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Where Do the Highly Educated Migrate?

Micro-Level Evidence from Finland*

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Abstract. This paper analyses the role which migration of highly educated labour plays in human capital reallocation. The study focuses on actual migrants, examining the direct effect of educational attainment on destination choices. The paper uses the ordered probability model and a micro-level data set in econometric analyses. Individual level investigations of migrants show that highly educated migrants are likely to move to urban regions. As a result, the reallocation of highly educated labour, and thereby also the redistribution of human capital, seems to be taking place in Finland.

Keywords: Human capital, migration, educational attainment, regional development

J.E.L. classification: O18, J60

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1. Introduction

According to migration theories, a number of different forces may affect the movements of labour, and thus, human capital. The individual decision to migrate can be seen as a utility maximising process, which is driven by personal, household and regional factors. One important factor is certainly education. The analysis of the effects of educational attainment on migratory behaviour is quite extensive (see e.g. Molho, 1987; Owen & Green, 1992; Levine, 1996; Antolin & Bover, 1997; Ritsilä & Ovaskainen, 2001). The overall finding of these studies is that educational attainment increases the likelihood of migration. On the other hand, micro-level analyses of destination choices of highly educated migrants are much scarcer and related themes have remained rather untouched (see, however, Kauhanen & Tervo, 2002).

From the viewpoint of human capital allocation, the role of educational attainment on destination choices of migrants is of special interest. As mentioned above, it is generally accepted that educational attainment increases the likelihood of migration. Similarly, it is empirically shown that population tends to concentrate spatially. This study accepts these results, but will show that the impression they give is incomplete because it neglects the possibility that divergent destination choices of highly educated migrants may even strengthen the concentration process. Qualified individuals choosing residential location expect a supply of relevant jobs, as well as interesting educational, cultural and recreational opportunities for themselves and their families. Thus, the location decisions of skilled labour are connected to the infrastructure and production of regions. In a coherent way, the settling of enterprises, services and skilled labour support each other (see e.g. Myrdal, 1957; Hansen, 1992; Camagni, 1995; Ritsilä, 1999).

The aim of this paper is to investigate the extensive role which migration of the highly educated plays in human capital reallocation. For simplicity, this paper assumes that the human capital acquired from schooling is the main factor in the formation of the human capital stock of a person. The empirical analysis focuses on migrants, examining the direct effect of educational attainment on destination choices. Consequently, the approach of this paper is different compared with a number of other studies dealing with the relationship between migration and educational attainment. These studies usually aim to define the effects of educational attainment on the likelihood of migration, without considering the destination of this movement.

The empirical analysis of the paper is based on data from the Finnish Longitudinal Census File. The data set used herein is a sample of inter-municipal migrants in the period from 1994 to 1995, and it includes information on population characteristics such as mobility, economic activity, dwelling conditions, family and district of residence. The analysis focuses on persons of working age. The econometric estimations of the paper are based on the ordered probability model.

The paper is organised as follows. The theoretical background of the paper is outlined in Section 2. Section 3 describes our data and the framework of analysis. The results are presented and discussed in Section 4. Finally, the paper ends with concluding remarks.

2. Migration decisions and human capital redistribution

2.1. Migration as utility maximisation

The analytical setting of this paper is related to human capital framework. The framework is based on the modelling work of Sjaastad (1962), Weiss (1971), Seater (1977) and Schaeffer (1985). Herein, heterogeneous individuals possess different utility functions, and consequently encounter differences in the net benefits of living in a specific location. Migration is supposed to result from variations in individual economic utility in different locations.

An important factor that affects economic utility, and hence the decision making of an individual, is her or his personal human capital reserve. Human capital can be considered as a heterogeneous asset, resulting from formal schooling, training and experience, etc. In addition, human capital can be defined as being of general use, or valuable only in specific tasks. For simplicity, we assume that there are only two types of human capital: one acquired by education (vector E), and one gained from other sources (vector O).

