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Transition into Higher Education among participants in Municipal Adult Education in Sweden

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Foreword

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Head of Unit,
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Abstract

The purpose of this essay is to analyse the transition into higher education among participants in Municipal Adult Education in the autumn term of 1997. A subordinate intention is to analyse regional aspects on the decision to attend higher education and migration among participants in higher education is analysed in this context. A logit model is estimated to evaluate different attributes that could affect the individual decision to proceed with further education and also their decision to migrate. The analysis is based on micro data deriving from official registers.

The results indicate that regional labour market conditions affect the decision to attend higher education. Generally, unfavourable regional labour market conditions increase the probability of enrolment. However, individuals residing in municipalities within the objective 1 area (in large coinciding with the EU structural fund programme area) have a relatively lower probability of continuing studies at higher levels. In the case of migration behaviour, improving regional labour market conditions seems to reduce the probability of migration, except for the regional unemployment rates in the municipalities which have the opposite effect. Moreover, participants in the Adult Education Initiative receiving the special grant for education and training (UBS) differed from other participants in Municipal Adult Education by a relatively higher probability of transition to higher education and a lower probability of migration.

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1 Introduction

During the last decades, the demand for workers with lower education has decreased and this seems to be a permanent change in the structure of aggregate labour demand. It can, for example, be seen when studying the unemployment rates in the last twenty years. Individuals with a lower education have higher unemployment rates than the highly educated who also have a lower number of days as unemployed. Possible reasons for this reduced demand for less educated individuals can be traced to technological development. Increasing international trade and the reallocation of labour intensive production to developing countries are other possible reasons.[1]

For individuals, there are other benefits from education than lower unemployment rates. Generally, more educated and trained individuals tend to have higher wages than those with a lower education. In addition, fringe benefits tend to rise with money income. There are also non-monetary job-related returns, since qualified occupations are most likely more exciting and satisfying than the jobs available to less educated people. Other benefits from schooling are to be better equipped for changes in society and an increased capability of understanding and taking on new technology and knowledge. The social benefits of schooling include a literate community, environmental consciousness, less crime, speaking a common language, better health. Worker productivity also increases with education, thereby contributing to growth.[2]

There are many, mainly adults, who never had the chance of getting any kind of higher education in their youth. Some have less than the nine-year compulsory school as their highest educational attainment. Another issue is that technological development makes learning through life necessary, as was pointed out in public inquiries already in the mid-sixties.[3] One way among several[4] for adults of complementing their earlier schooling, both compulsory and upper secondary school, is through Municipal Adult Education (here labelled MAE). In addition, during the last fifteen years, there has been a considerable expansion in college education in Sweden. Nowadays, there is a relatively even geographical distribution of higher education. Every county has at least one college which means that the possibility of getting a higher education has greatly improved.[5]

[1] *Ackum Agell & Harkman [1997]. Lundborg [2000] pp. 34-36.*
[2] *Ehrenberg & Smith [1982] p. 250. SOU1996:164, p. 14. Forneng et al. [2003] pp. 43ff.*
[3] *See e.g. SOU 1965:60, p. 19.*
[4] *For example folk high school, study associations, the Swedish Educational Broadcasting Company, Labor Market Training, the national adult education programme.*
[5] *Forneng [2002].*

The purpose of this essay is to analyse the transition to higher education among participants in MAE in the autumn term of 1997, in the period of the autumn term of 1998 to the autumn term of 2001. A second and subordinate objective of this paper is to evaluate the regional aspects of MAE and higher education. In this context, studying migration patterns among MAE students enrolled in higher education can be useful. More specific questions to be answered are: Do regional labour market conditions affect the transition to higher education or migration? Are there differences between the metropolitans and the objective 1 area (in large coinciding with the EU structural fund programme area) regarding transition or migration behaviour? Does earlier educational attainment influence these decisions? Do unemployed participants in the Adult Education Initiative[6] (here labelled AEI) differ from other participants in MAE in these respects? In this analysis, only observed enrolment in higher education is examined. Nothing is said about how long the individuals participated or if they fulfilled their college education.

The human capital model is used as the underlying theory of the enrolment decision among individuals. In the empirical analysis, a logit model of the transition to college or university is estimated. To the best of my knowledge, there exists no previous study of the transition from Municipal Adult Education to higher education. Earlier studies only consider transition to higher education by upper secondary school graduates, not by adults complementing their earlier education.

The essay proceeds as follows. Section two presents some basic facts about Adult Education in Sweden, especially the MAE. Section three contains the theoretical framework. Section four provides an overview of the data, a presentation of the econometric model and estimation results. Conclusions and a brief discussion are given in section five. Appendix A contains a glossary pertaining to a selection of terms and institutions.

[6] *A five-year project starting in 1997, primarily aiming at giving unemployed low educated adults the possibility of complementing their earlier education. The purpose was to give them a stronger position on the labour market and qualifications for higher education.*

2 Adult education

In the 1960s, there was an increase in the need for complementary education for adults since school reforms[7] quickly increased the educational gap between age cohorts. The Commission of Inquiry on Upper Secondary School 1960, advocated enhanced possibilities to complement earlier education. The possibilities were very limited at that point in time and, according to the Commission, an adult education was needed that could provide the labour market with a well-educated labour force and the necessary competence to promote Swedish economic growth. In 1968, Municipal Adult Education commenced. At the beginning, MAE primarily targeted those who needed to complement their earlier education to qualify for higher education.[8]

Almost from the start, the Swedish Trade Union Confederation (LO) and the Swedish Confederation of Professional Employees (TCO) argued that MAE should be characterized by a more re-distributive policy view. The primary goal should be to provide "a second chance" for those with a low education. The unions wanted MAE to promote increased equality within and between generations, social justice, cultural participation, individual development, contribution to a stronger status in working life and improved participation in the general development of society.[9] The proposals put forward by the unions became, by and large, the explicit goals for the government policy in this field. During the latter part of the 1970s, MAE was recognized as being an important part of lifelong learning and one aim was to strengthen the individuals' position on the labour market. As of 1976, participants in MAE may receive various forms of study assistance to enable participation in adult education at other times than during their spare time.[10]

