AN EVALUATION OF THE ADULT EDUCATION INITIATIVE RELATIVE LABOR MARKET TRAINING

by

Anders Stenberg

Abstract

This thesis consists of three papers which evaluate the effects of the Adult Education Initiative (AEI) in Sweden relative to the vocational part of Labor Market Training (LMT).

Paper [I] studies unemployment incidence and unemployment duration for participants in the AEI relative to LMT. When evaluating the relative program effects on duration, one needs to take into account both the problem of selection and the fact that the outcome variable is right hand censored. The method used is an instrumental variable adaptation of the symmetrically trimmed least squares estimator. A bivariate probit model is used in order to study unemployment incidence. The results indicate a beneficial effect of the AEI relative to LMT on unemployment incidence, but longer duration in unemployment among the AEI participants.

Paper [II] uses annual wage earnings in 1999 to compare the AEI and LMT for individuals that do not continue in education following program completion. Two separate estimation methods are used, the classical selection model and the method of matching on the propensity score. The results of both methods indicate negative effects of the AEI relative to LMT on wage earnings. The earnings effect of the AEI for individuals with a weak position in the labor market is particularly poor, implying that the official target to assist those individuals appear not to have succeeded.

Paper [III] employs data for those enrolled in 1997 as well as 1998 to study the annual wage earnings of 1999 and 2000 and data on attachment to branches of employment before and after program. Data on branches of employment indicate less mobility among the AEI participants. This is largely due to a stronger attachment to the public service sector. The analysis of wage earnings of the sample enrolled in 1997, indicate that the effects on wage earnings tended to be more advantageous for the AEI in 2000 rather than 1999, possibly implying a lag in the effects of the program.

Keywords: Selection; adult education; wage earnings; labor market training; duration; incidence; unemployment
JEL: J62;J64; J68; I21

This thesis consists of a summary and the following three papers:

[I] Anders Stenberg (2002) Comprehensive Education for the Unemployed - Evaluating the Effects on Unemployment of the Adult Education Initiative in Sweden, *Umeå Economic Studies 579,* revised April 2003.

[II] Anders Stenberg (2002) Short Run Effects on Wage Earnings of the Adult Education Initiative in Sweden, *Umeå Economic Studies 593,* revised April 2003.

[III] Anders Stenberg (2003) The Adult Education Initiative in Sweden – Second Year Effects on Wage Earnings and the Influence on Branch Mobility , *Umeå Economic Studies 608*.

1. Introduction

The Adult Education Initiative (AEI) in Sweden was introduced in the autumn of 1997 and continued until 2002. It offered primarily unemployed individuals a year of full time studies of adult education at compulsory or upper secondary levels.

The main intention with this expansion of adult education was to raise the educational levels of the groups of adults in most need of education. This would enhance economic growth and reduce unemployment. By minimizing the obstacles for those unaccustomed to theoretical studies, the idea was to improve their prospects on the labor market, build up their confidence and encourage them to further studies. In Sweden, there are many individuals with a two year upper secondary diploma as their highest educational attainment. In general these individuals do not fulfill the criteria to apply for studies at university level. Since 1995, all the upper secondary school diplomas are based on three years of studies. The construction of the AEI made it very well suited for the group with a prior two year upper secondary education.

A subordinate objective of the AEI was that the increase of the adult education would be combined with a development and a renewal of the methodology and pedagogy. The thought was that experiences would be exchanged between the educational organizers to improve the overall quality in adult education.

Various forms of financial support during adult education already existed but a new form of allowance was introduced, a special grant for education and training, UBS, which was equal to the unemployment insurance (UI) of the individual. Eligibility to apply for UBS demanded that the individual was 25-55 years old, studied at compulsory or upper secondary level and was entitled to the UI. A limited number of employed individuals could also apply for UBS, provided that their employer would hire a long term unemployed in their place.

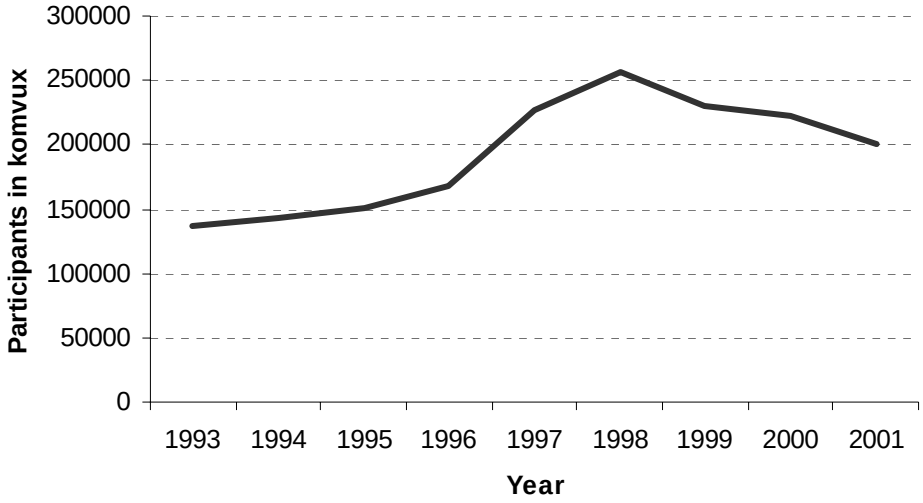
The government's decision from 1996 was that the AEI would amount to an expansion of 100,000 seats in the adult education, mostly within the existing municipal adult education institute *komvux*. Ten per cent of the seats

would be distributed to the folk high schools which, besides traditional subjects, offer a variety of classes in art, music and drama. The municipalities were financially supported based, *inter alia*, on their population, the educational level in the municipality and the numbers enrolled in adult education.

Since the 1970's, each municipality has had the responsibility to offer education for adults at compulsory or upper secondary level. Komvux has steadily grown in proportions and at the start of the 1990's, around 130,000 individuals were enrolled in komvux. The existence of komvux, as an already established institution for adult education, was a key for the AEI to take place.

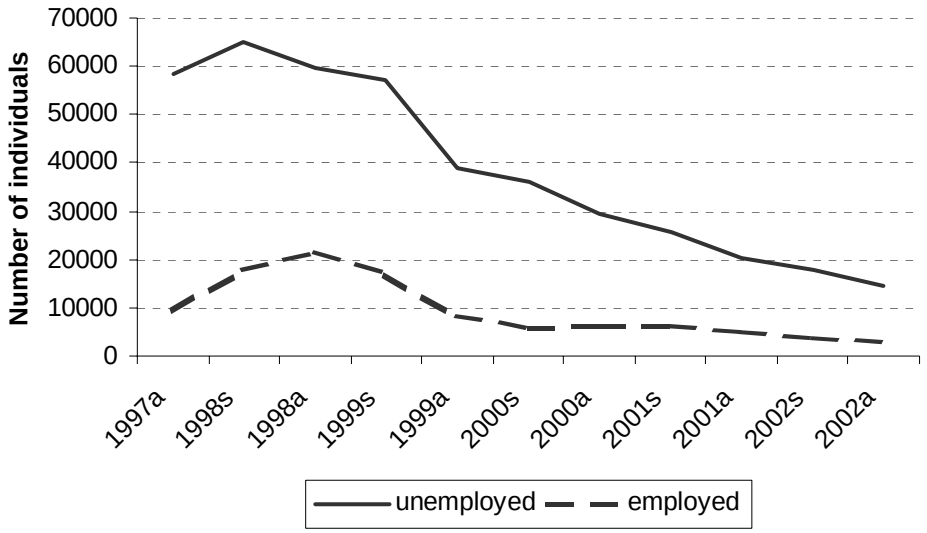
Figure 1 shows how the number of individuals enrolled in komvux developed during the period 1993 – 2001. The numbers include both full-time and part-time students. When the AEI was introduced in 1997, the increase was substantial. The figures can be compared with the yearly numbers in regular upper secondary school, which were approximately 300,000 during this period.

Figure 1: Number of individuals enrolled in komvux during 1993 – 2001.



A couple of years after the introduction of the AEI the number of participants started to decrease. This can also be seen in the number of individuals with the special grant for education and training (of which some went to folk high schools). In Figure 2, these numbers are presented over the semesters, starting from the autumn of 1997. Those that received the UBS coming from employment and unemployment are separated. The numbers remained high in 1998-99 before continually decreasing until the program ended in 2002. One reason for the high numbers to persist during the first four semesters was that those enrolled in the first year were offered UBS for another schooling year, i.e. 1998-99. This was an offer which was accepted by 47 per cent of the participants. The prolongation of UBS was not repeated in later years. A possible reason for the decrease was a steady improvement of the labor market situation. In 2002, the termination of the AEI was followed by a decision of a permanent expansion of 50,000 seats in the adult education. The UBS was replaced by a new form of study allowance, the recruitment grant, with partly different conditions.

Figure 2: The number of individuals with the special grant for education and training. Spring (s) and autumn (a) semesters.



The constitution of the AEI, a large scale labor market program which offered the unemployed the opportunity of formal education, makes it differ from traditional labor market programs with more work related training. If successful, the AEI would become interesting for policy makers in other countries. The rather straightforward set up makes it easy to copy if there is an existing well functioning body for adult education.

The comparative nature of this thesis

This thesis consists of three papers that evaluate the effects of the AEI on unemployment and wage earnings. Throughout, the definition of a participant in the AEI is that the individual was enrolled in komvux, had registered as unemployed during the year of enrollment and received the special grant UBS. The outcome variables used are in Paper [1] the incidence to unemployment, and the duration in unemployment, in Paper [2] the annual wage earnings in 1999, and in Paper [3] the annual wage earnings in 1999 and 2000 as well as data on the individual's attachment to branches of employment before and after program. The first two studies concern those who registered in the AEI in the autumn 1997. The third paper also includes those who enrolled in the autumn 1998.

The vocational part of Labor Market Training (LMT) is used in all three papers as comparison group. LMT had a very broad supply of programs which covered most branches on the labor market. The basic plan with LMT was to offer vocational programs aimed at branches with a high demand for workers. The program has a long history which in fact goes back as far as 1918. From the 1950's, and until the introduction of the AEI, LMT was the largest labor market program in Sweden. In 1997, some thirty per cent of those enrolled in LMT were in "preparatory training". It included more basic courses such as preparations for other programs. This thesis only concern the vocational part of LMT.

The set up of LMT resembled the AEI in that the participants in LMT received a training grant equal in size to the UI, and that the target groups of both programs included those with a weak position in the labor market. Since many individuals would have enrolled in LMT if the AEI had not been in operation, one may also argue that their proportions make them suitable for comparative studies. Had the AEI not been launched, many of

the participants in the AEI would have gone to LMT. The obvious difference between the AEI and LMT was that one was mainly theoretical while the other one was mainly vocational. The comparison between LMT and the AEI becomes one between a traditional and more vocational program and a newly introduced, theoretical one.

Related studies

Most of the economic evaluation literature deals with either the effects of labor market programs or the returns to education in the form of comprehensive schooling. The hybrid nature of the AEI, which offers comprehensive schooling as a labor market program, makes this thesis related to both these lines of research.

Evaluation studies of the returns to education has suggested that there would be an “iron law of wage differentials”. It implies that the return to another year of education would be in the region of four to five per cent (e.g. Card, 1999). Swedish studies, using data containing valuable information to correct for unobservable characteristics, include Isacsson (1999), Kjellström (1999) and Meghir and Palme (1999). Their results did not substantially alter the conclusions from previous studies.

The results concerning wage differentials of another year of schooling influence what effects one would expect of the AEI, but the studies mentioned concerned formal education completed at a young age. Adult education may produce different effects. Considering the volume of adult education in Sweden it is striking how little we know of its effects. Alm Stenflo (2000) is the only economic study of adult education at komvux. She found positive effects on both income and employment but corrected for selection effects only by a few variables.

In an international perspective evaluations of adult education have foremost concerned community colleges in the United States. According to Kane and Rouse (1999), of those enrolled in community colleges, some 35 per cent are at least 30 years old and many of them study on a part-time basis, about half of the participants report work as their primary activity. Leigh and Gill (1997) studied groups that entered community college at different ages and did not find support for earnings differentials for those that attended com-

munity college after the age of 25. Jacobson *et al*. (1997) analyzed a sample of displaced workers and reported an earnings increase associated with a year of community college of approximately 2 – 5 per cent. More closely related, in a geographical context, is Holm *et al*. (1995) who evaluated general adult education in Denmark. They found a significantly beneficial effect of adult education, on both income and employment, and especially so for long-term unemployed.

In contrast to adult education, there are many Swedish studies which have evaluated the effects of LMT. Most of these have used data from the 1980's or the start of the 1990's, when Sweden underwent an economic recession which was relatively deep. At one stage, during that period, there were more than 100,000 individuals enrolled in LMT, representing about two per cent of the labor force. The survey of Swedish labor market program evaluations by Calmfors *et al*. (2002) contains results from twelve different studies of LMT. The results vary but studies based on data from the start of the 1990's tend to indicate negative effects. Carling and Richardson (2001) is one of few studies with data from the latter part of the 1990's. They compared eight different labor market programs. According to their findings the programs could be separated into two groups, with one group of programs producing more favorable effects. LMT was in the group with the less favorable effects.

The AEI has been evaluated by Westerlund (2000) and Axelsson and Westerlund (2001). Both studies used LMT as comparison group, including those in preparatory training. Their results indicated relatively beneficial effects of the AEI on various measures of unemployment. However, when they corrected explicitly for selection effects by using a two-step Heckman estimation, the differences between programs were not significantly different from zero.

The evaluation problem

Evaluation literature in economics generally seeks the average program effects of the program participants. As the literature originates from medicine, it is often expressed as the average treatment effect on the treated. To exemplify, let y_0 be the wage earnings before program, and y_1 the wage earnings after program. The average treatment effect on the treated is then

$E\,[y_1 - y_0 \mid D = 1]$

where D=1 for a participant and D=0 for a non-participant. To make the model relevant for causal analysis, the outcome of an individual is assumed independent of the outcomes of other individuals. In the case of such massive programs like the AEI and LMT, general equilibrium effects can be important. However, these effects are ignored in this thesis.

The fundamental problem of causal analysis is that the effect of a program, defined as the difference of the two potential outcomes, can never be observed for an individual. The ideal situation, from the point of view of the evaluator, would be if the enrollment in a certain program were random. Unfortunately for researchers, such experimental data are very rare. To approximate the so called "counterfactual state" of the participants, researchers instead use some group as comparison and check if the differences in average outcomes between the groups can be explained by other characteristics than program participation.

One way of doing this is by considering differences in observable variables between the two groups. This can be done by using, e.g., ordinary least squares (OLS) or the method of matching (which are both used in this thesis). Matching is non-parametric and avoids the functional form restrictions of OLS, and also corrects for potential bias related to the lack of overlap in observable characteristics and to differences in the distribution of observable characteristics between the two programs. However, if there are systematic differences in unobservable characteristics between programs, such as motivation or ability, these may also influence the outcome of interest and thereby bias the estimates from OLS and matching.

In economic evaluation literature it is widely believed that selection on unobservables is a crucial factor. This means that individuals with an ability to gain from a program are aware of this advantage and, therefore, on average, have a higher probability of enrolling to a particular program. The classical selection model stipulates conditions under which one may take unobservable differences between program participants into account. One of the problems when using this model is that in order to obtain reliable estimates, one usually needs valid instrumental variables, i.e. variables that explain the

participation decision but not the outcome. Such instrumental variables are often difficult to find. Moreover, as the reference group to the AEI in this thesis is participants in the vocational part of LMT rather than “non-participants”, it is not obvious what kind of selection effects one should expect.

Main results

The main results of this thesis are that, for the sample that enrolled in the AEI 1997, there was a relatively beneficial effect on the probability of unemployment incidence. However, the estimates of unemployment duration, given that the individual did become unemployed straight from leaving program, indicate longer duration among the participants in the AEI relative to LMT. The estimation results on the annual wage earnings in 1999 indicate a negative effect of the AEI relative to LMT. Using annual wage earnings in 2000, the results indicate an improvement, although the effects were still negative, compared with the estimation results on wage earnings in 1999. Finally, the mobility between branches of employment was less frequent among participants in the AEI compared with LMT. This result was mainly a consequence of a low mobility among the individuals in the AEI that were employed in the public service sector before entering the program.

2. Summary of the papers

Paper [1] Comprehensive Education for the Unemployed - Evaluating the Effects on Unemployment of the Adult Education Initiative in Sweden

The first paper in this thesis evaluates the effects of the AEI relative to LMT on incidence to unemployment and, if unemployed straight after program completion, the duration of unemployment.

The empirical methods seek to take selection on unobservables into account. Concerning the estimations of unemployment incidence, a bivariate probit model is employed, estimating the participation and outcome regressions simultaneously. In estimations of unemployment duration, the additional problem of censored observations has to be addressed. In order to

consider both selection and censored observations, the estimation procedure follows Brännäs (2000) who used an instrumental variable adaptation of the symmetrically trimmed least squares estimator of Powell (1986).

The parameter estimates indicate that participation in the AEI decreased the incidence to unemployment but increased the duration of unemployment. However, the estimated parameter is in the latter case only significantly different from zero at the ten per cent level. Using various subsamples, the sample of females is the only one that indicate significant effects. Like the total sample, the estimated parameters indicate a lower probability of unemployment incidence for females but longer unemployment duration for those in the AEI. Moreover, the estimations of the probability of enrolling in the AEI indicate that individuals residing in municipalities with on average low educational levels among its population had a higher probability to participate in the AEI. It means that one of the targets of the AEI, to reduce educational differences across municipalities, seems to have succeeded.

Paper [II] Short Run Effects on Wage Earnings of the Adult Education Initiative in Sweden

The second paper of this thesis evaluates the effects of the AEI relative to LMT with respect to annual wage earnings in 1999. The aim is also to discern patterns in the effects between subgroups of participants in the AEI. Two separate estimation methods are used. The method of matching on the propensity score and the classical selection model. Matching is non-parametric and it avoids some sources of bias that are present in estimations like ordinary least squares (OLS) or the classical selection model. On the other hand, matching yields biased results if there is selection on unobservable characteristics between the programs which correlate with the outcome variable. The advantage with the selection model is that it, under certain conditions, take systematic differences in the unobserved heterogeneity into consideration.

Employing the method of matching on the propensity score, one obtains results that indicate negative effects of the AEI relatively to LMT on wage earnings, SEK -15,500. The estimates based on matching turned out to be slightly closer to zero than the OLS estimates.

Using the selection model, the estimations suffer from identification problems and there are no obvious instrumental variables to use. For the specification applied, a simple test for the validity of the instrumental variables is rejected in about half of the subsamples used, including the full sample. However, every estimate where the validity of the instruments cannot be rejected indicate a positive selection on unobservables into the AEI. It means that matching and OLS would overestimate the effects of the AEI. When interpreting the results, one must remember that one of the explicit aims of the AEI was to encourage individuals to enter higher education, and approximately half of the participants in the AEI were still in education and not included in the study.

Regardless of method used, the coefficient values of the different subsamples indicate that the effects of the AEI were less favorable for participants with a weak position on the labor market compared with the total sample. This may be a sign of a failure of the AEI which explicitly aimed at assisting those in a weak position. The estimated effects of the AEI are more positive, i.e. closer to zero, for the individuals in the Stockholm county. A possible interpretation of this is that a general labor market program such as the AEI is more dependent on a diversified labor market in comparison with LMT. Finally, there are also indications of differences in the estimated coefficients with respect to gender. The effects of the AEI seem to be relatively more favorable for women than for men.

Paper [III] The Adult Education Initiative in Sweden – Second Year Effects on Wage Earnings and the Influence on Branch Mobility

The third paper of this thesis uses the annual wage earnings of both 1999 and 2000 as outcome variables. It allows for an analysis of the effects concerning participants enrolled in 1998. Also, it allows for estimates of those enrolled in 1997 on two successive years following program completion. In addition, data on attachment to branches of employment, before and after program, provides a basis for studying the relative program effects on labor market mobility.

One may expect the beneficial effects of the AEI to be delayed relative to LMT as the AEI does not have a natural connection to a specific profession or a working site. Also, if the returns to the AEI vary across the population,

it would be reasonable to believe that those with the highest expected gains would enroll first. Concerning the mobility between branches of employment, the government's intentions with the AEI explicitly included to increase the mobility on the labor market.

The estimation methods employed are OLS and the classical selection model. For the estimations of mobility between branches of employment, binomial and multinomial logit models are used. The estimated parameters in the income equation indicate only small differences between those enrolled in 1997 compared with those enrolled in 1998. Estimations with wage earnings in 2000 indicate support for the hypothesis that there is a lag in the effects of the AEI relative to LMT. The differences in the effects of the AEI between the inland of Norrland and Stockholm county indicated in Paper [II], are not present in estimates using wage earnings from 2000. Besides this result, the implications concerning the effects of the AEI for subgroups in Paper [II] are confirmed.