Formally, an individual i is assumed to decide to migrate from location j to location k under the following utility maximisation process at a present date 0:

$$E(R_i) = \max_{(E,O)} \left[\int_0^T e^{-rt} \{U_{ikt}(E_{it}, O_{it}) - U_{ijt}(E_{it}, O_{it})\} dt - CM_{ijk} \right] \quad (1)$$

under the precondition

$$\int_0^T e^{-rt} (U_{ikt} - U_{ijt}) dt - CM_{ijk} \geq 0,$$

where $E(R_i)$ is the net present value of expected economic utility of an individual i , U_{kt} is the expected utility level achieved in the alternative location k at time t , U_{jt} is the

expected utility achieved by living in the present location j at time t , and CM_{jk} are the direct costs involved in moving from location j to location k . The expected utilities U_{kt} and U_{jt} , as well as the direct costs CM_{jk} , are formed as a result of personal, household and regional factors involved in the migration decision process. As a result of the rational decision making process, the positive migration decision is reached when the expected utility gained from moving exceeds the direct costs of moving.

2.2. *Reallocation of human capital*

The new theories of economic growth emphasise the role of human capital as a prerequisite for economic growth processes (e.g. Lucas, 1988; Romer, 1990; Krugman, 1991; Barro & Sala-i-Martin, 1995). The know-how of population acts as a non-material input for the producers of goods and services, institutes of research and education, trade organisations and local services. Research and development personnel, as well as skilled operative personnel, can be considered as necessary labour input in the process of innovation (see e.g. Davelaar & Nijkamp, 1997; Ritsilä, 2001). As a result, the corporal and mental endowments of regions affect the location decisions of enterprises. Economic activity tends to concentrate geographically, because it generates sizable returns to producers in form of greater productivity (see e.g. Lucas, 1988; Krugman, 1991; Wheeler, 2001).

Usually the geographical concentration of economic activities also implies the concentration of population, as agglomerating firms require large labour pools (Richardson, 1995); Considering potential migrants, qualified personnel choosing residential location expect a supply of relevant positions/posts, as well as interesting educational, cultural and recreational opportunities for themselves and their families. Thus, the accumulation of enterprises, skilled personnel and services support each other,

which can create a self-feeding agglomeration process (see e.g. Myrdal, 1957; Hansen, 1992).

As a result of agglomeration benefits, human capital often migrates from where it is scarce to where it is abundant, rather than vice versa (Lucas, 1988). This is in line with the rational decision making process, according to which labour is assumed to move from declining regions of high unemployment to expanding regions with modern and well-paid jobs. From the regional perspective, especially in the case of educated persons, there are significant dynamic gains from inward migration. Highly educated migrants raise the educational level of the region, provide new ideas and encourage investment that embodies new technologies, and so on (see e.g. Nijkamp & Poot, 1997). Hence, migration can lead to regional concentration of human capital, which may have a diverging rather than converging effect on the development of local economies (see e.g. Myrdal, 1957; Nijkamp & Poot, 1997).

3. Data and framework of analysis

The empirical analysis is based on a sample of inter-municipal migrants registered in the Finnish Longitudinal Census data. The sample covers the period from 1994 to 1995, and it contains information, for example, on economic activity, dwelling conditions and the families of individuals. This analysis focuses on persons that were of working age in 1994 (aged 17 to 64). The sample size is 24 904 individuals. The analysis focuses on the destination choices of migrants, and stresses the role of educational attainment in the decision making process.

The use of the unusual framework of analysis (using the data set of actual movers instead of modelling the destination choice of potential migrants) in this study can be rationalised by at least three arguments. First, the simultaneous modelling of moving

decisions and choices of destination usually involves a pitfall in estimating the effects of aggregate variables on micro units, i.e. integrating regional and individual level factors into the same econometric models (Moulton & Randolph, 1989; Moulton, 1990).