2.1 Municipal adult education

Today, participants in MAE are offered to participate in three different educational levels. *Basic Education for Adults* corresponds to the regular 9-year compulsory school. The purpose is to give adults the necessary knowledge for participation in society and the labour market and to enable further education. The purpose of *Adult Upper Secondary Education* is to provide knowledge and skills corresponding to the regular upper secondary school and they also have the same curriculum and syllabi. Finally, the *Continuing Education Programmes,* the purpose of which is to provide the necessary education for mobility within one's profession or a new occupation.[11]

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[7] *From a six-year elementary school to at least eleven years of coherent education. SOU 1965:60 p. 11.*
[8] *Jacobson [1994] pp. 16, 21.*
[9] *Ibid. pp. 21f.*
[10] *SOU 1982:29 p. 18. Jacobson [1994] p. 25.*
[11] *<http://www.skolverket.se/fakta/faktablad/english/adult.shtml>, 2003-06-23. SFS 1985:1100 chap. 11.*

Qualified for *Basic Education* is every inhabitant of a municipality who is 20 years old. Participants must reside in the country and lack the skills supposed to be obtained in the regular 9-year compulsory school. Qualified for *Adult Upper Secondary Education* and *Continuing Education Programmes* is every inhabitant of a municipality in the country. Participants must be 20 years old *or* having finished their education in a national programme or likewise in the regular upper secondary school.[12]

2.2 Study Assistance

Before[13] July 1st 2001, there were two kinds of regular allowances; *Special Adult Education Support (SVUX)*, mainly intended for participants who had taken time off from work to study and *Special Adult Education Support for the Unemployed (SVUXA)* for participants partly or entirely unemployed. Both of these allowances consisted of one part subsidy and one part governmental loan.[14] During a limited time period (July 1st 1997 – December 31st 2002), it was also possible to get an allowance corresponding to the unemployment benefits, *Special Grant for Education and Training*[15] (UBS). This was a pure subsidy connected to the *Adult Education Initiative* (AEI). AEI participants in the academic year 1997-98 could obtain UBS during a period of 360 days, which could be extended to a second year ending on June 30th 1999. This was later restricted to a maximum of 360 days.

[12] *SFS 1985:1100 chap. 11.*

[13] *See <http://www.csn.se/Avdelningar/Studerande/Komvux/Komvux.asp?MenyIdnr=10> for current allowances valid after July 1st 2001.*

[14] *<http://www.csn.se/Avdelningar/Studerande/Komvux/Komvux.asp?MenyIdnr=10>, 2003-06-24.*

[15] *To be entitled to UBS, individuals had to be between 25 and 55 years of age, unemployed or been given notice and qualified for the unemployment benefit fund. Moreover, they had to lack 3-year upper secondary school and the studies had to be at least 25 percent of full time. Some employed individuals could get the allowance if they wanted to complement their earlier education and a long-term unemployed person was hired instead.*

3 Theoretical framework

The empirical analysis is based on the human capital model which provides a framework for discussing individuals' decisions to enrol in higher education.

3.1 Human Capital Theory

People are assumed to make rational investment choices of current resources through their life, given the expectations of future returns. Improvements in human capital through schooling, on-the-job training, migration, medical care, searching for a new job or information about prices are examples of this kind of investment. This investment behaviour is the outcome of an optimization process. The individual maximizes the expected value of discounted earnings by an optimal distribution of resources to human capital investment. This is done by properly deciding how much time s_t should be invested in human capital, where $0 \leq s_t \leq 1$. Let w indicate the wage[16] per unit of human capital and K_t the human capital stock at time t; then wK_t becomes the potential earnings. Let I_t indicate the investment costs at time t, consisting of the cost of purchased inputs and foregone earnings, where $I_t = s_t wK_t$. Assuming the cost of purchased inputs = 0, the net earnings can be expressed as $wK_t - I_t$. If Y_t indicates the net present value of each period where $Y_t = [1 - s_t]wK_t$, the maximization process of human capital investment can be expressed as

$$\underset{s_t}{Max} \int_0^T Y_t e^{-rt} dt \tag{3.1}$$

$t = 0,1,2,\ldots,T$,
r = rate of interest.

The first-order optimization condition of the human capital investment is that the benefit from the investment on the margin is equal to the expenditure of the investment on the margin in each period. Individuals weigh the marginal costs of the invested time (wK_t) against the marginal gains (marginal productivity of K_t times the amount of net human capital gained).[17] The stock K_t is increased, as long as the marginal benefits exceed the marginal costs.

In this context, the individual must consider two alternative earning streams when faced with the decision of going to college. If he/she decides not to go to college, the earning stream is that of a high-school graduate, starting immediately after high-school but does not rise considerably during the lifetime. If the individual instead decides to spend the next three or four years in college, he/she will have a very limited income during this period. When having finished college, the income could still be less as compared to high-school graduates. However, the future time profile of earnings may be more favourable for the college graduate. The student

[16] *All human capital is assumed to receive the same wage.*
[17] *Ben-Porath [1967]. Polachek [1995].*

compares the costs of going to college with the benefits and will undertake the educational investment if the long-run return outweighs the cost.[18]

The model provides some implications concerning the demand for college education. The *first* result is that the incentives for education are relatively stronger at younger ages, because younger individuals have a longer remaining working life ahead of them, over which benefits can be recouped. A *second* implication of the model is that college attendance will increase, if the costs of college fall, other things equal. This is also related to the age-implication. Since earnings tend to increase with experience and maturity, the opportunity cost for younger people is typically less than that for older people. A *third* result is that college attendance will increase if the earnings difference between college graduates and high-school graduates increases. Another implication of this model concerns the psychic costs of going to college. People with relatively high capacity and abilities have an easier and more pleasant time in college and therefore have a lower cost than others.[19] Generally, the human capital theory implies that empirical models of individuals' investments in human capital should include variables that may affect benefits and/or opportunity costs of the investment. The empirical model is presented in the next section.