Data on branches of employment show that the AEI participants more frequently came from the public service sector. Among those attached to some branch of employment before and after program, the probability of mobility was lower among participants in the AEI as compared with LMT. This result is largely due to the strong attachment to the public service sector among the AEI participants. Conditioning on being in the public service sector before program, the AEI participants were less likely to move to any other branch of employment. However, among those in manufacturing and construction, the individuals in the AEI had a higher probability of mobility to all other sectors. This result held for the 1997 sample but not for the sample which enrolled in 1998.

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Comprehensive Education for the Unemployed - Evaluating the Effects on Unemployment of the Adult Education Initiative in Sweden

Anders Stenberg*
Department of Economics
Umeå University

Abstract

This paper evaluates the effects on unemployment of the Adult Education Initiative (AEI) in Sweden. The AEI offered the unemployed adult education at a compulsory or upper secondary level. The AEI is compared with the vocational training part of Labor Market Training (LMT). The study uses unemployment incidence and unemployment duration times as outcome variables, both measured immediately after completion of the programs. For the incidence, selection on unobservables is taken into account while the analysis of duration times in unemployment considers both

*Authour's address: Department of Economics, Umeå University, SE-901 87 Umeå, Sweden. E-mail: anders.stenberg@econ.umu.se. The authour wishes to thank Roger Axelsson, Kurt Brännäs, Xavier de Luna, Per Johansson, Olle Westerlund and Magnus Wikström as well as seminar participants at IFAU, Uppsala. Financial support from The Commission for Adult Education and Training is gratefully acknowledged.

selection bias and censored observations. The results indicate lower incidence following participation in the AEI, but also, significant at the ten per cent level, longer duration times.

Key words: Duration, incidence, unemployment

JEL classification: J64

1. Introduction

Swedish labor market policy has traditionally been characterized by measures that seek to activate the unemployed in some form of work related training rather than passively receiving unemployment benefits. The ambition has been to keep the labor force participation rate as high as possible during recessions and to avoid bottlenecks during economic boom periods. On July 1st 1997, this strategy was boosted by the introduction of a large scale project, the Adult Education Initiative (AEI, *Kunskapslyftet*). It was intended as an alternative to traditional labor market programs as the AEI offered the unemployed education at compulsory or upper secondary levels. Some of the overriding aims of the AEI were to reduce unemployment, reduce differences in formal education and to promote economic growth. The AEI involved studies at the municipal adult education centers, *komvux,* which, since 1968, have offered education to adults who lack elementary or upper secondary level education. The municipalities received government funds to cover their added expenses as the number of participants at komvux increased. The program was set to continue for five years and was subsequently brought to an end in 2002. The AEI was then replaced by a reduced scheme with partly different conditions for the participants.

The AEI was primarily aimed at unemployed adults who lacked complete three year upper secondary school qualifications. Individuals with a short education that were in employment were also eligible, under the condition that their employers filled their vacancies with a long term unemployed individual.

Mainstream evaluation literature in economics is essentially concerned with either labor market programs or with comprehensive schooling. The hybrid nature of the AEI therefore makes this evaluation interesting from the point of view of a policy maker. Es-

pecially as the AEI had a general and evident set up which, if successful, should be relatively easy to copy in other countries.

The present paper evaluates the AEI by using register data of unemployment as the outcome, and by comparing the outcome of the AEI with the vocational training part of Labor Market Training (LMT). The counterfactual world is one where the AEI did not exist and where LMT was its substitute. The evaluation should then answer the question whether unemployment outcomes improved with the introduction of the AEI. The outcomes in focus are the incidence and duration of unemployment immediately after a program ends. Only the duration of the first period of unemployment is considered.

Both the AEI and LMT are primarily intended for job searchers who are unemployed or at risk of becoming unemployed. The training grant in either program is equal to the size of the unemployment insurance (UI) and the completion of a program lasting more than six months qualifies the participant for a new period of unemployment benefits.[1] Also, the policy declarations of both programs make it a priority to promote the prospects of those with a weak position on the labor market.

LMT involves various types of vocational training. A criterium for enrollment in LMT, which slightly differed from the AEI, is that enrollment must be preceded by search for work at an employment agency. The basic idea is to offer vocational training in sectors where there is a shortage of labor supply. The object is to increase the probability of finding work for the individual and to promote economic growth. Until the AEI was introduced, LMT was the largest labor market program in Sweden. At one stage, in 1992, there were more than 100,000 participants in LMT, representing

[1]The UI benefit level is based on the income before unemployment. It presumes membership in a UI-fund for at least 12 months. During this period, one must have worked at least part-time for six months.

about two per cent of the total labor force. In the sample at our disposal, the number of participants in LMT was about 33,000. A third of these were in "preparatory training" which included courses in job-search or preparations for other programs. LMT referred to in this paper, only concerns the vocational training part of the program, meaning that individuals in preparatory training are excluded.

The important difference between the programs is that the AEI involves comprehensive education whereas LMT is orientated towards a given profession. This represents two types of programs and this study will compare the effects of a theoretical program to a more practical one. It could be argued that the relatively large number of participants in LMT makes it a suitable object of comparison with the AEI, since it would have been the alternative for many of the individuals participating in the AEI.

Economic evaluations of the AEI so far include Westerlund (2000) and Axelsson and Westerlund (2001). These studies also use LMT participants including those in preparatory training, as a reference group. Summarizing their results, they indicate beneficial effects of the AEI on both unemployment duration and incidence to unemployment. However, outcomes are in general not estimated with explicit correction for selection effects. When this is done in Axelsson and Westerlund (2001) by way of a two-step Heckman estimation, using the total number of days in unemployment as dependent variable, there are no significant differences between the programs.

The impact of LMT in Sweden has been evaluated a number of times. In their survey, Calmfors *et al.* (2002) mention twelve studies since 1991, with data from both the 1980's and the 1990's. The estimated effects of LMT, on various measures of employment and income, tend to be less beneficial with data from the 1990's when the numbers participating in LMT were, as hinted above,

very high.

In this study, the empirical estimations seek to take into account selection on unobservables. In the case of estimating the incidence for unemployment a bivariate probit is employed. The estimates of the duration of unemployment deal with the presence of selection and censored observations. The method used follows Brännäs (2000) who suggested an instrumental variable (IV) adaptation of the symmetrically trimmed least squares estimator of Powell (1986).

The plan of the paper is as follows, section two describes the data and section three presents the econometric models. Section four contains the empirical results and section five concludes.

2. Data

The data used in this study were collected from different registers which have been merged by Statistics Sweden (SCB). First, all individuals are included that were registered in adult education at komvux, some time during the autumn semester of 1997. Second, the stock of individuals registered as participants in LMT on October 15th 1997, are collected from the event history database *Händel* of the National Swedish Labor Market Board (AMS). The data set also includes information on age, gender, income, education, citizenship, place of residence, civil status and family situation.

The individuals registered in Händel are classified in different categories. Some of these indicate that the individual is unemployed and in search of work while others indicate participation in labor market programs. The latter include LMT but *not* the AEI. This is the reason why the data of the participants in komvux have been collected separately. Based on the registers of employment agencies, unemployed individuals can be followed over time until the 1st of October 2002 (when the data were reported) if they were openly unemployed or participating in labor market programs.

In this study, the definition of unemployment following program, is to be registered in Händel, i.e. openly unemployed and/or enrolled in some labor market program (not including the AEI).

There were 222,209 participants in adult education during the autumn semester of 1997. To identify the participants in the AEI, information on the special grant for education and training (UBS) is used. It was equal in size to the UI. To be eligible to apply for UBS, the individual must have met the criteria that he or she was between 25 and 55 years old, studied at elementary or upper secondary level and was entitled to the UI when the studies were initiated. If the individual was employed, his or her employer must have agreed to hire a long term unemployed person as a replacement. Here, the definition of a participant in the AEI, is that the individual has been registered in adult education at some point during the autumn of 1997 *and* has received the special grant UBS during the same semester (55,965 observations). Of those offered UBS there were, according to the Report of the Government Commission (SOU 1998:51), eight per cent which enrolled in studies at folk high schools. Besides classes in traditional subjects, these offer a variety of courses such as art, music and drama. Our data only includes those with UBS that were enrolled in komvux.

There are only poor individual records of what kind of education, within a program, the individuals attended. The Report of the Government Commission (SOU 1998:51) summarized enrollment to different educations within the AEI among those unemployed that had been offered UBS in the autumn of 1997. These fractions are presented in Table 1. "Core courses" include mathematics, Swedish, social science and English. Both the preparatory courses and "other vocational" courses, representing almost one fourth, may overlap the programs offered by LMT. However, the probability is small as less than five per cent of the vocational training part of LMT was purchased from komvux.

The number of individuals registered in the vocational training part of LMT, on the 15th of October 1997, were 21,867. The program spans over most sectors of the economy. AMS (1999) names the five largest sectors in the second quarter of 1998, without presenting the various fractions, as being technology and science, health care, administration, manufacturing and service.[2] The vocational training sometimes, wholly or partially, takes place directly in a company.

In order to make the two program samples comparable, observations are excluded according to the criteria given below. An individual may have been excluded for more than one of these conditions.

• If age in 1997 is not between 25 and 55 (AEI 0 and LMT 4,487 obs.).

• If LMT program start is registered before May 1st 1997, when the AEI was announced with an information campaign (4,775 obs.). From May 1997, it is more probable that the individuals in this sample made choices whether to enroll in LMT or the AEI.

• If participants in the AEI were already in adult education during the spring term of 1997 (15,416 obs.). Presumably, these individuals would have continued their studies even without the introduction of the AEI.

• If recorded as a participant in the AEI in the autumn of 1998 (26,447 obs.). A lot of individuals in the AEI continued in the autumn semester of 1998. The special grant, UBS, was also offered for a second year to the individuals that had enrolled in 1997. This extension of the UBS was not repeated for the coming years when the AEI was in effect. Those excluded for this reason had on average 159 days of unemployment in 1996 compared with the average of

[2] AMS (2000) gives a more detailed description of fractions across 16 different sectors for 1999.

Table 1: Enrollment of unemployed with UBS in 1997.

	% of AEI
Preparatory course	4.9
Mainly compulsory level	12.8
Upper secondary level	
core courses	10.6
core courses & other theoretical	52.4
core courses & other vocational	19.3
Total	100.0

Source: SOU 1998:51.

the original sample, 167 days.

• If individuals were recorded in LMT during more than 365 days and/or finished program after July 1st 1998 (3,438 obs.).

• If individuals had zero days in Händel in 1997 prior to enrolling to the AEI (8,067 obs.). The purpose of this is to avoid having individuals who arrive from employment. This is not possible to control for altogether, as people with more than one day in Händel could have experienced those days at the start of the year, then found employment, and from employment entered a program.

• If data of the first day in unemployment, following program, has been recorded incorrectly *before* the program started (AEI 1,507 and LMT 0 obs.).

• If there were missing observations (various variables) (AEI 4,829 and LMT 266 obs.). There are more observations missing among the AEI participants as some of the variables were collected from Händel.

The remaining sample consists of 26,988 observations of which 56 per cent were in the AEI. The sample of the vocational training part of LMT, had an average program time of 146 days. By the

1st of January 1998, 49 per cent of the LMT participants had completed their programs. As for the AEI, 21.8 per cent studied only one semester. If one approximates the length of the autumn and spring semester, the average time on the AEI is in the region of 220 days. When studying duration, only those who go from a program straight to unemployment are included.[3] The number remaining is then 21,926 of which 51.8 per cent were in the AEI with the average program lengths roughly unaltered.

It should be noted that there are no individual records of dropping out. The notion "program participation" actually refers to *started program* rather than *completed program*. For the vocational training part of LMT, the drop out rate as reported by AMS (1999) was approximately 18 per cent in the second quarter of 1998, including those that found work. According to the Report of the Government Commission (SOU 1999:39), ten per cent of the participants in the AEI interrrupted their studies.

In Table 2, various individual characteristics are described in terms of program participation frequencies (out of 21,926 obs.), mean duration of unemployment and unemployment incidence (out of 26,988 obs.). The definition of incidence to unemployment following a program is to be registered in Händel as in search of a job within five days after the individual's program was supposed to end, or before, as in the case of a drop-out. This definition is used as there are signs in the data that many unemployed individuals did not go to the employment office until after a few days. The incidence to unemployment is 74.9 per cent for the AEI compared with 89.7 per cent from LMT. Detailed definitions of the variables are given in the Appendix.

Note from Table 2 that the distribution of program participants

[3] It is not possible to know whether those outside the unemployment register are in employment or have withdrawn from the labor market.

Table 2: Program participation, unemployment duration and unemployment incidence for various characteristics.

	N	% of AEI	% of LMT	Mean duration N=21,926	% incidence N=26,988
Total	21,926	51.8	48.2	443	81.4
AEI	11,349	100	0	418	74.9
LMT	10,577	0	100	470	89.7
366 days unemp. 1996	10,857	49.4	49.6	501	84.4
Zero days unemp. 1996	2,340	10.6	10.8	369	75.2
Outside labor force 1996	742	2.8	4.0	364	78.7
Age 25-29	5,666	29.3	22.1	361	79.0
Age 30-34	5,294	26.0	22.2	408	79.8
Age 35-39	3,898	17.1	18.5	448	80.8
Age 40-44	3,022	12.8	14.8	500	84.3
Age 45-49	2,242	8.4	12.2	529	84.3
Age 50-	1,806	6.3	10.3	596	86.9
Elementary school	677	2.8	3.4	535	82.5
9 year compulsory school	3,653	18.7	14.5	456	79.3
2 year upper secondary school	11,390	61.1	42.1	433	79.8
3 year upper secondary school	2,977	10.4	17.0	439	85.2
University $<$ 3 years	2,108	5.6	13.9	436	84.4
University $\geq$ 3 years	1,121	1.4	9.1	475	88.5
Swedish citizens	19,839	93.5	87.2	445	81.1
Scandinavian, not Swedish	523	2.2	2.6	429	83.0
Non Scandinavian	1,564	4.3	10.2	425	83.6
Born in a foreign country	4,101	15.4	22.3	442	84.1
Stockholm county	3,065	12.7	15.4	335	80.5
Inland of Norrland	1,565	7.4	6.8	446	78.3
Munic. with high educ. level	10,790	45.0	53.7	431	82.7
Male	9,212	32.9	51.8	430	82.1
Male, $\geqslant$ 1 child at home	2,281	7.7	13.3	433	82.7
Male, married	2,933	9.2	17.8	450	83.4
Female	12,714	67.1	48.2	453	80.8
Female, $\geqslant$ 1 child at home	7,689	43.1	26.5	442	79.7
Female, married	4,768	24.7	18.6	467	79.7
Disabled 97	2,667	10.7	13.7	560	85.4

with zero or 366 days of unemployment in 1996, only show minor differences. The mean number of days in unemployment in 1996 (not displayed) was 261 for the AEI and 263 for LMT.

As can be seen, 17.4 per cent of those in the AEI had more than a two year upper secondary education. Individuals was eligible to the special grant UBS even with a formally completed upper secondary level. The condition would be that the individual had not completed secondary level with passes in all subjects or did not have the required knowledge in one or more subjects. Further, those that were long term unemployed or had an "old" secondary education could also apply. In the groups with the highest and lowest educational levels, Swedish citizens and younger age groups are underrepresented.[4] Note that foreign citizens, both Scandinavian and non-Scandinavian, have *shorter* mean duration than average.

There were large differences in the mean outcomes between regions. Apart from the regional labor markets, one could expect different program effects as both the AEI and LMT were implemented locally. However, there are no clear patterns across regions except that Stockholm county had much shorter duration than other regions. One would be tempted to think it is associated with the population density, but the second and third largest municipalities in Sweden, Gothenburg and Malmo (not displayed), have means of 463 and 428 days (compared with the overall average of 443 days). The sparsely populated inland of Norrland, which is a region often referred to as a labor market with difficulties, has a mean duration of 446 days and a lower than average incidence frequency.

Another regional dummy variable is "municipalities with high levels of education". It takes the value one for municipalities with fractions of the population having completed at least a three year

[4] An exception to this rule is the elementary level (folkskola) which was stepwise replaced by the nine year compulsory school (grundskola) 1962-1972.

upper secondary school education, which exceed the median in Sweden. It is one for 67 of 288 municipalities, which represents approximately half, 54 per cent, of the Swedish population. In the sample, this variable is one for 49 per cent and is also connected with shorter than average duration (431 days).

It is difficult to say whether one should think that the sample has a positive or negative self selection into the AEI relative LMT. There are indications of a positive self selection to the AEI, as it has higher representation in the younger age groups and among those with a two year upper secondary school. These are groups with lower incidence to unemployment and shorter duration. On the other hand, there are fewer participants from the county of Stockholm, fewer from municipalities with high levels of education and there are also fewer men. Characteristics which, in Table 2, indicate a negative self selection into the AEI.

3. Econometric methods

3.1. Incidence to unemployment

To estimate incidence to unemployment, a bivariate probit model is estimated (see e.g. Greene, 2000 ch. 21). The approach is intended to take potential problems of selection bias into account. In a bivariate probit setting, the assignment decision to a program is estimated simultaneously with the outcome. Let v_{1i} indicate empirical observations of the individual's choice whether to enroll in the AEI ($v_{1i} = 1$) or in LMT ($v_{1i} = 0$). Also, let v_{2i} denote whether the individual was registered in unemployment immediately after finishing a program ($v_{2i} = 1$) or not ($v_{2i} = 0$). The latent variables v_{1i}^* and v_{2i}^* are determined by the independent variables represented by the vectors $\mathbf{w}_{1i}$ and $\mathbf{w}_{2i}$. This gives the following general speci-

fication of the model

$$\begin{aligned} v_{1i}^{*} &= \mathbf{w}_{1i}^{'}\boldsymbol{\gamma}_1 + \eta_{1i} \\ v_{1i} &= 1 \text{ if } v_{1i}^{*} > 0,\ v_{1i} = 0 \text{ otherwise} \end{aligned} \tag{1}$$

$$\begin{aligned} v_{2i}^{*} &= \mathbf{w}_{2i}^{'}\boldsymbol{\gamma}_2 + \eta_{2i} \\ v_{2i} &= 1 \text{ if } v_{2i}^{*} > 0,\ v_{2i} = 0 \text{ otherwise} \end{aligned}$$

where $\boldsymbol{\gamma}_1$ and $\boldsymbol{\gamma}_2$ are vectors of unknown parameters to be estimated, and the disturbances η_{1i}, η_{2i} are assumed to be bivariate normally distributed, with correlation coefficient ρ. The parameters $\boldsymbol{\gamma}_1$ and $\boldsymbol{\gamma}_2$ are estimated simultaneously with ρ. The joint estimation approach has two advantages. First, joint estimation will be more efficient if $\rho \neq 0$. Second, joint estimation allows for potential selection bias to provide consistent estimates of the underlying parameters.

3.2. Unemployment duration

The estimation of the program effect on the duration of unemployment deals with both potential selection bias and censored data. The methodology follows Brännäs (2000) who applied an instrumental variable (IV) adaptation of the symmetrically trimmed least squares estimator introduced by Powell (1986).

The symmetrically trimmed least squares estimation uses the fact that the OLS estimator is unbiased when the distribution of the disturbance term is symmetric. In the presence of censored observations, symmetry is constructed by "trimming", i.e. by modifying or discarding censored observations at one end of the distribution and non-censored observations at the other end. There are no explicit distributional assumptions in accounting for censoring.

As a point of departure, consider a "true" underlying regression

equation

$$y_i^* = x_i'\beta + \varepsilon_i \qquad i = 1, ...N \tag{2}$$

where y_i^* varies symmetrically around the value $x_i'\beta$. Because of right hand side censoring, the dependent variable takes the form $y_i = \min\{x_i'\beta + \varepsilon_i\ , c\}$ where c indicates a censored value.

To restore symmetry, Powell (1986) presents a modified normal equation

$$0 = \sum_{i=1}^{N} 1(x_i'\beta < c) \cdot (\max\{y_i, 2x_i'\beta - c\} - x_i'\beta) \cdot x_i \tag{3}$$

where 1(.) is an indicator function which takes the value one if the claim in parenthesis is true and zero otherwise. The solution for β in (3) is not necessarily unique. Accordingly, Powell (1986) instead minimizes the corresponding objective function

$$\begin{aligned} S_N(\beta) &= \sum_{i=1}^{N} \left(y_i - \max\left\{ \frac{1}{2} y_i, x_i'\beta \right\} \right)^2 \\ + \sum_{i=1}^{N} 1(y_i &< 2x_i'\beta - c) \cdot \left[\left(\frac{1}{2} y_i \right)^2 - (\min\{c, x_i'\beta\})^2 \right] \end{aligned}$$

and defines the "symmetrically censored least squares estimator", $\widehat{\beta}_N$, which is given by

$$\begin{aligned} \widehat{\beta}_N &= \left[\sum_{i=1}^{N} 1(x_i'\widehat{\beta}_N < c) \cdot x_i x_i^{'} \right]^{-1} \times \\ \sum_{i=1}^{N} 1(x_i'\widehat{\beta}_N &< c) \cdot \max\left\{ y_i, 2x_i'\widehat{\beta}_N - c \right\} \cdot x_i \end{aligned} \tag{4}$$

The sample is made symmetric by replacing the uncensored observations in the left tail of the distribution with their estimated values, in Powell's words, their "symmetrically censored" values.