Second, the procedure used herein makes it possible to treat the destinations as ordered choices of the municipality class. This characteristic is not reached by using, for example, the multinomial logit model in the case of potential migrants. Our model can also yield very interesting and relevant information from the viewpoint of spatial concentration. Third, the analysis of potential migrants often involves the difficulty that the proportion of migrants in the whole population is minor, for which reason the econometric analysis may be problematic.

The dependent variable (**municipality class**) of this analysis has three different ordered classes based on the amount of population and degree of urbanisation of the municipalities of destination:

Y = 2 (Urban)	if the number of population > 50 000 and the level of urbanisation \geq 90% (N = 10 332)
Y = 1 (Densely populated)	if the number of population > 15 000 or the level of urbanisation \geq 70%, and the condition of Y = 2 is not valid (N = 9 802)
Y = 0 (Rural)	otherwise (N = 4 770)

This classification of spatial concentration applies the same elements as the Communal Classification of Statistics Finland (1996).

The regional division of classification is presented in Figure 1. Exploiting the municipal moves enables a larger sample size, but the problem of the municipal level sample is that the migrations of the sample include a number of moves that are not labour market based. However, this problem is reduced to some extent by forming a relevant data set (e.g. an individual being of working age) and by using the explanatory

variables that control the relevant labour market characteristics (e.g. an individual being a student) of an individual.

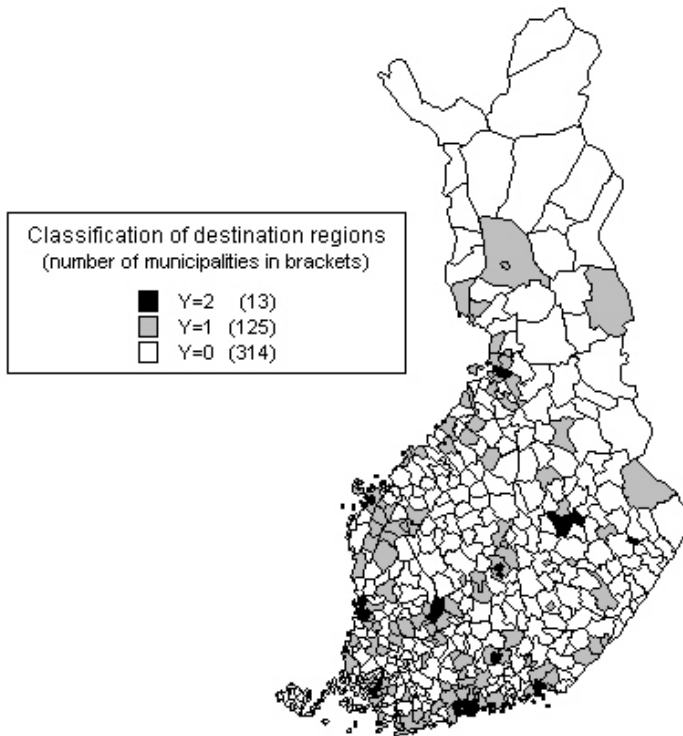


Figure 1. Classification of municipalities used in the analysis

The construction of the dependent variable as ordered levels of spatial concentration suggests a use of an ordered probit model (see e.g. Hausman et al., 1992; Greene, 1997; Long, 1997). Thereby, we assume that a migrant i chooses her or his destination region y_i (**municipality class**) according to a latent variable y_i^* , which describes the regional level of human capital concentration in the destination region:

$$y_i^* = \beta' x_i + \varepsilon_i, \quad \varepsilon_i \sim N(0, \sigma_i^2) \quad (2)$$

$$y_i = j \quad \text{if} \quad \mu_{j-1} < y_i^* \leq \mu_j, \quad j = 0, 1, 2 \quad (3)$$

where x_i is a set of explanatory variables, β is a parameter vector and μ 's are unknown threshold parameters ($\mu_{-1} = -\infty$ and $\mu_2 = \infty$). The variance of the error term ε_i is assumed to depend on a set of explanatory variables, z_j (see e.g. Davidson & MacKinnon, 1984): $\sigma_i^2 = [\exp(\gamma' z_i)]^2$, where γ is an additional parameter vector to be estimated with β and μ 's. This multiplicative heteroskedasticity is introduced into the model, because uncorrected departures from homoskedasticity can bias the estimated parameters and standard errors in non-linear models (Godfrey, 1988).