[18] *Ehrenberg & Smith [1982] pp. 231f.*
[19] *Ehrenberg & Smith [1982] pp. 233-236. Berndt [1991] pp. 154f.*

4 Empirical analysis

This chapter begins with a presentation of the data and the dependent and independent variables used in the empirical analysis. The chapter continues with a description of the logit model and ends with a presentation of the estimated results.

4.1 Data

The population consists of the participants in MAE during the autumn term of 1997. This term is chosen because it was the first term with the AEI, and the available data and the follow-up period are the largest. The data comes from several official administrative registers. The individual attributes are, in part, collected from the Swedish National Tax Board which administers the national income register. Statistics Sweden has merged the income register with background variables from the register of the inhabitants' education, and with data from the Swedish National Labour Market Board (AMS) and the National Agency for Education. The data from AMS derives from the event history database and has been processed by the Computer Centre at Umeå University (UMDAC). The regional attributes are collected from registers administered by Statistics Sweden.

The population consists of all 222,208 participants in MAE during the autumn term of 1997. However, due to missing observations in some of the variables, 5,528 observations are excluded. The final sample consists of 216,680 individuals.

4.2 Variables

This section begins with a presentation of the dependent variable, followed by a presentation of the independent variables representing a number of regional and individual attributes. Last in this section, there is a summarizing table of all variables providing definitions and sample mean values. The presentation is confined to the model for transition into higher education. The migration model is outlined in *section 4.4*.

4.2.1 The dependent variable

The dependent variable *Enrolment* takes the value one if the participants in MAE in the autumn term of 1997 attended higher education some time in the period of the autumn term of 1998 to the autumn term of 2001, and the value zero otherwise.

4.2.2 The independent variables

Regional attributes

Seven variables are used to control for regional influence on the enrolment decision. The variable *Size of Population* measures the size of the local labour market. The hypothetical effects on the educational decision can be twofold. The larger is the labour market, the easier it can be to get employment, by assigning a higher opportunity cost to higher education. On the other hand, a larger labour market can have an outlet for highly educated people, thereby making higher education more profitable. The variable measures the population size of municipalities on the 31st of December 1997 and applies to the population aged 20 to 64 years. The variable *High Educated* measures the portion of highly educated people on the municipal level. From Statistics Sweden, figures are collected of people aged 20 – 74 with a post upper secondary level education in the year 1998. These are then divided with the population between 20 – 74 years. The idea is that more highly educated people in the surroundings will motivate further education.

The variable *Unemployment* measures the unemployment rate at the municipal level in 1998. Higher unemployment rates can motivate higher education because of lower opportunity costs. This could be seen after the large recession in 1992. As the unemployment rate increased, so did the enrolment to college.[20] This variable is the sum of openly unemployed individuals and individuals in business cycle dependent labour market policy programmes. The variable *Growth 97–99* measures the average of the annual employment growth 1997–1998 and 1998–1999 at the county level. If there is an expansion in the labour market, finding a job could be easier and hence giving further education a higher opportunity cost.

Access to educational places is something that individuals may take into consideration when deciding to participate in higher education. This is measured by the variable *Proportion Admitted* which indicates how easy it is to obtain one of the places at college/university in the county of residence. The number of admitted is divided by the number of qualified first hand-choice applicants and is an average of the autumn terms of 1998 and 1999.

Besides the above mentioned attributes, the regional conditions across Sweden differ considerably. Two variables taking this into account are *Objective 1* and *Metropolitan Areas*. The Objective 1 area coincides in large with the EU structural fund programme area. The economic characteristics of this area are such that it qualifies for various kinds of growth support.[21] The *Objective 1* variable takes the value 1

[20] *SOU 2000:7, p. 197.*
[21] *<http://www2.nutek.se/finans/sok/smlist.taf#4100>, 2003-07-08. <http://www.mal1.nu>, 2003-08-18.*

for individuals residing in Torsby in Värmlands län, Vansbro, Malung, Orsa and Älvdalen in Dalarnas län, Ljusdal in Gävleborgs län, Västernorrlands län, Jämtlands län, Västerbottens län and Norrbottens län. Municipalities with only a few parishes included in the programme and all other municipalities are indicated by the value zero. The *Metropolitan Areas* dummy variable is given the value one if the individuals resided in the three largest cities in Sweden; Stockholm, Gothenburg or Malmö, and the value zero otherwise.

Individual attributes

The special grant for education and training (UBS) was connected to the AEI. One of the goals of this project was to stimulate the transition to higher education. There is no reliable data on participation in the AEI. In this case, the variable *UBS* can serve as an indicator of a major target group for the AEI. The variable takes the value one if the participant had UBS during the autumn term of 1997, and zero otherwise.

On average, women have lower income than men, perhaps due to less favourable career possibilities. Moreover, women are over represented among temporary employees and involuntarily part time jobs.[22] This could bring a lower opportunity cost in the decision to attend further education. On the other hand, there are several reasons not to attend higher education. During history, women have had the major responsibility for taking care of children and husband at home. Therefore, women have a shorter career in the labour market and are less likely to work overtime or choose occupations offering jobs with a high pay but long hours.[23] The variable *Female* is given the value one if the individual is a woman and zero if the individual is a man.

