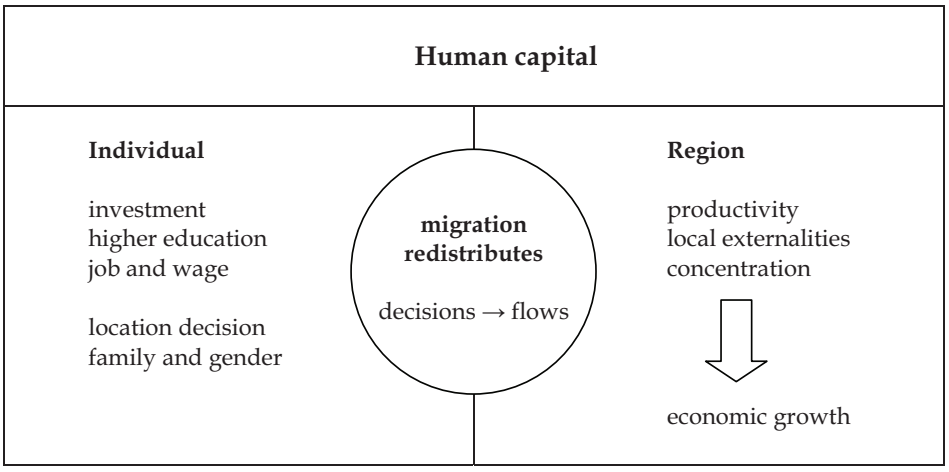

FIGURE 1 Framework of the thesis

In this introductory chapter, the previous evidence on human capital and migration is reviewed in sections 2 and 3. The spatial distribution of human

capital is described in section 4. The aims, methods, and main results of this thesis are presented in section 5. The second chapter analyses the migration of Finnish university graduates, and the third chapter describes the regional concentration of highly educated couples. Chapters 4 and 5 focus on labour market outcomes such as the effect of migration on household income and the regional pattern of overeducation in the Finnish labour markets.

2 Human capital

2.1 Human capital and the individual

Human capital is an essential concept in this thesis. The theory of human capital was introduced by Becker (1962), with the aim of explaining individual income differences since these differences could no longer be explained in terms of physical capital. All activities that improve human resources and increase future income are investments in human capital. Indeed, human capital consists of, for example, the acquired knowledge, skills, and experience that are bound to individuals.

Investment in human capital has costs and returns. When individuals invest in human capital, they encounter a trade-off between present and future income. As such, this investment decreases their present income but increases the income they generate in the future. When making a decision on whether or not to invest in human capital, individuals discount their lifetime earnings and compare the costs and the returns of the investment incurred. Education is a typical investment in human capital. For example, tuition fees and books are direct costs, whereas a loss of earnings during schooling is an indirect cost. The return on this investment is the potential to generate higher future income upon completing education. For instance, earnings accrued during schooling are low, but they increase after qualifying and entering working life.

This investment process continues through our lives. The period of investment in human capital, in other words human life, is finite, indicating that the incentive to invest in human capital is higher for younger people. They have a longer period in which to profit from their investment. However, human capital suffers from deterioration when acquired knowledge and skills become outdated.

At the individual level, the level of education or the number of years spent in education are typical ways of measuring human capital. Work experience is another important measure. For its part, on-the-job training is also a relevant component, but is more difficult to measure. At the macro-level, the percentage of attendance in education is used as a measure. Currently, the proportion of individuals having completed a higher education degree has become a more relevant measure when tertiary-level human capital has been accentuated (OECD, 2007).

The concept of overeducation is somewhat contradictory to the human capital theory. Individuals occasionally work in jobs that may not be commensurate with the level of their education. In other words, they are overeducated. The theoretical framework of overeducation aims to explain these mismatches. Compensation, heterogeneity, and career mobility are the most prevailing explanations for overeducation (Groot & Maassen van den Brink, 2000; Sloane, 2003). The concept of compensation suggests that individuals having less experience and on-the-job training may be more educated than they need to be in order to carry out their jobs. Overeducation may reflect the lower ability, in other words heterogeneity, of workers. According to the career mobility theory (Sicherman & Galor, 1990), workers may accept a job with lower education requirements in order to enhance their labour market position at a later point in time. The compensation model and the career mobility theory imply that overeducation is a temporary situation.

Previously conducted empirical studies have examined, for example, the effect of overeducation on wage (Hartog, 2000; Bauer, 2002; Dolton & Silles, 2008), overeducation and discrimination (Battu & Sloane, 2002), the duration of overeducation (Sicherman, 1991; Dolton & Vignoles, 2000; Büchel & Mertens, 2004), and the regional pattern of overeducation (Büchel & van Ham, 2003). Overeducation in the context of spatial labour markets is discussed in chapter 5 of this thesis.

2.2 Human capital and regional economic growth

In the endogenous growth theory, technological change is endogenously created and generates economic growth. Growth of capital stock, growth of labour force, and technological progress are regarded as the sources of economic growth in the traditional neoclassical growth model. However, these models offer an incomplete explanation for economic growth today. The endogenous growth models, developed from the neoclassical models, have sought new ideas and proposed that human capital is a crucial factor in economic growth.

In his endogenous growth model, Lucas (1988) separated the internal and external effects of human capital. The internal effect is the increase in an individual's personal productivity, whereas the average level of human capital has the external effect on all of the production factors. Human capital increases the productivity of physical capital and labour through this external effect, which is inherently local. Therefore, this external effect is intense in cities and increases productivity there.

In Romer's model (1990), technological change is a nonrival and excludable good. New designs can be reproduced and developed further, but this new technology is at least partially excludable and it generates profits. Hence, new technology is invented as a result of market incentives. In contrast to nonrival technology, human capital is bound to individuals. New designs enhance production directly and indirectly by making human capital more productive in the research sector. The conclusion of these models is that human

capital increases economic growth. The fact that human capital is significant to economic growth provides the main motivation to examine inter-regional human capital flows in this thesis.

The human capital externalities are clearly local, which, in this respect, makes the endogenous growth models relevant in the regional context. However, the endogenous growth theories cannot be directly applied to the regional context because they describe the growth path of a closed economy. Regions are not closed economies: they interact with other regions through trade, capital flows, migration flows, and innovation diffusion (Nijkamp & Poot, 1998). In their framework of regional economic development, Faggian and McCann (2009a) stated that human capital has a similar effect on productivity at both a regional and national level. However, because the mobility of highly educated individuals is frequent, the regional stock of human capital is not endogenously created. In fact, human capital is unevenly distributed across space. Since human capital is a mobile factor, its flows affect regional growth differently when some regions gain and some lose human capital. Finally, the total impact of human capital on regional development consists of the productivity effect and human capital flow.

Several studies have empirically tested the endogenous growth theory and examined the effects of human capital on regional economies. According to Simon (1998), the concentration of highly educated individuals increases productivity and generates local spillovers. Indeed, human capital was shown to increase employment growth from 1940 to 1980. The proportion of college-educated people, in particular, had a strong connection with the employment growth; the disparities between regions increased during the period observed. Simon and Nardinelli (2002) studied the effects of human capital on employment growth from 1900 to 1990 in the US and observed that there was a positive relationship between the proportion of college graduates and employment growth. The instrumental variables estimation suggested that human capital promoted employment growth and supported the hypothesis that this causality was not likely to work in reverse. Simon and Nardinelli (2002) tested the industry composition and comparative advantage patterns and showed that human capital was also important to manufacturing cities.

Rauch (1993) proposed that a high level of human capital leads to higher wage and higher rents in equilibrium. Human capital is a local public good that increases the productivity of a city. Empirical evidence supported this hypothesis. Johansson and Karlsson (2009) described the relationship between knowledge and regional growth. They stated that knowledge is spatially sticky, because technology is concentrated in specific regions and firms are dependent on clusters. Südekum (2008) examined the effect of high-skilled labour on employment growth in the West Germany and observed similar trends to those found in the US studies.

Moretti (2004) stated that social returns on human capital exist through spillovers. The spillovers occur when educated workers make other workers more productive. The knowledge transfer has friction costs that encourage communication with agents located in close proximity. The spillovers are

difficult to explore empirically, yet some evidence has been found. For example, the average wage level is higher if the proportion of highly educated people is high (Moretti, 2004). According to Johansson & Karlsson (2009), the sources of knowledge are knowledge creation through research and development, knowledge flows inside a region, and knowledge flows between regions. In addition, some studies have emphasised the inter-regional human capital flows as a source of spillovers (Mukkala, 2008; Faggian & McCann, 2009b).

3 Migration

According to the classical migration theory, individuals react to wage level differentials and migrate to regions in which the level is higher. Eventually, migration flows lead to equilibrium in wage levels. The human capital model of migration contradicts the classical migration theory and aims to explain why the labour force flows also in unfavourable directions. Sjaastad (1962) stated that migration to another region is considered to be an investment. Individuals optimise their prospective lifetime utility rather than their current wage. In this model, the costs and benefits of migration can be monetary or non-monetary. For example, transportation costs are monetary costs and lost earnings are non-monetary costs. The monetary benefits are composed of nominal earnings, regional price level and employment costs. Different locations also cause psychological costs and benefits, which are due to personal preferences and affect utility. This model has been criticised because individuals are not actually able to take every cost and benefit into account.

In terms of monetary costs and benefits, the maximasation problem of human capital model can be presented in continuous form[1]:

$$\Pi_j = \int_0^T R_j(t)e^{-rt}dt - \int_0^T C(t)e^{-rt}dt$$

$$\Pi_i = \int_0^T R_i(t)e^{-rt}dt$$

The equations describe a migration decision from region i to region j. R_j is the expected return in region j and R_j in region i, respectively. Individuals compare the costs and benefits of moving when making migration decisions. C is the relocation costs. Π_j is the present value of earnings after migration and Π_i is the present value of earnings when the person stays in region i. If Π_j is higher than Π_i, migration is the optimal decision. According to this theoretical framework, migration should have positive effects on the individual's income.

Several studies (e.g. Ritsilä & Ovaskainen, 2001; Lehmer & Möller, 2008) have observed highly educated individuals having a higher probability of migrating. The possible explanations for this more frequent mobility are low information costs, low psychic costs, previous migration experience, and small

1 Formal presentation according to McCann (2001) and Faggian and McCann (2009a)

risks in the labour market. Future income is specific to personal characteristics. Therefore, individuals who have invested in human capital tend to migrate to urban areas regardless of the concentration of human capital in those areas.

Mincer (1978) analysed family migration decisions and adapted the human capital model of migration to accommodate the family framework. In this model, the migration decision is based on the family's combined gain. For example, if one spouse gains and the other spouse encounters a negative outcome, the family decides to relocate if the gain is greater than the loss. This decision-making process may cause a situation in which one spouse is a "tied mover" or a "tied stayer". In other words, one spouse has to move or stay although it might be disadvantageous for his or her own personal labour market status. The gender role theory (Cooke, 2003) states that, in family migration decisions, families prioritise the husband's career regardless of the proportion of the household income generated by the wife. The effect of migration on household income is examined in chapter 4.

In the neoclassical growth theory, physical capital and labour force flow into higher-return-producing regions when an economy moves towards equilibrium. In contrast, previous studies conducted by Pekkala (2003) and Waldorf (2009) have shown that human capital, in other words skilled labour, moves to regions in which the level of human capital is already high. Johansson and Karlsson (2009) proposed the notion that human capital is localised and that a high level of human capital encourages migration into the region in question. Nijkamp and Poot (1998) synthesised growth theories in a spatial framework and argued that labour and capital flows do not necessarily have an equilibrating influence. Indeed, differences in regional human capital accumulation, the external benefits of human capital, and trade may cause divergence between regions. According to Faggian and Mcann (2009a), migration causes divergence because it is not a random process. Human capital flows are biased towards certain geographic locations. These flows produce cumulative externalities when knowledge-intensive individuals move to regions in which knowledge-dependent firms are located. Similarly, knowledge-dependent firms prefer to be located in regions in which knowledge-intensive labour is available.

New economic geography (NEG) has focused on the sources of concentration of economic activity and introduced new modelling tools for analysing spatial economy. In Krugman's model (1991), internal scale economies, transportation costs, and demand are key factors in the location choices of manufacturing companies. For their part, market size, labour markets, external economies, and spillovers are the centripetal forces. The model presents a core-periphery economy in which manufacturing and labour are concentrated in the core region and the agriculture sector is located at the periphery. The concentration process starts from historical endowments. Economies of scale, transportation costs, and market size subsequently lead to a cumulative concentration process. Labour mobility between regions, increasing returns, and transportation costs create a tendency for firms and workers to agglomerate. (Krugman, 1991; Krugman, 1998.)

4 Regional distribution of human capital

4.1 Previous evidence

Since human capital is essential for regional economic growth, the regional stock and flow of human capital have been widely studied. For example, Glaeser (1999), Costa and Kahn (2000) and Peri (2002) have empirically observed that human capital is concentrated in metropolitan areas. Glaeser (1999) formulated a model for the analysis of learning in cities and showed that individuals acquire skills when they interact with other people. Since contacts are more frequent in densely populated areas, learning occurs more quickly in cities. Young people prefer to reside in cities, with the aim of learning and increasing their future income. Costa and Kahn (2000) focused on "power couples" in which both spouses need professional level jobs. Consequently, from 1940 to 1990, these couples were increasingly concentrated in metropolitan areas. Peri (2002) observed that college-educated workers prefer to live in densely populated areas. According to his model, young highly educated individuals tend to reside in urban areas in order to invest in learning and to increase their productivity. The regional concentration of highly educated couples in Finland is examined in chapter 3 of this thesis.