Given these assumptions, the probability of alternative j is

$$\Pr(y_i = j) = \Phi((\mu_j - \beta' x_i) / \exp(\gamma' z_i)) - \Phi((\mu_{j-1} - \beta' x_i) / \exp(\gamma' z_i)), \quad (4)$$

where $\Phi(\cdot)$ denotes the cumulative distribution function of standard normal. Hence, the appropriate log-likelihood function for the heteroskedastic ordered probit model can be expressed as

$$\log L = \sum_{i=1}^N \sum_{j=0}^2 y_{ij} \log[\Phi((\mu_j - \beta' x_i) / \exp(\gamma' z_i)) - \Phi((\mu_{j-1} - \beta' x_i) / \exp(\gamma' z_i))], \quad (5)$$

where $y_{ij} = 1$ if $y_i = j$ and 0 otherwise (dummy variable). Since the full set of μ 's is not identified if vector x contains a constant, normalisation $\mu_0 = 0$ is adopted.

Maximisation of the Equation (5) gives maximum-likelihood estimates of β , γ and μ_1 . The procedure employed to determine the terms included in the heteroskedastic function follows O'Higgins (1994). First, the heteroskedastic ordered probit model was estimated with vector z containing all variables in x save the constant. Second, the vector z was subsequently reduced so as to have the simplest form which, at the same time, was not rejected in a comparison with the more general model. Likelihood ratio tests are used for the analyses (see e.g. Godfrey, 1988; Greene, 1997). Note that a

homoskedastic ordered probit can be estimated by setting the variance of the error term to one ($\sigma_i^2 = 1$). Thus, the presence of heteroskedasticity can be tested easily.

As stated above, this analysis focuses on the effect of educational attainment on the destination choices of migrants. The dummy variable (**highly educated**), which is used for educational attainment, is 1 if an individual has at least the lowest level of tertiary education, the whole length of education being about 13-14 years. The definition of the variable follows the Finnish Standard Classification of Education (31.12.1994). Row percentages in Table 1 suggest that an individual is more likely to move to urban regions if she or he is highly educated. This result is strongest for individuals living in the rural area of Finland.

Table 1. Crosstabulation of municipal class in 1994 and 1995 by the educational attainment

Municipality class in 1994 (origin)	Municipality class in 1995			
	Rural (y = 0)	Dens. pop. (y = 1)	Urban (y = 2)	Total
<i>Not highly educated</i>				
Rural	1419 (26.1%)	2415 (44.4%)	1604 (29.5%)	5438 (100%)
Densely pop.	1957 (20.8%)	3618 (38.5%)	3816 (40.6%)	9391 (100%)
Urban	856 (12.8%)	2449 (36.7%)	3375 (50.5%)	6680 (100%)
Total	4232 (19.7%)	8482 (39.4%)	8795 (40.9%)	21509 (100%)
<i>Highly educated</i>				
Rural	154 (24.0%)	270 (42.1%)	217 (33.9%)	641 (100%)
Densely pop.	234 (18.6%)	481 (38.1%)	546 (43.3%)	1261 (100%)
Urban	150 (10.0%)	569 (38.1%)	774 (51.8%)	1493 (100%)
Total	538 (15.8%)	1320 (38.9%)	1537 (45.3%)	3395 (100%)

Notes: Sample frequencies are given first. Row percentages are in brackets.