According to the human capital theory, younger people have a stronger incentive to attend higher education than older individuals. The individuals in the sample were aged between 20 and 55, as measured in 1997 by the variable *Age*. To control for the eventuality that the effect of age is non-linear, two dummy variables indicating individuals younger than 30 years, $Age < 30$, and older than 44, $Age > 44$, are included as explanatory variables. Marital status may affect the decision to attend higher education. If other family members must be considered, the opportunity cost of further education is affected. Schooling is an engagement that takes time and effort and during this time, income is lower. If single, education may seem easier because considering other family members is not necessary. On the other hand, a husband or wife may bring in the income making it possible for a family to survive during the educational years. The dummy variable *Single* takes the value one if single, and zero if not. Further, the opportunity cost of attending a college education can become higher if children are involved, since they demand time and money. The variable *Children* measures the number of children of the individuals in 1997. In accordance with the human capital theory, higher income brings a higher opportunity cost to schooling. Thus, the higher the income, the less likely is

[22] *de los Reyes [2000] p. 9.*
[23] *Ehrenberg & Smith [1982] p. 397.*

an individual to enrol in further education. The variable *Income* measures the individual's income in Swedish kronor[24] in 1996.

Other individual characteristics controlled for are highest earlier attained educational level, national origin and unemployment days during 1996. The highest level of education attained as measured at the end of 1996 is divided in four subgroups; *Elementary School*, *2-Year Upper Secondary School*, *3-Year Upper Secondary School* and *Post Upper Secondary School*. In particular individuals with a non-Scandinavian citizenship experience low labour force participation rates, high unemployment, long periods of unemployment, a high share of time-limited occupations, difficulties in getting a job connected to the educational ability and worse income increases and career possibilities.[25] This could reduce the opportunity cost for transition into higher education. The four dummy variables indicate if the individual is a citizen of *Sweden*, *Scandinavia* outside Sweden, *Europe* outside Scandinavia or the rest of *The World*. The variable *Unemploymentdays* measures the days spent by the individuals in any of the job search categories[26] during 1996, with the exception of "on the job search", as defined by the Swedish National Labour Market Board (AMS).

4.2.3 Descriptive statistics and variable definitions

Descriptive statistics and short definitions are presented in *Table 1*. Means are provided for the sub samples of those enrolled in college education at least once in the period from the autumn term of 1998 to the autumn term of 2001, and those not enrolled in college education during the same time. The dependent variable is *Enrolment*.

[24] *The average exchange rate SEK/USD during 1996 was 6.71.*
[25] *de los Reyes [2000] p 11.*
[26] *<http://www.ams.se/admin/Documents/rapporter/2002/uin02_2.pdf>, 2003-07-18.*

Table 1: Definitions and sample means.

Variables	Description	En-rolled	Not enrolled	Total
Enrolment	Dummy variable = 1 if the individual is attending a higher education after participation in MAE.	-	-	0.238
Size of Population	The size of the population in the municipality of residence in 1997.	91,849	85,582	87,074
High Educated	The proportion of highly educated in the municipality of residence in 1998.	0.261	0.247	0.251
Unemployment	The proportion of unemployed in the municipality of residence in 1998.	0.084	0.084	0.084
Growth 97–99	The employment growth in the county of residence 1997 to 1999.	0.018	0.018	0.018
Objective 1	Dummy variable = 1 if living in the objective 1 area in 1998.	0.122	0.105	0.109
Metropolitan Areas	Dummy variable = 1 if living in the metropolitan area in 1998.	0.190	0.182	0.184
Proportion Admitted	The proportion admitted to college or university in the county of residence 1998 to 1999.	0.508	0.504	0.505
UBS	Dummy variable = 1 if the individual received UBS in the autumn term of 1997.	0.190	0.275	0.255
Female	Dummy variable = 1 if the individual is female.	0.670	0.664	0.666
Age	Age of the individuals in 1997.	28.3	32.9	31.8
Age < 30	Dummy variable = 1 if the individual is younger than 30 years.	0.634	0.419	0.470
Age > 44	Dummy variable = 1 if the individual is older than 44 years.	0.033	0.132	0.109
Single	Dummy variable = 1 if the individual is single in 1997.	0.739	0.614	0.644
Children	The number of children in 1997.	0.562	0.794	0.739
Income	Income of individuals in 1996.	67,843	67,332	67,454
2-Year Upper Sec.	Dummy variable = 1 if the highest education is 2 years of upper secondary school in 1996.	0.324	0.419	0.396
3-Year Upper Sec.	Dummy variable = 1 if the highest education is 3 years of upper secondary school in 1996.	0.386	0.204	0.247
Post Upper Sec.	Dummy variable = 1 if the highest education is post secondary school or post-graduate in 1996.	0.186	0.121	0.137
Scandinavia	Dummy variable = 1 if having citizenship in Scandinavia outside Sweden in 1997.	0.014	0.019	0.018
Europe	Dummy variable = 1 if having citizenship in Europe outside Scandinavia in 1997.	0.036	0.064	0.057
The World	Dummy variable = 1 if having citizenship in the rest of the world outside Europe in 1997.	0.037	0.070	0.062
Unemploymentdays	Days spent in any of the job search categories as defined by AMS during 1996.	124	164	155
N		51,604	165,076	216,680

The dependent variable indicates individuals who participated in higher education at some point in time from the autumn term of 1998 to 2001. 23.8 percent of the entire sample of 216,680 individuals chose to do so. As can be seen in*Table 1*, the size of the population in the municipality of residence was on average about 92,000 for those who enrolled in higher education and about 6,000 less for the rest of the sample. The proportion of highly educated in the municipality of residence was also slightly higher than for those not enrolled, 26.1 percent as compared to 24.7 percent. Moreover, regional unemployment rates and growth rates were the same for those enrolled in higher education and those who were not. 12.2 percent of those who decided to attend higher education were living in the objective 1 area, while only 10.5 percent of those not attending. In addition, of those enrolled in higher education, 19 percent were living in the metropolitan areas, of those not enrolled, 18.2 percent were living there. Turning to proportion admitted, 50.8 percent were on average admitted to college or university in the counties of residence where the individuals enrolled in further education were living. In the counties where the not attending was living, the proportion admitted was 50.4 percent.

