# Comprehensive Adult Education as a Means of Reducing Unemployment

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**Abstract**

This paper evaluates whether general education is better than traditional vocational training as a means of reducing the time individuals remain in unemployment and the risk for the individual of becoming unemployed. The empirical analysis is built on longitudinal data from Sweden. Post-program unemployment for unemployed participants in comprehensive adult education and participants in labor market training is compared.

Generally, the results indicate no substantial difference between the two programs regarding their effects on post-program unemployment.

**Keywords:** Proportions, unemployment, adult education

**JEL classification:** I29, J64

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# 1 Introduction

In *Human Capital* (Becker, 1964) and *Investment in Human Capital* (Schultz, 1961), it is suggested that individuals invest in education to boost their productivity. In this way, they will possibly be better off in terms of earnings and employment prospects. From a governmental view, investment in human capital is expected to promote growth. In recent years, life-long learning has become a major theme for educational policies in the OECD. Comprehensive education of adults is one of the main ingredients within this concept. It is also a potential alternative to vocational training, provided within the framework of traditional labor market policy.

On July 1, 1997 the Swedish government introduced a very large comprehensive education program, the Adult Education Initiative (AEI, Kunskapslyftet). The main purpose of the AEI was to reduce unemployment, reduce differences in formal education and promote economic growth. The AEI involved studies at the Municipal Adult Education Centers (Komvux) and the program ended in 2002.

The purpose of this study is to evaluate whether general education of unemployed adults is better than traditional vocational training as a means of reducing unemployment among participants. Sweden has a long tradition of labor market programs; Labor Market Training (LMT) of the unemployed has been a major ingredient in labor market policy.[1] [2]

The AEI was publicly financed and offered education to adults at both the elementary and upper secondary levels. The program was primarily aimed at unemployed

[1] Labor Market Training is mainly vocational but can, in some instances, be preparatory. Both types of courses are included in this study.

[2] Vocational training has been studied by various authors. For a summary of these studies, see Calmfors *et al.* (2001). More recent studies can be found in Andrén and Gustafsson (2004) and Sianesi (2004).

adults who lacked three years of upper secondary school. During the fall semester of 1997, about 129,500 individuals studied within the AEI, which corresponds to almost three per cent of the labor force in Sweden. The unemployed who enrolled in the AEI received a special subsidy for education and training (UBS). In this paper, participation in Municipal Adult Education and receiving UBS is used as the definition of participation in the AEI.

Previous studies within this particular field of research are relatively few and mainly focused on wage earnings. Although closely related to the outcome in terms of wage earnings, the potential effects on unemployment are highly relevant in relation to e.g. labor market policy and individual welfare.

Most economic studies of adult education refer to on-the-job-training or publicly provided vocational training.[3] One example is Jenkins *et al.* (2003), who study the effects of lifelong learning in the UK. Their results indicate no significant effects of adult education on wages. However, the effect on individual employment is found to be positive. Vignoles *et al.* (2004) study on-the-job-training in the UK and find a positive effect of training on participants' wages.

There are relatively few previous economic studies of comprehensive adult education. Holm *et al.* (1995) use a panel data set based on a random ten per cent sample from the Danish population. They estimate the impact of comprehensive adult education on subsequent earnings. Their results indicate a wage increase of about seven per cent as an effect of education.

Even fewer studies exist on comprehensive education of the unemployed. Jacobson *et al.* 2005) study the effect of attending community college, using a sample

[3] Calmfors *et al.* (2001) review twelve previous studies on publicly provided vocational training in Sweden. These studies are based on data from both the 1980's and 1990's, using different approaches. Most studies pertaining to the 1980's show a significant positive effect of participation in LMT, while the studies based on data from the 1990's show mixed results.

of prime aged laid-off workers in the state of Washington. It is indicated that male participants in academic courses in math, science, and technical professions received a wage increase of about ten per cent, whereas the corresponding number for females is about seventeen per cent. Participants in less technical vocational tracts, social sciences, business etc., did not receive any significant increase in their hourly wage. Moreover, there seems to be an increase in the hours of work for this group of students.

Stenberg (2003) studies the short-run effects of comprehensive adult education in Sweden on unemployment and wage earnings. The main findings are that participation in the AEI decreases the incidence of unemployment, but may lead to longer duration. It is also found that the AEI had smaller effects on wage earnings than vocational training. Axelsson and Westerlund (2001) also study the effect of comprehensive adult education in Sweden. They find a lower probability of registering as unemployed after the end of the program for participants in the AEI as compared to participants in LMT. They do not find any significant effect on the time in unemployment. However, examples of other studies of comprehensive adult education in Sweden are Stenberg and Westerlund (2004) and Albrecht *et al.* (2004).