Now, assume the estimated model to be a loglinear duration

model and introduce a conventional selection model specification

$$y_i = \ln t_i = \mathbf{x}_i'\boldsymbol{\beta} + \alpha d_i + \varepsilon_i$$

$$\begin{aligned} d_i &= 1 \qquad \text{if } \delta_i = \mathbf{z}_i'\boldsymbol{\gamma} + \xi_i > 0 \\ d_i &= 0 \qquad \text{if } \delta_i \leq 0 \end{aligned}$$

where $d_i = 1$ indicates participation in the AEI. The use of the estimated $\widehat{d}_i$ for participation creates a consistent parameter for the program effect.

Define $\boldsymbol{\Theta} = (\boldsymbol{\beta}, \alpha)$, $\mathbf{x}_i^* = (\mathbf{x}_i, d_i)$ and $\widehat{\mathbf{x}}_i = (\mathbf{x}_i, \widehat{d}_i)$. Then, from Brännäs (2000), the IV adaptation to the Powell estimator is

$$\begin{aligned} \widehat{\boldsymbol{\Theta}} &= \left[\sum_{i=1}^{n} \mathbf{1}(\mathbf{x}_i^*\widehat{\boldsymbol{\Theta}} < c_i) \cdot \widehat{\mathbf{x}}_i \mathbf{x}_i^{*\prime}\right]^{-1} \times \qquad (5) \\ \sum_{i=1}^{n} \mathbf{1}(\mathbf{x}_i^*\widehat{\boldsymbol{\Theta}} &< c_i) \max(y_i, 2\mathbf{x}_i^*\widehat{\boldsymbol{\Theta}} - c_i) \cdot \widehat{\mathbf{x}}_i \end{aligned}$$

where c_i is the value of censored observations. $\widehat{\boldsymbol{\Theta}}$ is iterated until convergence. A consistent estimator of the covariance matrix is of the form

$$Cov(\widehat{\boldsymbol{\Theta}}) = n^{-1}\mathbf{C}^{-1}\mathbf{D}\mathbf{C}^{-1}$$

where

$$\begin{aligned} \mathbf{C} &= n^{-1}\sum_{i=1}^{n} \mathbf{1}(2\mathbf{x}_i^*\widehat{\boldsymbol{\Theta}} - c_i \leq y_i < c_i)\widehat{\mathbf{x}}_i'\mathbf{x}_i^* \\ \mathbf{D} &= n^{-1}\sum_{i=1}^{n} \mathbf{1}(\mathbf{x}_i^*\widehat{\boldsymbol{\Theta}} < c_i) \min(\widehat{\omega}_i^2, (c_i - x_i^*\widehat{\boldsymbol{\Theta}})^2)\widehat{\mathbf{x}}_i'\widehat{\mathbf{x}}_i \end{aligned}$$

The covariance matrix estimator above adapts the original Powell estimator to right censored data and to instrumental variables.

4. Results

4.1. Incidence to unemployment

Table 3 presents the results of the bivariate probit model. The columns show the bivariate probit estimates of the probability of participation in the AEI and, of the probability of going straight into unemployment following a program.[5] There are two instruments used, i.e. variables that are excluded from the outcome equation. First, the fraction of the municipal population registered in adult education during the autumn of 1997 and, second, a dummy indicating a municipality having high fraction of their population with at least a completed three year upper secondary school education (defined in section two). These are insignificant if included in the outcome regression.

In the estimation of assignment to the AEI, in the first column, the two instruments are both significant. Living in a municipality where a high educational level is more common lowers the probability of enrolling in the AEI. As mentioned in the introduction, one of the targets of the AEI was to promote the prospects of people with a weak position in the labor market. The evidence here suggests that the AEI, as an egalitarian tool, evened out some of the regional differences in educational levels.

The second instrument signals that a large local adult education, in relation to the municipal population, is positively correlated with enrolling in the AEI. Possibly, it reflects a relative capacity to offer a variety, as well as a magnitude, of courses. There is a negative sign on the coefficient associated with the fraction of 25-64 year

[5] Reference groups are: for the Stockholm county and the inland of Norrland, the rest of Sweden; for the age groups, those above 50 years of age; for the educational groups, Elementary and Compulsory levels; for the foreign citizens, Swedish citizens; for the gender and civil status dummies; unmarried females with no children under the age of 16 at home.

Table 3: Bivariate probit model.

Dependent variable: Incidence to unemployment.				
N = 26,988	Participation in the AEI		Incidence to unemployment	
Variable	Coeff.	$\|t$-value$\|$	Coeff.	$\|t$-value$\|$
Constant	.010	.02	.400	.86
AEI			-.585	2.26
Fraction in adult edcuation	15.554	9.46		
High educ. level	-.120	5.59		
Aged 25-64 in municip. (%)	–2.208	4.55	1.893	3.98
Stockholm county	.177	4.12	-.121	2.46
Inland of Norrland	-.046	1.36	-.060	1.65
Regional growth	-.004	.36	-.051	3.83
Regional employment	.014	3.42	.003	.64
Age 25-29	.324	9.20	-.208	3.94
Age 30-34	.261	7.48	-.196	3.88
Age 35-39	.154	4.27	-.185	3.86
Age 40-44	.148	3.98	-.065	1.31
Age 45-49	.059	1.54	-.104	2.14
2 year upper secondary school	.074	3.48	.059	2.45
3 year upper secondary school	-.454	16.21	.129	2.33
University $<$ 3 years	-.665	20.78	.049	.66
University $\geq$ 3 years	-1.141	24.37	.129	1.08
Disabled 97	-.210	7.98	.109	3.01
Outside labor force 1996	-.451	7.96	.075	1.08
181-365 days unemp. 1996	-.044	2.21	-138	5.87
91-180 days unemp. 1996	.004	.13	-.183	5.63
1-90 days unemp. 1996	.014	.42	-.222	6.41
Zero days unemp. 1996	.115	3.67	-.333	9.69
Scandinavian, not Swedish	-.224	4.03	-.022	.31
Non Scandinavian citizen	-.327	7.76	-.119	1.97
Born in foreign country	.103	2.06	.071	1.18
Yrs in Sweden*Born in f.c.	-.002	.80	.001	.16
Male	-.393	16.54	-.118	2.54
Male, married	-.668	1.70	.013	.25
Male, $\geqslant$ 1 child at home	.113	2.72	-.016	.22
Female, married	.025	1.07	-.086	3.36
Female, $\geqslant$ 1 child at home	-.040	.47	.024	.23
ρ			-.001	.01

olds in the municipal population. It may indicate that increased competition on the local labor market, makes the unemployed prefer a program with a close connection to a specific profession, such as LMT.

In the second column, which considers the incidence to unemployment, the coefficient of the participation in the AEI is significantly negative.[6] In Table A.1 in the Appendix is a list of results using different subsamples. All samples display negative coefficients. However, only the result of the total sample is significantly determined at the five per cent level. The result of the female sample is significant at the ten per cent level.

If one returns to the second column of Table 3, there are some other parameter estimates which deserve attention. First, the regional variables show the expected signs throughout. A high fraction of the population aged 25-64 in the municipality, is a measure of the competition on the local labor market, and subsequently, its parameter sign is positive. A higher age seems to indicate a higher incidence to unemployment. Furthermore, those with an upper two or three year secondary school diploma, have a significantly higher probability of incidence than the reference group with no secondary school. One must remember that the sample under study here, where the average time in unemployment in 1996 was more than eight months, is by no means a good representation of the working population. The unemployment background of the sample tells us that, on average, this is a negative selection of all educational levels. For the highly educated, it should in addition be a *more* negative selection than for other groups (given that education has a beneficial effect on labor market performance).

Those with fewer days in unemployment in 1996 show lower

[6] This becomes insignificant ($|t$-value$|$ of 1.51) if one does not exclude any variables from the outcome equation.

probabilities of incidence than the reference group with 366 days. Finally, males have a lower probability of incidence. Among females, married women have a relatively low probability of incidence to unemployment.

4.2. Unemployment duration

Histograms of unemployment duration, for those who were registered as searching for job within five days after program completion, are shown in Figures 1 and 2 for the AEI and LMT respectively. The mean duration is 418 (calendar) days for the AEI and 470 days for LMT. Note that after 300 weekdays, which is in the region of 420 calendar days, eligibility to the UI has either been prolonged through participation in some labor market program or the individual has relied on social allowances or other sources of income.

There is a nail, in both Figure 1 and Figure 2, which occurs after about three months, especially for the participants in the AEI. It depends on individuals leaving unemployment for further education after a summer break.[7] Among the spells lasting 80 to 100 days, 70 per cent of the AEI participants had left unemployment for further studies. For LMT, the corresponding figure is 18 per cent.

If one excludes those that escaped unemployment through further studies the pattern of the means changes to become 487 days for the AEI and 484 days for LMT. It is an indication of how the AEI creates opportunities for further studies. The effect of the AEI on duration cannot only be interpreted in terms of an effect on the ability to escape unemployment but also as one of increasing the set of possible routes of escape. There is a second, smaller nail, at the end of each histogram which regards the censored observations, i.e. those still unemployed on October 1st 2002.

[7] However, note that those who leave adult education for a summer (or Christmas) break in unemployment and then resume adult education with UBS

Figure 1: The AEI post program unemployment duration.

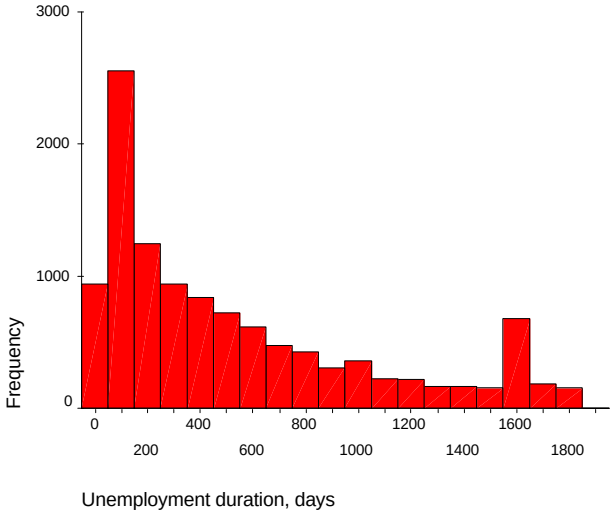

Figure 2: LMT post program unemployment duration.

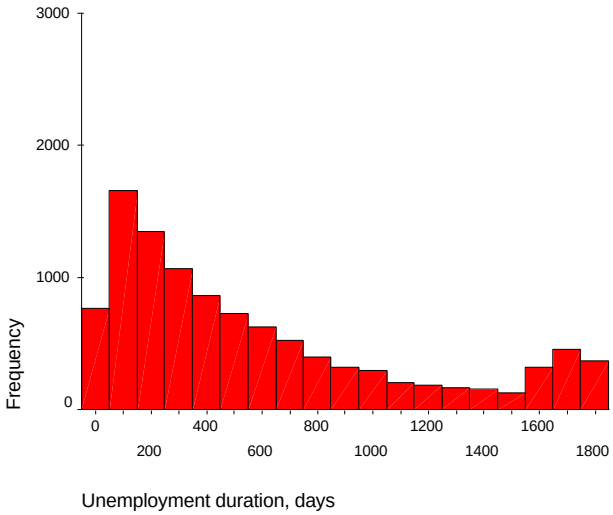

Table 4: Reason for end of unemployment spell by treatment group.

	Mean duration	% of AEI	% of LMT
Censored	1,666	8.6	9.3
Employment	467	38.0	52.0
Miscellaneous	514	14.2	17.0
Unknown reason	460	14.4	10.8
Further Education	319	25.0	10.9
Total	553	100.0	100.0

Figure 3: Post program survival rate in unemployment of the AEI and LMT participants.

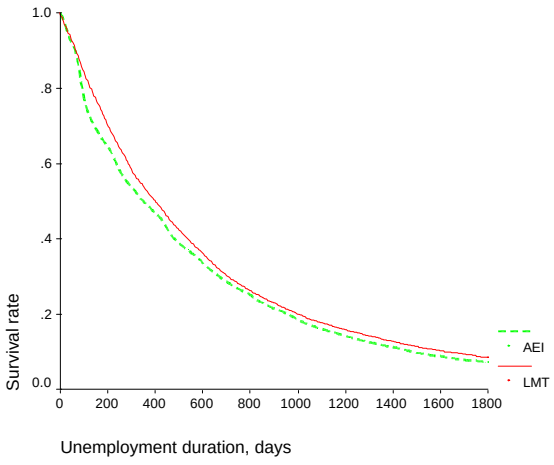

Table 4 shows frequencies of different reasons for deactivation. Detailed definitions of these are given in the Appendix. The main difference between the programs is that the AEI participants go on to further education more frequently while LMT has a larger fraction going into employment. Figure 3 shows the survival rate in unemployment of the AEI (dashed line) and LMT participants (solid line). The difference between the survival rates increases after 80-100 days.[8] After that, the differences are small.

For the study on duration, the fact that the incidence is lower for the AEI represents a selection process *out* of the program. To see this selection problem clearly, suppose an unobserved characteristic such as motivation, on average, speeds up the job finding process. If those who do not enter unemployment immediately after the program have a higher motivation than average, the sample of those unemployed will correspondingly be less motivated. The unemployment incidence, 74.9 per cent for the AEI and 89.7 per cent for LMT, indicates a selection effect which is more negative on unemployment duration for the AEI than LMT.

The results of the duration model are presented in Table 5. The first column presents the coefficient values of a probit estimation with participation in the AEI as the dependent variable. The second column has duration in unemployment as the dependent variable and contains the results of estimations according to equation (5) in section three, taking into account selection by using IV. As in the previous estimations, the instruments used are the municipal fraction of participants in adult education and a dummy indicating a municipality with a high level of education. These are insignificant if included in the duration equation.

The results of the participation equation are similar to that of

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are treated as still in the AEI.

[8] If $F(t) = \Pr[T < t]$ is the probability that duration T is less than some value t, the survival function is $S(t) = 1 - F(t) = \Pr[T \geq t]$.

Table 5: Powell IV estimations of duration times in unemployment.

Dependent variable: Log time in unemployment. N = 21,926	Participation in the AEI		Duration times	
Variable	Coeff.	$\lvert t\text{-value}\rvert$	Coeff.	$\lvert t\text{-value}\rvert$
Constant	-.545	1.17	6.574	15.49
AEI			.389	1.85
High educ. level	-.110	4.67		
Fraction in adult edcuation	16.205	8.89		
Aged 25-64 in municip. (%)	-2.247	4.18	-.911	2.19
Stockholm county	.070	1.46	-.420	9.67
Inland of Norrland	-.044	1.17	-.022	.64
Regional growth	-.007	.50	-.033	2.82
Regional employment	.021	4.48	.003	.64
Age 25-29	.325	8.66	-.777	18.61
Age 30-34	.246	6.45	-.618	16.02
Age 35-39	.136	3.42	-.482	13.21
Age 40-44	.143	3.52	-.326	8.82
Age 45-49	.049	1.18	-.210	5.72
2 year upper secondary school	.082	3.50	-.083	3.86
3 year upper secondary school	-.413	13.32	.000	.01
University $<$ 3 years	-.636	17.89	.034	.57
University $\geq$ 3 years	-1.153	21.96	.190	2.12
Disabled 97	-.209	7.64	.352	12.05
Outside labor force 1996	-.392	6.41	.121	2.12
181-365 days unemp. 1996	-.048	2.17	-.226	11.24
91-180 days unemp. 1996	.008	.24	-.299	10.16
1-90 days unemp. 1996	.030	.83	-.325	10.10
Zero days unemp. 1996	.059	1.69	-.439	13.92
Scandinavian, not Swedish	-.243	3.94	-.084	1.41
Non Scandinavian citizen	-.356	7.33	.027	.54
Born in foreign country	.121	2.14	-.015	.30
Years in Sweden * Born in f. c.	.002	.72	.005	1.83
Male	-.372	14.32	-.049	1.33
Male, married	-.076	1.76	.014	.36
Male, $\geqslant$ 1 child at home	.111	2.41	-.062	1.51
Female, married	.007	.26	-.045	2.06
Female, $\geqslant$ 1 child at home	.185	7.24	.004	.16

the previous section. The main result being that individuals in municipalities with overall lower education levels, tend to join the AEI and thus reduce regional differences in education. In column two, the coefficient of the AEI dummy is positive and significant at a ten per cent level, indicating that participants in the AEI have longer duration in unemployment following program than those in LMT. In Table A.1 in the Appendix, there is a list of results from using different subsamples. Apart from the estimates of the total sample, the only significant effect, also at a ten per cent level, is the positive coefficient for the female sample. These implications remain unaltered if those escaping unemployment through further studies are excluded. In Table 5, a high fraction of the municipal population aged 25-64, is presumed to reflect the level of competition on the local labor market. Unexpectedly, the parameter is significantly negative. Those with more than two years of university studies show significantly longer duration. The reasoning on the educational dummies in the previous section is probably valid. The dummies for days in unemployment in 1996 also show parameters with the logical negative signs.

5. Conclusion

This paper uses register data to evaluate the effects of the Adult Education Initiative (AEI) in Sweden. One of the main objects of the AEI was to offer the unemployed education at compulsory or upper secondary levels. The question that has been evaluated is how the AEI compares with labor market training (LMT) which instead offers vocational training to, in many ways, similar target groups as the AEI. In terms of outcome variables, the focus has been on the incidence of unemployment and duration in unemployment, following the period immediately after program participation.

The empirical estimations seek to take into account selection

on unobservables. In the case of estimating the incidence to unemployment a bivariate probit model is employed. The estimations of duration deal simultaneously with selection and censored observations. The econometric approach follows Brännäs (2000) who used an IV adaptation of the symmetrically trimmed least squares introduced by Powell (1986). There is evidence that the AEI decreases the incidence of unemployment.

Regarding duration, there are indications of longer times in unemployment following the AEI compared with LMT. In general, when performing the estimations with various subsamples, the results are insignificant, both in terms of incidence and duration of unemployment. The results are at odds with Westerlund (2000) who found beneficial effects of the AEI on duration. The findings are more in line with Axelsson and Westerlund (2001) who found a beneficial effect of the AEI on unemployment incidence but no effects on the accumulated time in unemployment during the two years that followed program completion.

An explicit aim of the AEI was to reduce educational differences. In the estimations of the participation choice there is evidence that municipalities with lower educational levels among their inhabitants have attracted more participants to the AEI. This may have reduced differences between regional educational levels.

Appendix

Definitions of data

AEI; Officially domiciled in Sweden and registered in adult education some time during the autumn semester of 1997 and receiving the special grant for education and training. Individuals registered in adult education in the spring 1997 or autumn 1998 were excluded.
CHILDREN; Number of children below the age of 16 living at home.
DAYS UNEMPLOYED; Number of days spent in any of the search categories, including unemployment and labor market programs, as defined by the Swedish National Labor Market Board.
DISABLED 1997; Classified with a working disability in 1997.
EDUCATIONAL LEVEL; Highest level of education attained by 1997.
END OF UNEMPLOYMENT PERIOD; Employment; Employed, re-employed or employed with a time-limit. Miscellaneous; Other reasons for deactivation. Unknown reason; Contact discontinued or unknown reason. Further education; Not LMT or the AEI.
FRACTION IN ADULT EDUCATION; The number of individuals registered in adult education at komvux during the autumn semester of 1997 divided by the municipal population.
INLAND OF NORRLAND; Norrland except municipalities on the coast line.
LMT; Registered in LMT October 15th 1997, with a program start later than May 1st 1997, officially domiciled in Sweden and aged between 25 and 55.
MUNICIPALITY WITH HIGH EDUCATION LEVEL; Equals one for those living in municipalities with a higher than median fraction of individuals having completed at least a three year upper secondary school. It equals one for 56 of 288 municipalities, representing 54 per cent of the population.
OUTSIDE THE LABOR FORCE 1996; Zero days in unemploy-

ment in 1996 and less than SEK 50,000 in wage earnings in 1996.
REGIONAL EMPLOYMENT GROWTH; Measured for 21 counties as the change of employment rate in the fourth quarter of 1998 compared with that of a year earlier. Employment figures based on Statistics Sweden and their Labor Force Surveys (*Arbetskraftsundersökningarna, AKU*).
REGIONAL EMPLOYMENT LEVEL; As measured in 21 counties in the second quarter of 1998. Employment figures based on Statistics Sweden and their Labor Force Surveys (*Arbetskraftsundersökningarna, AKU*).