19 percent of the individuals taking the decision to attend further education had UBS, which was a smaller portion than among those who did not. 67 percent of those continuing with higher education after Municipal Adult Education in the autumn of 1997 were women. The mean age of the participants is 28.3, which is more than 4 years less than those who did not enrol. 73.9 percent of those who attended higher education were single, their children were fewer and their income was 67,790, which was slightly more than that of non-attending individuals. The majority were Swedish citizens, and of those who continued with further schooling, 38.6 percent had three-year upper secondary school before attending Municipal Adult Education. The number of days spent in any of the search categories during 1996 was 124, 40 days less than those who did not participate in higher education.

4.3 Econometric model

The logit model is a nonlinear model belonging to the group of qualitative response models. These models have in common that the dependent variable is a discrete outcome that can take two or several values. In this case, the dependent variable y_i can take two values

$$y_i = \begin{cases} 1 & \textit{the individual is attending higher education} \\ 0 & \textit{the individual is not attending higher education} \end{cases} \qquad (4.1)$$

From the rational choice made by the individual, it is assumed that he/she is getting a certain amount of present value net benefits and that the individual chooses the alternative maximizing the present lifetime value (eq. 3.1). Consider the net benefits of two alternatives

Y_{i1} = *the net benefit individual i obtains from additional investment in formal education*

Y_{i2} = *the net benefit individual i obtains from not investing in additional formal education*

The net benefit is not observed but the actual chosen alternative is. Let $y^* = Y_{i1} - Y_{i2}$ and y_i = the chosen alternative, then

$$y_i = \begin{cases} 1 & if\ y_{i1}^* \geq 0 \\ 0 & if\ y_{i2}^* < 0 \end{cases} \tag{4.2}$$

It is impossible to predict the choice a randomly selected individual will make with certainty. These choices depend on the net benefits, in turn determined by both observable and unobservable attributes of the individual and the alternatives available. The underlying index for net benefits y_i^* for the *i*th individual is defined by

$$y_i^* = \beta_0 + \sum_{j=1}^{T} \beta_j x_{ij} + \varepsilon_i = \boldsymbol{x_i'\beta} + \varepsilon_i, \tag{4.3}$$

where x are explanatory variables, β are the parameters to be estimated, ε is an error term with the mean zero and a standardized logistic distribution, and where $\boldsymbol{x_i'} = (1 \quad x_{i2} \ldots x_{iK})$ and $\boldsymbol{\beta} = (\beta_1, \beta_2, \ldots, \beta_K)'$. When there is a change in the values of the explanatory variables x_{ik}, the value of the index y_i^* varies over the real number line, ranging from -∞ to +∞. The greater the value of y_i^*, the larger are the benefits and the higher the probability P_i of an individual i choosing the alternative $y = 1$. The probability must lie in the [0,1] range and the cumulative distribution function, assumed to be logistic, is a probability transformation of y_i^* achieving

$$P_i = F(y_i^*) = F(x_i'\beta) = \frac{1}{1 + e^{-x_i'\beta}} \tag{4.4}$$

which, when logged and rewritten, takes the form

$$\log \frac{P_i}{1 - P_i} = \beta_0 + \sum_{j=1}^{k} \beta_j x_{ij} \,. \tag{4.5}$$

The equation is now transformed from a non-linear to a linear one. The left-hand side of equation 4.5 is called the log-odds ratio, which is a linear function of the explanatory variables.[27]

The unknown parameters β in the logit model are estimated using the maximum likelihood procedure. The main idea behind this method is to find the values of β that maximize the probability of obtaining the actually observed sample. This is appropriate because of the discrete nature of the dependent variable, and in the parameters, the nonlinear functional relation between the choice probability P_i and the explanatory variables x_k (see eq. 4.4). The maximum likelihood estimation of the unknown parameters β begins with identifying the probability density function of the observable individual choices y_i of a given sample of T independent observations, that is

$$g(y_i) = P_i^{y_i}(1-P_i)^{1-y_i} . \tag{4.6}$$

Given the known sample outcomes y_i and x_i, the joint probability density function of the sample is a function of the unknown coefficients β. This joint probability density function is known as the likelihood function

$$l(\beta) = \prod_{i=1}^{T} [F(x_i'\beta)]^{y_i} [1-F(x_i'\beta)]^{1-y_i} . \tag{4.7}$$

The method of maximum likelihood estimation finds the set of parameters β maximizing $l(\beta)$.[28]

4.4 Results

This section begins with a presentation and an analysis of the estimation results pertaining to the transition into higher education. Then, there is a presentation and analysis of the results on migration behaviour.

4.4.1 Transition to higher education

The estimates of four different specifications are presented in columns 1 – 4 in *Table 2*. The dependent variable is $y = 1$, if the individual is observed as enrolled in higher education some time in the period between the autumn term of 1998 to 2001, and $y = 0$ otherwise.

[27] *Griffith, Hill & Judge [1993] pp. 736-752. Maddala [2001] pp. 317-329.*
[28] *Griffith, Hill & Judge [1993] pp. 736-752.*

Table 2: Results of logit estimations, *y* = 1 if enrolled in higher education and *y* = 0 otherwise.