Human capital flows are biased towards specific locations. When migrants are self-selected, the gain and loss in regional human capital stock might be higher than the net migration flows. Glaeser et al. (1995) examined the ways in which population growth in cities is related to the respective characteristics of a city. Previously expanded cities continued to grow during several decades and the initial median education had a positive relationship with city growth. No evidence on convergence between cities was observed. According to Waldorf (2009), the high regional human capital stock attracts the flow of highly educated individuals. The results showed that the newcomers were significantly better educated than the existing population in the sample of 18 US states. In addition, the educational level of migrants varied across regions. The effect of human capital stock decreased when rurality increased, indicating that highly educated individuals preferred urban areas. The observed selection of migrants, the brain gain and brain drain, has widened the regional differences. The highly educated become increasingly spatially concentrated and the regional disparities increase.

Although divergence has been a general finding in the US, Südekum (2008) observed convergence between regions in West Germany. The initial share of high-skilled labour had a significant and positive effect on the employment growth of low-skilled labour. This convergence was also observed at the industry level. Concentration forces were weak and the development of the skill composition was not a self-reinforcing process. A possible explanation for these contradictory findings is lower labour mobility in Germany than in the US. The higher rate of home ownership and tuition-free higher education might

decrease the migration incentives. Arntz (2010) examined the factors that attract human capital in Germany and showed that a high wage level attracts high-skilled labour. The unemployment rate had no effect on the highly skilled, whereas the regional disparities in wage level resort the skill composition in Germany.

Kauhanen and Tervo (2002) examined migration flows into depressed regions in Finland from 1993 to 1996. Higher education increased the probability of migration to a prosperous region, whereas older and unemployed individuals tended to relocate to the depressed regions. A significant proportion of in-migration to a depressed region was migration from another depressed region or return migration. In addition, the out-migrants from depressed regions were more educated than those who stayed there. Ritsilä and Haapanen (2003) examined migration flows and spatial distribution of human capital in Finland. The results of their study showed that graduates from higher education were ten per cent more likely to migrate to urban areas than less-educated people who otherwise share similar personal characteristics. Pekkala (2003) studied different migrant types and the destination choices therein, observing that migration flows were biased. Highly educated individuals moved to the few growth centres in Finland, whereas older, less-educated individuals moved back to their region of origin.

4.2 Human capital in Finnish regions

In total, there are 19 regions (NUTS 3) in mainland Finland[2]. These regions are presented in figure 2. The population distribution of these regions in 2001 is also presented in figure 2 in order to indicate the spatial concentration of the Finnish population in general. The Uusimaa region (1) comprises 26 percent of the total Finnish population. Southwest Finland (2) and Pirkanmaa (6) both have a 9 percent share of the population, respectively. 56 percent of the population lives in the remaining 16 regions. The Finnish population is concentrated in the southern parts of the country, in and around the Helsinki metropolitan area.

[2] In addition to the 19 regions on the mainland, there is also the Åland region, which is located in the southwest archipelago. Åland is a significantly different region because of its autonomous status.

1	Uusimaa	26%
20	Eastern Uusimaa	2%
2	Southwest Finland	9%
3	Satakunta	5%
4	Kanta-Häme	3%
6	Pirkanmaa	9%
7	Päijät-Häme	4%
8	Kymenlaakso	4%
9	South Karelia	3%
10	South Savo	3%
11	North Savo	5%
12	North Karelia	3%
13	Central Finland	5%
14	South Ostrobothnia	4%
15	Ostrobothnia	3%
16	Central Ostrobothnia	1%
17	North Ostrobothnia	7%
18	Kainuu	2%
19	Lapland	4%

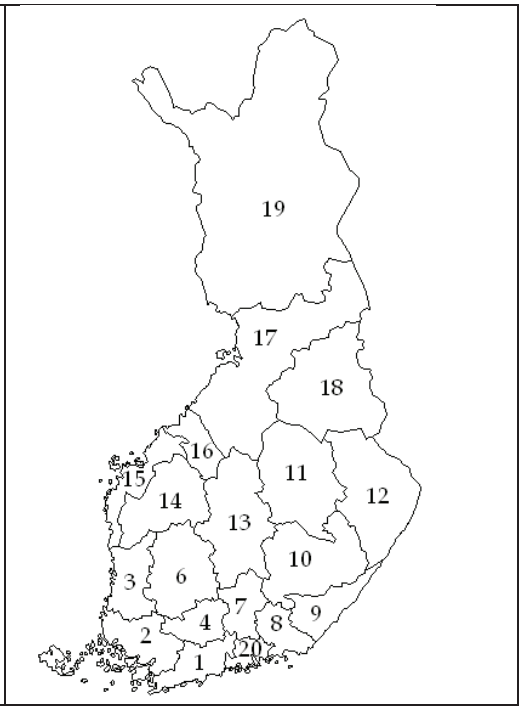

FIGURE 2 Finnish regions and their population proportions in 2001

Figure 3 provides a detailed picture of the spatial distribution of human capital; in other words, the highly educated individuals throughout the Finnish regions. The percentage of the population (over 15 years old) with a higher education degree in 1998, 2001, and 2004 is also presented in the figure 3. There were 85 sub-regions (NUTS 4) in Finland in 2000. These sub-regions are functional areas formed by neighbouring municipalities sharing a labour market and industrial conditions. Therefore, the sub-regions are fairly well representative of local labour market areas. The percentage of highly educated individuals in each region varies from 11 percent to 33 percent in the sub-regions. In figure 3, the sub-regions are divided into four categories according to this human capital stock. The categories are: under 15 percent, from 15 to 20 percent, from 20 to 25 percent, and over 25 percent.

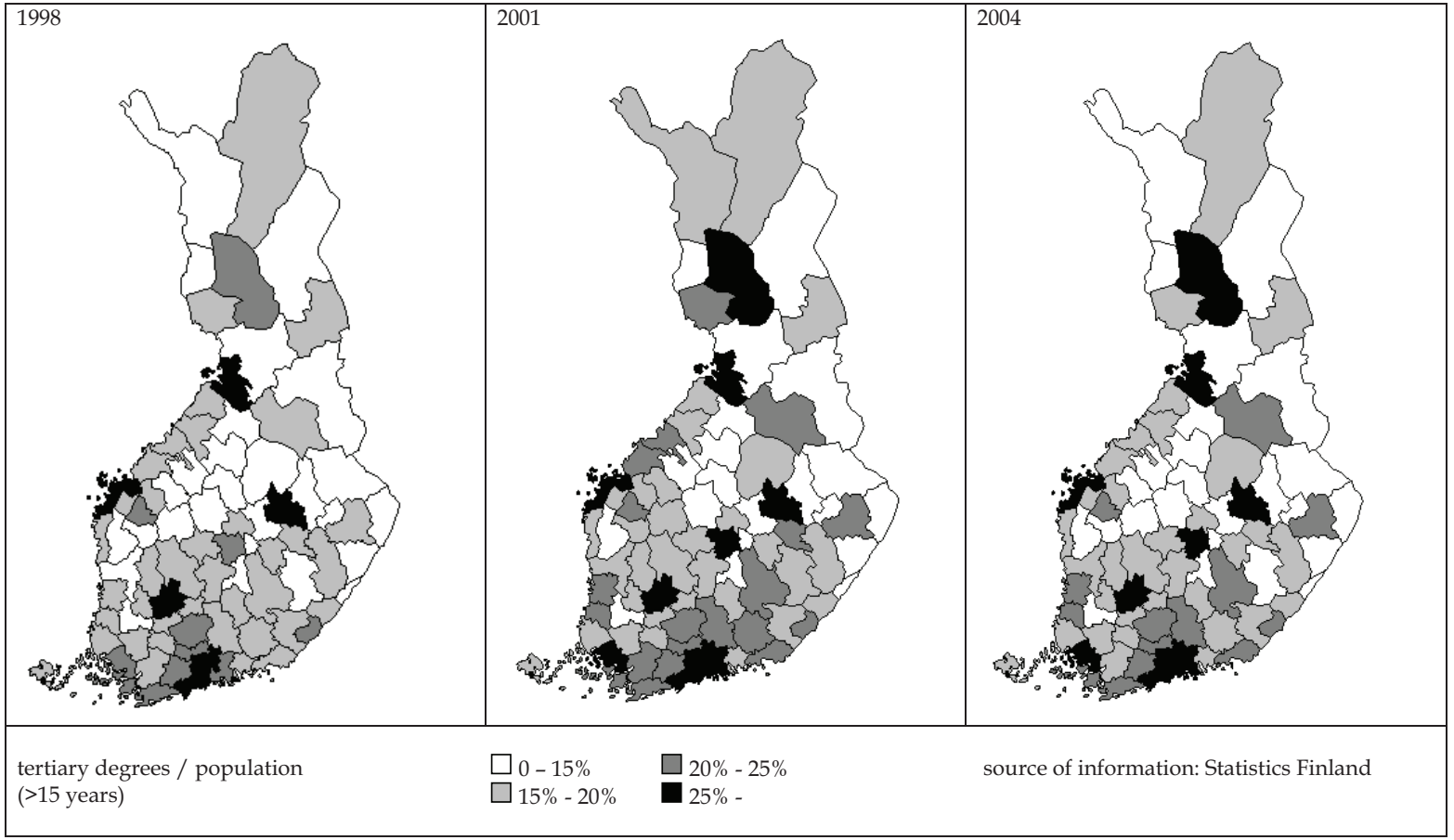

FIGURE 3 Human capital in Finnish sub-regions

Three underlying trends shape the distribution of human capital. First, the average level of education has increased. The average proportion of tertiary degree graduates was 22.5 percent in 1998 and 25 percent in 2004. Only five sub-regions were in the highest category (over 25 percent) in 1998, whereas there were nine regions in this category in 2004. Second, the population has generally become more concentrated during the observed period. This process is most obvious in the Helsinki metropolitan area. The population in the neighbouring sub-regions around Helsinki have increased as the labour market of the Helsinki metropolitan area has attracted more labour. Third, the concentration of human capital increased during 1998-2004. The eastern and northern parts of Finland seem to have lower levels of human capital throughout the observed period. The Helsinki metropolitan area has the highest proportion of individuals having tertiary qualifications. The university cities can also be observed on the map.

4.3 The role of higher education institutions

Human capital is not endogenously created in a region. This is due to the fact that the migration flows redistribute the human capital. However, the role of higher education institutions is an important aspect in the regional distribution of human capital. This topic has become more interesting because tertiary level human capital and knowledge sectors have been emphasised.

Higher education institutions became part of regional policy and regional development during the 1980s (OECD, 2007). In the beginning, equal education opportunities were emphasised. Subsequently, the role of knowledge as a driver of economic growth was introduced. The role of higher education institutions as sources of innovation became widely supported and regional policy turned into innovation policy. Currently, clusters' co-operation with higher education institutions has become a general goal. Although the trust in innovation creation in regional policy is solid, the empirical evidence on the interaction between higher education institutions and local agents is ambiguous (Faggian & McCann, 2009b).

Universities are geographically decentralised in Finland. There is at least one university in ten of the twenty Finnish regions (NUTS 3). These regions and their universities are presented in table 1. In six of the remaining ten regions, universities have secondary units, while four regions provide no university education. In 2006, over 170 000 people studied at twenty universities.

TABLE 1 Universities in Finnish regions prior to 2010

	Region	Universities
1	Uusimaa	University of Helsinki Helsinki University of Technology, Helsinki School of Economics, Swedish School of Economics, Art Schools (4)
2	Southwest Finland	University of Turku, Åbo Akademi, Turku School of Economics
6	Pirkanmaa	University of Tampere Tampere University of Technology
9	South Karelia	Lappeenranta University of Technology
11	North Savo	University of Kuopio
12	North Karelia	University of Joensuu
13	Central Finland	University of Jyväskylä
15	Ostrobothnia	University of Vaasa
17	North Ostrobothnia	University of Oulu
19	Lapland	University of Lapland

The development of the Finnish higher education system is a story of expansion, as in many other countries. In 1950, there were three universities and eight specialised higher education institutions in Finland. The total number of university students was 15 000 in 1950. Many universities were established during the 1960s and the 1970s. At the end of the 1980s, the number of universities and specialised higher education institutions was twenty, with over 100 000 students in total.

The second wave of expansion occurred in the 1990s when the polytechnics (nowadays referred to as universities of applied sciences) were established. The universities of applied sciences are practically oriented higher education institutions mainly offering bachelor's level education. The higher education system expanded to serve regional needs and generate human capital to all parts of the country. The Finnish higher education system is currently undergoing a major reform, the aim of which is to enhance the international competitiveness of Finnish higher education. The main instruments of this reform are cooperation, mergers, differentiation, and new forms of leadership. In 2010, there are sixteen universities in Finland. (Kivinen et al., 1989; Ahola, 1995; Tirronen & Nokkala, 2009.)

Figure 4 indicates the relationship between human capital creation and human capital stock in the Finnish regions in 2005. The numbers refer to the region numbers presented in the map of figure 2. The figures show the way in which the capacity of higher education institutions accumulates regional human capital stock. The ratio of graduates is the number of 20- to 64-year-old individuals with a master's degree, scaled with the population of the same age. The number of university students is the average number from 2001 to 2004 and it is also scaled with population. The migration flows of Finnish university

graduates are more precisely analysed in chapter 2 in order to evaluate the regional contribution of universities.