Table A.1: Estimations of unemployment incidence and duration for various samples. Coefficient values of the AEI dummy is reported.

	Incidence			Duration		
	N	Coeff.	$\|t\|$	N	Coeff.	$\|t\|$
Total sample	26,988	-.585	2.26	21,926	.389	1.85
Men	11,235	-.485	1.28	9,212	.040	.12
Women	15,753	-.693	1.89	12,714	.508	1.73
Inland of Norrland	2,000	-.514	.96	1,565	2.393	.91
Stockholm county	3,817	-.930	1.09	3,065	-.092	.17
No secondary school	5,440	-.611	1.43	4,330	.240	.67
2-year secondary school	14,282	-.596	1.36	11,390	.766	1.64
Born in foreign country	4,886	-.658	1.11	4,101	-.013	.02
Foreign citizens	2,503	-.690	1.06	2,087	-.024	.04
Disabled	3,123	-.753	1.39	2,667	.085	.21

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Short Run Effects on Wage Earnings of the Adult Education Initiative in Sweden

Anders Stenberg*
Umeå University

Abstract

This paper evaluates the Adult Education Initiative (AEI) in Sweden which offers full-time comprehensive education at compulsory or upper secondary level to unemployed aged between 25 and 55 year old. Using register data, the AEI is compared with Labor Market Training (LMT) which mainly involves vocational training. The change in yearly wage earnings between 1996 and 1999 is used as outcome variable. Bias caused by the selection process into programs is dealt with using two separate methods. First, a method of matching on the propensity score and wage earnings levels in 1996 is used, and second, a classical selection model. The results indicate that the AEI has a positive effect compared with LMT for the subsamples of foreign citizens, females and individuals with a prior two year upper secondary school education.

Key words: education, labor market training

JEL Classification: J68, I21

1. Introduction

The Adult Education Initiative (AEI) in Sweden offers unemployed persons, aged between 25 and 55, comprehensive education at compulsory or upper

*Authours' address: Department of Economics, Umeå University, SE-901 87 Umeå, Sweden. E-mail: anders.stenberg@econ.umu.se, the authour wishes to thank Roger Axelsson, Olle Westerlund, Magnus Wikström as well as participants at a seminar at IFAU, Uppsala.

secondary level. In common with typical active labor market measures, it seeks to create some form of human capital improvement. However, it also represents a change of focus as it creates an alternative to traditional labor market programs such as e.g. vocational or on-the-job training. The objective of the AEI is not only to enhance the individual's possibilities of finding future employment, but also to encourage the participants to continue with further studies once he or she has completed the program. Target groups, therefore, include those who need one year of full time studies to complete either their compulsory or three year upper secondary schooling (most university studies in Sweden require a three year upper secondary school). A participant in the AEI is compensated financially in the same way as in any other labor market program, i.e. if eligible to the unemployment benefit fund, he or she receives an allowance equal to the unemployment benefit and, following completion of the program, qualifies for a new period of unemployment benefits (300 days). The AEI was introduced in July 1997, and the number of participants immediately made it larger than any other labor market program in Sweden. The education is mainly provided by the municipal adult education centers, *komvux*, which has offered full time comprehensive education to adults since 1968. *Komvux* is well established among both employers and employees and has greatly facilitated the implementation of the AEI.

The AEI is a combination of labor market program and schooling, which makes it interesting to evaluate especially from the point of view of the policy maker. It has a general and clear set up which, at least theoretically, should be possible to copy in other countries. Sweden, however, has a very active labor market policy which, according to Martin & Grubb (2001), is one of the most generous of those provided by the OECD countries. Further, the municipal adult education centers, *komvux,* were already an integral part of the Swedish educational system which reduced the costs of implementing the AEI.

To evaluate the effect of the AEI the present paper uses microdata of the change in annual wage earnings between 1996 and 1999, as reported by the National Swedish Tax Board (RSV). The outcomes are compared with those of Labor Market Training (LMT) which involves both vocational and preparatory

training, e.g. courses in job-search and preparations for other courses.[1] The question evaluated in this paper is what would have happened to the gross wage earnings if the sample of individuals who chose the AEI had instead joined LMT?

The main target groups of LMT are unemployed who need vocational training in order either to continue in their present occupation or to change profession. LMT has been one of the most important labor market measures in Sweden since the 1950s. In January 1992, during a deep economic recession in Sweden, more than 100,000 people participated in LMT. This constituted almost two per cent of the labor force. It could be argued that the large scale nature of LMT makes it a suitable object of comparison with the AEI. It would have been the alternative for many of the individuals who participated in the AEI. In the present study, the individuals who went on to further studies following the AEI are not included. This makes the samples from the AEI and LMT similar, but it probably also means that the sample used is a negative selection of the population from the AEI.

Earlier studies of the AEI have also used those participating in the LMT as a comparative group but, in contrast to the present paper, these have used different measures of unemployment as the outcome variable. Westerlund (2000) reported that the AEI had a more beneficial effect on the duration of unemployment but without taking explicit account of selection to programs. Axelsson & Westerlund (2001) used a Heckman two-step method to take account of selection and found no significant differences in the (log) total number of days unemployed following completion of the program. Stenberg (2002) looked at both the incidence and duration of unemployment. Taking into account selection through the use of instrumental variables, results implied that the AEI reduced the probability of unemployment as well as its duration. Using various subsamples, including regional ones, evidence was found of either reduced incidence or duration of unemployment.

[1] The active nature of the Swedish labor market policies makes it difficult to use "non-participants" as comparison group. Most unemployed are enrolled in some form of program if they do not find work or withdraw from the labor market.

There are numerous evaluations of LMT. Calmfors et al. (2002) mention 14 studies since 1991. According to the evidence, the effects of the program have been relatively poor. In an overview of Swedish labor market measures during the 1990s, Ackum-Agell et al. (2000) expressed concern about the post program outcomes of the participants in LMT.

This paper is the first evaluation study of the AEI to use annual wage earnings as the outcome variable. A drawback with the earlier studies is that unemployment contains no information about the activities of individuals outside unemployment. The data concerning the 1999 annual wage earnings add important information in this respect. Empirically, two separate approaches are used. The first is a method of matching on the propensity score and the wage earnings in 1996 and the second is a classical selection model. Matching is non-parametric and thereby avoids the functional form restrictions of OLS. It also corrects for two sources of potential bias that are not necessarily taken into account in regressions. These may either arise because of the lack of overlap or because of different distributions in observable characteristics between the groups compared (see e.g. Heckman et al. (1999)).

The large number of participants involved in the programs, 88,000, raises the issue of general equilibrium effects. However, these are not dealt with in the present paper.[2]

The remainder of the paper is structured so that the data are described in the following section. In section three the empirical methods are presented. Section four presents the estimated results and section five contains the conclusions.

2. Data

The data have been collected from several official administrative registers. Information on income has been obtained from the National Swedish Tax Board and details concerning unemployment have been taken from the Na-

[2]For a study of the general equilibrium effects of the AEI, see Albrecht et al. (2002).

tional Swedish Labor Market Board's (*AMS*) event history data base, *Händel*. Individuals are registered in *Händel* as long as they are registered at an employment office as either openly unemployed or in a labor market program. The data on income and unemployment have been merged with registers from Statistics Sweden (*SCB*) including information on participation in adult education, the individual's age, educational level, gender, citizenship and place of residence. The full data set includes all those in adult education during the autumn of 1997 or in LMT on the 15th of October 1997, in total 254,444 individuals, of which 222,209 were in adult education and 32,235 were in LMT.

The municipalities receive financial support from the government to provide additional places at the municipal adult education centers, *komvux,* for those entering the AEI. The participants in the AEI are entitled to apply for the special grant for education and training (UBS) which is equal to the UI. To be eligible to UBS the individual must be unemployed or, if employed, his or her employer must agree to take on an unemployed person as a replacement. Further, one must be eligible for the unemployment insurance (UI), 25-55 years old and study at compulsory or upper secondary level. In this study, those who were registered in adult education during the autumn of 1997 *and* received UBS are considered as participants in the AEI. This group includes 55,965 individuals.

In order to create relevant groups for comparison, participants in the AEI are excluded if they were already registered in adult education in spring 1997, as they presumably would have continued in education even without the introduction of the AEI. Participants in the AEI with zero days in unemployment in 1997 are also excluded, as they either come from employment or from outside the labor force. Participants in LMT are those 25-55 years old who entered the program after the first of May 1997, when the AEI was announced. To make the program lengths more similar, individuals in both programs must have ended by the first of July 1998. Those enrolled in the educational system in 1996 or in 1999 are excluded, as are those who appear to have been outside

the labor force in either of the two years.[3] Finally, outliers, with differences in gross wage earnings of less than SEK -300,000 or more than SEK 300,000, are excluded.[4] It seems implausible that such differences have been generated by the programs under study. Of the remaining sample, 35.3 per cent are in the AEI, of these 7.6 per cent are at compulsory school level. In the case of LMT, 29.0 per cent are in preparatory training.

Among the participants in the AEI, 29.6 per cent left the program before the 1st of January 1998, i.e. had only one semester of studies. The length of time spent in LMT varies greatly. The average is 146 days. Two thirds spend between 60 and 240 days in the program with the remainder evenly shared between fewer than 60 days and more than 240 days.

There are no reliable individual records of drop outs from either program so the interpretation of the concept "participation" should be *started program* rather than *completed program*. In AMS (2000) it is reported that for the vocational training part of LMT, the drop out rate in the second quarter of 1998 was approximately 15 per cent. There are no such records available for the AEI.

The outcome variable is based on the yearly gross wage earnings. It includes gross salary and holiday compensation, but not taxable benefits or transfers such as the UI. In the following, the expression "wage earnings" refers to this measure. In comparison with measuring outcome by unemployment, it improves the information on the economic activities of individuals when they are outside unemployment.

The period 1996 to 1999 was one in which unemployment decreased in Sweden. The yearly average unemployment rates were 8.05 per cent for 1996 and 5.60 per cent for 1999. As expected, the average wage earnings of the sample increased. In 1996, the average was SEK 62,700 for participants in the AEI and SEK 56,800 for those in LMT. In 1999, the figures were SEK 96,100 for the AEI and SEK 104,500 for LMT. Thus, interestingly, the relation between

[3] Defined as outside the labor force are those who had wage earnings of less than SEK 50,000 *and* less than ten days of unemployment.

[4] A dollar was in 1996 on average worth SEK 6.70 and in 1999 SEK 8.27.

the program participants' averages was reversed between 1996 and 1999. The same impression is given by the number of days spent in unemployment. The average in 1996 was 265 days for the AEI and 278 days for LMT. In 1999, the AEI had, on average, 230 days in unemployment while those in LMT had 219 days. This is unexpected. In earlier studies, referred to in the introduction, the descriptive data indicated the AEI to have fewer days in unemployment than LMT. This is presumably due to the exclusion of those in further studies in 1999, where the AEI is overrepresented.

Figure 1 presents the wage earnings profiles of the participants in the two programs for 1996 and 1999 respectively. There are four columns for every wage earnings interval. The first two are for LMT, the black column represents 1996 (far left of each interval) and the dark gray 1999. The following two are for the AEI with 1996 in light gray and 1999 in white. The proportions with zero wage earnings stand out as very high, especially in 1996 when they represented 25.9 per cent of the AEI participants and 34.7 per cent of LMT. There is a rightward move which can be observed in the clear increase in the percentages with incomes exceeding SEK 200,000 in 1999. For the sample as a whole, it goes from 4.0 per cent in 1996 to 14.4 per cent in 1999.

In Figure 2, the mean of the *difference* in wage earnings is displayed for separate wage earnings intervals in 1996. The different wage earnings intervals are, starting from the left, zero wage earnings followed by SEK 1-10,000, and then intervals of SEK 10,000 until SEK 200,000 and the highest open interval which is in excess of SEK 200,000. The difference is greater for those with low wage earnings in 1996 and, at around SEK 160,000, the mean difference of the sample becomes negative. Clearly, the pattern in Figure 2 is important when evaluating the two programs. It is reminiscent of regression to the mean which would imply a random element in how the income evolves between years. Another interpretation is that if an individual had high wage earnings in 1996, but was unemployed and in a labor market program in 1997, he or she had, on average, suffered a shock in proportion to the wage earnings in 1996.

Figure 3 confirms the impression from Figure 2. The number of days spent in unemployment in 1999 and in 1996 are compared across the wage earnings

Figure 1: Distribution of wage earnings for the AEI and LMT in 1996 and 1999 respectively.

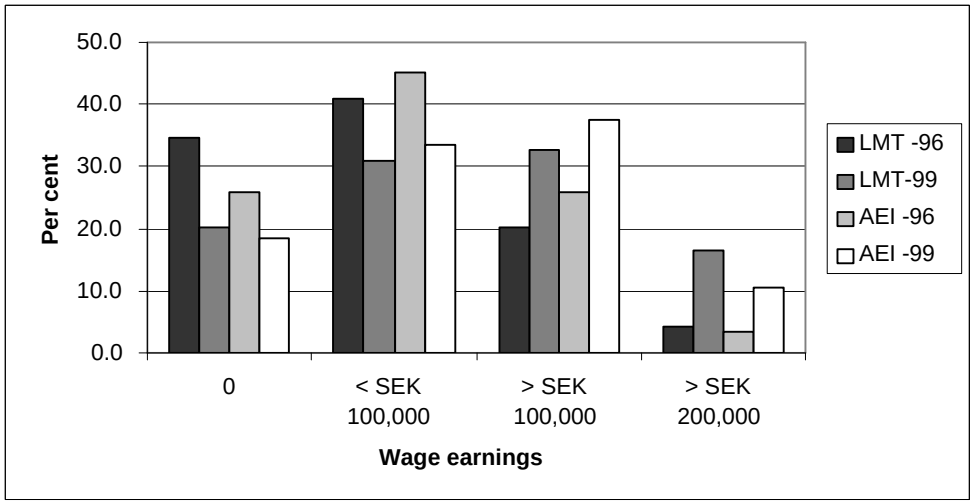


Figure 2: Differences in wage earnings 1999-1996 across intervals in 1996.

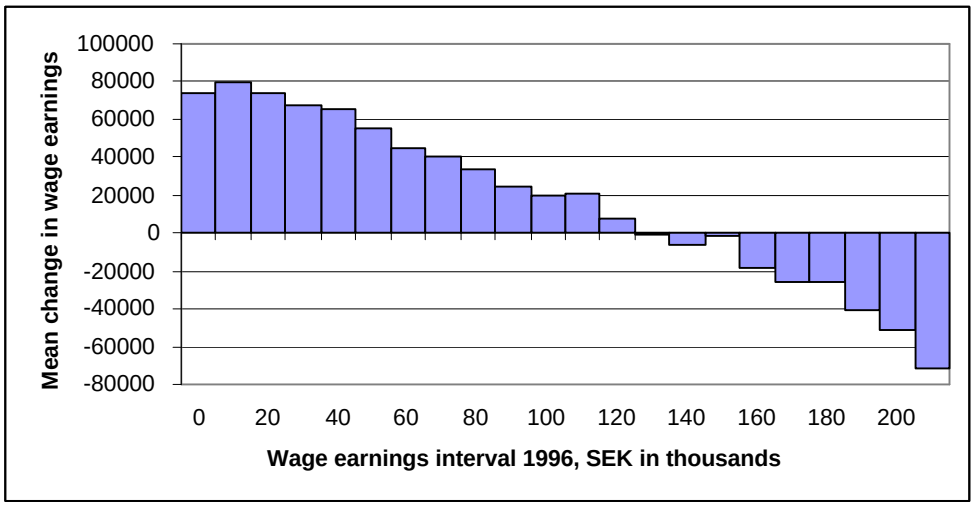


Figure 3: Number of days spent in unemployment across wage earnings intervals in 1996.

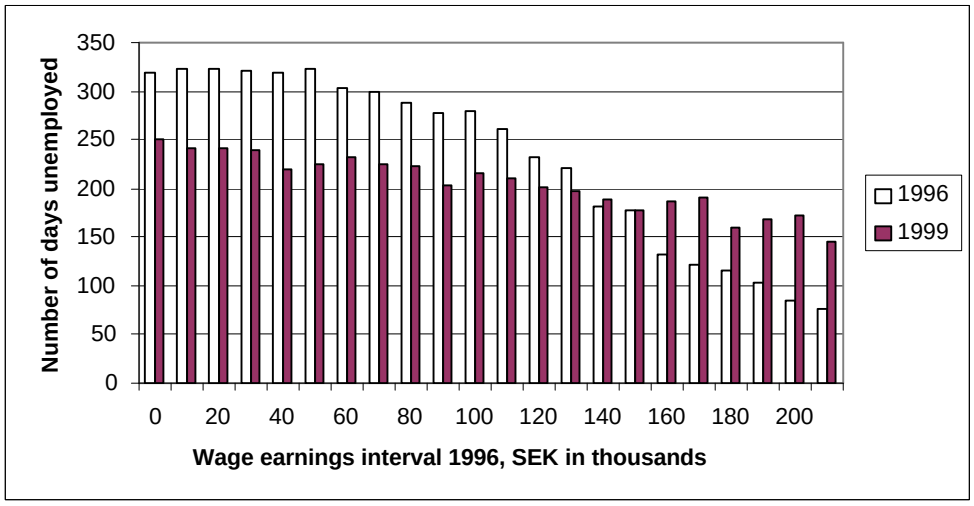
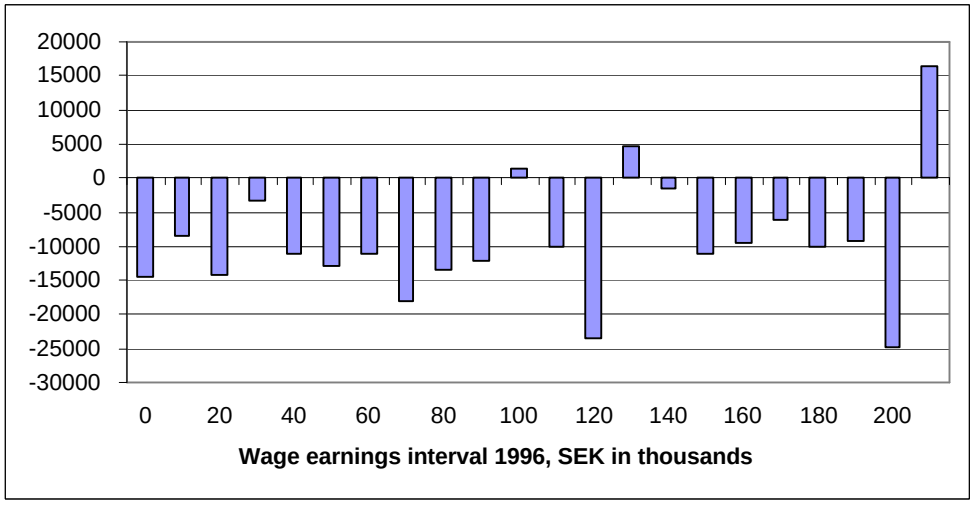


Figure 4: Mean values of difference in differences across wage earnings intervals in 1996.



intervals in 1996. Groups with a high number of days spent in unemployment in 1996 show a decrease, while they increase for the groups with relatively fewer unemployment days in 1996. It is important to note from Figure 3 that the lowest average observed for 1999 is 146 days. This reveals a rather gloomy unemployment record for the sample. Note, however, that the registers do not separate part-time unemployment from full-time unemployment.

Figure 4 displays the differences in the mean changes in wage earnings between the programs' participants. To clarify, let WE denote wage earnings, conditioning on the wage earnings interval in 1996, each column represents the expression

$$\left(\overline{WE}_{99} - \overline{WE}_{96}\right)_{AEI} - \left(\overline{WE}_{99} - \overline{WE}_{96}\right)_{LMT}$$

The bars denote average values. This is the difference in differences between the two programs. Most columns in Figure 4 are below zero, indicating that LMT has a more favorable effect.

Table 1 compares the fractions of various characteristics of the participants in the AEI and LMT, and presents the overall frequencies. The last two columns show the mean wage earnings in 1996 and the mean *change* in wage earnings between 1999 and 1996. The numbers in these two columns are most naturally compared with the average for the whole sample which is given in the top row.

Comparing the participants in the respective programs, the sample in the AEI is on average younger, while those in LMT have higher educational levels. Both attributes seem to imply higher changes in wage earnings. The biggest educational group is, for both programs, those with a two year secondary school. For the AEI, the proportion is particularly high, 63.8 per cent. This is expected given that this is a major target group for the AEI.