Variables	**Model 1**		**Model 2**		**Model 3**		**Model 4**	
Size of Population	-6.5E-07	***	2.9E-07	**	3.6E-07	***	4.4E-07	***
	(-11.57)		(2.53)		(3.06)		(3.73)	
High Educated	0.020	***	0.019	***	0.019	***	0.019	***
	(23.83)		(22.44)		(22.69)		(22.33)	
Unemployment	0.037	***	0.045	***	0.048	***	0.037	***
	(13.15)		(15.28)		(15.64)		(10.97)	
Growth 97–99	-0.066	***	-0.067	***	-0.077	***	-0.074	***
	(-10.81)		(-10.95)		(-11.38)		(-10.89)	
Metropolitan Areas			-0.324	***	-0.354	***	-0.322	***
			(-9.24)		(-9.81)		(-8.88)	
Objective 1					-0.074	***	-0.114	***
					(-3.48)		(-5.25)	
Proportion Admitted							0.008	***
							(8.67)	
UBS	0.138	***	0.136	***	0.137	***	0.133	***
	(9.36)		(9.18)		(9.25)		(9.02)	
Female	0.166	***	0.166	***	0.165	***	0.166	***
	(13.90)		(13.91)		(13.88)		(13.92)	
Age	-0.062	***	-0.062	***	-0.062	***	-0.062	***
	(-35.23)		(-35.14)		(-35.17)		(-35.15)	
Age < 30	-0.099	***	-0.098	***	-0.098	***	-0.098	***
	(-4.50)		(-4.43)		(-4.45)		(-4.44)	
Age > 44	-0.499	***	-0.500	***	-0.499	***	-0.500	***
	(-13.84)		(-13.87)		(-13.85)		(-13.89)	
Single	-0.012		-0.012		-0.012		-0.011	
	(-0.75)		(-0.77)		(-0.77)		(-0.72)	
Children	-0.058	***	-0.058	***	-0.058	***	-0.058	***
	(-8.06)		(-8.06)		(-8.04)		(-8.04)	
Income	-5.9E-07	***	-6.0E-07	***	-5.9E-07	***	-5.8E-07	***
	(-7.00)		(-7.12)		(-6.99)		(-6.92)	
2-Year Upper Sec.	0.696	***	0.694	***	0.695	***	0.694	***
	(39.15)		(38.98)		(39.04)		(38.97)	
3-Year Upper Sec.	1.258	***	1.256	***	1.257	***	1.257	***
	(69.96)		(69.88)		(69.91)		(69.87)	
Post Upper Sec.	1.696	***	1.695	***	1.696	***	1.696	***
	(80.87)		(80.83)		(80.86)		(80.85)	
Scandinavia	-0.094	**	-0.095	**	-0.093	**	-0.085	*
	(-2.14)		(-2.14)		(-2.10)		(-1.91)	
Europe	-0.692	***	-0.685	***	-0.689	***	-0.687	***
	(-24.91)		(-24.65)		(-24.78)		(-24.69)	
The World	-0.731	***	-0.730	***	-0.730	***	-0.725	***
	(-26.51)		(-26.47)		(-26.47)		(-26.27)	
Unemploymentdays	-0.002	***	-0.002	***	-0.002	***	-0.002	***
	(-44.19)		(-44.40)		(-44.42)		(-44.51)	
Constant	-0.432	***	-0.498	***	-0.507	***	-0.803	***
	(-5.71)		(-6.55)		(-6.66)		(-9.62)	
N	216,680		216,680		216,680		216,680	
Log-L	-105,743.7		-105,700.5		-105,694.5		-105,657.1	

Note 1: Figures in parentheses are t-ratios and -6.5E-07 = -0.00000065.
*Note 2: * significant at the 10 % level, ** significant at the 5 % level, *** significant at the 1 % level.*

As is evident from *Table 2*, all estimates of *model 1* are significant at the 1 percent level, except the estimate on the variable *Scandinavia* that is significant at the 5 percent level and the coefficient on the *Single* variable which is not significant at all. The estimated coefficient on the *Size of Population* variable is negative, indicating a lower probability of attending higher education, the larger is the population in the municipality of residence. Further, the estimated parameter on the *Growth 97–99* variable is negative, which indicates that individuals living in a region with higher growth in employment have a lower probability of attending higher education. The relative share of *High Educated* in the region of residence has a positive effect on the decision to attend higher education. The larger is the portion of highly educated in the region, the higher is the probability that the individuals will attend further education. Moreover, the estimated parameter on the *Unemployment* variable is positive, indicating a higher probability of enrolling in further education in municipalities with higher unemployment rates.

The results indicate that the probability of participation in college education is higher for *Females* and individuals receiving *UBS* during the MAE autumn term of 1997. This was also the case for individuals with a higher educational attainment than elementary school when starting MAE the same term.

However, there are also factors with a negative influence on the probability of participation in college education. As expected, the estimated parameter on the *Age* variable is negative. This indicates that younger individuals are more likely to attend higher education than older individuals. This is also supported by the estimated parameter on the variable indicating individuals aged above 45. On the other hand, the variable indicating individuals younger than 30 years is negative, which may indicate that the effect of age is non-linear. The number of *Children* also has a negative effect on the decision; the more children, the less likely is an individual to go to further education. Moreover, the higher *Income* or the more *Unemploymentdays* during 1996, the lower is the probability of transition into higher education. Finally, Swedish citizens are more likely to attend higher education than individuals with foreign citizenship.

Turning to the results in *model 2*, when adding the *Metropolitan Areas* variable, the coefficient on the *Size of Population* changes signs and becomes significant at the 5 percent level instead of the 1 percent level, but leaves other estimates virtually unchanged. This may imply that when taking the three largest cities into consideration, the larger the municipalities, the more likely are the individuals to attend higher education. The coefficient on the *Metropolitan areas* variable is negative and significant at the 1 percent level, however, which indicates that participants in MAE in one of Sweden's three largest cities have a lower probability of enrolling in further education.

In *model 3*, the *Objective 1* area variable is added to the specification. This does not affect the estimated parameters on the other variables, as compared to model 2, except that the estimate on the *Size of Population* variable is once more significant at the 1 percent level. The estimated coefficient on the *Objective 1* variable is negative and significant at the 1 percent level, implying a lower probability of attending higher education among individuals living in that area. Note that this is the case after controlling for variation in other variables.