The present study evaluates comprehensive adult education of the unemployed within the AEI, using participants in labor market training (LMT) as a comparison group. For this purpose, we study a sample of individuals participating either in the AEI or LMT in 1997/1998. The outcome of education is analyzed in terms of the amount of unemployment[4], and the number of spells of unemployment, from the end of the program to the last date of post-program observation in November

[4]Here, unemployment means open unemployed as well as participation in labor market programs.

2003. It is worth noting that both the AEI and LMT are completely publicly financed, with very few exceptions. There are some other close similarities between the AEI and LMT, regarding who can participate and the financial benefits when participating in one of them. Both programs have a training grant equal to the Unemployment Insurance (UI), and participation also qualifies for a new period of unemployment benefits. Both programs are also targeted towards job searchers that are unemployed or at risk of becoming unemployed, and program participation must be preceded by search for work via the public employment agency.

The main contributions of this paper are that the follow up period is fairly long, and the empirical section covers all spells of unemployment up to November 2003. Stenberg (2003) used data measuring the first period of unemployment after the end of the program, given that unemployment is observed during the period of observation. There are advantages with that type of approach, especially when studying the short-term effects. It may, however, lead to misleading results if there is a systematic difference between groups regarding the probability for re-entry into unemployment. One of the treatments could, hypothetically, lead to more permanent jobs. Another possibility is that a relatively longer period of job search during the first period in unemployment may be associated with a better match and, therefore, a longer period as employed. The results in Stenberg (2003) and Axelsson and Westerlund (2001) indicate that participants in the AEI had a relatively lower incidence of unemployment. In the present study, this potential problem is taken into account using data from a relatively long period of post-treatment observation, and considering all spells of unemployment when analyzing the proportion of time in unemployment after the end of program. Moreover, the analysis of time in unemployment is complemented by the estimation of a model for the number of spells in unemployment after the end of the program.

The next section describes the underlying data set and sampling. The third section deals with the econometric strategy while section four presents the estimation results. The fifth section concludes.

# 2 Data

The data refers to individuals participating in the AEI or LMT during the fall of 1997, and originates from different official registers of Statistics Sweden (SCB) and the Swedish National Labor Market Board (AMS). It includes information on age, gender, yearly income, education, citizenship, place of residence, civil status, family situation and unemployment history. The unemployment information originates from the event database Händel of AMS and pertains to the period January 1 1996 to November 1 2003, while individual characteristics are available from 1990 until 2001. Händel contains information from August 1991 and onwards. Individuals are registered in Händel each time they become openly unemployed[5], or participate in a labor market program (not including the AEI). Deactivation and the reason for deactivation are also registered. Using these events, it is possible to create a time series with information on for how long and when each individual has been *e.g.* unemployed or participated in labor market programs.[6]

For the purpose of this study, individuals registered in adult education at the Municipal Adult Education Centers in the fall of 1997 and individuals registered as participants in LMT in October 1997 are included in the underlying data set. A total of 222,209 individuals participated in adult education during the fall semester of 1997 and 55,965 of these received the UBS. The number of participants in LMT

[5]Individuals must be registered as openly unemployed to receive unemployment benefits.
[6]Labor force status is not observed after the date of deactivation from Händel, however.

in October 1997 was 30,464. The sample used in the empirical analysis is the result of applying the following selection criteria:

- Individuals who were at least 25 years old and no older than 55 in 1997, since only individuals of this age were eligible for UBS.
- All individuals must have had at least one day of unemployment during 1997, since the AEI was primarily targeted at unemployed individuals.
- From the group participating in LMT during 1997, I have selected those starting no earlier than April 30, due to the fact that the AEI was announced at that time, and the individual could apply for participation in LMT or the AEI from this point in time. Hence, individuals in the selected sample have a positive probability of entering both programs.
- The individuals must also have completed their participation in the respective programs before the end of 1998.
- Individuals participating in either LMT or municipal adult education during 1999 or 2000 are excluded.
- Individuals classified as students in any of the years between 1999 and 2001 are excluded.[7]
- Program participation amounts to at least seven days.

The resulting sample consists of 23,209 observations, 13,326 of which were in the AEI and 9,883 in LMT.

[7]The definition of a student used here is individuals observed as participants in education according to the register of education (SCB) and with annual gross wage earnings of less than 100,000 SEK. To receive student benefits, individuals cannot earn more than 100,000 SEK per year.

## 2.1 Variable definitions and descriptive statistics

Days in unemployment after program participation are defined as the number of days in registered job search, as openly unemployed or as a participant in a labor market program, from the last day of the program until November 1, 2003. The number of days are summed up over all unemployment spells for the individual during this period. The post program unemployment proportion is the ratio of days in unemployment to the total number of days since the program ended. *Figures 1* and *2* show histograms of the proportion of time spent in unemployment after the end of the program, for participants in the AEI and LMT, respectively. The relative frequency generally decreases with the proportion of unemployment. However, there is a nail at the beginning and end of both diagrams. They represent individuals with no or little unemployment, and those who have been unemployed the whole or almost the whole time period, respectively. Note, however, that the relative frequency does not exceed ten percent in either of these cases. Moreover, there is no dramatic difference between groups.