Control variables used in the analysis measure an individual's personal characteristics, household and region of origin. Further details on the variables are presented in Table 2.

Table 2. The explanatory variables of the ordered probit models

Explanatory variable (Year 1994)	Definition	Mean
Highly educated	1 if an individual has at least the lowest level of tertiary education; 0 otherwise	0.136
Female	1 if an individual is female; 0, otherwise	0.504
Age	Age of an individual (continuous)	29.186
Unemployed	1 if a person has been unemployed at least two weeks in the observation year; 0 otherwise	0.394
Student	1 if an individual is reported as a student on the basis of the main type of activity in the last week of the observation year; 0 otherwise	0.222
Commuter	1 if the location of an individual's job is different from her or his municipality of residence at the end of the observation year; 0 otherwise	0.192
Fragmented work experience	1 if a person has experienced terminated spell of employment at least twice in the observation year; 0 otherwise	0.131
House owner	1 if an individual has her/his own house; 0 otherwise	0.265
Flat owner	1 if an individual has her/his own flat; 0 otherwise	0.204
Size of household	Size of the household unit an individual belongs to (continuous)	3.167
Urban (origin)	1 if the number of population > 50 000 and level of urbanisation \geq 90% at the region of origin; 0 otherwise	0.328
Densely populated (origin)	1 if the number of population > 15 000 or level of urbanisation \geq 70% and region of origin is not urban; 0 otherwise	0.428

4. Empirical results

Table 3 presents the results of the homoskedastic and heteroskedastic ordered probit models for destination choices of migration. All the coefficients, except for the size of household in the homoskedastic model, reach statistical significance at the 5% level. Looking at the diagnostics reported in the table, we can see that the Likelihood ratio test for heteroskedasticity is highly significant (58.4 against the 1% critical χ^2 value 16.8), so that the null hypothesis of homoskedasticity is rejected. On the other hand, a more general form of heteroskedasticity is rejected (6.37 against the 5% critical χ^2 value 12.6).

Table 3. Estimated models for destination choices of migration, 1994-1995

Variable	Homoskedastic model		Heteroskedastic model	
	Coefficient	St. Err.	Coefficient	St. Err.
Constant	0.817**	0.038	0.966**	0.053
Highly educated	0.115**	0.022	0.137**	0.026
Female	-0.032*	0.015	-0.044*	0.018
Age	-0.014**	0.008	-0.016**	0.001
Unemployed	-0.058**	0.016	-0.054**	0.020
Student	0.246**	0.021	0.335**	0.030
Commuter	0.185**	0.020	0.218**	0.025
Fragmented work experience	0.107**	0.022	0.156**	0.030
House owner	0.271**	0.019	0.314**	0.026
Flat owner	0.195**	0.019	0.234**	0.025
Size of household	-0.008	0.004	-0.010*	0.005
Urban (origin)	0.631**	0.021	0.759**	0.035
Densely populated (origin)	0.285**	0.018	0.357**	0.026
Threshold parameter, μ_1	1.142**	0.010	1.382**	0.047
<i>Correction for heteroskedasticity</i>				
Age	—	—	0.040**	0.009
Unemployed	—	—	0.061**	0.018
Student	—	—	0.121**	0.024
Fragmented work experience	—	—	0.075**	0.026
House owner	—	—	-0.042*	0.019
Densely populated (origin)	—	—	0.058**	0.017
<i>Diagnostics</i>				
Log-likelihood	-25167.95		-25138.76	
LR-test for heteroskedasticity	58.4** (d.f. = 6)		—	
LR-test for more general heteroskedasticity	—		6.37 (d.f. = 6)	

Notes: Dependent variable: Municipality class (0, 1, 2). Number of observations: 24 904. * (**) = Statistically significant at the 5% (1%) level. The first test for heteroskedasticity compares the homoskedastic model with the heteroskedastic model reported in the table. The test for more general heteroskedasticity compares the latter model with a model including all the independent variables save the constant term in the heteroskedastic function (d.f. = degrees of freedom).