In Figure 2, low mean wage earnings in 1996 implied a more positive change in wage earnings. This is generally the case also in Table 1. Exceptions include the groups with low levels of education and those classified as disabled in 1997, which is a very heterogeneous group (see Melkersson (1999)). Despite low initial levels, these groups have relatively low mean changes in wage earnings.

Table 1: Frequencies, fractions in programs and mean wage earnings statistics for various characteristics.

	N	% of AEI	% of LMT	$\overline{WE}_{96}$	Mean diff. $\Delta\overline{WE}$
Total	17,125	39.5	60.5	58,116	42,387
AEI	6,051	100.0	.0	62,703	33,389
AEI, compulsory	462	7.6	.0	53,090	24,770
LMT	11,074	.0	100.0	55,610	47,304
LMT, preparatory	3,216	.0	29.0	40,272	42,679
>1 unemp spell 97	14,587	70.1	93.4	56,716	43,086
Zero days unemp 1996	1,469	10.3	7.7	170,131	-30,364
366 days unemp 1996	9,121	51.5	54.2	58,116	42,387
Age 25-29	3,783	26.9	19.5	53,169	52,523
Age 30-34	3,851	24.8	21.2	54,501	48,770
Age 35-39	3,056	17.1	18.3	55,990	46,564
Age 40-44	2,510	13.4	15.4	60,535	40,508
Age 45-49	2,123	9.9	13.8	65,348	31,091
Age 50–55	1,802	8.0	11.9	67,944	16,310
Elementary school	756	3.1	5.1	43,109	38,275
9-year compulsory sch.	2,912	18.6	16.2	49,011	37,874
2-year secondary sch.	8,570	63.8	42.6	61,866	40,118
3-year secondary sch.	2,403	8.8	16.9	54,477	50,171
University ≤ 2 years	1,542	4.8	11.3	65,878	48,542
University >2 years	942	1.0	8.0	60,767	50,353
Stockholm county	2,222	12.5	13.2	64,061	48,147
Norrland	3,031	16.8	18.2	66,293	35,155
Educ. in municip., high	8,555	43.9	53.3	56,899	42,751
Educ. in municip., low	8,570	56.1	46.7	57,554	42,141
Born outside Sweden	3,865	14.5	27.0	33,171	54,510
Swedish citizens	15,061	93.9	84.7	62,290	39,208
Scandinavian, not Sw.	438	2.2	2.7	49,204	38,080
European citizen	995	1.9	7.9	20,534	87,285
Outside Europe	631	2.0	4.6	23,935	50,467
Male	8,115	35.7	53.8	59,247	48,536
Female	9,010	64.3	46.2	57,097	36,849
Disabled	2,515	11.4	16.5	32,566	31,730
Unemp. insurance	15,136	96.0	84.2	61,827	39,800
Cash allowance	278	3.2	.7	37,421	57,819

In contrast, the groups with a higher level of education and males display relatively high increases in wage earnings considering their high means in 1996.

It might seem intuitively appealing that there are larger increases with more education. However, given that education enhances labor market performance, the sample of highly educated should represent a more negative selection of its population than is the case for other subgroups.

The northern part of Sweden, Norrland, constitutes almost 60 per cent of the area of Sweden but contains only 13 per cent of the population. It is a region often referred to as a labor market with permanently higher than average unemployment rates. Stockholm county on the other hand, is its opposite in this respect.

"Education in municipality, high/low" are dummy variables based on the percentages with completed three year upper secondary school. "High" is one for the municipalities with the highest fractions, representing approximately half of the Swedish population. It equals one for 67 of the 288 municipalities, representing 54.4 per cent of the population and 50.0 per cent of the sample. "Low education", naturally, is indicated for the municipalities with the lowest fractions.

The dummy for being eligible for the UI in 1997 involves the individuals who have been members of a UI-fund for at least 12 months and worked part-time for no less then six months of this period. The benefit level is based on the worker's wage before unemployment. Eligibility for the UI is a prerequisite for receiving the special grant for education and training, which partly defines the participants in the AEI in this study. As can be seen, 96 per cent of the group fulfill this requirement.

Workers not eligible for the UI may receive a cash allowance (KAS) which is lower than UI and not related to earnings.

3. Econometric methods

The purpose of this section is to present the method of matching and the classical selection model and to discuss how the two methods are associated

with different sources of selection bias.

Theoretically, the evaluation literature assumes that individuals are in one of two states with potential outcomes Y_1 for treatment (participation in program) and Y_0 for no treatment. Hence, each individual has *a pair* of outcomes of which only one can be observed. Most evaluation studies seek the average treatment effect on the treated, $E[Y_1 - Y_0|D = 1]$ where D equals one for participation and zero for non-participation. The focus is in general on comparing the average outcomes of samples of participants with those of non-participants. The outcomes of the non-participants then serve as an approximation of what would have happened to the treated individuals had they not participated. The potential bias B can be written

$$B = E[Y_0|D = 1] - E[Y_0|D = 0]$$

The method of matching assumes that, conditional on some observable characteristics X, outcomes are independent of the assignment to treatment and as a consequence the bias $B(X)$ is pointwise zero. An important result is that, given such an assumption, it is consistent to assume that the bias is pointwise zero also when conditional on some function $P(X)$.[5] Formally, the assumption is

$$Y_0 \perp D|P(X) \tag{1}$$

where $P(X)$ is e.g. the probability of assignment, often called the propensity score, and $\perp$ denotes independence. The matching procedure is then reduced to matching on a scalar and the loss of a large number of observations is avoided. In fact, (1) is not necessary, the sufficient implication is

$$B\left[P(X)\right] = E\left[Y_0|P(X), D = 1\right] - E\left[Y_0|P(X), D = 0\right] = 0 \tag{2}$$

which is zero over small intervals of $P(X)$ rather than pointwise zero. Empirically, one adds a common support condition; $0 < P(X) < 1$ so that there is a

[5] A result first derived in Rosenbaum & Rubin (1983).

positive probability that both $D = 1$ and $D = 0$ can occur for every value of X.

The method of matching seeks to replicate a social experiment. Potential bias still exists, but characteristics are balanced between the groups *as if* assignment was random. After conditioning on observable characteristics, matching assumes that individuals choose randomly whether to participate or not.

To introduce the difference in differences estimator, suppose that treatment takes place at time k and that $t' < k < t$. Given that the treated and the non-treated groups have the same *change* in outcomes with no treatment, it holds that

$$E[Y_{0t} - Y_{0t'}|D = 1] = E[Y_{0t} - Y_{0t'}|D = 0]$$

and the difference in differences is given by

$$\left(\overline{Y}_{1t} - \overline{Y}_{0t'}\right)_1 - \left(\overline{Y}_{0t} - \overline{Y}_{0t'}\right)_0 \tag{3}$$

The footindex outside the parenthesis is one for treated and zero for non-treated. Any disparity between the two is seen as a treatment effect. With the use of the difference in differences as the outcome variable, the matching estimator requires

$$B_t\left[P(X)\right] - B_{t'}\left[P(X)\right] = 0$$

The bias in (2) no longer needs to be zero, but instead to be equal at t and at t'.

The method of matching, like OLS, conditions on observable characteristics. The advantage of matching is that it is non-parametric, i.e. it avoids the functional form restrictions in OLS. Matching also seeks to correct for two other sources of bias, characterized by Heckman et al. (1998), which originate from the observable X-variables. One emerges from values of X that do not overlap between participants and non-participants. It makes the evaluator compare non-comparable persons. The other is due to differences in the *distribution* of X (that do overlap) between participants and non-participants.

It makes the comparable persons weighted in an incomparable fashion.[6] The matching method corrects consistently for both these sources of bias.

However, a well known problem in evaluation studies is that individuals, consciously or not, act systematically on the basis of unobservable characteristics such as motivation or ability. An econometric selection model takes this into account by specifying two regressions. One equation models the outcome

$$Y_i = W_i\beta + D_i\alpha + e_i \tag{4}$$

and the other the assignment decision

$$D_i^* = Z_i\gamma + u_i \tag{5}$$

where

$$\begin{aligned} D_i &= 1 \quad \text{if} \quad D_i^* > 0 \\ D_i &= 0 \quad \text{if} \quad D_i^* \leq 0 \end{aligned}$$

The "unobservable" part of the respective regressions, i.e. the error terms, are assumed to be correlated and have a bivariate normal distribution. A widely used selection model is the Heckman two step method (see e.g. Greene (2000)). However, more efficient estimates can be obtained by estimating the two equations jointly with maximum likelihood (MLE). The MLE coefficient estimates do not include the extra variable based on the inverse Mill's ratio which is produced in the two-step method, but estimates are adjusted for the correlation in the error terms. The approach used in this paper is to run the two step method and use the coefficient associated with the inverse Mill's ratio as a test of whether the selection model is compatible with the data. MLE is then used to produce the estimated results.

Compared with matching, the selection model is more realistic as it allows

[6] At each value of the covariates, the weights are with matching proportional to $\Pr(D = 1)$. With OLS they are proportional to the variance, i.e. $\Pr(D = 1)[1 - \Pr(D = 1)]$ (see Angrist (1998).

for unobserved characteristics to influence the estimates. In the present setting, the "cost" of the added realism of the selection model is that it imposes a bivariate normal distribution of the error terms as well as requiring the relation between outcome and regressors to be additively separable with additive errors. In practice, it is also difficult to identify covariates that influence the assignment process but not the outcome.[7]

4. Estimations and results

This section presents the estimated results of the relative program effects. The two methods presented in the previous section are used. To start with, focus is on the method of matching. It is based on the wage earnings in 1996 and the propensity score, i.e. the probability of assignment to the AEI as estimated with a probit model. The selection model, which follows, uses a probit model where some variables are excluded from the simultaneously estimated outcome equation. These variables are discussed in more detail below. The section is concluded with estimates of various subsamples using the different methods.

The estimation of the propensity score, $P(X)$, is presented in Table A.1 in the Appendix. There is an exact matching of observations from the AEI and LMT for each one hundredth of $P(X)$ and each one of the 22 wage earnings intervals for 1996 used in section two (constituting 2,200 cells). Each cell potentially contains observations from both programs. If the number of observations in a cell is unequal, observations from the program which exceeds the other are randomly deleted to make the numbers identical. Thus, pairs of observations are constructed. Consequently, if only one of the programs is represented, all observations in that cell are deleted. The 17,125 observations are then reduced to 8,288. To assess how the matching balances the two groups, Table A.2 in the Appendix compares the observable characteristics of the original sample with the matched ones. Despite the very simple matching rule, it appears to be fairly successful.

[7] This is not strictly necessary for the model to be identified.

Table 2: Comparing outcomes between the AEI and LMT.

Sample matched on P(X) and wage earnings interval in 1996.

SEK wage earnings in 1996	N	Mean difference 1999-1996 AEI	Mean difference 1999-1996 LMT	Difference in mean differences AEI - LMT	Difference in mean differences $\lvert t\text{-value}\rvert$
Total sample	8,288	35,653	50,163	-14,511	7.46
0	2,442	63,360	79,553	-16,193	5.24
1-10,000	882	73,256	86,139	-12,883	2.51
10,001-20,000	402	66,774	85,328	-18,554	2.36
20,001-30,000	352	65,290	70,410	-5,120	.65
30,001-40,000	322	49,280	75,782	-26,502	2.92
40,001-50,000	284	47,284	52,811	-5,527	.61
50,001-60,000	298	33,230	45,922	-12,692	1.47
60,001-70,000	258	35,696	51,971	-16,275	1.68
70,001-80,000	260	29,297	43,252	-13,955	1.42
80,001-90,000	240	19,516	20,409	-893	.09
90,001-100,000	198	18,144	28,442	-10,298	.95
100,001-110,000	226	20,922	37,729	-16,807	1.67
110,001-120,000	166	-23,232	20,310	-43,541	3.87
120,001-130,000	210	-8,467	-890	-7,576	.71
130,001-140,000	154	3,619	3,641	-21	.00
140,001-150,000	182	-2,724	1,530	-4,254	.39
150,001-160,000	172	-20,046	-25,757	5,711	.47
160,001-170,000	116	-24,722	-22,407	-2,225	.15
170,001-180,000	150	-43,855	-38,853	-5,002	.34
180,001-190,000	126	-49,685	-39,937	-9,748	.66
190,001-200,000	74	-60,396	-42,540	-17,856	.86
$>$ 200,000	280	-53,244	-74,861	21,617	1.91

In Table 2, the mean differences in wage earnings between 1999 and 1996 of the matched sample are presented. The overall change in mean wage earnings is SEK 35,653 for participants in the AEI and SEK 50,163 for those in LMT. The disparity of SEK -14,511 is significantly different from zero. Using subsamples, the negative effect of the AEI relative to LMT is also indicated for three of the four lowest wage earnings levels in 1996.

Turning to the selection model, the probit estimation in this model is presented in Table 3. It is estimated simultaneously with the outcome equation. There are three variables in Table 3 that are not included in the outcome equation. These are the "municipal assignment frequency" (defined below), the dummy for "individuals with more than one unemployment spell in 1997" and quartiles of the municipal fractions of "highly educated". The latter is based on the percentages with completed three year upper secondary school in 288 municipalities.

The "Municipal assignment frequency" is defined for each municipality j as

$$\left(\frac{\sum_i AEI}{\sum_i (AEI + LMT)}\right)_j$$

i.e. the proportion of the individuals in the AEI who were assigned to either the AEI or LMT. The variable is created from 58,370 observations, including the individuals in this study. It is used as a way of trying to capture the local influence on program choice originating from officials at the unemployment offices. The significance of the influence of these officials has been argued in e.g. Harkman (2002), Melkersson, née Eriksson (1997) and Carling & Gustafson (1999). Its coefficient in Table 3 is positive and highly significant.

The coefficient of the dummy for having more than one spell of unemployment in 1997 is negative and highly significant. One interpretation is that individuals who often experience short periods of unemployment are used to short term agreements. This might be typical in sectors where the AEI is valued as less important. LMT could also be preferred by this group as it requires less time compared with the AEI. The variable works very well as an instrument as it is insignificant if included in the outcome equation.

Table 3: Binomial Probit model, MLE.

Dependent variable: participation in the AEI.

N=17,125

Variable	Coefficient	$\lvert t\text{-value}\rvert$
Constant	-2.295	21.37
Municipal assignment frequency	3.210	33.06
>1 unemp spell 97	-1.117	34.95
Q1 of highly educ. municip.	-.341	8.16
Q2 of highly educ. municip.	-.407	8.86
Q3 of highly educ. municip.	-.249	6.54
Stockholm county	.040	1.04
Norrland	-.143	4.62
Age 25-29	.275	5.99
Age 30-34	.206	4.41
Age 35-39	.104	2.16
Age 40-44	.087	1.80
Age 45-49	.020	.40
9 year compulsory school	.256	3.97
2 year secondary sch	.387	6.36
3 year secondary sch	-.156	2.37
Univ, ≤ 2 years	-.267	3.78
Univ, >2 years	-.898	9.97
Unemp insurance 97	1.008	17.08
Cash allowance 97	1.586	20.34
Disabled 97	-.258	7.94
Born outside Sweden	-.096	1.75
Years in Sweden * Born in f. c.	.002	.67
Scandinavian, not Swedish	-.129	1.75
European citizen, not Scand.	-.387	4.97
Outside Europe	-.122	1.63
Gender (male = 1)	-.377	11.26
Male, married	-.061	1.15
Male, $\geqslant 1$ child	.115	2.05
Female, married	-.060	1.84
Female, $\geqslant 1$ child	.190	5.63

NOTE: Reference groups: for the age groups, those above 50 years old; for the educational groups, Elementary level; for the gender and civil status dummies; unmarried females with no children under the age of 16 at home.

A high municipal education level has a positive effect on the probability to enroll in the AEI. This is perhaps contrary to expectations. A high proportion of upper secondary school diplomas should make the demand for adult education *smaller*. This was implied by the descriptives in Table 1 which showed a lower proportion of AEI participants in these municipalities. The result presented in Table 3 possibly reflects some sort of local "culture" which encourages theoretical studies.

Table 4 presents the results of the outcome equation of the selection model. The hypothesis of no selection is rejected, i.e. the coefficient in front of the inverse Mill's ratio is significant ($|t|$=4.89, not displayed), and the MLE produces a coefficient of the AEI dummy which is significantly positive (4,143).[8] An alternative specification is also presented in Table 4, referred to as MLE(2) in contrast to MLE(1). It includes the assignment frequency in both equations. The AEI coefficient now becomes negative but insignificant, -1,837 ($|t|$ =1.19). The use of both MLE(1) and MLE(2) serves the purpose of displaying the (in)stability of the results of the selection model. Finally, in the third column, the AEI coefficient in an OLS estimation is similar to that obtained with matching, -12,116 ($|t|$=8.62).

The specification of the MLE equations can, to some extent, be tested. If there are more variables excluded than necessary from the outcome equation, the model is said to be overidentified. A test for overidentification is a *joint* test of both the correctness of the specification of the outcome equation and of the validity of the variables excluded. Unfortunately, the latter can not be tested by itself. Using the test suggested by Davidson & MacKinnon (1993) the joint hypothesis that the instruments are valid and the outcome equation is correctly specified cannot be rejected for either specification (p-values .27 and .77).

When subsamples of different initial wage earnings are employed, as in

[8] Apart from those presented in Table 4, the explanatory variables also include 21 wage earnings intervals in 1996 with zero wage earners as the reference group. The coefficients were significant with values increasingly negative the higher the initial wage earnings. The complete results are available from the author on request.

Table 4: Sample selection model, MLE and OLS.

Dependent variable; wage earnings difference 1999 - 1996.						
N=17,125	MLE(1)		MLE(2)		OLS	
Variable	Coeff.	$\|t\|$	Coeff.	$\|t\|$	Coeff.	$\|t\|$
Constant	-3,161	.10	-21,203	.68	-31,061	1.01
AEI	4,143	2.71	-1,837	1.19	-12,116	8.62
Munic. assignment freq.			14,020	2.79	23,419	4.74
Regional growth	-899	1.76	-910	1.78	-972	1.96
Regional employment	810	2.41	795	2.37	812	2.44
Fraction 25-64 years old	-14,660	.52	7,004	.24	15,276	.52
Stockholm county	8,684	2.87	8,104	2.66	8,098	2.59
Norrland	131	.07	-225	.12	-766	.41
Age 25-29	29,421	11.95	29,901	12.19	30,743	12.65
Age 30-34	25,978	10.60	26,331	10.79	26,918	11.05
Age 35-39	23,759	9.39	23,917	9.50	24,164	9.59
Age 40-44	21,738	8.40	21,876	8.50	22,123	8.66
Age 45-49	13,533	5.33	13,614	5.38	13,685	5.37
Compulsory school	-8,552	2.42	-8,066	2.30	-7,280	2.19
2 year secondary sch	-693	.21	145	.04	1,462	.47
3 year secondary sch	5,328	1.53	5,255	1.52	4,782	1.43
Univ, ≤ 2 years	10,714	2.95	10,553	2.92	9,859	2.77
Univ, > 2 years	11,702	3.04	10,990	2.87	9,254	2.37
Unemp insurance 97	-1,352	.62	-353	.16	1,653	.78
Cash allowance 97	-2,251	.45	-9	.01	4,400	.90
Disabled 97	-26,511	13.80	-27,022	14.13	-27,948	15.89
Born in foreign country	-15,934	5.38	-15,971	5.42	-16,260	5.47
Yrs in Sw. * Born in f. c.	-76	.44	-73	.43	-71	.42
Scandin., not Swedish	6,338	1.48	6,101	1.43	5,703	1.39
European	24,342	7.48	23,846	7.36	23,149	7.00
Outside Europe	-10,466	2.74	-10,451	2.74	-10,585	2.86
Gender (male = 1)	16,715	9.03	16,035	8.70	14,861	8.19
Male, married	1,745	.71	1,680	.68	1,594	.59
Male, $\geqslant 1$ child	9,790	3.75	9,899	3.81	10,182	3.55
Female, married	11,731	6.00	11,553	5.94	11,325	6.46
Female, $\geqslant 1$ child	240	.12	558	.28	1,256	.69
ρ	-.001	.34	.001	.01		
σ	78,539	132.67	78,348	133.23		

Table 2, estimations using MLE(1) and MLE(2) produce mostly insignificant results. The 22 subsamples reject the hypothesis of no selection only four times each. Both specifications then show significantly positive coefficients for the intervals SEK 20-30,000 and SEK 110-120,000. Thus, the implications of the different specifications seem less contradictory when used in subsamples, but in conflict with the implications from the method of matching.

In Table 5, results are displayed from further use of subsamples applying different estimation methods. An asterisk by the t-values for MLE(1) and MLE(2) indicates that the hypothesis of no selection is rejected.