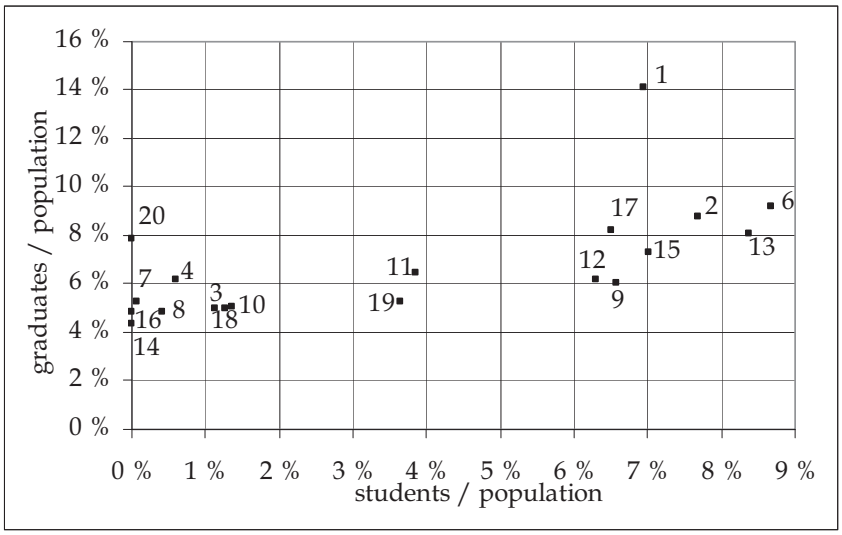

FIGURE 4 Percentages of students and graduates in 2005

The Uusimaa region (1) had the highest human capital stock in 2005. The higher education capacity was very small or there were no higher education institutions in nine of the regions. Some of these regions had a relatively high human capital stock, although the number of university students was very small. For example, Päijät-Häme (7) had almost the same percentage of university graduates as South Karelia (9) even though the difference in the capacity of respective higher education provision is considerable. The figure implicates that the ability of higher education to accumulate regional human capital stock varies. Indeed, the dynamics of a regional labour market play a significant role in retaining graduates and in attracting graduates from other regions.

5 Outline of the thesis

5.1 Research questions

This thesis analyses the determinants of location decisions, describes the spatial distribution of human capital, and estimates labour market outcomes at the individual level. The research questions of this thesis are:

Chapter 2: How do individual characteristics and regional indicators affect migration decisions before and after higher education?

Chapter 3: Where do highly educated couples live? Are highly educated couples more spatially concentrated than other couples and single people?

Chapter 4: How does migration affect household income and women's income? Does the outcome of migration vary in correlation with the relative income share of the female spouse?

Chapter 5: Do spatial factors affect the probability of overeducation? Are there gender differences in the spatial pattern of overeducation?

Human capital is a significant factor in economic growth, as was reviewed in section 2.2. Therefore, the spatial distribution of human capital is a relevant research topic. Chapters 2 and 3 focus on the distribution of human capital across the Finnish regions. In these two chapters, I examine the location decisions of students, recent university graduates, and highly educated couples, with the aim of recognising which factors affect the spatial distribution of human capital.

In the two subsequent chapters, I investigate whether mobility and spatial concentration are advantageous for families and individuals. I analyse the effect of migration on household income and the effects of regional factors on the probability of overeducation. Chapters 2 and 4 particularly focus on mobile individuals, whereas the spatial distribution of highly educated individuals is the focal point of analysis in chapters 3 and 5. Nevertheless, the human capital model of migration is the theoretical framework of both mobile and immobile households.

The main themes of this thesis – the spatial distribution of human capital, migration, and labour market outcomes – are examined from the perspective of gender and family. In Finland, women are more likely to have completed a higher education degree than are men. Moreover, women participate actively in the labour market. Nevertheless, the Finnish labour market still is gender-segregated, and a gender wage gap exists. Since the labour market participation rate of men and women is equal, most families have two earners. This structure determines the migration decisions of Finnish families. As such, the themes analysed here and the perspective of gender and family are intertwined. Chapters 3 and 4 particularly focus on family migration decisions. The gender differences in the regional pattern of overeducation are examined in chapter 5.

5.2 Data and methods

I use Finnish micro-level data, more precisely a seven per cent random sample drawn from the Finnish 2001 census, in the empirical analyses. The data contain annually observed and detailed information on education, work, and family from 1987 to 2004. In addition, basic variables on spouse and family background are included. Labour registers and municipal and regional indicators, furthermore, are combined with the census data. The data are reliable and comprehensive but also have limitations. Since these data are compiled from census and other registers, they do not contain information, for

example, on personal attitudes and values. The total size of the sample is 360 000 individuals. Several sub-samples are extracted for different studies in this thesis.

The aim of chapters 2 and 3 is to explore location decisions and the spatial distribution of human capital. Therefore, I use a multinomial logit model and bivariate probit model. In these models, the dependent variables are categorical. In chapters 4 and 5, I use a probit model with the sample selection and a treatment effect model. Overeducation can be observed only when an individual is working. An individual might not accept a job that does not match his or her level of education and, instead, choose to be unemployed or otherwise outside of the labour force. Therefore, an estimation method controlling for the selection bias is needed (Heckman, 1979). The decision to migrate is not a random process: migrants are self-selected on their observable and unobservable characteristics. Hence, a model controlling for endogenous migration decisions is applied in chapter 4. The treatment effect model takes the selection on observables into account and has been previously applied to a migration framework (Axelsson & Westerlund, 1998).

5.3 Main results

The main results of the analyses presented in the chapters of this thesis are summarised in table 2. The results on university students and graduates presented in chapter 2 affirm that a prior history of migration strongly predicts migration at a later date. In the Helsinki metropolitan area, university students and graduates are significantly less mobile than in other university regions.

The migration of highly educated couples is examined in chapter 3. Individuals do not choose their spouse randomly but rather choose a similar spouse. The results show that the level of education of a man and the level of education of a woman have an interaction effect on location decision, indicating that the probability of spatial concentration increases when both spouses are highly educated. Couples such as this, in which both partners are well educated, are concentrated in the metropolitan area and university cities. The conclusion presented in chapter 3 is that, to some extent, the spatial concentration of human capital coincides with the concentration of highly educated couples.

In chapter 4, the findings on family migration show that higher education increases, whereas employment decreases, the probability of migration. In addition, families in which both spouses contribute equally to the household income are the least mobile. Here, note is made of the positive effect of migration on household income. Migration also has a positive effect on a woman's income growth, regardless of her relative earnings as part of a family.

The question of whether regional factors have an effect on the possibilities people have in finding a job that corresponds to their education is examined in chapter 5. The results show that the risk of overeducation varies between regions. In fact, living in a large region decreases the probability of overeducation. The estimation results show that the regional effects are similar for men and women. Indeed, living in a large regional labour market decreases

the probability of both men and women being overeducated. However, the regional effect is stronger for men.

TABLE 2 Summary on the main findings

	Focus	Main results
2	migration of university graduates	• migration patterns vary regionally • students and graduates in the metropolitan area are relatively immobile • repeated migration is frequent in five regions
3	regional concentration of highly educated couples	• highly educated couples are spatially more concentrated than other couples • single people are concentrated in the metropolitan area
4	family migration and household income	• migration has a positive effect on household income • migration has a positive effect on women's income • when spouses equally contribute to the household income, the positive effect of migration on women's income is modest
5	overeducation and regional labour market	• living in a large local labour market decreases the probability of overeducation • regional disparities in the probability of overeducation are smaller for women than for men

In general, the results show that highly educated individuals are concentrated in certain regions of Finland, as is noted in chapter 2. These growing regions are the Helsinki metropolitan area and three university regions: namely, Southwest Finland, Pirkanmaa, and North Ostrobothnia. These regions attract students and retain graduates upon completion of their higher education. The remaining six university regions, as well as the other regions, seem to lag behind in human capital accumulation. The findings presented in chapter 3 show that highly educated couples are more likely than other couples to reside both in the Helsinki metropolitan area and in the university cities.

The Helsinki metropolitan area seems to be a special case. In particular, highly educated and single people prefer the metropolitan area. Single women have the highest probability of living in the metropolitan area, in comparison to single men and highly educated couples. When students and university graduates are examined, a significant level of immobility can be observed in the metropolitan area. Young people living in the metropolitan area prefer to study there and have no incentive to migrate upon completion of their higher education.

The highly educated labour force is spatially concentrated and regionally self-selected in Finland. The supply of highly educated workers is high in the biggest cities and the demand for those workers is also high in the same regions. Although the regional concentration is frequent, the labour market outcomes in large labour markets are positive, as shown in chapters 4 and 5. The occurrence of overeducation is frequent in the metropolitan area because a considerable number of highly educated people live there. However, when individual characteristics are controlled for, the spatial pattern shows that living in the large local labour market decreases the probability of overeducation. Migration has a positive effect on household income, indicating that profitable employment opportunities have been available.

From the gender perspective, the results reflect the gender-segregation in the Finnish labour market. Since the observed gender differences were surprisingly insignificant, the migration behaviour of university students and graduates can be said to be similar for men and women. Regional factors have a stronger effect on the probability of overeducation for men than for women. Migration has a positive effect on women's income. However, equal income shares in the household seem to be related to a lower increase in income after migration, when compared to families that have a distinct primary wage earner. Single men and single women are significantly different. On average, single women are more educated than are single men. Moreover, the concentration of single women in the metropolitan area is extensive, whereas single men are not geographically concentrated.

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CHAPTER 2
EDUCATION AND EMPLOYMENT OPPORTUNITIES: MIGRATION OF UNIVERSITY GRADUATES IN FINNISH REGIONS[1]

Human capital is an essential factor in economic growth, and migration is the main process in redistributing human capital across regions. This paper examines the sequential migration behaviour of Finnish university graduates. Graduates are observed from the location of their residence to the university region and then to initial employment. As a result, migration decisions of individuals before and after higher education are investigated. Finnish micro-level data on 5 437 university graduates from 1994 to 2003 are used in the empirical analysis. The data contain personal characteristics and regional indicators and are analysed with multinomial logit and bivariate probit models. The results show that both education and employment opportunities affect migration decisions. Previous migration history strongly predicts migration later. No gender effects are found. In the Helsinki metropolitan area, university students and graduates are significantly less mobile than in other university regions.

keywords: migration, human capital, university graduates

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1 Introduction

Individuals acquire human capital, for example, in higher education, and they optimise their lifetime utility in migration decisions. From the regional perspective, human capital has been considered an essential factor in economic growth (Lucas, 1988; Romer, 1990). Since migration redistributes human capital across regions, examining the migration decisions of university students and graduates is important. The effects of personal characteristics and regional economic conditions on migration have been widely studied in the previous literature. For example, Kodrzycki (2001), Gottlieb and Joseph (2006) and Faggian et al. (2007b) have examined the migration behaviour of university graduates.

Universities are geographically decentralised in Finland to provide equal higher education opportunities and to meet the regional demand of skilled labour. However, the regional mobility before and after higher education is frequent, which makes the opportunities of higher education institutions to accumulate regional human capital limited. This interaction of higher education institutions and the labour market is an important topic. The contribution of universities to the regional human capital stock has been previously examined by Bound et al. (2004), Groen (2004) and Faggian & McCann (2009).

This paper examines the sequential migration behaviour of university graduates from the family home to higher education and then to initial employment. This paper provides a broad picture of the inter-regional mobility of Finnish university graduates. Migration among university students and graduates is more frequent than it is among the population in general. This considerable mobility helps to enhance knowledge of migration behaviour. The aim of the paper is to describe who migrates and analyse how personal and regional characteristics affect the probability of migration. Additionally, the migration patterns of university graduates in different regions are compared and discussed.

Finnish census data are used in the empirical analysis. In these data, an individual can be observed in different stages of his or her life. In addition, the year of graduation from the university and the location of the university are included in the data. These features enable a detailed analysis of sequential migration decisions. The data also contain regional indicators. The sample of university graduates from 1994-2003 is analysed with a multinomial logit model and a bivariate probit model. In the multinomial logit model, the different migration groups are described. The bivariate probit model takes the sequential nature of migration decision into account.

This paper is organised as follows. In the next section, studies on migration and higher education are shortly reviewed. Section 3 introduces the data and methods. The results of the multinomial logit model and the bivariate probit model are presented and discussed in section 4. Section 5 concludes.

2 Previous studies of migration and higher education

Sjaastad (1962) presented the human capital model of migration. He described migration as an investment and proposed that individuals maximise their lifetime utility in the migration decision. As a result, individuals compare the costs and benefits and decide whether to move or to stay. The cost and the benefits can be monetary or psychological.

University students and graduates find education opportunities and employment opportunities, respectively, to be the main factors in migration decisions and in the maximisation of lifetime earnings. Previous empirical studies have examined, among other factors, the effects of previous migration and regional economic factors on migration. According to the human capital model of migration, previous relocation decreases the psychological costs of moving and increases the probability of migration later. Regional economic factors affect lifetime earnings.

Kodrzycki (2001) noticed that previous migration history was a strong predictor of migration after college. If an individual had moved between high school and college, the probability to move again after higher education was 31 percent higher than the probability of a non-mover. Gottlieb and Joseph (2006) observed that especially individuals who were born, attended high school and attended college in the same state preferred to stay after higher education.

Groen (2004) investigated the effect of a college's location on the probability of working in the same state in the US. Individuals who studied in their home state were 10 percentage points more frequently working in the same state 15 years after graduation than those who had moved before college. Faggian et al. (2007a) compared Scottish and Welsh students and showed that the migration distance from university to the first employment was positively correlated with the migration distance from the domicile to the university. Haapanen and Tervo (2009) studied the duration of the residence spells of Finnish graduates and noticed that staying a longer period in a region decreases the propensity for migration. However, graduates are more mobile in the year of graduation or shortly after graduation.