The dependent variable exploited herein involves ordered classification of destination municipalities, and hence, direct interpretation of coefficients is not advisable (see e.g. Long, 1997). Therefore, we look at the marginal effects of changes in the regressors. These effects are calculated as partial derivatives and are presented in Table 4.

Table 4. Marginal effects on the probability of destination choices for migrants, 1994-1995

Variable	Homoskedastic model			Heteroskedastic model		
	Rural	Dens. pop.	Urban	Rural	Dens. pop.	Urban
Highly educated	-0.030**	-0.015**	0.045**	-0.030**	-0.014**	0.044**
Female	0.008*	0.004*	-0.012*	0.010*	0.005*	-0.014*
Age	0.004**	0.002**	-0.005**	0.004**	0.001	-0.005**
Unemployed	0.015**	0.007**	-0.022**	0.026**	-0.014*	-0.012
Student	-0.064**	-0.031**	0.096**	-0.043**	-0.075**	0.118**
Commuter	-0.049**	-0.023**	0.072**	-0.047**	-0.023**	0.070**
Fragmented work experience	-0.028**	-0.014**	0.042**	-0.016*	-0.041**	0.057**
House owner	-0.071**	-0.034**	0.106**	-0.078**	-0.019**	0.097**
Flat owner	-0.051**	-0.025**	0.076**	-0.051**	-0.024**	0.075**
Size of household	0.002	0.001	-0.003	0.002*	0.001*	-0.003*
Urban (origin)	-0.166**	-0.080**	0.245**	-0.165**	-0.079**	0.244**
Densely populated (origin)	-0.075**	-0.036**	0.111**	-0.063**	-0.056**	0.120**

Notes: Marginal effects are partial derivatives that are computed on overall means of the data. The reported effect for the heteroskedastic model is the total effect from a variable in x and from a possible heteroskedastic term in z . * (**) = Statistically significant at the 5% (1%) level.

Let us first consider the outcomes of control variables. The following interpretations of the results are based on the preferred heteroskedastic model, if not otherwise stated. According to the results, if an individual is a student (**student**) at the beginning of the observation period, her or his likelihood of moving to urban regions increases by some 11.8 percentage points. Urban regions possess more job opportunities, and hence, a greater likelihood of finding new employment compared to remote districts. Availability of job vacancies is even more important in the case of newcomers to labour markets, since finding a first job without any work experience is usually tricky. On the other hand, the first job is very important for the work résumé.

The results imply that commuting (**commuter**) and short-term employment (**fragmented work experience**) increase the propensity for moving to urban regions by some 7 and 5.7 percentage points, respectively. Again, these outcomes are connected to the ability of urban municipalities to offer more job opportunities. In contrast, it seems that personal unemployment (**unemployed**) does not encourage individuals to move to

urban municipalities. Note also that the introduction of the heteroskedastic terms alters the marginal effects of the **unemployed** to some degree.

House (**house owner**) or flat owners (**flat owner**) seem to be more likely to migrate to urban regions. This might partly be explained by welfare factors. If migrants have their own accommodation therein, or they have the capital to buy housing, they are more able to move to urban municipalities that normally have a lack of housing. **Size of household** has only a minor effect on the destination choices of migrants. The effects of **age** and **female** are also slight. However, the outcomes of these variables show that large households, aged individuals and females are less likely to move to urban municipalities. These results are logical from the viewpoint of opportunity costs and labour market reasons.

Furthermore, the dummies of **urban** and **densely populated regions** were used in the estimations to control the effect of origin on destination choices of migrants. The estimates of these dummies indicate that individuals living in urban municipalities or in densely populated regions are more likely to move to urban regions compared to the reference group of persons living in remote districts.