To exclude the disabled has almost been routine in Swedish evaluation studies. Presumably, researchers prefer to avoid using this group as it is very heterogeneous. However, excluding the disabled produce only minor changes in the estimated results compared with the original sample.

Using regional samples provides some interesting estimations as they put individuals in more similar labor markets. None of the regional samples rejected the hypothesis of no selection. When the matching method is used, the estimates are insignificant except for Norrland which shows a negative effect for the AEI.

When the foreign citizens in the sample are used, the selection model produces a beneficial effect of the AEI regardless of the MLE specification. The same implication is also valid for females, as well as stability between MLE specifications. Even if the negative results for males are not as evident, there seems to be a clear gender pattern. This is in line with Martin & Grubb (2001) who reported that formal classroom training appears to help women to a greater extent than men. The matching method though, shows negative results for both groups.

An important target group of the AEI are those with two year upper secondary school education in 1997. This is because participation in the AEI would allow them to complete a three year upper secondary school diploma. Using the selection model the results indicate a positive effect. Again, the effect displayed is negative when the method of matching is employed.

Another idea behind the AEI was that compulsory level schooling was to

Table 5: MLE selection model and matching estimations of the effect of the AEI for various samples.

Dependent variable; wage earnings difference 1999 - 1996.

Sample used	N	MLE(1)	$\|t\|$	MLE(2)	$\|t\|$	N	Match.	$\|t\|$
Total sample	17,125	4,143	2.71*	-1,837	1.19*	8,288	-14,511	7.46
No disabled	14,610	3,943	2.39*	-1,597	.96*	6,986	-14,760	6.87
Stockholm county	2,222	2,990	.63	-7,390	1.56	636	-1,254	.17
Gothenburg	846	-12,473	.91	-12,473	.91	124	1,101	.07
Malmo	673	20,591	2.54	20,591	2.54	206	-8,228	.67
Norrland	3,031	-10,166	2.88	-5,551	1.53	1,048	-14,781	2.86
Swedish citizens	15,061	1,113	.71*	-6,064	3.80	9,520	-9,435	5.06
Foreign citizens	2,064	31,185	4.61*	29,382	4.33*	390	-6,843	.81
Born in foreign c.	3,865	13,400	3.06*	10,442	2.39*	1,132	-12,462	2.52
Male	8,115	-1,284	2.44*	-12,678	4.34	3,336	-19,504	5.76
Female	9,010	7,999	4.65*	9,552	5.33*	4,194	-8,907	3.66
Compulsory school	2,912	-10,560	3.14	-27,414	7.91	1,116	-16,526	3.36
2-year sec. school	8,570	11,116	6.03*	5,644	3.02*	4,520	-13,214	5.05
AEI sec. - LMT voc.	13,447	2,777	1.73*	-956	.59*	6,866	-15,971	7.37
AEI comp. - LMT pr.	3,678	-3,537	.53	-14,669	2.20	638	-6,975	1.08

NOTE: An asterisk by the t-values indicates the hypothesis of no selection is rejected.

partly replace the preparatory courses in LMT. Using only these two groups gives insignificant results.

To summarize the findings, the results of the selection model are very unstable for the original sample. Using limited samples, females, foreign citizens, foreign born and those with a prior 2-year upper secondary school, have significant but opposite results depending on whether one uses matching or the selection model. In these samples, bearing in mind the exclusion of those who have continued with higher studies, selection on unobservable characteristics is probably a serious problem. The selection model consistently rejects the hypothesis of no selection. The method of matching only takes into account observable characteristics. OLS estimates (not displayed) produce results very similar to matching but in general with coefficients slightly less negative.

5. Conclusions

This paper evaluates the effects on gross wage earnings from the Adult Education Initiative (AEI) in Sweden. The AEI offers the unemployed, aged between 25 and 55, adult education at compulsory or upper secondary level. Labor Market Training (LMT), which mainly involves vocational training, serves as a reference group. One of the ideas with the AEI is to encourage individuals to go on to further studies, but those who are involved in full-time education some time during 1999 are not included. There are indications that this creates a negative selection of the individuals enrolled in the AEI.

Using register data, the outcome variable is the change in wage earnings between 1999 and 1996. A method of matching on the propensity score and wage earnings level in 1996 produces results that indicate a weaker effect of the AEI compared with LMT. The estimated results of the selection model are unstable for the full sample, but, contrary to matching, show positive effects when estimated for the subsamples of foreign citizens, females and individuals with a prior two year upper secondary school education. For the subsamples mentioned, the hypothesis of no selection on unobservables can not be rejected. However, the method of matching only takes into account selection

on observable characteristics.

Earlier evaluations of the AEI all use LMT as comparison group. Whether the AEI is better than no program at all thus remains an open question. However, this study, as well as earlier ones, indicates that the AEI is not a failure at least when compared with LMT. Rather, it seems to have worked successfully for one of the main target groups, those in need of one year full time schooling to complete their three year upper secondary schooling.

The follow up period of the AEI is still rather short, which means that we still know little about its effects in a longer perspective. Future studies of the AEI will be able to include those that went on to further studies.

Appendix

Table A.1: Estimation of the propensity score.

Dependent variable: participation in the AEI.

N=17,125

Variable	Coefficient	$\lvert t\text{-value}\rvert$
Constant	-5.383	9.60
Municipal assignment frequency	2.945	32.55
Regional growth	-.020	2.26
Regional employment	.012	2.01
Fraction 25-64 years old	2.492	4.61
Stockholm county	-.005	.09
Norrland	-.138	4.22
Age 25-29	.271	6.12
Age 30-34	.206	4.58
Age 35-39	.108	2.31
Age 40-44	.105	2.22
Age 45-49	.029	.62
9 year compulsory school	.245	3.96
2 year secondary sch	.387	6.64
3 year secondary sch	-.165	2.59
Univ, ≤ 2 years	-.252	3.70
Univ, > 2 years	-.891	10.03
Unemp insurance 97	.934	18.85
Cash allowance 97	1.556	17.52
Disabled 97	-.291	9.18
Born outside Sweden	-.106	1.93
Years in Sweden * Born in f. c.	.002	.66
Scandinavian, not Swedish	-.138	1.86
European citizen, not Scand.	-.371	5.25
Outside Europe	-.136	1.81
Gender (male = 1)	-.360	11.24
Male, married	-.076	1.46
Male, $\geqslant 1$ child	.107	1.95
Female, married	-.045	1.48
Female, $\geqslant 1$ child	.188	5.94

Table A.2: Fractions of program participants. Matched and unmatched sample.

	Unmatched		Matched	
	% of AEI	% of LMT	% of AEI	% of LMT
Age 25-29	26.9	19.5	24.5	24.9
Age 30-34	24.8	21.2	23.5	23.0
Age 35-39	17.1	18.3	17.4	17.5
Age 40-44	13.4	15.4	14.1	13.9
Age 45-49	9.9	13.8	11.2	11.5
Age 50-55	8.0	11.9	9.4	9.1
Elementary school	3.1	5.1	3.9	3.6
9-year compulsury sch.	18.6	16.2	19.2	18.6
2-year secondary sch.	63.8	42.6	57.6	58.7
3-year secondary sch.	8.8	16.9	11.4	11.4
University $\leq$ 2 years	4.8	11.3	6.5	5.9
University $>$ 2 years	1.0	8.0	1.4	1.8
Stockholm county	12.5	13.2	12.5	11.9
Norrland	16.8	18.2	18.4	18.6
Born outside Sweden	14.5	27.0	17.4	16.8
Swedish citizens	93.9	84.7	92.5	93.0
Scandinavian, not Sw.	2.2	2.7	2.5	2.3
European citizen	1.9	7.9	2.5	2.5
Outside Europe	2.0	4.6	2.4	2.3
Male	35.7	53.8	43.9	44.2
Female	64.3	46.2	56.1	55.8
Disabled 97	11.4	16.5	13.7	13.0
Unemp. insurance 97	96.0	84.2	96.0	96.5
Cash allowance	3.2	.7	1.7	1.2

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The Adult Education Initiative in Sweden

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Second Year Effects on Wage Earnings and the Influence on Branch Mobility

Anders Stenberg*
Department of Economics
Umeå University

Abstract

This paper presents a follow up study of earlier economic evaluations of the Adult Education Initiative (AEI) in Sweden. The AEI was foremost directed to those unemployed and involved comprehensive education at compulsory or upper secondary levels. The AEI is compared with the vocational part of Labor Market Training (LMT). Outcome variables are annual wage earnings in 1999 and in 2000 as well as mobility between branches of employment. The estimated effects on wage earnings of the AEI relative to LMT are negative for both the samples enrolled in 1997 and in 1998. Selection model estimates indicate positive selection on unobservables into the AEI, which is larger for those enrolled in 1998. For the sample enrolled in 1997, the earnings effects of the AEI is relatively more beneficial in 2000 than in 1999. Results on mobility indicate that AEI participants had a lower probability of changing branch of employment and a relatively stronger attachment to the public service sector.

Keywords: Selection, adult education, wage earnings, mobility

JEL classification: J68, J62

* Author's address: Department of Economics, Umeå University, SE-901 87 Umeå, Sweden. E-mail: anders.stenberg@econ.umu.se. The author wishes to thank Roger Axelsson, Niklas Hanes, Per Johansson, Olle Westerlund and Magnus Wikström as well as seminar participants at IFAU, Uppsala. Financial support from The Commission for Adult Education and Training is gratefully acknowledged.

1. Introduction

The Adult Education Initiative (AEI) in Sweden was in effect between 1997 and 2002. It offered foremost the unemployed the opportunity to a year of formal education at compulsory or upper secondary levels, with financial support equal to the level of their unemployment insurance (UI). The policy declarations of the AEI announced as main targets to improve the confidence and employment possibilities of those in weak positions in the labor market, and to encourage its participants to pursue further studies. More all-embracing aims included to reduce unemployment, to reduce differences in education, to increase mobility on the labor market and to promote economic growth.

A considerable share of the Swedish labor force has a two year upper secondary education as the highest educational attainment level. Normally, this does not fulfill the requirements of applying to higher education. The design of the AEI made the unemployed adults with a two year upper secondary diploma a natural target group. Employed individuals with short educations could also enroll on the condition that their employer agreed to fill their vacancy with a long term unemployed.

The purpose of this study is twofold. First, the aim is to evaluate the effects of the AEI on wage earnings for two different cohorts that enrolled in the AEI in 1997 and 1998. The vocational part of Labor Market Training (LMT) is used as reference group. The outcome variables are the annual wage earnings of 1999 and of 2000, which means that individuals still in education in those years are excluded. With this reservation, the question evaluated is whether gross wage earnings improved with the introduction of the AEI compared with a world where LMT was its substitute. The second purpose is to study data on branches of employment before and after program participation to detect how the AEI influenced mobility on the labor market compared with LMT. Estimates of mobility are also compared between the samples that enrolled in 1997 and 1998 respectively.

The program of the comparison group, LMT, has been the largest labor market program in Sweden since the 1950’s. Among those enrolled in the

late 1990's, about a third of the participants in LMT was in preparatory training. It included preparations for other programs and courses in job search. Here, LMT only refers to the vocational training part of LMT.

There were similarities between the AEI and LMT in their enrollment procedures and their targets. Both programs offer financial support during program which is equal to the UI, and policy declarations state they aim at assisting individuals with a weak position in the labor market. One may also argue that a comparison between the two is relevant as these were the two largest programs for the unemployed. Had the AEI not existed, many of the participants in the AEI would have been in LMT. The comparative study between the effects on wage earnings of the AEI and LMT is also one which contrasts a theoretical program with a traditional and more vocational program.

The AEI has been evaluated by Westerlund (2000) and Axelsson and Westerlund (2001) who used LMT, including those in preparatory training, as reference group. The results in Westerlund (2000) indicated beneficial effects of the AEI on both unemployment duration and incidence to unemployment. However, when explicit correction for selection effects was used in Axelsson and Westerlund (2001), no indications of significant effects were found. Stenberg (2002a and 2002b) used only the vocational training part of LMT. The first study indicated that the AEI reduced the probability of unemployment incidence following program, but that LMT had more beneficial effects on duration in unemployment. The second study used the 1999 wage earnings as outcome variable, and reported significantly negative effects of the AEI relative to LMT. It was also indicated that groups with a weak position in the labor market prior to program, tended to show lower effects on wage earnings from the AEI than the total sample. This was also the case for males.

There are a number of studies which have evaluated LMT in Sweden. The survey by Calmfors *et al.* (2002) mention twelve different articles. The results tend to indicate positive effects of LMT when data from the 1980's are used, but negative effects with data from the start of the 1990's. There are fewer studies of LMT with data from the late 1990's. Apart from the comparative studies of the AEI mentioned above, Carling and Richardson (2001) compared LMT with seven other labor market programs. They found

the effects of LMT to be in the lower half within the group of programs evaluated.

The weaker connection to the labor market of comprehensive schooling may make the effects on wage earnings show later for the AEI. As mentioned, Stenberg (2002a) found that duration in unemployment were longer for participants in the AEI relative to LMT. A first contribution of this paper is to evaluate the effects of the AEI on wage earnings in 2000 and to make comparisons of earnings outcomes in 1999 and 2000. Also, it allows for a comparison between estimates of the samples enrolled in 1997 and 1998, i.e. whether the effects of the AEI changed between the samples. Ordinary least squares and the classical selection model will be used as methods of estimating the relative program effects on wage earnings.

With increased formal education, the AEI aimed at increasing the flexibility and mobility on the labor market. Intuitively, mobility between branches of employment may be enhanced by the AEI compared with LMT. There is a demand for general education in most parts of the labor market. On the other hand, LMT, with programs more specifically connected to professions, may assist the individual in a more natural way to change between branches of employment. Studying the branch mobility of the participants in the two programs, may also assist to explain the estimated outcomes on wage earnings. A second contribution of this paper is to study the mobility across branches of employment before and after program participation. Binomial and multinomial logit models are used to discern whether there are any differences in the patterns of mobility of the participants in the AEI relative those in LMT.

The remainder of the paper is structured so that the data are analyzed in the following section. In section three, the mobility patterns between branches of employment are analyzed and estimated. Section four presents the estimation results of the relative effects on wage earnings, and discusses methodological issues. Section five concludes.

2. Data

The data used in this study comes from several official registers. Included are all individuals registered at the municipal adult education centers, *kom-*

vux, some time during the autumn semesters of 1997 or 1998. The stock of individuals registered in LMT on October 15th in 1997 or in 1998, has been collected from the event history database *Händel*, of the Swedish National Labor Market Board (AMS). Information on income has been obtained from the Swedish National Tax Board. Statistics Sweden (SCB) has merged this data with official registers to make it include information on age, educational level, gender, citizenship, place of residence, civil status, branch of employment and family situation.

In order to distinguish the participants in the AEI from individuals in regular adult education, information on the special grant for education and training (UBS) is used. The UBS was a part of the government funding of the AEI and it was equal to the UI. To be eligible to apply for the special grant the requirements were that the individual was aged 25-55, studied at elementary or upper secondary level and was entitled to the UI when the studies were initiated. If the individual was employed, his or her employer must had agreed to hire a long term unemployed person as a replacement. Also, individuals with a completed three year upper secondary level could be considered on several grounds.[1] Participants in the AEI are defined as those who were registered in adult education at some point during the autumn of 1997 or 1998, *and* received the special grant UBS during the same semester (55,965 observations in 1997 and 74,406 in 1998). Participants in the vocational training part of LMT in Händel included 21,867 observations in 1997 and 28,895 in 1998.

There are only poor records of what kind of education the individuals attended within the programs. The Report of the Government Commission (SOU 1998:51) summarized the enrollment among unemployed that had been offered UBS in the autumn of 1997. Some 15 per cent then studied at compulsory level and the remainder upper secondary level of mathematics, Swedish, social science, English and various other subjects. LMT spans over most sectors of the economy and the largest being technology and science, health care, administration, manufacturing and service (AMS, 2000). Sometimes LMT takes place directly within a company.

[1] For example, if the individual lacked grades or sufficient knowledge in one or more subjects, had a particularly long unemployment period, or had an "old" secondary school diploma. The criteria also included some short college educations as “incomplete upper secondary school”.

To create comparable samples of the AEI and LMT, data has been excluded if it does not fulfill a number of criteria. These criteria are given in the Appendix, with numbers excluded for each condition given. In many cases, observations are excluded as a consequence of more than one of the restrictions.

The sample is set so that age is between 25 and 55. Furthermore, as the introduction of the AEI was announced by a promotion campaign in May 1997, individuals enrolled in LMT prior to May 1997 were excluded as they probably never made a choice between programs. To be consistent, among those enrolled in 1998, individuals are excluded if they started LMT before May 1st 1998. Along a similar way of reasoning, participants in the AEI that were in adult education already in the spring term, which preceded their enrollment to the AEI, are excluded. Presumably, these individuals would have continued their studies even without the introduction of the AEI.

The participants in the AEI in 1997 were offered an extension of the special grant UBS, to include another year. This offer was not made to any of the coming years of the AEI and those who did continue are therefore excluded. To keep program times relatively similar, LMT participants that were still in program after July 1st the year after program start, or were in program more than 365 days, are excluded. The intention is that both sets of program participants will have a more similar amount of time to find work, before the start of the year when the outcome variable is measured.

As mentioned earlier, it was possible to enroll in the AEI from employment as long as the employer agreed to hire a long term unemployed as replacement. To exclude individuals that entered program from employment, those with zero days as registered job searchers during the year of program enrollment are left out.[2]

There are no reliable individual records of drop outs from either program so the interpretation of the concept "participation" should be *started program* rather than *completed program*. Based on survey data, AMS (1999) and AMS (2000) report the fractions which interrupted the vocational training

[2] There may still be individuals in the sample that enrolled to the AEI from employment. Some individuals may have been unemployed at the start of the year, then found employment, and from employment entered the AEI.

part of LMT in the second quarter of 1998 and 1999 respectively. It was approximately 18 per cent out of which one half left LMT as they had found work. The Report of the Government Commission (SOU 1999:39) stated that, of those who enrolled in the AEI in the autumn of 1997, ten per cent ended their studies before program completion.

A problem with evaluating the AEI two years after program completion is that many of its participants were still in education. Comparing wage earnings makes little sense if the participants have not yet re-entered the labor market. This is why observations are excluded if a participant was registered in any formal education, adult education, university or other, during the course of 1999 and 2000 respectively. Of those enrolled in the AEI in 1997, 51 per cent were in some form of education in 1999, 11 per cent in higher education (19 per cent and 2 per cent for LMT). Among those enrolled in 1998 the fractions were almost identical. There is no impression that this exclusion concerns a weaker or stronger group of individuals. The average wage earnings before program of the excluded groups are similar to the overall averages in the respective years.

With a year in the AEI, those with a prior two year upper secondary school could acquire a three year secondary school diploma. However, most of the individuals in this group that continued education, did so at komvux (around 70 per cent). It indicates that they did not complete a three year upper secondary school diploma within the year of the AEI.

The outcome variable is based on the yearly gross wage earnings. It includes gross salary and holiday compensation, but not taxable benefits or transfers such as the UI. Outlier values in excess of SEK 300,000 are excluded. Using the yearly wage earnings from both 1999 and 2000 as outcome variables allow for three different sets of estimates. The program participants enrolled in 1997 can be evaluated based on their wage earnings in 1999 and in 2000 respectively. The sample of enrolled in 1997 is set so that outcomes can be observed for all individuals in both these years. Observations remaining are then 20,124. The program participants enrolled in 1998 are evaluated on the basis of their wage earnings in 2000 and consists of 14,433 observations. The fractions of participants in the AEI are 56.7 and 54.8 per cent in the respective samples.

The selection process into (or out of) the programs may change the characteristics of the sample from one year to another. Thereby, the relative effect of the programs could change. Table 1 presents the average wage earnings of the samples (thousands of SEK) the year before and the year(s) after program.[3] The overall increase in wage earnings after program is presumably influenced by the increase in the employment-population-ratio during the period under study. The yearly average in Sweden was 71.6 per cent in 1996 and 70.7 per cent in 1997. It rose to 72.9 per cent in 1999 and to 74.2 per cent in 2000 (source: Labor Force Surveys, SCB).

Table 1: Average wage earnings levels, in thousands of SEK, before and after program.

	1996-1999			**1996-2000**			**1997-2000**		
	Total	AEI	LMT	Total	AEI	LMT	Total	AEI	LMT
Before	58.5	60.9	55.5	58.5	60.9	55.5	73.6	70.4	77.5
After	96.8	91.0	104.4	117.9	113.0	124.4	111.8	102.8	122.8
% change	65.5	49.4	88.1	101.5	85.6	124.1	51.9	46.0	58.5
N	20,124	11,405	8,719	20,124	11,405	8,719	14,433	7,913	6,520

If one focuses on the AEI, those who engaged in the program in 1998 had higher average wage earnings the year before program than those enrolled in 1997. This was also found in Axelsson and Westerlund (2000). However, if one compares the AEI with LMT, those who enrolled in the AEI in 1997 had higher wage earnings before program and lower wage earnings after program. In the sample enrolled in 1998 LMT participants had slightly higher average wage earnings both before and after program.