Since access to college or university may influence the decision to enrol in higher education, *Proportion Admitted* is added in *model 4*. As above, the estimated results on the other coefficients remain intact, except for the coefficient on *Scandinavia* which changes its significance level from 5 to 10 percent. The parameter estimate on the *Proportion Admitted* variable is positive and significant at the 1 percent level, which indicates that individuals may take into consideration how easy it is to be admitted to college or university, or that enrolment is constrained. The easier it is to be admitted, the higher is the probability of further education.

4.4.2 Migration among participants in higher education

Another issue when discussing regional aspects in a country is migration behaviour. Migration to attend higher education constitutes a sizable part of total migration. In this context, it can be useful to investigate if the individuals who enrolled in higher education after participation in MAE in the autumn term 1997 have migrated and what factors influenced this decision.

During the period from the autumn term of 1998 to the autumn term of 2001, there were 51,604 individuals enrolled in higher education. These individuals constitute the sample used in the analysis of migration across municipal borders. Since the data covers a short period, it is likely that the individuals have migrated in connection with enrolment or shortly thereafter. The dependent variable takes the value one if the individual migrated from the municipality of residence in 1997 to 2000, and zero otherwise. Due to missing data in some of the independent variables, 54 observations are excluded from the regressions. The descriptive statistics pertaining to this sample is presented in *Appendix B*. The results of the estimated migration models are presented in *Table 3*. The independent variables are the same as previously. Since the migration behaviour can also be explained by the human capital theory, the variables are justified by the same discussion as above.

Table 3: Results of logit estimations, *y* = 1 if migrated across municipal boarder some time during the autumn term of 1997 to 2000 and *y* = 0 otherwise.

Variables	**Model 5**		**Model 6**		**Model 7**	
Size of Population	-1.5E-06	***	-1.5E-06	***	-1.6E-06	***
	(-12.34)		(-6.20)		(-6.58)	
High Educated	-0.026	***	-0.026	***	-0.026	***
	(-16.49)		(-16.20)		(-16.49)	
Unemployment	-0.073	***	-0.074	***	-0.079	***
	(-12.72)		(-12.37)		(-12.77)	
Growth 97-99	-0.088	***	-0.088	***	-0.070	***
	(-7.33)		(-7.32)		(-5.28)	
Metropolitan Areas			0.025		0.076	
			(0.34)		(1.03)	
Objective 1					0.128	***
					(3.16)	
UBS	-0.162	***	-0.162	***	-0.163	***
	(-4.48)		(-4.48)		(-4.52)	
Female	-0.164	***	-0.164	***	-0.163	***
	(-7.22)		(-7.22)		(-7.17)	
Age	-0.064	***	-0.064	***	-0.064	***
	(-14.60)		(-14.60)		(-14.58)	
Age < 30	0.093	*	0.093	*	0.094	*
	(1.82)		(1.82)		(1.85)	
Age > 44	0.124		0.125		0.124	
	(1.09)		(1.09)		(1.09)	
Single	0.406	***	0.406	***	0.407	***
	(9.93)		(9.93)		(9.94)	
Children	-0.444	***	-0.444	***	-0.445	***
	(-20.26)		(-20.25)		(-20.29)	
Income	-1.8E-06	***	-1.8E-06	***	-1.8E-06	***
	(-9.74)		(-9.73)		(-9.82)	
2-Year Upper Sec.	-0.040		-0.040		-0.041	
	(-0.99)		(-0.99)		(-1.01)	
3-Year Upper Sec.	0.079	**	0.080	**	0.079	**
	(2.10)		(2.11)		(2.09)	
Post Upper Sec.	0.179	***	0.179	***	0.179	***
	(4.02)		(4.03)		(4.03)	
Scandinavia	0.158		0.158		0.153	
	(1.62)		(1.62)		(1.58)	
Europe	-0.011		-0.012		-0.006	
	(-0.19)		(-0.20)		(-0.10)	
The World	0.438	***	0.438	***	0.439	***
	(7.44)		(7.44)		(7.45)	
Unemploymentdays	-3.7E-04	***	-3.6E-04	***	-3.6E-04	***
	(-4.22)		(-4.21)		(-4.19)	
Constant	2.258	***	2.262	***	2.279	***
	(13.11)		(13.09)		(13.18)	
N	51,550		51,550		51,550	
Log-L	-26,186.34		-26,186.29		-26,181.31	

Note 1: The sample only contains individuals enrolled in higher education during the autumn term of 1998 to 2001.
Note 2: Figures in parentheses are t-ratios and -1.5E-06 = -0.0000015.
*Note 3: * significant at the 10 % level, ** significant at the 5 % level, *** significant at the 1 % level.*

As is apparent from *Table 3*, the estimated parameters on all regional variables are significant at the 1 percent level in *model 5*. In fact, the estimated coefficients are also all negative. This indicates that larger regional population, larger share of more highly educated in the region, higher regional unemployment rates and higher growth in employment, lower the probability for migration among those who enrolled in higher education.

Turning to individual characteristics, the estimated parameters on the *UBS*-, *Female*- and *Age* variables are all negative and significant at the 1 percent level. This indicates that those individuals receiving UBS during the MAE autumn term of 1997 were less likely to migrate, as was also the case for females. Furthermore, the older the person, the lower was the probability of migration. Other estimated coefficients that are negative and significant at the 1 percent level are *Children* and *Income*. This indicates that the more children the individuals have, the lower is the probability of migration. Moreover, the higher was their income in 1996, the lower was their probability of migrating across municipality boarders. In contrast, individuals attending higher education and with more than 3 years of upper secondary school before participating in MAE autumn term of 1997 are more likely to migrate than those with a lower educational attainment. Singles and people with a non-European citizenship are also more likely to migrate. Finally, the estimated coefficient on the *Unemploymentdays* variable is negative and significant at the 1 percent level. Individuals with more registered days as unemployed or participating in labour market programmes have a lower probability of moving.