Next let us proceed to the main explanatory variable, educational attainment. The results presented in Table 4 suggest that, regardless of the model specification, highly educated individuals are more likely to migrate to urban municipalities. In fact, the sign of the marginal effects of the **highly educated** dummy is positive only for urban regions. Furthermore, if the assumption of the highly educated being more likely to move in the first place is considered, the outcomes of the dummies of **urban** and **densely populated regions** also seem to strengthen the effect. However, since the partial derivatives for a dummy variable is in principal inaccurate (see e.g. Greene, 1997), Table 5 below displays the predicted probabilities that result when the dummy of

educational attainment takes two different values (i.e. 0 and 1) while other variables are held at their sample means. From the predicted probabilities *ceteris paribus* highly educated versus not highly educated difference in probability is calculated.

Table 5. Effect of the highly educated dummy variable on the probabilities of moving

	Homoskedastic model			Heteroskedastic model		
	Rural Pr[y=0]	Dens. pop. Pr[y=1]	Urban Pr[y=2]	Rural Pr[y=0]	Dens. pop. Pr[y=1]	Urban Pr[y=2]
Not highly educated	0.184	0.411	0.404	0.184	0.411	0.404
Highly educated	0.155	0.395	0.449	0.156	0.396	0.449
Change	-0.029**	-0.016**	0.045**	-0.028**	-0.016**	0.044**
Change %	-15.7%	-3.9%	11.1%	-15.5%	-3.8%	10.9%

Note: * (**) = Statistically significant change at the 5% (1%) level.

The outcomes for the homoskedastic and heteroskedastic models are very close to the marginal effects presented in Table 4. According to the heteroskedastic model, the probability of moving to rural or densely populated regions decreases by 15.5% and 3.8%, respectively, if an individual is highly educated. In contrast, the probability of moving to urban municipalities increases by 10.9% if an individual is highly educated. To sum up the outcomes of this analysis, we may say that the highly educated prefer to move to urban municipalities, even if other personal factors are controlled and potential bias arising from heteroskedasticity is taken into account.

5. Concluding remarks

This paper examined the influence of educational attainment on destination choices of migrants. The modelling results, which were based on the findings of previous theoretical and empirical research, indicated that highly educated migrants are likely to move to urban municipalities, which offer better job opportunities as well as more versatile possibilities for self improvement, hobbies, etc. At the same time, rural regions, as well as densely populated regions, tend to lose a remarkable part of their

highly educated labour to urban regions. As a result, the destination choices of highly educated migrants seem to strengthen the human capital concentration in Finland.

The results are not very promising as regards the regional equality of human capital redistribution. It seems that the ongoing process of centralisation might even become set, and divergence between lagging regions and central areas deepen in the future. From a political point of view the phenomenon is interesting. A number of regional policy measures aim at developing the human capital endowments of lagging regions. However, it seems that simultaneously human capital flows at an increasing speed to central regions. Thus, future orientated regional policy should find new tools to enable more equal human capital allocation. Otherwise, the implementation made might remain as a decelerator of an unavoidable evolutionary process.

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References

- Antolin, P. & Bover, O. (1997) Regional migration in Spain: the effect of personal characteristics and of unemployment, wage and house price differentials using pooled cross-sections, Oxford Bulletin of Economics and Statistics, 59, pp. 215-235.
- Barro, R. J. & Sala-i-Martin, X. (1995) Economic Growth (New York, McGraw-Hill).
- Camagni, R. P. (1995) The concept of innovative milieu and its relevance for the lagging regions in the 1990s, Papers in Regional Science, 74, pp. 317-340.
- Davelaar, J. E. & Nijkamp, P. (1997) Spatial dispersion of technological innovation: a review, in: C. Bertuglia, S. Lombardo & P. Nijkamp (Eds.) Innovative Behaviour in Space and Time (Berlin, Springer-Verlag).
- Davidson, R. & MacKinnon, J. G. (1984) Convenient specification tests for logit and probit models, Journal of Econometrics, 25, pp. 241-262.
- Greene, W. H. (1997) Econometric Analysis (New Jersey, Prentice-Hall).
- Godfrey, L. G. (1988) Misspecification Tests in Econometrics: The Lagrange Multiplier and Other Approaches, (Cambridge University Press).
- Hansen, N. (1992) Competition, trust, and reciprocity in the development of innovative regional milieux, Papers in Regional Science, 71, pp. 95-102.
- Hausman, J., Lo, A. & MacKinlay, C. (1992) An ordered probit analysis of transaction stock prices, Journal of Financial Economics, 31, pp. 319-379.
- Kauhanen, M. & Tervo, H. (2002) Who moves to depressed regions? An analysis of migration streams in Finland in the 1990s, International Regional Science Review, 25, pp. 200-218.
- Krugman, P. (1991) Increasing returns and economic geography, Journal of Political Economy, 99, pp. 483-499.