In Table 2 the frequencies and fractions of various characteristics are displayed for the different samples. Detailed definitions of the variables are given in the Appendix. As Table 2 shows, there are no great changes in characteristics between the 1997 and the 1998 enrollees. The major differ-

[3] Note that in Table 1, and henceforth, the sample enrolled in 1997 is also referred to as both 1996 – 1999 and 1996 – 2000, based on the years of measurement before and after program. Similarly, the sample enrolled in 1998 is also referred to as 1997 – 2000.

ences between the programs are that the participants in the AEI are a little younger, include more females and have a slightly shorter education.

Table 2 also compares the fractions of participants in the AEI and LMT with respect to branches of employment prior to program. Given the differences in the contents of the AEI and LMT, there are surprising similarities between the programs when it comes to the pre-program employment by branch. The public service sector is the main difference. In the 1997 sample, the fraction in the AEI was 34.2 per cent compared with 24.8 in LMT (34.6 and 25.3 in the 1998 sample).

There are two dummy variables indicating regional residency in Table 2. The inland of Norrland is a sparsely populated area made up of the municipalities in the north of Sweden with no coast line. This region has a permanently higher than average unemployment rate. The Stockholm county is on the other hand a region where one may expect the diversity of branches and the overall employment level to be higher than in any other region in Sweden.

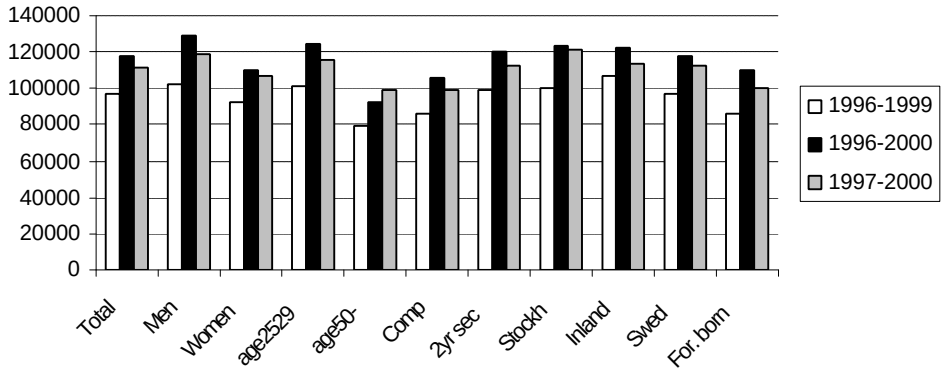
A “high percentage of upper three year secondary school diplomas” is a municipal dummy variable. It has been given the value one for the municipalities with fractions of the population with at least three year upper secondary education exceeding the median fraction of the whole population. It equals one for 67 out of the 288 municipalities, representing 54.4 per cent of the population (municipalities with high populations tend to have high fractions). In both samples, it takes the value one for roughly 48 per cent.

Table 2: The fractions of various characteristics among participants in the AEI and LMT.

	Enrolled 1997			Enrolled 1998		
	N	% of AEI	% of LMT	N	% of AEI	% of LMT
Total	20,124	56.7	43.3	14,433	54.8	45.2
Zero wage earnings 1996/97	5,873	26.5	32.7	3,738	25.3	26.6
>150,000 W.E. 1996/97	2,502	12.2	12.8	2,799	17.3	21.9
Male	8,601	33.8	54.4	5,657	31.0	49.7
- child(ren) at home	2,161	8.4	13.9	1,322	7.1	11.7
- married	2,750	10.0	18.5	1,711	8.9	15.5
Female	11,523	66.2	45.6	8,776	69.0	50.8
- child(ren) at home	6,880	41.4	24.7	5,333	44.5	27.8
- married	4,536	25.6	18.6	3,297	25.2	19.9
Age 25-29	5,024	27.4	21.8	3,693	27.8	22.9
Age 30-34	4,703	24.7	21.6	3,448	24.8	22.8
Age 35-39	3,534	17.3	17.9	2,577	18.4	17.2
Age 40-44	2,787	13.2	14.7	1,871	12.4	13.7
Age 45-49	2,232	9.8	12.7	1,477	9.1	11.6
Age 50-55	1,844	7.7	11.1	1,367	7.5	11.9
Elementary school	697	3.3	3.7	513	3.2	4.0
Compulsory school	3,478	19.2	14.7	2,628	20.5	15.4
2-year secondary school	10,842	61.8	43.5	7,637	63.1	40.5
3-year secondary school	2,505	9.0	16.9	1,869	8.8	18.0
< 3 years of university	1,739	5.2	13.1	1,196	3.4	14.3
≥ 3 years of university	863	1.4	8.0	590	1.0	7.9
Manufacturing	1,925	9.1	10.2	1,467	8.6	12.0
Construction	898	4.0	5.1	452	2.7	3.7
Retail	2,984	15.0	14.6	2,593	17.3	18.7
Private service	1,385	6.6	7.2	1,170	7.2	9.2
Public service	6,063	34.2	24.8	4,388	34.6	25.3
No attachment	6,869	31.1	38.1	4,363	29.6	31.1
Stockholm county	2,750	13.2	14.2	2,410	16.3	17.2
Inland of Norrland	1,434	7.3	7.0	946	7.0	6.1
High % sec. school	9,736	44.9	53.0	6,883	44.8	51.2
Swedish citizen	18,359	93.7	87.9	13,207	92.9	89.8
Born in a foreign country	3,415	14.2	20.5	2,287	14.1	17.9
Disabled	2,471	11.3	13.5	1,340	8.9	9.7

To conclude this descriptive part of the paper, Figure 1 shows the average wage earnings across some of the subgroups. Every subgroup has three columns, defined in the same way as in Table 1. As can be seen, wage earnings was on average higher for men, young age groups and Stockholm residents. The reverse is shown for individuals above the age of 50, those with a short education and those who are foreign born.

Figure 1: Mean wage earnings after program for various subgroups.



3. Mobility between branches of employment

This section will look at movements between the branches of employment that were mentioned in the previous section. The analysis is based on a rather crude division of the employed into five different branches, including the public service sector.

In Table 3, the frequencies in each branch of employment, before and after program, are given. Those who had no attachment are labeled “no branch”. As employment generally increased, there is a decrease in the fractions of “no branch” after program and an increase of the fractions on all branches. The largest changes occur in private service which in the 1997 sample increased its share by about 70 per cent. There is also a large increase in the fraction of manufacturing, in the region of 50 per cent.

Table 3: Distribution across branches of employment before and after program.

Sample	**1996 – 1999**		**1996 – 2000**		**1997 – 2000**	
	Before	After	Before	After	Before	After
No branch	34.1	21.7	34.1	18.2	30.2	17.9
Manufacturing	9.6	13.7	9.6	15.3	10.2	13.0
Construction	4.5	4.3	4.5	4.5	3.1	4.2
Retail	14.8	17.5	14.8	18.4	18.0	18.8
Private service	6.9	11.8	6.9	12.3	8.1	12.7
Public service	30.1	31.0	30.1	31.3	30.4	33.4

As it is difficult to get a picture of the flows between branches, one may start by looking at how large the fractions were that *returned* to the same branch as before the start of the program. Table 4 shows these fractions (those in "no branch" are excluded). The analysis in the following yields similar results for the sample enrolled in 1997 whether one looks at 1999 or 2000. For simplicity of exposition, the presentation in this section concentrates on the mobility between 1996 and 1999 for the 1997 enrollees.

The public sector had by far the highest percentage of individuals that returned after program. However, it is notable that the percentages which returned, were in most cases low. Considering the stable pattern between branches in Table 3, the flows between different branches of employment were substantial, with mobility rates in excess of 50 per cent. One must recall though, that all individuals in these samples had at least one unemployment spell during the year of enrollment to program. This may well be an explanation to the amount of mobility between the branches of employment.

Comparing the programs, the AEI participants tended to return to the public service sector to a greater extent than LMT participants. This may be an indication that the public service sector values theoretical education relatively highly. As its opposite, one would perhaps consider manufacturing, to which LMT had a relatively higher fraction of individuals that returned. Retail is the sector where the participants of the two programs seem to have behaved fairly alike.

Table 4: Percentage of individuals that return to a particular branch of employment.

	1996 – 1999		**1997 – 2000**	
	AEI	LMT	AEI	LMT
Manufacturing	41.0	48.6	40.0	50.5
Construction	41.5	46.3	48.7	47.4
Retail	50.2	47.8	50.9	48.8
Private service	35.6	38.5	32.7	37.9
Public service	73.3	59.1	76.1	66.9

Performing Logit estimations of the probability of changing branches, with the observations of the dependent variable Y coded $Y = 1$ if an individual changed branches of employment and $Y = 0$ otherwise, the results reveal that the AEI participants had a relatively lower probability of mobility. This holds in both samples. Table 5 shows the full results.[4]

In Table 5, the variable "branch density" indicates the number of branches that are represented in the municipality of residence. It follows the Swedish industrial classification system (SNI92) at the five digit level. The estimated coefficient on this variable have the expected sign and is significant for the 1997 sample. Among other explanatory variables, the parameter estimates on the regional dummies of the inland of Norrland and the Stockholm county have the expected signs (negative and positive respectively). Coefficient values for younger age groups and males indicate a higher probability of mobility. The estimated parameters on wage earnings before program indicate a higher probability of returning to the same branch.

[4] Reference groups are: for the Stockholm county and the inland of Norrland, the rest of Sweden; for the age groups, those above 50 years of age; for the educational groups, Elementary level; for the foreign citizens, Swedish citizens; for the gender and civil status dummies; unmarried females with no children under the age of 16 at home; for wage earnings, wage earnings SEK 0 – 50,000.

Table 5: Logit estimates of mobility between branches of employment.

Dependent variable: Y=1 if the individual changed branches of employment, Y=0 otherwise.

Sample	**1996 – 1999** N = 11,222 Coefficient	**1997 – 2000** N = 8,872 Coefficient
Constant	-1.125	-.976
AEI	-.210***	-.289***
Branch density	.004***	.001
Regional employment	.013	.007
Regional growth	-.003	.027
Inland of Norrland	-.040	-.203**
Stockholm county	.237***	.221**
Age 25-29	.148*	.180*
Age 30-34	.206**	.166*
Age 35-39	.024	.074
Age 40-44	-.074	-.053
Age 45-49	-.038	-.156
Compulsory school	.100	.239
2 year upper sec. school	-.015	.218
3 year upper sec. school	.034	.310**
University ≤ 3 years	.045	.137
University > 3 years	-.286*	-.051
Working disability	.060	.253***
Born in foreign country	-.095	-.283**
- yrs since last immigration	-.010	.010
Citizenship Scandinavian	.003	-.087
Citizenship European	.032	.455**
Citizenship outside Europe	.202	.115
Male	.431***	.597***
- male married	.181*	-.051
- male with child(ren)	-.198*	.053
- female married	-.001	.075
- female with child(ren)	-.122**	-.060
Wage earnings before prg	$-3.3 \cdot 10^{-6}$***	$-3.3 \cdot 10^{-6}$***
- W.E. mean dev. squared	$5.2 \cdot 10^{-6}$**	$1.1 \cdot 10^{-5}$***
- W.E. 50,001–150,000	-.157*	-.102
- W.E. 150,001-300,000	.166	.096

Note: *** significant at the 1 % level.
** significant at the 5 % level.
* significant at the 10 % level.

A more systematic analysis of mobility between branches of employment is provided by estimations of multinomial logit models (see e.g. Greene 2000, ch. 21). Conditioning on the branch of employment before program participation, observations of the dependent variable in the multinomial logit model represent four possible outcomes. These correspond to the four branches of employment *after* program, equal to those given in Table 4, but with manufacturing and construction merged.

The model handles four unordered outcomes $j = 0,1,2,3$ for each individual i. The multinomial logit model can be expressed in terms of the probabilities of outcome j:

$$\Pr[Y = j] = \frac{\exp(x_i b_j)}{\sum_{k=0}^{3} \exp(x_i b_k)}$$

where x_i contains explanatory variables and ß is a vector of parameters. Estimations require that the model is normalized by assuming the parameters ß = 0 for one of the outcomes. Defining $j = 0$ as the alternative of staying in the same branch of employment and assuming $ß_0 = 0$, there are three sets of parameters to be estimated, one for each remaining outcome $j = 1,2,3$. The outcome of staying in the same branch is the alternative of reference. Facilitating the interpretation of the parameters, the model can be written as a linear model in terms of the log – odds ratios:

$$\ln \frac{\Pr[Y = j]}{\Pr[Y = 0]} = x_i b_j$$

The multinomial logit parameter estimates pertaining to the variable indicating participation in the AEI, are presented in Table 6. To interpret the coefficient estimates one may use the public service sector as a point of departure. The estimations results indicate that given that an individual was in the public service sector in the year prior to program, the probability of moving to any other branch of employment is lower among the AEI participants relative to LMT. This holds in both samples.

Table 6: Multinomial logit estimates of the probability of mobility conditioning on a specific branch of employment before program. Estimated parameters on the variable AEI.

	Branch of employment after program							
	1996 – 1999				**1997 – 2000**			
	1	2	3	4	1	2	3	4
Before program:								
1. Manuf. + constr.		.470*	.526*	.472*		.278	-.358	.258
2. Retail	-.124		.044	.039	-.412*		-.197	-.103
3. Private service	-.029	.129		-.133	-.176	-.122		.216
4. Public service	-.656*	-.363*	-.910*		-.420*	-.250*	-.590*	

Note: * significant at the 5 % level.

If one instead conditions that participants were in manufacturing or construction the year before program, those enrolled in the AEI have a relatively higher probability of mobility to retail, private service or the public service sector. For the 1998 sample, these estimates are not significantly different from zero.

The results of the multinomial model indicate that the lower probability of mobility for the AEI, indicated in Table 5, is largely a consequence of the behaviour of those employed in the public sector.[5]

4. Effects on wage earnings

This section presents the estimation results of the effects of the AEI on annual wage earnings relative to LMT. To start with, the results from using ordinary least squares (OLS) estimations are displayed. These make corrections for observable differences in the characteristics of the program participants. Then follows a brief presentation of the classical selection model which, under certain assumptions, also considers systematic differences in unobservable characteristics between the program participants.

[5] The complete set of the multinomial logit model estimates is available from the author on request.

4.1 Ordinary least squares estimations

Theoretically, when individuals choose to enroll in one of two labor market programs, their decisions are based on their expected utility of participating in the respective programs. This causes the groups of enrollees to differ systematically with respect to various characteristics which in turn may influence the outcomes.

Using OLS the effect on wage earnings of the AEI relative to LMT is estimated conditional on the variables that are included in the regression. The complete OLS results of the total samples are presented in Table A.1 in the Appendix. The parameter values associated with the AEI are significantly negative in all three equations. In Table 7, the estimated coefficients on the indicator of participation in the AEI are presented using various subsamples. All the estimated coefficients in Table 7 are significantly different from zero at the five per cent level.

If one compares the estimated results of the 1997 sample on their wage earnings in 1999 and 2000, one would perhaps expect them to be more beneficial for the AEI in 2000. As the AEI does not have a connection to a profession or a specific working site, it could be that it is more difficult for the AEI participants to find work in the short run. This reasoning is in line with Stenberg (2002a) who found the AEI participants to have longer duration in unemployment than the vocational part of LMT. In Table 7, the coefficients of the estimates 1996 – 2000 are closer to zero compared with 1996 – 1999. This holds for all subsamples represented and indicates a lag in the effects on wage earnings of the AEI relative to LMT.

Hypothetically, there are several potential reasons for the coefficient values to differ between the estimations 1996 – 1999 and 1997 – 2000. First, one may suspect that a newly introduced program such as the AEI would attract the unemployed with the highest expected returns in its first year. Other things being equal, this implies that the earnings effect should be lower for 1998 participants. The effects could also be sensitive to changes in the composition of participants. According to Table 1, wage earnings before program changed somewhat between 1997 and 1998. Among other possible reasons for the estimation results to differ are structural changes in the labor market, economic fluctuations and quality changes in how the programs

were administered. If one compares the coefficient values for the total sample, the subsamples of males, females and several others, there are only minor differences in the estimation results 1996 – 1999 and 1997 – 2000.

Table 7: OLS estimates of post program wage earnings effects of the AEI.

Dependent variable: Wage earnings.

Sample used	**1996 – 1999** N		**1996 – 2000** N		**1997 – 2000** N	
Total sample	20,124	-15,809	20,124	-11,396	14,433	-16,866
Males	8,601	-18,569	8,601	-12,369	5,657	-19,055
Females	11,523	-12,505	11,523	-9,550	8,776	-14,642
Munic. with high % secondary school	9,736	-17,543	9,736	-12,646	6,883	-19,243
- low % sec. school	10,388	-14,279	10,388	-10,297	7,550	-14,193
Inland of Norrland	1,434	-19,537	1,434	-7,314	954	-8,938
Stockholm county	2,749	-9,905	2,749	-6,357	2,371	-7,779
No secondary school	4,175	-18,181	4,175	-14,894	3,141	-12,020
2-year secondary school	10,842	-14,103	10,842	-9,481	7,637	-15,660
More than secondary sch.	2,602	-15,784	2,602	-12,022	1,786	-25,215
Foreign citizens	1,765	-18,063	1,765	-13,337	1,226	-31,319
Foreign born	3,415	-21,722	3,415	-18,725	2,287	-28,003
Disabled	2,471	-8,120	2,471	-5,969	1,340	-8,432
Zero wage earnings	5,873	-20,706	5,873	-16,676	3,738	-20,998
Wage earnings >150,000	2,498	-13,399	2,498	-7,478	2,798	-18,694
Manufacturing	1,925	-16,626	1,925	-7,121	1,467	-24,316
Retail	2,983	-12,734	2,983	-6,117	2,593	-20,209
Public service	6,063	-10,439	6,063	-6,549	4,388	-6,823

Note: All estimates are significant at the 5 % level.

In Table 7, the estimates with respect to the subsamples of males and females give the impression of more beneficial effects of the AEI for females.[6] To explain this gender pattern, there is a potentially important ob-

[6] Coefficient values in Table 7 are influenced by the standard deviations of the respective sam-

servation outside the economics literature, in Axelsson (1996). She interviewed ten women and four men from groups with the lowest salaries. She met these individuals in their homes, on several occasions, during a period of 18 months. They generally stated that their short education was the most important explanation to their relative poverty. However, women often explained it with the fact that they had become young mothers. Men instead tended to say they were "too stupid". This could perhaps reveal a difference in self-esteem between gender at the lower end of the social scale. In fact, the reason there were only four men in her study was that it was so difficult to find men that would agree to be interviewed. If her observations were true in general, the men in our samples would have less confidence to confront theoretical studies and be more reluctant to participate in the AEI. This is also indicated in the estimated effects of participation in the AEI in Table A.2 in the Appendix. The implication here is also that males in the AEI relative to females, achieve less beneficial effects, as compared with vocational training.

The samples are also divided based on the municipal populations educational levels, i.e. the fractions of the population with at least a three year upper secondary education. If one looks at average wage earnings in these groups of municipalities (not displayed), they are very similar both before and after the respective programs. In municipalities with fractions below the median of the population, the marginal return of formal education may be higher because of a low supply of well educated. On the other hand, in municipalities with high fractions, there may be spill-over effects on the local labor market which increase the returns of formal education relative to vocational training. The results in Table 7 point towards more advantageous effects of the AEI relative to LMT in municipalities with a "low education".

As mentioned in section two, the county of Stockholm and the inland of Norrland represent two labor markets with opposite characteristics. In Stenberg (2002b) it was found that the effects of a general labor market measure such as the AEI, is more dependent on a diversified labor market. This is also indicated in the 1996 – 1999 estimates. However, the differences in coefficient values are small between the other columns. The hypothesis that

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ples. If one compares the ratios between the coefficient values and their standard deviations in the outcome variable, the patterns commented in this section still hold.

the outcome of the AEI was more dependent on a diversified labor market no longer finds support.

Participants with a two year secondary school diploma was a major target group of the AEI. In contrast to others, this group could improve their educational level with an established degree. As was seen in section two, they constituted more than 60 per cent of the participants in the AEI. For this group, the coefficient values of the 1997 sample are only slightly higher than for the total sample. As was mentioned in section two, there are indications that many of those with an upper two year secondary school diploma did not complete the third year while enrolled in the AEI.