The empirical evidence of the effects of previous migration behaviour on later migration is consistent. The previous studies show that individuals staying to study tend to stay after higher education. However, the self-selection of migrants and stayers might explain these empirical observations, indicating that unobservable individual preferences are heterogeneous. Some individuals prefer family ties and familiar surroundings, whereas others prefer urban amenities. If this self-selection explains the positive relationship between migration decisions, enticing more young people to study in their home region probably does not affect the regional human capital stock in the long run (Gottlieb and Joseph, 2006).

Employment opportunities are essential in migration decisions. According to Gottlieb and Joseph (2006), job opportunities are prioritised in mobility

decisions, whereas urban amenities are secondary factors. Hansen et al. (2003) concluded in their survey that an interesting job was valued more than salary. However, the effects of regional economic conditions on graduate migration behaviour are unclear.

Both Kodrzycki (2001) and Faggian et al. (2006) observed that regional economic variables had unpredictable effects on migration behaviour. According to Kodrzycki (2001), the high unemployment rate in the state of the college increased out-migration while economically strong states gained in terms of the net migration of college graduates. In contrast, college graduates also migrated to economically unfavourable states. Two explanations were offered for these findings. First, university graduates are an exceptional group that scarcely encounters unemployment. As a result, the regional unemployment rate is less significant for the highly educated than for low-skilled labour. Second, the decision to move to economically inferior regions could be explained by unobservable networks and job offers.

When regional economic activity and previous migration history play a pivotal role in the migration behaviour of university graduates, it is relevant to ask whether universities can accumulate human capital in their regions. Bound et al. (2004) studied the regional stock and flow of highly educated individuals. The results showed a moderate connection between flow and stock but also that migration decreased the effects of public policy. Faggian and McCann (2006; 2009) examined human capital and regional innovation. They discovered that university had no direct effects on the regional innovation market. Regional labour markets were extensively resorted by interregional migration. These studies concluded that universities attract talented young people to the region. However, universities and public policy have only a modest effect on the regional stock of human capital because graduates are mobile and prefer active regional labour markets.

3 Data and method

3.1 Finnish census data

Finnish micro-level data, a seven percent random sample drawn from the Finnish census in 2001, are used in the empirical analysis. These data provide an excellent opportunity to examine sequential migration behaviour because the same individuals are observed during a longer period. For this study, 5 437 individuals who completed a master's degree between 1994 and 2003 and were under 36 years old at the time of graduation were extracted from the original data. Labour registers and municipal and regional statistics are combined with the census data. The data contain information on education, work, place of residence, and family. In addition, the year of graduation and the region (NUTS 3) of higher education institution are included in the data. Because individual's region of residence and region of university can be identified at NUTS level 3 in

the data, migration between NUTS level 3 regions is the definition of migration in this study. There are 20 NUTS level 3 regions in Finland, and they are the main units of regional development.

The location of domicile residence, the region of origin, is defined at the age of 19 when secondary education is normally completed. If the time between secondary education and university graduation was more than 10 years, the region of residence 11 years before university graduation was considered the region of origin. If the region of the university was different from the region of origin, individuals are defined as movers in the first migration decision. Otherwise, they are defined as stayers. In the second stage, individuals were defined as stayers if they were working in the university region and movers if their region of employment was other than the university region one year after graduation. Those individuals who were unemployed one year after graduation were categorised as movers or stayers according to their region of residence.

Since the utilised data are based on registers, it has limitations. First, individuals who did not complete their master's degree cannot be identified in the data. This exclusion may cause bias if the migration behaviour of drop-outs differs from the migration behaviour of graduates. Second, the data contain no information on the application process at or on the competition for admission to different universities. However, the field of education and the size of university are included in the analysis to control for the variation in acceptance rates. Third, universities have secondary units located in neighbouring regions. Unfortunately, studying in these units cannot be observed in the data, indicating that a fractional amount of the graduates have not actually studied in the observed university region. Despite these shortcomings, the data enable a comprehensive analysis on graduate migration behaviour.

3.2 University regions and migration flows

Universities are geographically decentralised in Finland. At the end of the observed period in 2003, there were 20 universities located in 10 of 20 regions (NUTS 3). All of the universities were state-owned and mainly financed from the state budget. Of these universities, 10 are multidisciplinary and 10 are specialised schools in the fields of technology, business and art. There are no tuition fees, and students are selected by entrance exams in the Finnish higher education system. A master's degree is completed by most of the students. Aside from universities, the Finnish higher education sector contains more practically oriented polytechnic schools.

Over 20 000 new students enrol at universities in Finland every year. The enrolment of the whole tertiary level, universities and polytechnics, is almost 50 000, while the total size of a cohort is around 66 000. The population of Finland is 5.1 million. To compare with similarly sized nations, for example, in Ireland, the annual enrolmentto the tertiary level is 28 000 students[2], and the population is 4.2 million. In Norway, the population is 4.5 million, and the

[2] The enrollment statistics are available in: www.oecd.org/education/database.

enrolment is 43 000, whereas in Denmark, the population is 5.3 million, and the enrolment is 35 000. Although the education systems can be different, the capacity of Finnish higher education seems large.

Table 1 presents the university regions and migration behaviour in the sample. The first column shows the percentages of individuals whose region of origin and the university region are the same. In the Uusimaa region, the proportion was as high as 53 percent. The Uusimaa region is the only region where over half of the students are originally from the same region. In the region of North Ostrobothnia, 44 percent of the students have stayed to study. In contrast, less than 30 percent of students in South Karelia, North Savo, Central Finland and Ostrobothnia come from the same region.

Evidently, the percentages in the first column in table 1 reflect the supply of university education in the region. The volume and the diversity of university education vary. For instance, students need to migrate if the specific field of study is not available in their home region. Besides the supply of higher education, the individual preferences of young people affect migration decisions. Some might want to study in a bigger city because they prefer urban amenities while others optimise their employment opportunities after higher education.

The second column of table 1 shows the percentages of university graduates who were working in the university region one year after graduation. In total, 52 percent of the sample stayed to work in the region where they attended higher education. However, only in two regions, Uusimaa and North Ostrobothnia, over a half of the graduates worked in the same region one year after graduation. In another eight university regions the majority of the graduates migrated after completing their university degree. The high total proportion of stayers mainly results from the immobility of graduates in the Uusimaa region, which contains 35 percent of all graduates.

TABLE 1 Percentages of stayers ant number of students in the sample

region	stay to study	stay to work	stay to study stay to work	number of students
Uusimaa	54%	78%	48%	1 937
Southwest Finland	34%	40%	22%	798
Pirkanmaa	35%	47%	22%	789
South Karelia	18%	18%	10%	210
North Savo	28%	37%	15%	161
North Karelia	30%	28%	17%	281
Central Finland	22%	29%	10%	459
Ostrobothnia	15%	20%	7%	160
North Ostrobothnia	44%	53%	29%	506
Lapland	35%	26%	18%	136
all	40%	52%	29%	5 437

The percentages of those who did not migrate before or after university studies are in the third column of table 1. The proportion of these immobile

individuals is almost half in the Uusimaa region. In the following three regions, North Ostrobothnia, Southwest Finland and Pirkanmaa, the proportion is between 20 and 30 percent. All four of these regions have a good supply of university education, and they are the most active labour markets. Therefore, the high proportion of immobile individuals is plausible. Students and graduates do not have a strong incentive to migrate before or after higher education.

In sum, table 1 indicates that universities and regions attract young people and retain graduates differently. These figures can be interpreted from two perspectives. First, universities primarily have a national educational task. The division of fields and programmes between universities has lead to specialisation. All universities educate individuals for all regional labour markets and especially for the needs of the metropolitan area. Second, the universities are geographically decentralised to fulfil regional needs and tasks. However, the regional contribution of a university is limited because the labour market dynamics play a crucial role in retaining graduates.

3.3 Estimation methods

A multinomial logit model is estimated to analyse different migration categories. For this model, individuals are categorised into five groups according to their migration behaviour (Faggian et al. 2006). Groups and their proportions in the sample are in table 2. The least mobile individuals belong to the first group. They both studied and stayed after higher education in their region of origin. Individuals who studied in their home region but migrated after graduation are included into group two. The third group contains individuals who moved to study and stayed in the region of their university. The fourth group migrated to study but returned to their origin region. The most mobile group moved to study and then again moved to start working in another region. Group number one is the reference category in the estimation.

TABLE 2 Migration groups

	group	all n = 5437	men n = 2447	women n = 2990
1	stayers	30%	30%	29%
2	late migrants	10%	10%	11%
3	stickers	23%	24%	22%
4	return migrants	16%	14%	17%
5	repeat migrants	21%	22%	21%

According to table 2, the biggest group is stayers. Around 30 percent of the sample have studied and stayed to work in the same region in which they completed secondary education. The smallest group is number two, late migrants, which contains only 10 percent of the sample. Return migrants account for 16 percent of the sample. The remaining two groups each include approximately 20 percent of the sample. The gender differences in the

proportions of these five categories are small. Stickers are a slightly larger group among men and return migrants among women.

Variables of multinomial logit model are in table 3. In the previous studies, the set of explanatory variables has been somewhat constant. Personal characteristics, migration history and regional economic indicators have been the main predictors of migration (Kodrzycki, 2001; Gottlieb & Joseph, 2006; Faggian et al., 2006). Gender, language, family characteristics, home ownership, and the age of graduation are the personal characteristics in the models of this study. Marital status, having children and home ownership are observed in the year of graduation. Personal migration history is observed between birth and age of 19.

Previously, the wage rate, the unemployment rate and the employment growth rate have been used to describe regional economic conditions (Kodrzycki 2001). Unemployment rates in the origin sub-region (NUTS 4) and in the university sub-region (NUTS 4) control for the economic conditions in this study. The population of the original region and the number of students at a university are other regional characteristics. These two variables describe the supply of education and employment opportunities. In addition, a dummy variable, having a university in the origin sub-region (NUTS 4), is included in the model to control for the need to migrate.

TABLE 3 Explanatory variables of multinomial logit model and sample means

variable	min	max	mean (s.d)	
woman	0	1	0.55	
Swedish-speaking	0	1	0.06	
age of graduation	22	35	27,5	(2,78)
child(ren)	0	1	0.28	
single	0	1	0.32	
home owner	0	1	0.32	
migrated before secondary education	0	1	0,28	
unemployment rate in original sub-region	1	33	10.6	(7.38)
unemployment rate in university sub-region	7.7	26.7	14.3	(4.49)
population of original sub-region / 1000	2	1185	316	(404)
size of university / 1000	0.48	60.3	24.1	(18.6)
university in original sub-region	0	1	0,38	

In addition to the multinomial logit model, the migration behaviour of university graduates is examined more precisely with a bivariate probit model. In the bivariate probit model, there are two binary response probit models:

(1) $y_1^* = x_1'\beta_1 + \varepsilon_1$ $\quad y_1 = 1 \text{ if } y_1^* > 0, \text{ 0 otherwise}$

(2) $y_2^* = x_2'\beta_2 + \gamma_2 y_1 + \varepsilon_2$ $\quad y_2 = 1 \text{ if } y_2^* > 0, \text{ 0 otherwise}$

(3) $E[\varepsilon_1] = E[\varepsilon_2] = 0,\ Var[\varepsilon_1] = Var[\varepsilon_2] = 1,\ Cov[\varepsilon_1, \varepsilon_2] = \rho$

Dependent variable y_1 is the observed move from domicile to higher education and dependent variable y_2 is the observed migration from higher education to initial employment. Vectors x_1 and x_2 are the sets of explanatory variables. The bivariate probit model is chosen to allow two migration decisions to be connected. The error terms are allowed to covary; the covariance is ρ. The dependent variable of the first equation, migration decision before higher education y_1, is included in the second equation as an explanatory variable. Although this model is recursive, the maximum-likelihood estimates are consistent (Greene, 20003). The set of variables in this model is larger than in the previous multinomial logit model. The variables of the bivariate probit model and their sample means are presented in table 4.

TABLE 4 Variables of the bivariate probit model

	all	migrated to study		migrated to work	
		stayers	movers	stayers	movers
migrated to study	0.60			0.44	0.78
migrated to work	0.48				
woman	0.55	0.55	0.55	0.53	0.57
Swedish-speaking	0.06	0.06	0.06	0.06	0.06
previous migration	0.25	0.23	0.26	0.24	0.26
education	0.13	0.11	0.15	0.10	0.17
arts	0.15	0.14	0.15	0.15	0.15
business and economics	0.13	0.14	0.12	0.12	0.13
law and social sciences	0.10	0.10	0.10	0.10	0.11
science (reference category)	0.10	0.11	0.09	0.11	0.08
technology	0.22	0.23	0.21	0.26	0.17
medicine	0.07	0.07	0.08	0.07	0.08
other	0.10	0.09	0.11	0.09	0.12
university in original sub-region	0.39	0.61	0.24		
unemployment in orig. sub-region	10.60	9.43	11.37		
population of original sub-region	317	571	149		
age of graduation	27.45			27.59	27.31
children	0.28			0.26	0.30
single	0.32			0.32	0.32
home owner	0.32			0.36	0.28
Uusimaa (reference category)	0.36			0.53	0.16
Southwest Finland	0.15			0.11	0.19
Pirkanmaa	0.15			0.13	0.16
South Karelia	0.04			0.01	0.07
North Savo	0.03			0.02	0.04
North Karelia	0.05			0.03	0.08
Central Finland	0.08			0.05	0.13
Ostrobothnia	0.03			0.01	0.05
North Ostrobothnia	0.09			0.09	0.09
Lapland	0.03			0.01	0.04

Gender, language, previous migration and categories for fields of education are included in both equations. The field of education is not an exogenous variable; it is an endogenous decision. However, the categories are included in the model to control for the supply of university education and the regional variation in this supply. The population, the unemployment rate and having the university in the original sub-region are in the first equation. Personal characteristics at the

time of graduation are only in the second equation. Dummy variables for university regions are also included in the second equation.