- Levine, P. (1996) Migration theories and evidence: an assessment, Journal of Economic Surveys, 10, pp. 159-198.
- Long, J. S. (1997) Regression Models for Categorical and Limited Dependent Variables, (Thousand Oaks, CA, Sage).
- Lucas, R. E. (1988) On the mechanics of economic development, Journal of Monetary Economics, 22, pp. 3-42.
- Molho, I. (1987) The migration decision of young men in Great Britain, Applied Economics, 19, pp. 221-243.
- Moulton, B. R. (1990) An illustration of a pitfall in estimating the effects of aggregate variables on micro units, The Review of Economics and Statistics, 72, pp. 334-338.
- Moulton, B. R. & Randolph, W. C. (1989) Alternative tests of the error components model, Econometrica, 57, pp. 685-693.
- Myrdal, G. (1957) Economic Theory and Underdeveloped Regions (London, Duckworth).
- Nijkamp, P. & Poot, J. (1997) Endogenous technological change, long run growth and spatial interdependence: a survey, in: C. Bertugilia, S. Lombardo & P. Nijkamp (Eds.) Innovative Behaviour in Space and Time (Berlin, Springer-Verlag).
- O'Higgins, N. (1994) YTS, employment, and sample selection bias, Oxford Economic Papers, 46, pp. 605-628.
- Owen, D. & Green, A. (1992) Migration patterns and trends, in: T. Champion & T. Fielding (Eds.) Migration Processes & Patterns (London, Belhaven).
- Richardson, H. W. (1995) Economies and diseconomies of agglomeration, in: H. Giersch (Ed.) Urban Agglomeration and Economic Growth (Berlin/Heidelberg, Springer-Verlag).

- Ritsilä, J. (1999) Regional differences in environments for enterprises, Entrepreneurship and Regional Development, 11, pp. 187-202.
- Ritsilä, J. (2001) Studies on spatial concentration of human capital, Doctoral Dissertation, Jyväskylä Studies in Business and Economics, University of Jyväskylä.
- Ritsilä, J. & Ovaskainen, M. (2001). Migration and regional centralization of human capital, Applied Economics, 33, pp. 317–325.
- Romer, P. M. (1990) Endogenous technological change, Journal of Political Economy, 98, pp. 71-102.
- Schaeffer, P. (1985) Human capital accumulation and job mobility, Journal of Regional Science, 25, pp. 103-114.
- Seater, J. J. (1977) A unified model of consumption, labour supply, and job search, Journal of Economic Theory, 14, pp. 349-372.
- Sjaastad, L. A. (1962) The costs and returns of human migration, Journal of Political Economy, 70 (Supplement), pp. 80-93.
- Statistics Finland (1996) Kuntafakta (Helsinki, Tilastokeskus).
- Wheeler, C. H. (2001) Search, sorting, and urban agglomeration, Journal of Labor Economics, 19, pp. 879-899
- Weiss, Y. (1971) Learning by doing and occupational specialization, Journal of Economic Theory, 3, pp. 189-198.