*Table 1* presents the mean number of days in unemployment, the proportion of days in unemployment and the number of unemployment spells for various groups of unemployed. Columns two and three indicate the percentage of participants in the AEI and LMT, respectively, in each group.

The variable *AEI* takes the value of one for all individuals who participated in AEI and zero for those participating in LMT. Program participation means that an individual was enrolled in the program. We lack information on whether the individual completed the program.[8] Judging from the descriptive statistics, it

[8] AMS (1999) reports that 18 per cent of the participants in LMT do not complete the program. About half of them exit to employment during the period, while the other half has other reasons. The Report of the Government Commission (SOU 1999:39) indicates a ten per cent early exit rate from the AEI. Unfortunately, early exit information is not available at the individual level.

*Figure 1:* The distribution of post program unemployment, participants in the AEI

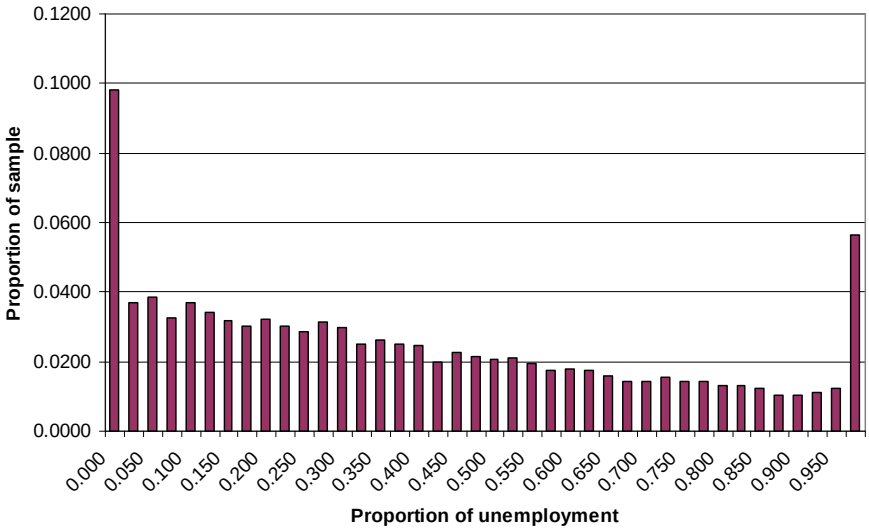



*Figure 2:* The distribution of post program unemployment, participants in LMT

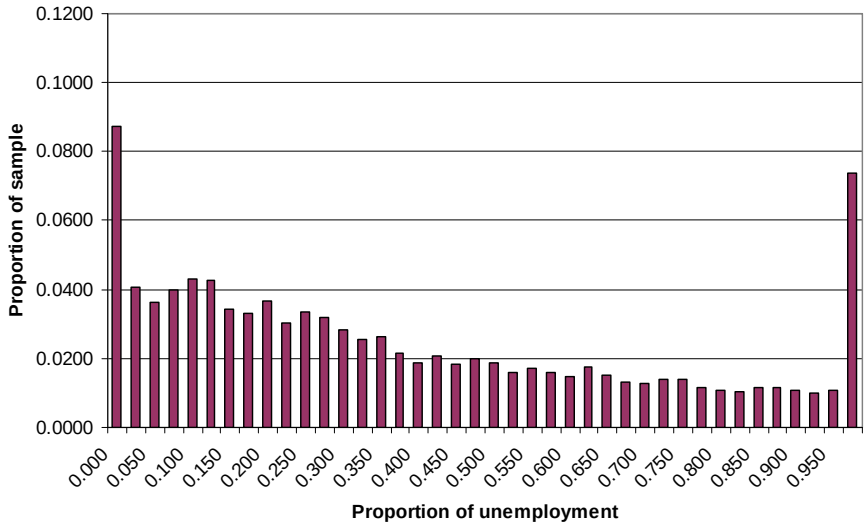


*Table 1:* Post program unemployment, sample means across selected subsamples

| | N | % of AEI | % of LMT | Sample means | | |
|---|---|---|---|---|---|---|
| | | | | Unempl. days | Prop. | Unempl. spells |
| Total | 23,209 | 57.4 | 42.6 | 799 | 0.392 | 1.973 |
| | | | | | | |
| AEI | 13,326 | 100 | 0 | 787 | 0.394 | 1.966 |
| LMT | 9,883 | 0 | 100 | 815 | 0.389 | 1.983 |
| 366 days of unemployment in 1996 | 9,860 | 39.5 | 47.0 | 943 | 0.463 | 1.969 |
| Zero days of unemployment in 1996 | 3,045 | 13.2 | 12.7 | 567 | 0.278 | 1.649 |
| Age 25-29 | 5,863 | 28.3 | 20.8 | 693 | 0.342 | 2.208 |
| Age 30-34 | 5,458 | 25.0 | 21.4 | 744 | 0.366 | 2.204 |
| Age 35-39 | 4,088 | 17.4 | 17.8 | 791 | 0.388 | 1.926 |
| Age 40-44 | 3,202 | 13.0 | 14.9 | 850 | 0.417 | 1.821 |
| Age 45-49 | 2,545 | 9.5 | 13.2 | 917 | 0.447 | 1.818 |
| Age 50-55 | 2,053 | 6.8 | 11.9 | 1,033 | 0.500 | 1.644 |
| Compulsory school | 5,234 | 24.8 | 20.3 | 869 | 0.427 | 2.032 |
| Two-year upper secondary school | 12,308 | 61.8 | 41.4 | 800 | 0.394 | 1.989 |
| Three-year upper secondary school | 2,720 | 8.2 | 16.3 | 752 | 0.365 | 1.965 |
| Post secondary schooling | 2,947 | 5.2 | 22.0 | 714 | 0.349 | 1.809 |
| Male | 9,066 | 28.4 | 53.9 | 741 | 0.360 | 2.131 |
| Female | 14,143 | 71.6 | 46.1 | 836 | 0.412 | 1.872 |
| Swedish | 20,987 | 94.3 | 85.0 | 803 | 0.394 | 1.964 |
| Scandinavian, not Swedish | 521 | 2.2 | 2.4 | 768 | 0.376 | 2.098 |
| European | 1,034 | 1.7 | 8.2 | 726 | 0.352 | 1.931 |
| Non European | 667 | 1.8 | 4.4 | 811 | 0.392 | 2.238 |
| Disabled 1997 | 2,734 | 8.7 | 16.2 | 1,090 | 0.529 | 1.790 |
| Stockholm | 3,741 | 16.7 | 15.8 | 543 | 0.263 | 2.031 |