Table 4 shows that 60 percent of the individuals in the sample moved to study and that 48 percent moved after higher education, confirming that highly educated young adults are very mobile. Sample means for movers and non-movers in both stages are also separately presented in table 4. The means show that individuals coming from larger regions are less mobile. The unemployment rate in the original sub-region is higher in the group of movers. Personal characteristics seem to have slight or no variation between groups. However, 78 percent of those who migrated to their first employment also migrated before their higher education. The means of stayers and movers are somewhat identical within fields of education. However, the individuals in the field of technology seem to be less mobile, especially after higher education.

4 Results

4.1 Migration categories

The five migration categories, stayers, late migrants, stickers, return migrants and repeat migrants, are analysed with a multinomial logit model. The marginal effects of the multinomial logit model are in table 5. The marginal effects are calculated for the whole sample at the means of explanatory variables. The marginal effects of the dummy variables are calculated as the discrete change in the expected value of the dependent variable as the dummy changes from 0 to 1.

In general, the results are consistent with those of previous studies. In contrast with previous studies (Faggian et al., 2007b), gender does not seem to have a strong effect, which is also observed in table 2. Gender only has a statistically significant effect in the group of repeat migrants. Speaking Swedish as mother tongue, owning a home, having children, and migrating before secondary education have statistically significant marginal effects in several migration groups. Marital status and the age of graduation are not strongly significant.

The probability of mobility decreases when the population of the original sub-region and the size of university increase. These variables have significant negative marginal effects in the group of repeat migrants and significant positive marginal effects in the groups of stayers. Having a university in the original sub-region has a strong and positive marginal effect in the group of stayers, whereas the effect is significant and negative for stickers, return migrants and repeat migrants.

The marginal effects of unemployment rates are ambiguous. The unemployment rate in the original sub-region has a positive effect for both stayers and late migrants categories. In addition, the effect of the initial unemployment rate is negative in the category of return. The unemployment

rate of the university sub-region has a statistically significant and positive marginal effect in the group of stayers. These results indicate that students and graduates are sticky in terms of unemployment rates. Students and graduates may value living in their home region regardless of the unemployment rate.

TABLE 5 Marginal effects and their standard errors of multinomial logit model

variable	1 stayers	2 late migrants	3 stickers	4 return migrants	5 repeat migrants
woman	-0.011	0.006	-0.005	0.024 **	-0.013
	(0.0147)	(0.0098)	(0.0117)	(0.0118)	(0.0120)
Swedish-speaking	-0.031	-0.079 ***	-0.091 ***	0.286 ***	-0.084 ***
	(0.0250)	(0.0148)	(0.0188)	(0.0337)	(0.0225)
age of graduation	0.0001	0.0004	0.006 **	-0.007 **	-0.0002
	(0.0034)	(0.0023)	(0.0025)	(0.0025)	(0.0027)
child(ren)	0.026	-0.022 **	-0.044 ***	0.096 ***	-0.056 ***
	(0.0178)	(0.0113)	(0.0132)	(0.0156)	(0.0133)
single	-0.026	0.001	0.006	-0.001	0.019
	(0.0160)	(0.0108)	(0.0127)	(0.0138)	(0.0136)
home owner	0.060 ***	-0.024 **	-0.009	0.034 **	-0.063 ***
	(0.0162)	(0.0103)	(0.0127)	(0.0138)	(0.0130)
migrated before	-0.092 ***	0.039 ***	0.040 ***	-0.034 ***	0.048 ***
secondary education	(0.0153)	(0.0120	(0.0139)	(0.0131)	(0.0145)
unemployment rate	0.004 ***	0.003 ***	-0.002 *	-0.005 ***	-0.0004
(orig. sub-region)	(0.0015)	(0.0009)	(0.0010)	(0.0011)	(0.0011)
unemployment rate	0.007 **	0.001	-0.002	-0.004 **	-0.0019
(univ. sub-region)	(0.0029)	(0.0018)	(0.0022)	(0.0021)	(0.0022)
population / 1000	0.0005 ***	0.0001 ***	-0.0006 ***	0.0001 ***	-0.0002 ***
(orig. sub-region)	(0.000032	(0.00002)	(0.00003)	(0.00003)	(0.00003)
size of university / 1000	0.004 ***	-0.002 ***	0.007 ***	-0.005 ***	-0.004 ***
	(0.0006)	(0.0004)	(0.0005)	(0.0007)	(0.0007)
university in	0.201 ***	0.095 ***	-0.068 ***	-0.193 ***	-0.134 ***
original sub-region	(0.0183)	(0.0117)	(0.0127)	(0.0131)	(0.0134)

* p < 0.10; ** p < 0.05; *** p < 0.01

The migration categories can be described according to the marginal effects. Individuals in the most immobile group, stayers, are more likely to own a home, live in a large university region and study at a large university. Late migrants have a higher probability of having a university in their original sub-region and a lower probability of studying at a large university. These findings describe that late migrants are not forced to migrate after secondary education but rather that employment opportunities encourage mobility after higher education.

Swedish-speaking individuals have a remarkably higher probability to of belonging to the group of return migrants. Return migrants are more likely to have children and own a home. In fact, return migrants may actually dwell in their original region at the of time graduation, indicating that having children and owning a home do not increase mobility. Stickers and repeat migrants seem to be quite similar groups. Both groups have a lower probability of having a university in their original sub-region and a higher probability of previous

migration. The only significant difference is that stickers are more likely to study at a large university whereas repeat migrants are less likely to choose a large university.

4.2 Sequential migration decisions

The probability of migrating from the region of the domicile residence to the region of the university is estimated in the first equation of the bivariate probit model. The coefficients of the model are in table 6.

TABLE 6 Coefficients of bivariate probit model

variable	coefficient		robust s.e.
migration to university region			
constant	0.936	***	(0.0780)
woman	-0.010		(0.0437)
Swedish-speaking	0.294	***	(0.0836)
previous migration	0.125	***	(0.0448)
university in the original sub-region	-0.705	***	(0.0419)
unemployment rate (orig. sub-region)	-0.014	***	(0.0028)
population / 1000 (orig. sub-region)	-0.002	***	(0.0001)
fields of education (ref. science)			
education	0.240	***	(0.0820)
arts	0.226	***	(0.0795)
business and economics	0.268	***	(0.0817)
law and social sciences	0.240	***	(0.0857)
technology	0.186	**	(0.0733)
medicine	0.308	***	(0.0974)
other	0.538	***	(0.0850)
migration after higher education			
constant	-1.192	***	(0.2168)
woman	-0.036		(0.0425)
Swedish-speaking	0.204	**	(0.0800)
previous migration	0.094	**	(0.0439)
age of graduation	-0.009		(0.0073)
child(ren)	0.064		(0.0450)
single	0.037		(0.0422)
home owner	-0.111	***	(0.0414)
migrated to study	0.512	***	(0.0782)
fields of education (ref. science)			
education	0.395	***	(0.0800)
arts	0.266	***	(0.0791)
business and economics	0.343	***	(0.0830)
law and social sciences	0.246	***	(0.0843)
technology	0.003		(0.0818)
medicine	0.373	***	(0.0944)
other	0.907	***	(0.0899)
dummies for university regions			
$\rho = 0.188$, Wald test of $\rho=0$, $\chi^2(1) = 13.66$ ***			

* p < 0,1; ** p < 0,05; *** p < 0,01

Consistent with the results of multinomial logit model, the coefficient of gender is insignificant. Previous migration and speaking Swedish increase the probability of migration before higher education. Having a university in the original sub-region and living in a large region obviously decrease the probability of moving before higher education. These findings seem to indicate that young people in the Uusimaa metropolitan region are immobile. Unexpectedly, the unemployment rate has a negative effect on migration. The fields of education have statistically significant effects compared to the reference category. The results indicate that students in the field of science are the least mobile, which may reflect the large supply of education in this field.

In the second equation, the decision to migrate from higher education to first employment is analysed. Gender, the age of graduation, having children, and being single do not reach statistical significance. Owning a home decreases the probability of migration. Previous migration history, before secondary education and before higher education, increases the probability of migration after higher education, which is consistent with previous evidence (Faggian et al., 2007a). All fields of education and regional dummies are statistically significant. The results show that graduates in the field of technology and science are the least mobile, implying that these individuals find sufficient labour market opportunities in their university regions.

4.3 Regional probabilities

Figures 1 and 2 present the predicted probabilities of four different migration combinations by university region. The predicted probabilities of choice combinations are computed for every individual in the sample. The presented figures are average probabilities across the sample conditioning the university region and the age of graduation. The averages are calculated among men who graduated at the age of 27 and among women who graduated at the age of 26.[3] The field of education cannot be defined because the supply of education varies according to region. The regional differences are mainly statistically significant.[4] The probabilities for women in South Karelia are not valid because the number of observation is very small. In general, the gender differences are modest. Regional differences seem slightly more pronounced for men.

The most obvious result is that the probability of staying to study and staying to work is almost 0.5 in the metropolitan region. The probabilities of migrating to study and stay to work are quite equal, around 31 percent, in the North Ostrobothnia and in the metropolitan region. Universities in these regions seem to succeed best at accumulating regional human capital, but the active regional labour market also has a strong influence.

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[3] In the sample, 27 years is the mode value of the age of graduation for men and 26 for women.

[4] The probabilities and their 95 percent confidence intervals are available in the appendix.

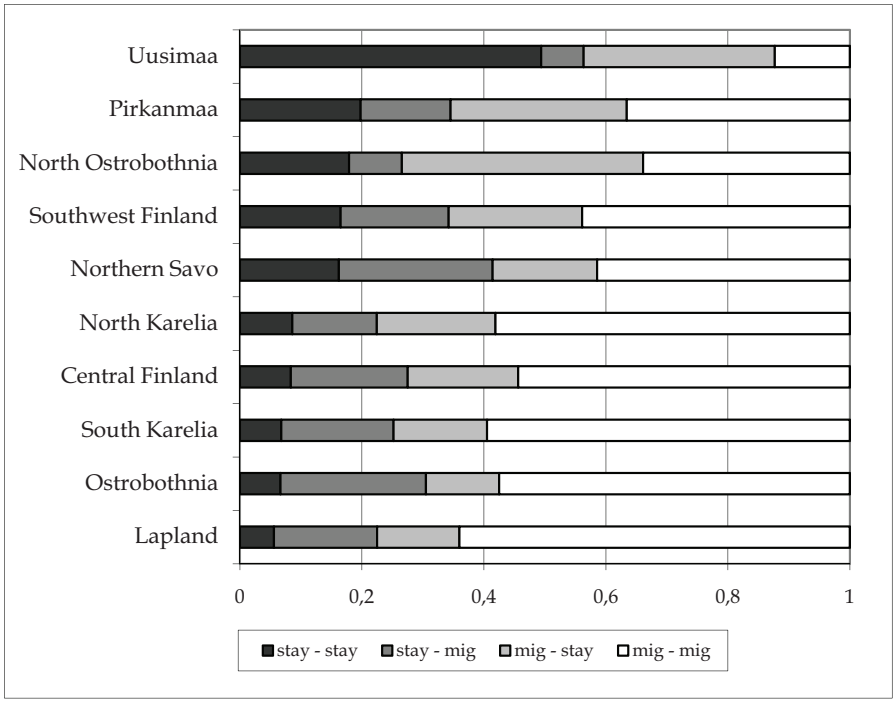

FIGURE 1 Predicted probabilities for men

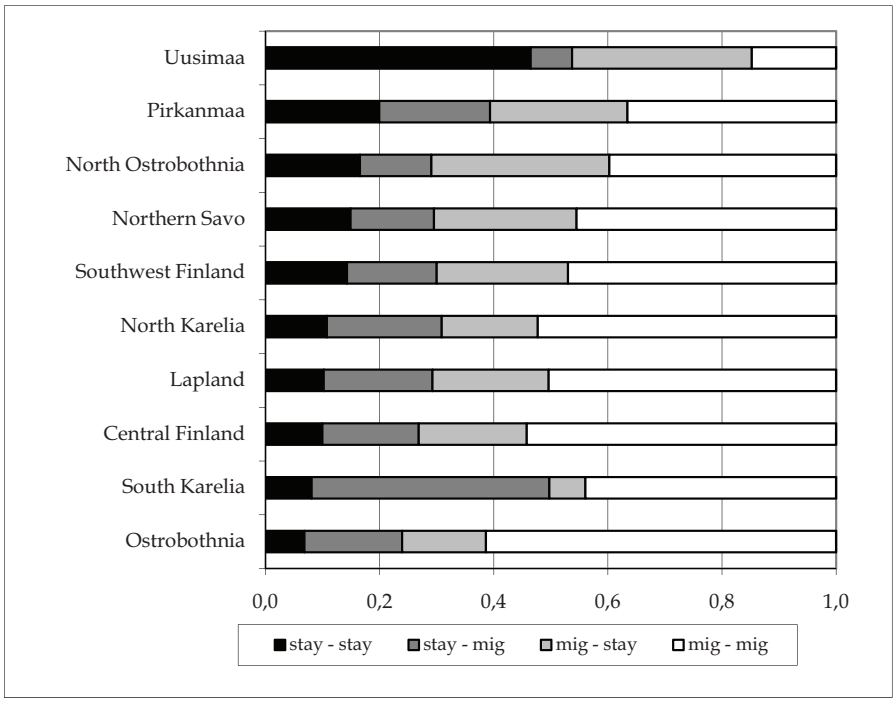

FIGURE 2 Predicted probabilities for women

The probability of staying to study and staying to work is less than 0.10 in five regions. The probability of repeated migration is consistenly over 0.5 in the same five regions, in North Karelia, Central Finland, Ostrobothnia, Lapland and South Karelia. These five regions can be distinguished from the probabilities of both men and women, although the order of regions varies. It is relevant to ask how well universities in these five regions meet the regional needs for education opportunities and the demand for skilled labour.