One of the explicit aims of the AEI was to assist groups with a weak position in the labor market. Disadvantaged groups are represented by those with a reported working disability, foreign born, foreign citizens and those with zero wage earnings the year before program.

The parameter estimates for those with a reported working disability are closer to zero than the estimates of the full samples. Negative coefficients are obtained for the samples of foreign born and foreign citizens which, in absolute values, exceed those of the full samples. These two groups may be special as they might have cultural barriers to overcome. On this evidence, vocational training then seems as a more efficient tool than theoretical schooling. Participants with zero wage earnings the year before program show weaker effects of the AEI compared with most other groups. Apart from those with a working disability, the impression is that, on average, participants with a weak position prior to program had lower effects on wage earnings from the AEI relative to LMT than other subsamples.

Finally in Table 7, there are results from samples of the different branches of employment the year before program. Compared with manufacturing and retail, those attached to the public service sector have earnings effects which are more beneficial for the AEI. This is what one would expect. Arguably, LMT has a more natural connection to manufacturing than the AEI. The results could imply that the public service sector values theoretical education relatively higher than other branches do. However, the estimation results for 1996 – 2000 are fairly similar across different branches.

Both for manufacturing and retail, the estimates 1996 – 1999 indicate considerably more beneficial effects of the AEI compared with 1997 – 2000. This is interesting to note in view of the results on mobility in Table 6. The AEI overall had a lower probability of mobility, but when conditioning on employment in manufacturing and construction before program, the participants in the AEI had a *higher* probability of mobility to all other sectors in the 1996 – 1999 sample. For estimates 1997 – 2000 this difference in mobility was not significantly different from zero. A relatively higher mobility among the participants in the AEI in the 1997 sample may be a partial explanation to the relatively beneficial estimate obtained.

4.2 The selection model

Evaluation studies of labor market programs and formal education are widely believed to be influenced by selection on unobservable characteristics. Researchers assume that individuals with certain abilities tend to be overrepresented in certain programs. If the unobservable characteristics also affect the outcome, OLS estimates will be biased. A typical unobservable attribute would be motivation. If one uses "non-participants" as reference group to education one would normally assume those who enroll to be more motivated. However, when comparing two labor market programs, as in this study, it is not obvious in which direction the selection on unobservables would bias the OLS estimates.

The classical selection model has an intuitively attractive set up which, under certain assumptions presented below, yield unbiased estimates even if the individuals choose program on the basis of their unobservable characteristics. The model specifies two equations, one for the decision in which program to participate and one for the outcome. Let D_i be a dummy variable which takes the values $D_i = 1$ for the AEI and $D_i = 0$ for LMT. The participation equation can then be written

$$D^*_i = z_i g + u_i$$

where

$D_i = 1$ if $D^*_i > 1$
$D_i = 0$ if $D^*_i = 1$

The outcome equation is given by

$y_i = x_i ß + aD_i + e_i$

The vectors z_i and x_i contain observable explanatory variables (to be defined), a indicates the effect of participating in the AEI while $ß$ and g are vectors of parameters to be estimated. The error terms in the respective regressions are assumed to be correlated with correlation coefficient ρ and have a bivariate normal distribution. Based on the assumption of bivariate normality, the first step estimation is used to create an extra variable, the inverse Mill's ratio. It is inserted in the outcome regression and takes account of the unobserved heterogeneity in the samples of the participants of the two programs.[7] This variable is often referred to as "Heckman's lambda" (? henceforth). The sign of the coefficient on ? indicates the sign of ρ, and thereby, the direction of how the selection on unobservables has biased the OLS estimates.

Theoretically, to identify the two step estimations, it is not necessary to use instrumental variables (IV's), i.e. variables that are excluded from the outcome equation. However, quite implausible coefficient values indicate that the model is not properly identified without the exclusion of variables from the outcome equation. The criteria of valid IV's are (i) that they should have a strong explanatory power in the participation equation, and (ii) they should not affect the structural form of the outcome equation. The strategy to find IV's here follows Stenberg (2002b), who excluded the municipal fractions enrolled in komvux and the educational level dummy variables from the outcome regression. In the OLS estimates (see Table A.1), the educational level dummies are rarely significantly different from zero.

In Table 8, the selection model estimates of the effects of participation in the AEI, are given for different subsamples. The complete selection model results for the total samples are presented in the Appendix in Table A.2 (the participation equation) and Table A.3 (the outcome equation).

A simple two step procedure is performed in order to test whether the IV's are valid or not. First, the participation in the AEI is estimated with a Probit

[7] Formally, the inverse Mill's ratio created in the first step is the estimated value of $f(z_i g)/?(-z_i g)$, where f (·) and ? (·) denote the pdf and cdf of the normal distribution, respectively.

model to generate fitted values of the probability to enroll in the AEI. These fitted values replace the AEI dummy in two different OLS regressions on wage earnings. The first uses all the explanatory variables in Table A.1 as well as the municipal fractions enrolled in komvux, i.e. it includes the IV's. The second regression excludes the IV's but is otherwise identical. A likelihood-ratio test indicates whether the excluded variables had any explanatory power in the regression on the outcome variables. A *p*-value above .05 indicates that the null hypothesis of valid instruments is not rejected.

In Table 8, the *p*-values of the full samples reject the null hypothesis of valid instruments. Fortunately, in order to get an idea of the direction of the selection on unobservables, for the majority of the samples the specification of the selection model is not rejected. The indication is in general that there is a positive selection into the AEI, implying that OLS overestimates the effects of the AEI relative to LMT. In fact, all the estimates in Table 8 where the specification is not rejected, and where the coefficient on ? is significantly different from zero, indicate a positive selection on unobservable variables into the AEI.

Note that for samples based on the educational level there is a shortage of strong IV's and it becomes difficult to get reliable estimates. The same reservation may also be valid for samples below some 2,000 observations which have a tendency to show large variations in the coefficient estimates.

Table 8: Selection model estimates of post program wage earnings effects of the AEI.

Dependent variable: Wage earnings.

	1996 – 1999			**1996 – 2000**			**1997 – 2000**		
	N		*p*	N		*p*	N		*p*
Total sample	20,124	-26,430*	.003	20,124	-23,971*	.000	14,433	-36,596*	.034
Males	8,601	-36,777*	.411	8,601	-32,532*	.031	5,657	-42,558*	.339
Females	11,523	-24,186*	.002	11,523	-23,517*	.011	8,776	-34,211*	.165
Munic. with high % secondary school	9,736	-21,240*	.287	9,736	-18,977*	.010	6,883	-40,733*	.025
- low % sec. school	10,388	-30,878*	.004	10,388	-24,034*	.004	7,550	-28,824*	.686
Inland of Norrland	1,434	-52,307*	.129	1,434	-32,212*	.601	954	-11,967	.387
Stockholm county	2,749	-13,120	.201	2,749	-3,920	.093	2,371	-27,148*	.189
2+3-yr secondary sch.	13,346	-13,204	.071	13,346	-2,460	.003	9,506	-26,288*	.282
Foreign born	3,415	-34,814*	.020	3,415	-36,431*	.026	2,287	-73,852*	.587
Disabled	2,471	-24,759	.535	2,471	-14,118	.579	1,340	-40,319	.857
Zero wage earnings	5,873	-47,896*	.298	5,873	-40,407*	.070	3,738	-63,387*	.184
W.E. >150,000	2,498	-4,375	.841	2,498	-1,165	.269	2,798	-660	.496
Manufacturing	1,925	-44,963*	.554	1,925	-30,930	.648	1,467	-66,202*	.567
Retail	2,983	-35,454*	.571	2,983	-33,300*	.103	2,593	-41,663*	.718
Public service	6,063	-13,910*	.352	6,063	-14,957*	.440	4,388	-14,666*	.072

Note: * significant at the 5 % level.

The results displayed in Table 8 are in general not in contradiction with the relations that were commented regarding Table 7, despite the larger variation in coefficient values. However, there are two exceptions. The implication that those with a reported working disability had a relatively favorable outcome of the AEI relative to the total sample is moderated considerably in Table 8. Another difference compared with Table 7 is that the public service sector has estimates which are relatively higher as compared with manufacturing and retail also in 2000 for those enrolled in 1997.

5. Concluding discussion

This paper has evaluated the effects of the Adult Education Initiative (AEI) relative to the vocational part of Labor Market Training (LMT), with wage earnings from 1999 and 2000 as outcome variables. Using data on branches of employment, the mobility among the participants in the respective programs have also been studied.

Data on attachment to branches of employment shows that the participants in the AEI more frequently were employed in the public service sector. Among those who were employed in the year before and in the year after program, logit estimations yield results which indicate that participants in the AEI had a lower probability of mobility relative to LMT. Performing multinomial logit model estimations, conditioning on the public service sector as the branch of employment before program, the results also indicate a lower probability of movement among the AEI participants. However, conditioning on those in manufacturing and construction (merged), the estimates imply that the AEI participants have a higher probability of changing between branches of employment. This result changes for the 1998 sample to be insignificantly different from zero. Hence, the generally lower mobility among participants in the AEI seems to be the result of low mobility from the public sector.

The effects of the AEI relative to LMT of participants enrolled in 1997, could be evaluated for two subsequent years to help determine whether there is a lag in the effects of the AEI. The negative effects are reduced when estimated on wage earnings 2000. This may be a consequence of the fact that the AEI participants had more difficulties finding work after program, something which is plausible given the natural link of LMT to a given profession or a working site.

Conversely, the OLS estimates 1996 – 1999 showed only small differences compared with the estimates 1997 – 2000, despite the fact that they could differ for a number of reasons. In particular, one may be tempted to think that the AEI would have attracted the unemployed with an, on average, higher expected gain from the AEI in the first year. There was no support for this hypothesis in the OLS estimates

Several results from Stenberg (2002b) are confirmed. Females seem to have had a relatively more beneficial effect of the AEI compared with men. Also, groups with a weak position in the labor market had smaller effects on wage earnings of the AEI than the full samples. On the other hand, differences in the effects between the Stockholm county and the inland of Norrland, found in Stenberg (2002b), does not hold for earnings outcomes measured in 2000. The results pertaining to the group with a prior two year upper secondary school did not differ substantially from the total sample estimates.

Concerning samples of different branches of employment prior to program, the AEI seemed to have rendered the most advantageous effects among participants attached to the public service sector. Conditioning on manufacturing as branch before program, there is a substantial decrease in the effects of the AEI in the sample enrolled in 1998. This is interesting considering the mobility estimations which indicate that the AEI participants, when one conditions on manufacturing and construction, were relatively *more* mobile than LMT participants in the sample enrolled in 1997. For the same subgroup, this is not found among those enrolled in 1998. A possible interpretation is that the extent of the mobility partially explain the differences in the estimated effects on wage earnings.

Selection model estimates indicate a positive selection on unobservables into the AEI. It implies that OLS overestimates the effects of the AEI relative to LMT.

The short run evaluations of the AEI are so far incomplete as there was a large group still in the educational system. Future studies of the AEI will hopefully clarify what this exclusion has meant for the results.

Appendix

Exclusion conditions and the number of observations excluded:

Note that an observations may have been excluded for more than one reason.

If age is not between 25 and 55, 4,487 observations from 1997 and 5,964 from 1998 were excluded.

If recorded in LMT before May 1st the year of enrollment, 4,775 and 16,258 observations.

If recorded as participant in the AEI in the autumn after program, i.e. 1998 and 1999 respectively, 26,447 and 11,888 observations.

If recorded in LMT more than 365 days and/or finished LMT after the 1st of July in the year which follows enrollment, 3,438 and 16,144 observations.

If participants in the AEI were in adult education already in the spring term of the year they enrolled in the autumn, 15,416 and 45,301 observations.

If zero days in Händel in the year of enrollment to program, 8,067 and 18,689 obs.

If missing observations (various variables), 8,375 and 13,749 observations.

If registered in any formal education, adult education, university or other, during the year of measured outcome 31,926 and 44,113 observations.

Conditioning that the samples 1997 – 1999 and 1997 – 2000 are identical, 2,851 observations.

Outlier values of wage earnings of SEK 300,000 and more, 1,364 and 1,059 observations.

Definitions of variables:

AEI; Officially domiciled in Sweden and registered in adult education some time during the autumn semester of 1997 or 1998, and receiving the special

grant for education and training.

BRANCH OF EMPLOYMENT; Five sectors are given, manufacturing, construction, retail, private service and public service.

CHILDREN; Number of children below the age of 16 living at home.

DISABLED; Classified with a working disability in the year of enrollment.

EDUCATIONAL LEVEL; Highest level of education attained by 1997.

FRACTION IN ADULT EDUCATION; The number of individuals registered in adult education at komvux during the autumn semester of 1997 or 1998, divided by the municipal population.

INLAND OF NORRLAND; Norrland except municipalities with a coast line.

LMT; Registered in LMT October 15th 1997 or 1998, with program start not before May 1st 1997 or 1998, officially domiciled in Sweden and aged between 25 and 55.

MUNICIPALITY WITH HIGH EDUCATION LEVEL; Equals one for the those living in municipalities with a fraction of individuals with completed three year upper secondary school, which exceeds the median of the population. It equals one for 56 of 288 municipalities, representing 54 per cent of the population.

REGIONAL EMPLOYMENT GROWTH; Measured for 21 counties as the change in the employment rate in the second quarter of 1999 and 2000, compared with that of a year earlier. Employment figures based on Statistics Sweden and their Labor Force Surveys (Arbetskraftsundersökningarna, AKU).

REGIONAL EMPLOYMENT LEVEL; As measured in 21 counties in the second quarter of 1999 and 2000. Employment figures based on Statistics Sweden and their Labor Force Surveys (Arbetskraftsundersökningarna, AKU).

Table A.1: Results of OLS estimations.

Dependent variable: Wage earnings.			
Sample	**1996 – 1999**	**1996 – 2000**	**1997 – 2000**
	N = 20,124	N = 20,124	N = 14,433
	Coefficient	Coefficient	Coefficient
Constant	-28,201	-15,321	14,469
AEI	-15,809***	-11,396***	-16,866***
Munic. % with 3yr sec. sch.	-179*	-116	178
Munic. % aged 25-64	-27,622	-17,228	-86,424**
Regional growth	-1,034**	332	-224
Regional employment	1,555***	1,385***	1,227***
Stockholm county	971	2,657	8,986***
Inland of Norrland	7,538***	4,808*	15
Age 25-29	27,021***	35,840***	27,392***
Age 30-34	22,616***	31,634***	22,606***
Age 35-39	21,519***	29,491***	18,580***
Age 40-44	19,897***	26,971***	18,168***
Age 45-49	13,220***	18,463***	13,442***
Compulsory school	-5,526*	-10,441***	-8,238**
2 year upper sec. school	2,114	-801	-1,471
3 year upper sec. school	3,088	-319	1,161
University ≤ 3 years	8,072*	7,340*	9,070**
University > 3 years	187	-2,859	1,993
Manufacturing	8,535***	7,804**	16,750***
Construction	18,807***	16,539***	19,505***
Retail	10,243***	10,352***	14,553***
Private service	9,407***	10,921***	11,970***
Public service	14,924***	9,221***	18,447***
Working disability	-28,628***	-33,921***	-31,624***
Born in foreign country	-9,693***	-9,452***	-9,031**
- yrs since last immigration	-342**	-395**	-186
Citizenship Scandinavian	4,614	1,594	-35
Citizenship European	22,832***	31,501***	20,656***
Citizenship outside Europe	-5,689	-10,341**	-10,148**
Male	9,887***	19,674***	11,378***
- male married	1,544	2,815	2,586
- male with child(ren)	11,633***	11,385***	6,677*
- female married	8,534***	9,353***	10,217***
- female with child(ren)	1,605	2,572	73
Wage earnings before prg	.365***	.328***	.307***
- W.E. mean dev. squared	-.664***	-.663***	-.747***
- W.E. 1 – 50,000	-2,961	-1,417	2,150
- W.E. 50,001–150,000	-10,062***	-5,928	-4,123
- W.E. 150,001-300,000	-10,685*	-4,821	-240

Note: *** significant at the 1 % level.
** significant at the 5 % level.
* significant at the 10 % level.

Table A.2: Results of ML probit estimations.

Dependent variable: Participation in the AEI.

Sample	**1996 – 1999** N = 20,124 Coefficient	**1996 – 2000** N = 20,124 Coefficient	**1997 – 2000** N = 14,433 Coefficient
Constant	.962**	.962**	1.244***
Munic. % in adult education	16.744***	16.744***	3.338
Munic. % with 3yr sec. sch.	-.004**	-.004**	.002
Munic. % aged 25-64	-3.385***	-3.385***	-1.712***
Regional employment	.010**	.010**	-.008
Stockholm county	.215***	.215***	.198***
Inland of Norrland	-.088*	-.088**	-.016
Age 25-29	.197***	.197***	.254***
Age 30-34	.137***	.137***	.162***
Age 35-39	.051	.051	.188***
Age 40-44	.054	.054	.106**
Age 45-49	.013	.013	.067
Compulsory school	.143**	.143***	.235***
2 year upper sec. school	.172***	.172***	.316***
3 year upper sec. school	-.410***	-.410***	-.399***
University ≤ 3 years	-.596***	-.596***	-.828***
University > 3 years	-1.057***	-1.057***	-1.218***
Manufacturing	.001	.001	-.165***
Construction	-.019	-.019	-.060
Retail	.011	.011	-.071
Private service	.042	.042	-.097*
Public service	.163***	.163***	130***
Working disability	-.120***	-.120***	-.104***
Born in foreign country	.197***	.197***	.048
- yrs since last immigration	-.006**	-.006**	.005*
Citizenship Scandinavian	-.331***	-.331***	-.039
Citizenship European	-.545***	-.545***	-.182**
Citizenship outside Europe	-.009	-.009	-.007
Male	-.415***	-.415***	-.364***
- male married	-.064	-.064	.053
- male with child(ren)	.132***	.132***	.003
- female married	-.019	-.019	-.020
- female with child(ren)	.182***	.182***	.130***
Wage earnings before prg	$2.1 \cdot 10^{-6}$***	$2.1 \cdot 10^{-6}$***	$-5.4 \cdot 10^{-7}$
- W.E. mean dev. squared	$-5.2 \cdot 10^{-6}$***	$-5.2 \cdot 10^{-6}$***	$-8.5 \cdot 10^{-7}$
- W.E. 1 – 50,000	-.080**	-.080*	.049
- W.E. 50,001–150,000	-.102*	-.102	.055
- W.E. 150,001-300,000	-.254***	-.254***	.057

Note: *** significant at the 1 % level.
** significant at the 5 % level.
* significant at the 10 % level.

Table A.3: Results of the selection model outcome equation.

Dependent variable: Wage earnings.

Sample	**1996 – 1999** N = 20,124 Coefficient	**1996 – 2000** N = 20,124 Coefficient	**1997 – 2000** N = 14,433 Coefficient
Constant	-17,926	-5,849	32,309
AEI	-26,430***	-23,971***	-36,596***
Regional growth	-1,019**	348	-195
Regional employment	1,572***	1,406***	1,162***
Munic. % with 3yr sec sch.	-192*	-129	185
Munic. % aged 25-64	-34,538	-26,102	-95,119***
Stockholm county	1,397	3,155	10,167***
Inland of Norrland	7,648***	4,948*	243
Age 25-29	27,798***	36,198***	29,105***
Age 30-34	23,248***	31,845***	23,717***
Age 35-39	21,736***	29,262***	19,797***
Age 40-44	19,931***	26,547***	18,649***
Age 45-49	13,349***	18,372***	13,681***
Manufacturing	8,432***	7,704**	15,202***
Construction	18,890***	16,639***	19,086***
Retail	10,306***	10,399***	14,031***
Private service	9,540***	11,028***	11,427***
Public service	15,888***	10,385***	19,568***
Working disability	-29,454***	-34,921***	-32,647***
Born in foreign country	-9,510***	-8,947***	-121**
- yrs since last immigration	-341**	-400**	-9,249
Citizenship Scandinavian	3,025	-305	-924
Citizenship European	21,124***	29,372***	19,242***
Citizenship outside Europe	-6,015	-10,702**	-10,871**
Male	8,153***	17,611***	8,745***
- male married	1,221	2,388	3,109
- male with child(ren)	12,310***	12,254***	6,585*
- female married	8,547***	9,397***	10,209***
- female with child(ren)	1,950	2,936*	730
Wage earnings before prg	.376***	.341***	.306***
- W.E. mean dev. squared	-.690***	-.697***	-.760***
- W.E. 1 – 50,000	-3,367	-1,894	2,680
- W.E. 50,001–150,000	-10,705***	-6,701	-3,823
- W.E. 150,001-300,000	-11,963**	-6,365	-68
? (inverse Mill's ratio)	6,417**	7,566**	11,995***

Note: *** significant at the 1 % level.
** significant at the 5 % level.
* significant at the 10 % level.

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