In *model 6*, *Metropolitan Areas* is added to the specification. This has virtually no effect on the other estimates. The estimated coefficient on the *Metropolitan Areas* variable is positive, but not significant. Finally, in *model 7*, the *Objective 1* variable is added. The estimated parameter is positive and significant at the 1 percent level. Thus, individuals living in the objective 1 area are more likely to move when enrolling in higher education. As previously, the rest of the estimates are practically the same.

5 Conclusions

The empirical results indicate that regional labour market conditions do affect the transition of participants in Municipal Adult Education into higher education. Generally, deteriorating regional labour market conditions increase the probability of enrolment. This is in accordance with the implication of the human capital model; a lower probability of finding a job implies a lower opportunity cost for investment in further education. Nonetheless, individuals residing in municipalities within the objective 1 area have a relatively lower probability of continuing studies at higher levels. This is the case after controlling for regional labour market conditions and other explanatory variables.

The results indicate that municipalities with a larger population have a higher transition rate from adult education to higher education. This effect may, however, be non-linear since the results also indicate lower participation in higher education in metropolitan areas. This may reflect positive aspects of the largest labour markets not measured by unemployment rate and employment growth. Moreover, individuals living in municipalities with a larger number of highly educated individuals have a higher transition rate into further education. This is in accordance with a priori expectations. Furthermore, the share of individuals admitted to colleges and universities of the qualified first hand-choice applicants influences the decision to attend a higher level of education.

Turning to the characteristics of the individuals, the results are in several cases in agreement with human capital theory. The results indicate relatively lower participation in higher education among older individuals, individuals with higher income and those with more children. Other individual attributes with a negative effect on the probability of enrolment are foreign citizenship and the number of days in employment during 1996. The probability of enrolment in higher education is found to be relatively higher among females, recipients of UBS and individuals with a higher earlier education than elementary school before MAE.

Regarding the migration behaviour among participants in higher education, there is evidence of the decision to migrate also being affected by regional labour market conditions. By and large, the results indicate a lower probability of migration if the regional labour market conditions are favourable in terms of employment growth, which is in accordance with earlier studies.[29] However, the unemployment rate in the municipality of residence is found to be negatively correlated with migration.

Evidently, individuals living in municipalities with a smaller fraction of highly educated or a smaller population are more likely to migrate. This is also the case for regions with lower employment growth. Furthermore, the objective 1 region has a higher probability of migration. Joining this with the fact that individuals with a higher education before MAE and also those with less unemployment days during 1996 migrate to a larger extent may indicate an impoverishment of human capital in already exposed regions. However, one reservation can be made here. These

[29] *See e.g. Greenwood [1985].*

individuals may have an inherent ability making them attend higher education to a larger extent than others, and they may also have a high probability of migrating, even in the absence of adult education.

Municipal Adult Education is one possibility among several for adults of complementing their earlier education and improving their human capital. At the individual level and perhaps also at the national level, there are few doubts about the positive effects in this respect. In a regional context, however, the net effect of adult education on the aggregate stock of regional human capital seems less obvious. Further studies on this issue are needed.

Appendix A

Glossary

English	Swedish
Adult Education Initiative (AEI)	Kunskapslyftet
Adult upper secondary education	Gymnasial vuxenutbildning
Basic Education for Adults	Grundläggande vuxenutbildning
Business cycle dependent labour market policy programmes	Konjunkturberoende arbetsmarknadspolitiska program
Computer Centre at Umeå University	Umeå Universitets Datacentral (UMDAC)
Continuing education programme	Påbyggnadsutbildning
County	Län
Event History Data Base	Händelsedatabasen (Händel)
Municipal Adult Education (MAE)	Komvux
National Agency for Education	Skolverket
Objective 1 area	Mål 1 område
Register of the inhabitants' education	Utbildningsregistret
Special Adult Education Support	Särskilt vuxenstudiestöd (SVUX)
Special Adult Education Support for the Unemployed	Särskilt vuxenstudiestöd för arbetslösa (SVUXA)
Special Grant for Education and Training	Särskilt utbildningsbidrag (UBS)
Statistics Sweden	Statistiska centralbyrån (SCB)
Swedish Confederation of Professional Employees	Tjänstemännens centralorganisation (TCO)
Swedish Educational Broadcasting Company	Utbildningsradion (UR)
Swedish National Labour Market Board	Arbetsmarknadsstyrelsen (AMS)
Swedish National Tax Board	Riksskatteverket (RSV)
Swedish Trade Union Confederation	Landsorganisationen (LO)
The Commission of Inquiry on the Upper Secondary School 1960	1960 års gymnasieutredning

Appendix B

Mean values of the variables, sample only containing individuals who attained post upper secondary school.

Variables	Migrated	Not migrated	Total
Migrated	-	-	0.267
Size of population	71,458	99,244	91,831
High educated	0.250	0.265	0.261
Unemployment	0.084	0.085	0.084
Growth 97 – 99	0.017	0.018	0.018
Metropolitan areas	0.133	0.211	0.190
Objective 1	0.128	0.120	0.122
UBS	0.108	0.220	0.190
Female	0.589	0.700	0.670
Age	24.8	29.5	28.3
Age < 30	0.846	0.556	0.633
Age > 44	0.009	0.042	0.033
Single	0.903	0.680	0.739
Children	0.176	0.703	0.563
Income	53,645	73,055	67,877
2 year upper sec.	0.234	0.358	0.325
3 year upper sec.	0.523	0.336	0.386
Post upper sec.	0.142	0.201	0.185
Scandinavia	0.012	0.014	0.014
Europe	0.031	0.037	0.036
The world	0.039	0.036	0.037
Unemploymentdays	121	126	125
N	13,752	37,798	51,550

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