In order to understand these differences, a more precise picture is needed. The supply of university education might offer an explanation to the profile of these five regions. The university in South Karelia only offers education in the fields of technology and business. Universities in Ostrobothnia and Lapland also have a limited number of faculties. North Karelia and Lapland are peripheral areas in Finland, which indicates that geography is also a relevant factor. The outlier in this group seems to be Central Finland that is centrally located and has a multidisciplinary university. The number of students there (table 1) is fifth highest among the ten regions. Central Finland attracts young people nationally and educates labour for all regional labour markets. However, the university's contribution to the regional human capital stock seems to be relatively low. The probabilities indicate that in addition to education opportunities and previous migration, the active labour market is a significant factor in migration decisions.

5 Conclusion

The aim of the paper was to describe the migrant and non-migrant university students and graduates and to analyse how personal and regional characteristics affect migration decisions. Migration patterns were described with the multinomial logit model, and sequential migration decisions before and after higher education were analysed with the bivariate probit model. In addition, the regional disparities in the probabilities of migration patterns were discussed.

The results of both models are consistent with the previous findings. The results show that migration in the past increases the probability of migrating later, as was expected. The effects of regional economical conditions were ambiguous. Fields of education and university regions significantly affect the probability of migration.

The results show that the metropolitan area, the Uusimaa region, is an exceptional case. In this region, the university students and graduates are significantly less mobile before and after higher education than individuals in other regions. According to the results of the bivariate probit model, living in the large region decreases the probability of migration. As the metropolitan area is undoubtedly the largest centre in Finland, it attracts and retains skilled labour. This concentration tendency is a very typical pattern in Finnish labour migration, especially for university graduates. Indeed, those who are originally

from the metropolitan area have no incentive to migrate either to study or to work.

The examined data confirm that migration before and after higher education is frequent. Universities attract talented young people to their regions when young people tend to move to study. However, universities' ability to contribute skilled labour for regional needs is limited because migration redistributes university graduates after higher education. Apparently, all universities educate labour for the demand of the metropolitan area. Young adults assess both educational opportunities and labour market incentives when making migration decisions.

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APPENDIX

TABLE A1 Predicted probabilities and their 95% confidence intervals

region		man	95% C.I.		woman	95% C.I.	
1	p00	0.494	0.450	0.537	0.465	0.419	0.510
	p01	0.070	0.063	0.077	0.072	0.066	0.079
	p10	0.313	0.281	0.345	0.315	0.283	0.346
	p11	0.123	0.104	0.142	0.148	0.125	0.171
2	p00	0.165	0.130	0.200	0.143	0.120	0.165
	p01	0.177	0.141	0.214	0.157	0.135	0.180
	p10	0.219	0.193	0.245	0.230	0.213	0.247
	p11	0.439	0.385	0.493	0.470	0.436	0.504
6	p00	0.198	0.169	0.227	0.199	0.170	0.229
	p01	0.147	0.122	0.173	0.194	0.159	0.230
	p10	0.289	0.265	0.312	0.241	0.213	0.269
	p11	0.366	0.332	0.400	0.366	0.325	0.407
9	p00	0.068	0.057	0.079	0.081	0.005	0.156
	p01	0.184	0.128	0.240	0.417	-0.062	0.895
	p10	0.153	0.126	0.181	0.063	-0.034	0.160
	p11	0.595	0.542	0.648	0.439	-0.024	0.903
11	p00	0.162	0.079	0.246	0.149	0.101	0.197
	p01	0.252	0.102	0.402	0.146	0.103	0.189
	p10	0.171	0.096	0.247	0.250	0.211	0.289
	p11	0.414	0.258	0.571	0.455	0.382	0.528
12	p00	0.086	0.059	0.113	0.107	0.086	0.129
	p01	0.138	0.116	0.161	0.201	0.158	0.245
	p10	0.194	0.148	0.241	0.168	0.144	0.193
	p11	0.581	0.511	0.651	0.523	0.471	0.575
13	p00	0.083	0.058	0.108	0.100	0.082	0.117
	p01	0.192	0.100	0.284	0.169	0.136	0.202
	p10	0.181	0.127	0.235	0.189	0.167	0.212
	p11	0.544	0.459	0.629	0.542	0.500	0.585
15	p00	0.066	0.029	0.104	0.068	0.055	0.082
	p01	0.239	0.045	0.432	0.171	0.135	0.207
	p10	0.120	0.065	0.175	0.147	0.125	0.169
	p11	0.575	0.387	0.763	0.614	0.572	0.655
17	p00	0.179	0.146	0.212	0.166	0.138	0.194
	p01	0.086	0.072	0.101	0.125	0.101	0.149
	p10	0.396	0.361	0.430	0.312	0.283	0.341
	p11	0.339	0.301	0.377	0.398	0.361	0.435
19	p00	0.056	0.033	0.079	0.102	0.071	0.133
	p01	0.169	0.080	0.258	0.191	0.084	0.297
	p10	0.135	0.089	0.181	0.204	0.139	0.268
	p11	0.640	0.564	0.716	0.504	0.400	0.607

CHAPTER 4
MIGRATION AND HOUSEHOLD INCOME: EMPIRICAL EVIDENCE ON FINNISH FAMILIES[1]

Abstract

A family maximises lifetime household welfare in migration decisions in the family migration framework (Sjaastad, 1962; Mincer, 1978). Consequently, migration should have a positive outcome on household even though the outcomes may be asymmetrical between family members. This study examines the effect of migration on household income. In addition, the effect of migration on women's income is studied to detect whether the effect varies along with woman's share of household income. The study focuses on economically active households and inter-regional migration, and uses Finnish micro-level data from 1998 to 2004. The effect of migration on household income is analysed using a treatment effect model to control for endogenous migration decision. The results show that the income of migrating households grows more quickly than income in non-migrant households. Migration also has a positive effect on a woman's income growth regardless of her relative earnings in a family.

keywords: migration, gender, household income

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1 Introduction

Migration has been considered an investment in future utility (Sjaastad, 1962). Therefore, migration should have a positive outcome. The labour market outcomes of migration have been widely examined. Some studies (Lehmer & Möller, 2008; Nakosteen & Westerlund, 2004; Pekkala, 2002; Yankow, 2003) have noted a positive effect of migration on income level and income growth, whereas other studies (Axelsson & Westerlund, 1998; Détang-Dessendre et al., 2004) have observed no effect.

In the family migration framework, migration decisions are made according to the net gain of the whole household (Mincer, 1978). Outcomes may be asymmetric between family members if a wife or husband moves against her or his personal benefit. Several studies have discovered that the effects of migration on men and women are different. Indeed, women have appeared to encounter weaker outcomes of migration than men (Boyle et al., 2001; Nilsson, 2001; Cooke, 2003).

This paper examines the effect of migration on household income in Finland. According to the human capital model of migration, the effect is assumed to be positive. In addition, the effect of migration on women's income is studied with the aim of detecting whether this effect varies along with women's relative earnings within a family. Do primary wage-earners and secondary wage-earners gain equally from migration? This study focuses on economically active households and examines inter-regional migration motivated by labour market factors.

Most Finnish households experience a family migration decision. The female labour force participation rate and the proportion of women in higher education are high in Finland. In 1998, women's employment rate was 63.1 percent, and in 2004, it was 65.5 percent, while men's employment rate in 1998 was 66.9 percent and in 2004 was 68.9 percent. Finnish women actively participate in the labour market, and most households have two earners. Consequently, it seems rational to assume that household migration decisions are based on joint decision-making, in which the preferences of all family members are balanced. Indeed, Finnish households are an interesting sample for exploring family migration. Although Finnish women actively participate in the labour market, women earn lower wages, and the labour market is gender-segregated. This inequality may affect migration decisions within families and cause asymmetrical outcomes for men and women.

The spatial concentration of the Finnish labour force is another important motive for studying the outcomes of inter-regional mobility. Finland is a geographically large country, but its population has been increasingly concentrated in a few central regions during recent decades. Around 26 percent of the Finnish population lived in the metropolitan region in 2001. The three biggest regions account for 44 percent of the total population. Therefore, it is

interesting to test whether this rapidly developing concentration has been advantageous for households.

Finnish micro-level data from 1998 to 2004 containing matched married and cohabiting couples are used in this study. The earnings of both spouses are available in the data. Therefore, household income, the income of men and women and relative income shares can be investigated. The effects of migration on household income are analysed using a treatment effect model to control for endogenous migration decisions.

The remainder of this paper is organised as follows. Previous empirical evidence is reviewed in the next section. The data and treatment effect model are described in the third section. The descriptive statistics on employment and household income are in the section four. The results regarding household income and women's income are presented and discussed in section five. Section six concludes.

2 Previous evidence on the effects of migration

The human capital model of migration was first introduced by Sjaastad (1962). This model sees migration desicion as an investment decision in which individuals estimate their lifetime utility. Change in future income and relocation costs are then compared. In addition, regional price level and psychological costs and benefits also affect the lifetime utility. Empirical findings are fairly consistent with the human capital model of migration. Pekkala (2002), Yankow (2003), Nakosteen and Westerlund (2004) and Lehmer and Möller (2008) noted that migration has had a positive effect on income level. Migration did not affect income change instantly after migration, but income growth was higher a few years after migration. However, migration did not increase the income level of young people during the early stages of their professional life. These studies did not apply the family migration framework.

In Mincer's (1978) framework for family migration, a family's common gain is assessed in migration decisions. The decision-making process may create a situation wherein an individual's preferences are in contradiction with the benefit of the whole family. If a family member moves or stays against his or her personal benefit, he or she is a tied mover or a tied stayer. The family migration framework has been criticised because empirical studies have discovered gendered effects of migration. The gender role model (Cooke, 2003) states that family migration decisions are made not according to the relative earning potential of spouses but rather according to the husband's employment opportunities.

Empirical migration studies are increasingly focusing on family migration. The effect of migration on employment in households has also been studied, but the results are ambiguous. Cooke and Bailey (1996) observed that migration had no effect on employment for men but had a positive effect for women. Boyle et al., (2001) noted that both male and female long-distance migrants

were more often unemployed or inactive than those who stayed. Nivalainen (2005) observed that moving had a negative effect on the wife but no effect on the employed husband. Women may have sacrificed their employment opportunities in the context of family migration.

Axelsson and Westerlund (1998) examined the income change of Swedish households from 1978 to 1990. Men's higher education had a significant positive effect on the probability of long-distance migration. The results showed that migration did not affect income. Women's real income increased regardless of their migration decisions along with the increase in working hours during the observed period. The researchers concluded that families prioritize the husband's career. Nilsson (2001) focused on the earnings of young men and women in Sweden from 1990 to 1995. The aim of the research was to determine whether migration affects the earnings of men and women differently. The individual characteristics explained the income growth of men, whereas household variables were more significant factors for women. The results showed that men benefit significantly from migration but that migrating once during a five-year period had a negative effect on the earnings of women living with children. The variation in women's earnings was narrower than the variation in men's earnings, mainly due to a gender-segregated labour market.

Jacobsen and Levin (2000) observed that single women gained from migration while married women's earnings decreased. They also analysed the earnings share of spouses within a household. The change in husbands' earnings was negatively correlated with changes in wives' earnings, especially among migrants. This finding indicates that migration affects spouses' earnings asymmetrically. However, the authors concluded that migration does not significantly influence the relative earnings share of women within a household. Cooke (2003) examined matched married couples and the relative earnings of husbands and wives. In that study, the human capital model and the gender role model provided opposite explanations for family migration. The main results showed that the effect of migration on income varies mainly by gender, as the gender role model predicts. An increase in family income was correlated with the husband's income growth, while women did not benefit from migration. Men gained from migration regardless of their income share within a family, indicating that the gender role model explained family migration better than the human capital model. In other words, the migration decision and post-migration outcomes are somewhat unrelated to the relative earning potential of spouses because families tend to prioritise the husband's career.

3 Data and model

3.1 Data

Finnish micro-level data, a seven per cent random sample drawn from Finnish census in 2001, are used in the empirical analysis. Labour registers and regional

statistics are combined with the census data. Variables for both spouses in married and cohabiting couples are available, allowing the analysis of matched couples. The sample used in this study is comprised of 88 246 married or cohabiting couples in which both spouses were under 65 in 2001 and in which at least one of the spouses was employed in 1998, 2001 and 2004. These restrictions were implemented so that we could analyse economically active households and migration motivated by labour market factors. In addition, the problem of tied migrants and the asymmetric consequences of migration could be investigated using this setup.

Because this study focuses on labour market-related migration, migration between sub-regions (NUTS level 4) was examined. Households who moved from one sub-region to another sub-region at least once between 1998 and 2001 are categorised as migrants. According to this definition, 2 947 of 88 246 couples, covering 3.3 percent of the sample, migrated during the observed period. There were 85 sub-regions in Finland in 2001. These sub-regions are functional areas organised by neighbouring municipalities for co-operation in regional and industrial development. Thus, sub-regions are fairly representative of local labour market areas. Migration within a sub-region is not analysed because it is more likely to be motivated by residential needs.

3.2 Model and variables

Migration decisions do not constitute a random process; on the contrary, migrants are self-selected based on their observable and unobservable characteristics. Previous studies have examined observable traits and noted that migrants are more often highly educated and younger than immobile individuals (Lehmer & Möller, 2008). However, the results are ambiguous. Axelsson and Westerlund (1998) found no evidence of self-selection, and Pekkala (2002) observed self-selection, but the results remained unchanged after selectivity correction.

Another unsolved question is whether migrants are positively or negatively selected based on their observable characteristics. High wages improve the financial capacity to relocate but increase the opportunity costs associated with moving. Cooke and Bailey (1996) and Nivalainen (2005) observe that migrants are positively selected. Nakosteen et al. (2008) discuss whether high wages increase or decrease the likelihood of migration and note that women with high earnings are particularly immobile. Détang-Dessendre et al. (2004) observe that among the highly educated, the most highly educated are more mobile; however, a similar pattern was not observed among individuals with lower education.

Nakosteen et al. (2008) conclude that migrants are also selected based on unobservable characteristics. For example, attitudes towards work cannot be observed. Differencing income reduces the bias caused by unobservable characteristics on the condition that unobservable characteristics are time-invariant. Therefore, the dependent variable in the earnings equation is the change in logarithmic income from 1998 to 2004 *(ln(income2004)* –

ln(income1998)). Prior to differencing, the real income is calculated according to the consumer price index in 2004. The income definition used is annual taxable transfers. In addition to income from employment and self-employment, social security benefits are included in this income definition. Unfortunately, the regional price levels are not included in the model. The increase in income from the pre-migration level to the post-migration level is analysed for a seven-year period because migration does not instantly affect income.

A model controlling for selection based on observable characteristics is used. A treatment effect model that takes endogenous migration decision into account has been previously applied to migration frameworks (Axelsson & Westerlund, 1998). The earnings equation that estimates the effect of migration in the treatment effect model (Greene, 2003) is:

(1) $y_i = x_i^{'}\beta + \delta M_i + \varepsilon_i$

where x_i is the vector of control variables and M_i is a dummy variable for migration. In the treatment effect model, the probability of migration decisions is as follows:

(2) $M_i^* = w_i'\gamma + u_i$ where $M_i = 1$ if $M_i^* > 0$
$M_i = 0$ otherwise

where w is the vector of observed characteristics. It is supposed that the error terms ε and u are correlated. We derive the expected value of y_i based on the migration decision:

(3) $E[y_i|M_i = 1] = x_i'\beta + \delta + E[\varepsilon_i|M_i = 1] = x_i'\beta + \delta + \rho\sigma_\varepsilon\lambda(-w_i'\gamma)$

(4) $E[y_i|M_i = 0] = x_i'\beta + \rho\sigma_\varepsilon\left[\frac{-\phi(w_i'\gamma)}{1-\Phi(w_i'\gamma)}\right]$

Finally, the difference in expected earnings between migrant and non-migrant is:

(5) $E[y_i|M_i = 1] - E[y_i|M_i = 0] = \delta + \rho\sigma_\varepsilon\left[\frac{\phi_i}{\Phi_i(1-\Phi_i)}\right]$.

The variables of the treatment effect model are presented in table 1. The years, sample means and minimum and maximum values are included in the table. Employment status and higher education are explanatory variables in migration and income equations. Education is regarded as a significant determinant of both income and migration (e.g., Nivalainen, 2003). The presumption is that women-related variables have a smaller effect on family migration behaviour although women are more often highly educated than men in the sample. Woman's share of household income is included in both equations because it may affect the mobility decisions and income dynamics. According to previous studies, equal intra-family income shares decrease

mobility (Nivalainen, 2005; Swain & Garasky, 2007). In addition, control variables such as children, age and language are present in both equations.

TABLE 1 Variables of the treatment effect model

	year	mean (sd)	min	max
household income change (ln-ln)	1998-2004	0.29 (0.41)	-6.06	7.02
age	1998	41.0 (9.33)	17	62
Swedish-speaking	2001	0.06	0	1
children (0-7 years)	2004	0.21	0	1
children (7-18 years)	2004	0.42	0	1
higher education (man)	2004	0.35	0	1
employed 1998 (man)	1998	0.91	0	1
employed 2004 (man)	2004	0.87	0	1
higher education (woman)	2004	0.42	0	1
employed 1998 (woman)	1998	0.82	0	1
employed 2004 (woman)	2004	0.84	0	1
metropolitan area	2004	0.27	0	1
university regions	2004	0.25	0	1
regional centres	2004	0.32	0	1
small regions (reference category)	2004	0.16	0	1
woman's share of household income	1998	0.40 (0.17)	0	1
migration	1998-2001	0.03	0	1
migration	1998-2001	0.03	0	1
age	1998	41.0 (9.33)	17	62
Swedish-speaking	2001	0.06	0	1
children (0-7 years)	1998	0.30	0	1
children (7-18 years)	1998	0.43	0	1
married	1998	0.80	0	1
home owner	1998	0.78	0	1
living in native region of either spouse	1998	0.76	0	1
employed (man)	1998	0.91	0	1
employed (woman)	1998	0.82	0	1
higher education (man)	1998	0.34	0	1
higher education (woman)	1998	0.39	0	1
self-employed (man)	1998	0.15	0	1
self-employed (woman)	1998	0.08	0	1
woman's share of household income	1998	0.40 (0.17)	0	1
metropolitan area	1998	0.27	0	1
university regions	1998	0.21	0	1
regional centres	1998	0.33	0	1
small regions (reference category)	1998	0.19	0	1

To control for regional motivations for migration as well as regional discrepancies in income level, a categorical variable for the region of residence is included. Finnish sub-regions are divided into four categories, the Helsinki metropolitan area, university cities, regional centres and small regions, of which the latter is the reference category.

The sample contains both married and cohabiting couples. Hence, a variable identifying married couples is present in the migration equation as a proxy of family values and stability. Married couples might prioritise husband's career more highly than cohabiting couples (Cooke, 2003). Around 80 percent of couples in the sample are married. In addition, home ownership and self-employment are explanatory variables in the migration equation because they may affect relocation costs. Because previous migration history increases the probability of migrating again, living in the native region of either spouse is included in the migration equation. Living in the original region does not have a significant effect on household income change. Therefore, this explanatory variable is excluded from the income equation to properly identify the treatment effect model.

4 Descriptive analysis

The employment status of migrant and non-migrant households in the sample is presented in table 2. As the theory of family migration (Mincer, 1978) predicts, migrant households were more frequently one-earner households than non-migrant households. While 74 per cent of stayers were two-earner households, only 60 per cent of migrant households had two earners in 1998. This discrepancy was considerable in 1998 but diminished during the observed period. In 21 percent of migrant households, only man was employed in 2004. In contrast, women were nearly as frequently single earners as men in non-migrant households. This observation may imply that the preferences in migrant households differ from those in and non-migrants households.

TABLE 2 Employment status of households in 1998, 2001 and 2004

	1998		2001		2004	
	stayers	migrants	stayers	migrants	stayers	migrants
both employed	74 %	60 %	75 %	67 %	71 %	72 %
only man employed	17 %	29 %	15 %	26 %	16 %	21 %
only woman employed	9 %	11 %	10 %	7 %	13 %	7 %

The average income of households in 1998, 2001 and 2004 is presented in table 3. The general trend is that migrants had a lower pre-migration income level but they also enjoyed faster income growth than stayers. A similar pattern and selection were also observed by Lehmer and Möller (2008). The growth in mean income was 48 percent for migrants and 24 percent for stayers. Because migrants are self-selected, this descriptive analysis does not provide a reliable picture of causal effect of migration on income.

TABLE 3 Mean income (1000 €/year), s. d. and income growth (%) 1998-2004

		1998		2001		2004		income growth
households	stayers	51.8	(27.8)	57.3	(34.2)	64.3	(45.0)	24 %
	migrants	44.7	(26.5)	55.2	(33.0)	66.0	(45.2)	48 %

In 2004 euros

Table 4 shows transitions in women's labour market status. Stayers are on the left side and migrants on the right side of the table. Economically inactive and unemployed women are combined. The proportions are labour market status conditioned on previous status and migration. For example, 7 percent of the non-migrant women who were employed in 1998 were not employed in 2001. In contrast, among migrants, the corresponding proportion was 18 percent, indicating that the labour market situation of migrants weakened from 1998 to 2001 compared to that of non-migrant women. On the other hand, the transition from non-employment to employment was also frequent in the group of migrants. After migration, from 2001 to 2004, the situation of migrants and stayers was somewhat similar. However, transitions from non-employment to employment and vice versa were more common in the group of migrants.

TABLE 4 Employment transitions of women 1998-2001 and 2001-2004

		stayers		**migrants**	
		2001		**2001**	
		employed	not employed	employed	not employed
1998	employed	93 %	7 %	82 %	18 %
	not employed	49 %	51 %	55 %	45 %
		2004		**2004**	
		employed	not employed	employed	not employed
2001	employed	92 %	8 %	88 %	12 %
	not employed	41 %	59 %	51 %	49 %

Table 5 presents the average of woman's income share by migration status. Households are also divided according to their positive and negative income changes from 1998 to 2004. At the beginning of the observed period, the income shares were fairly equal in all groups: between 42 and 45 percent. Average shares in 2004 show that women contributed to household income more in households that encountered a negative income change. The contribution of women was lowest in the households that migrated and whose income increased, although the differences between the groups are modest. These figures indicate that growth in household income is related to growth in the man's income.

TABLE 5 Women's income share in 1998 and 2004

		stayers		migrants	
		1998	2004	1998	2004
household income change	positive	0.444	0.427	0.447	0.398
	negative	0.425	0.460	0.434	0.439

5 Estimation results

5.1 Household income

The effect of migration on household income change is analysed using the treatment effect model presented in section 3.2. The coefficients and standard errors of the treatment effect model are displayed in the lower section of table 6. According to the Wald test, migrant households are self-selected. The chi-squared statistic, which tests the independence of the income and migration equations ($\rho = 0$), is highly significant.

In the migration equation, higher education increases and employment decreases the probability of migration, as was predicted. The coefficient of women's higher education is significantly smaller than the coefficient of men's higher education. This result indicates that men's higher education is more relevant in family migration decisions, although women have a higher education degree more often than men. However, spouses' education levels are highly correlated, which might cause multicollinearity. The coefficients of employment are somewhat equal. Woman's share of household income has a non-linear effect on the probability of migration. The effect is the most negative for households in which both spouses equally contribute to household income. Equal income shares within a household seem to decrease mobility, as is consistent with the previous findings (Nivalainen, 2005; Swain & Garasky, 2007). Apparently, the opportunity costs of migration are higher when women and men equally contribute to household income.

Families living in an owner-occupied home and those with children are less likely to migrate. As was predicted, living in the native region of either spouse decreases the likelihood of migration as well. Previous migration decreases the psychic costs of repeated migration and increases mobility. Marriage does not have a significant effect on the probability of migration. Men's self-employment reduces mobility, while women's self-employment has the opposite effect, indicating that relocation costs from men's self-employment are higher. Regional factors affect migration decisions. Living in the metropolitan area, in university cities or in regional centres decreases the probability of migration compared to that associated with the reference category.

TABLE 6 Results of treatment effect model of households

income equation household income change	**coefficient**		**robust s.e.**
age	-0.048	***	0.0014
age²	0.000	***	0.0000
Swedish-speaking	-0.008		0.0058
children (0-7 years)	-0.070	***	0.0043
children (7-18 years)	0.022	***	0.0029
higher education (man)	0.068	***	0.0030
employed 1998 (man)	-0.127	***	0.0056
employed 2004 (man)	0.226	***	0.0046
higher education (woman)	0.027	***	0.0028
employed 1998 (woman)	-0.146	***	0.0048
employed 2004 (woman)	0.165	***	0.0043
metropolitan area	0.021	***	0.0042
university region	0.000		0.0041
regional centre	-0.010	***	0.0039
woman's income share	-0.697	***	0.0396
woman's income share²	1.044	***	0.0424
migration 1998-2001	0.146	***	0.0132
constant	1.367	***	0.0281
migration equation migration 1998-2001			
age	-0.057	***	0.0089
age²	0.000	**	0.0001
Swedish-speaking	-0.160	***	0.0484
children (0-7 years)	-0.035	***	0.0217
children (7-18 years)	-0.197		0.0229
married	0.031	***	0.0235
home owner	-0.414	***	0.0207
native region	-0.557	***	0.0202
higher education (man)	0.211	***	0.0208
employed (man)	-0.184	***	0.0350
self-employed (man)	-0.176	***	0.0364
higher education (woman)	0.077	***	0.0205
employed (woman)	-0.134	***	0.0268
self-employed (woman)	0.166	***	0.0409
woman's income share	-0.542	***	0.1840
woman's income share²	0.638	***	0.1932
metropolitan area	-0.355	***	0.0287
university region	-0.161	***	0.0290
regional centre	-0.154	***	0.0263
constant	1.060	***	0.1592
log likelihood = - 48 127			
ρ = - 0.098, Wald test of independent equations (ρ = 0): $\chi^2(1)$ = 88.53 ***			

* p < 0.1; ** p < 0.05; *** p < 0.01

The coefficients of the income equation are displayed in the upper section of table 6. Employment and higher education have a significant and positive effect on income growth. Having small children has a negative effect on household

income change, while having older children has a positive effect. In addition, age has a non-linear effect. These results indicate that the stage of the family life cycle is related to the family's economic conditions. The coefficients of regional categories are statistically insignificant or small. Women's income share has a non-linear effect on household income growth. If woman's share is between 40 and 50 percent, household income growth is slower than in other households.

Finally, migration has a positive effect on household income growth. This finding indicates that inter-regional migration is profitable, as the hypothesis of the human capital model predicts. The concentration of the labour force has been intense in Finland since the recession in 1990s. Because a positive relationship between migration and household income growth is observed, the spatial concentration seems to be advantageous for households.

5.2 *Women's income and income share*

The second part of the empirical analysis examines whether migration affects women's income. Previous evidence (Nivalainen, 2005) shows that spouses' income shares have an effect on a family's migration decisions. On the other hand, Cooke (2003) states that gender rather than relative income share is the dominant determinant of post-migration outcomes. The results of the household specification in section 5.1 indicate that relative income shares within a family have a significant and non-linear effect on migration and income growth. When the share of household income contributed by woman is between 40 and 50 percent, families are less mobile, and income growth is slower than in households with an evident primary wage-earner. Therefore, this empirical analysis focuses on differences between families in which the man is the primary wage-earner, those in which spouses are equal wage-earners, and those in which the woman is the primary wage-earner.

For this second empirical analysis, the sample is divided into three groups according to the income share of woman in 1998 to examine whether there are differences between these groups. There is a gender wage gap in the Finnish labour market; in other words, the average income of women is lower. Therefore, spouses are regarded as equal earners if the woman's income share is from 40 to 50 percent. The three groups, divided according to income share, are as follows: 1) man as the primary wage-earner (woman's share < 40 percent), 2) man and woman equal wage-earners (woman's share 40-50 percent) and 3) woman as the primary wage-earner (woman's share > 50 percent).
The specification is similar to the household specification. The dependent variable is the woman's income change. Therefore, the education and employment characteristics of men are excluded from the income equation. The treatment effect model is estimated for all women and then separately for every income share category. The results are presented in table 7.

The coefficients of the migration equation are not systematically discussed because they are mostly consistent with the results of the household specification. The effect on migration of having small children is insignificant, although in the household specification, it was significant and negative. In

families in which the man is the primary wage-earner, marriage has a significant and positive effect on migration. In contrast to the results of the household specification, woman's higher education degree does not have a significant effect in the second category.

TABLE 7 Results of treatment effect model for woman's income growth

income equation woman's income change	**all** n=86 591		**< 0.4** n=41 106		**0.4 - 0.5** n=23 992		**> 0.5** n=21 493	
age	-0.059	***	-0.084	***	-0.034	***	-0.032	***
age²	0.0006	***	0.0009	***	0.0003	***	0.0003	***
Swedish-speaking	-0.043	***	-0.025	*	-0.040	***	-0.024	*
children (0-7 years)	-0.207	***	-0.245	***	-0.173	***	-0.178	***
children (7-18 years)	0.039	***	0.055	***	0.053	***	0.047	***
higher ed. (woman)	0.061	***	0.069	***	0.063	***	0.058	***
employed 1998 (woman)	-0.272	***	-0.448	***	-0.288	***	-0.283	***
employed 2004 (woman)	0.600	***	0.587	***	0.535	***	0.553	***
metropolitan area	-0.028	***	-0.026	**	0.001		0.015	*
university region	-0.026	***	-0.035	***	-0.009		-0.013	
regional centre	-0.031	***	-0.037	***	-0.015	**	-0.009	
woman's income share	-3.566	***						
woman's income share²	2.926	***						
migration 1998-2001	0.131	***	0.228	***	0.094	***	0.110	***
constant	2.190	***	2.074	***	0.675	***	0.612	***
migration equation migration 1998-2001								
age	-0.056	***	-0.072	***	-0.025		-0.055	***
age²	0.0003	**	0.0005	***	-0.0002		0.0002	
Swedish-speaking	-0.147	***	-0.121	*	-0.131		-0.230	**
children (7-18 years)	-0.200	***	-0.192	***	-0.225	***	-0.186	***
children (0-7 years)	-0.034		-0.054	*	0.0004		-0.020	
married	0.024		0.084	**	-0.033		-0.035	
home owner	-0.420	***	-0.428	***	-0.399	***	-0.410	***
native region	-0.557	***	-0.565	***	-0.552	***	-0.554	***
higher ed. (man)	0.209	***	0.248	***	0.180	***	0.159	***
employed (man)	-0.194	***	-0.316	***	-0.256	***	-0.189	***
self-employed (man)	-0.163	***	-0.212	***	-0.155	*	-0.114	**
higher ed. (woman)	0.077	***	0.062	**	0.039		0.129	***
employed (woman)	-0.126	***	-0.121	***	-0.199	***	-0.256	**
self-employed (woman)	0.148	***	0.146	**	0.203	**	0.159	*
metropolitan area	-0.360	***	-0.397	***	-0.244	***	-0.377	***
university region	-0.167	***	-0.199	***	-0.052		-0.195	***
regional centre	-0.155	***	-0.221	***	-0.098	*	-0.055	
woman's income share	-0.552	***						
woman's income share²	0.608	***						
constant	1.077	***	1.353	***	0.493		1.108	***
ρ	-0.08	***	-0.11	***	-0.06	***	-0.09	***

* p < 0.1; ** p < 0.05; *** p < 0.01

The coefficients of the migration equation are not systematically discussed because they are mostly consistent with the results of the household

specification. The effect on migration of having small children is insignificant, although in the household specification, it was significant and negative. In families in which the man is the primary wage-earner, marriage has a significant and positive effect on migration. In contrast to the results of the household specification, a higher education degree for the woman does not have a significant effect in the second category.

The results of the income equation are consistent with those of the household specification, and the differences between the three groups are small. Living in the metropolitan area has a negative effect on a woman's income when the man is the primary wage-earner, whereas the effect on women who are primary wage-earners is positive. The most important finding is that migration has a positive effect on income growth in all groups. Previous studies have not found positive effect of migration on women's income in the family framework (Cooke, 2003; Nilsson, 2001). However, the effect is smaller when man and woman are equal earners.

These results raise a question: why do women who earn a smaller share gain more from migration than do women contributing substantially to household income? First, this greater effect of migration among women earning less than 40 percent of household income may be due to improved employment opportunities for them after migration. Although employment status prior to migration is controlled for, part-time work and shorter unemployment periods are not observed. Therefore, the specific effect of relocation on income growth cannot be isolated. Secondly, the results may indicate that families do not optimise the income growth of women earning more than 40 percent share of household income. Families in which man and woman are equal wage-earners probably prioritise the man's career when they make migration decisions. These women may actually be tied movers even though they earn a substantial proportion of household income. Nevertheless, these women eventually benefit from migration.

Table 8 summarises the coefficients of migration in the income equations by income share groups. Besides for women (table 7), the model is estimated for households and men. The specifications are consistent with each other. The coefficients of the other variables are not shown here because they do not differ significantly from the coefficients in tables 6 and 7. The effect of migration on household income and on the income of man and woman is smaller in families in which man and woman contribute equally than in other families. In addition, the effects on the income growth of men and women are somewhat equal in those families. Unexpectedly, the effect on household income is larger in the third group than in the other two groups. In fact, the coefficients reveal that households in which woman is the primary wage-earner benefit from migration not because the woman gains but rather because man gains. This finding suggests that a woman as the primary wage-earner in a family is a temporary situation. Families might have migrated to enhance the man's status in the labour market.

Unlike what is indicated by the gender role model of migration, the implication here is that the effects of migration on labour market outcomes are not entirely gendered. The relative earning share is a relevant factor in determining the effect of migration. However, the results indicate that families prioritise men's career opportunities even when the woman is the primary wage earner as the gender role model predicts.

TABLE 8 Migration coefficients for man's, woman's and household income growth

		all	**< 0.4**	**0.4 - 0.5**	**> 0.5**
migration	man	0.147***	0.121***	0.105***	0.353***
	woman	0.131***	0.228***	0.094***	0.110***
	household	0.146***	0.164***	0.111***	0.206***

6 Conclusion

The effect of migration on household income and on women's income was examined in this paper. The aim of this study was to empirically test the human capital model of migration and compare different types of households. The treatment effect model was used to control for endogenous migration decision. Finnish micro-level data from 1998 to 2004 were utilised.

The results show that higher education increased the probability of migration, whereas employment decreased it. In addition, men's and women's self-employment have opposite effects on mobility. As the theory of family migration predicts, families in which the man and woman are equal wage-earners were the least mobile. The effect of migration on household income change was studied, and a positive effect was noted.

Women's income growth was analysed based on three income share categories. Women who are equal or primary wage-earners experienced a significantly lower positive effect from migration than did women who earned less than 40 percent of household income. These results may indicate that the employment opportunities of women earning a lower share improved. Equal wage-earners are trying to strike a balance between spouses' preferences when making family migration decisions. Families in which the woman was the primary wage-earner might have made the migration decision to enhance the man's status at the labour market rather than to optimise the future income of the woman.

This paper contributes to the current literature by indicating that women seem to benefit from migration regardless of their relative income share in the family. However, the tied migrant experience can also occur. Future research will be necessary for us to fully understand family migration decisions. A topic for further research could be the dynamics of spouses' employment status and migration decisions.

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SUMMARY IN FINNISH (YHTEENVETO)

Väitöskirja koostuu neljästä empiirisestä tutkimuksesta, jotka käsittelevät inhimillisen pääoman virtoja ja alueellisia työmarkkinoita Suomessa. Johdantoluvussa esitellään tarkemmin tutkimusten teoreettisia lähtökohtia. Inhimillinen pääoma tarkoittaa jokaisessa ihmisessä olevia tietoja ja taitoja, jotka on hankittu koulutuksen ja työkokemuksen kautta. Investoiminen inhimilliseen pääomaan parantaa mahdollisuuksia työmarkkinoilla ja kasvattaa tuloja tulevaisuudessa. Inhimillinen pääoma on kiinni jokaisessa ihmisessä, joten se on siellä missä ihmisetkin ovat. Inhimillinen pääoma on keskeinen tekijä kansantaloudessa ja erityisesti aluetalouksien kasvun ja kehityksen kannalta, joten on tärkeä tietää, miten inhimillinen pääoma päätyy eri alueille. Inhimillistä pääomaa on erityisesti korkeakoulutetuilla ihmisillä, joten he ovat tämän tutkimuksen kohteena.

Kahdessa ensimmäisessä tutkimuksessa kuvataan inhimillisen pääoman virtoja ja jakautumista Suomessa eri alueille sekä tutkitaan virtoihin vaikuttavia tekijöitä. Kaksi jälkimmäistä tutkimusta käsittelee yksilöiden ja kotitalouksien asemaa eri työmarkkina-alueilla Suomessa. Tutkimusaineistona on otos Tilastokeskuksen kokoamasta väestölaskennan pitkittäistiedostosta. Aineisto sisältää tietoja noin 360 000 suomalaisen perhetilanteesta, koulutuksesta ja työmarkkina-asemasta. Lisäksi aineistoon on liitetty runsaasti henkilön asuinaluetta kuvaavia tietoja. Aineistoa analysoidaan mikroekonometrisin menetelmin

Tutkimuksissa saatujen tulosten mukaan korkeakoulutetut ihmiset ovat keskittyneet Suomessa suuriin kaupunkeihin. Luvussa 2 tutkitaan erityisesti yliopistoista valmistuneiden maistereiden muuttopäätöksiä ennen opintoja ja niiden jälkeen. Alueellinen liikkuvuus on yleisestä mutta metropolialueelta ei juuri muuteta pois. Kaikki yliopistot kouluttavat työvoimaa metropolialueen tarpeisiin. Luvussa 3 tarkastellaan korkeakoulutettuja pariskuntia. Molemmat puolisot tarvitsevat koulutusta vastaavat työpaikat, mikä lisää osaltaan inhimillisen pääoman kasaantumista suuriin kaupunkeihin. Lisäksi havaittiin, että erityisesti yksinelävät naiset asuvat muita naisia ja miehiä todennäköisemmin metropolialueelle. Luvussa 4 tutkitaan, miten muuttaminen vaikuttaa kotitalouden tuloihin. Kotitaloudet, joissa puolisot tasapuolisesti vastaavat perheet tuloista, ovat muita kotitalouksia epätodennäköisempiä muuttamaan. Kotitalouden tulot kasvavat muuttamisen jälkeen. Vaikka naisen tulot olisivatkin perheessä suuremmat, erityisesti miehen tulot kasvavat muuttamisen jälkeen. Luku 5 käsittelee ylikoulutusta eli tilannetta, jossa työntekijällä on enemmän koulutusta kuin työhön vaadittaisiin. Alueelliset tekijät vaikuttavat mahdollisuuteen löytää koulutusta vastaava työpaikka. Suurella työmarkkina-alueella asuminen lisää todennäköisyyttä löytää koulutusta vastaava työ eli ylikoulutuksen todennäköisyys on näillä alueilla pienempi. Yhteenvetona voidaan todeta, että korkeakoulutettujen ihmisten keskittyminen on voimakasta mutta yksilölle kannattavaa, kun tarkastellaan tulojen muutosta ja koulutusta vastaavan työpaikan löytämistä.

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