| East Mid | 3,894 | 15.9 | 17.8 | 811 | 0.398 | 1.871 |
| Småland | 2,188 | 9.8 | 8.8 | 816 | 0.402 | 1.868 |
| South | 3,601 | 16.9 | 13.9 | 846 | 0.414 | 1.975 |
| West | 4,401 | 20.1 | 17.5 | 859 | 0.422 | 1.804 |
| North Mid | 2,584 | 9.6 | 13.0 | 938 | 0.460 | 2.276 |
| Mid North | 1,208 | 5.2 | 5.1 | 859 | 0.425 | 1.987 |
| Upper North | 1,592 | 5.8 | 8.1 | 802 | 0.393 | 2.192 |

Note: Post-Secondary Schooling includes all types of post-secondary schooling including university. The dummy variables indicating individuals' region of residence on Dec 31 in 1996 are: Stockholm (Stockholm county), East Mid Sweden (Uppsala, Södermanland, Östergötland, and Västmanland counties), Småland and the Islands (Jönköping, Kronoberg, Kalmar, and Gotland counties), Southern Sweden (Blekinge and Skåne counties), Western Sweden (Halland and Västra Götalands counties), North Mid Sweden (Värmland, Dalarna and Gävleborg counties), Mid North (Västernorrland and Jämtland counties), and Upper North (Västerbotten and Norrbotten counties).

seems that there is very little difference in outcome between participants in the AEI and those in LMT. Naturally, it remains to be seen whether this will prevail when considering heterogeneity in regional and individual attributes in a multivariate setting.

An individual who has been unemployed more in the past is expected to experience relatively more unemployment also after the program. The descriptive statistics indicate that individuals who had *366 days of unemployment in 1996* have a higher proportion of unemployment after the program than those with no registered unemployment in 1996. Judging from the proportions in column five, it seems as if older people have a higher proportion of time in unemployment than younger individuals.

Turning first to the sample proportions in the second and third columns, a significantly larger proportion of the participants in the AEI are female as compared to LMT. Participants in AEI are also relatively younger and have a lower educational attainment than participants in LMT. It is also worth noting that a larger proportion of the participants in LMT has a foreign citizenship, than of the participants in the AEI. The same is true for disabled individuals.

Individuals residing in Stockholm had a relatively low proportion of time in unemployment after the end of program, while those who resided in the of middle and upper North regions had proportions above the average. 310 (2.3 per cent) of the participants in the AEI were unemployed the whole period. The corresponding figure for participants in LMT is 545 individuals (5.5 per cent). Moreover, 892 (6.7 per cent) of the participants in the AEI have not been registered in Händel after the end of program. For participants in LMT, this number amounts to 497 (5.0 per cent).

There are some indications that even though the mean values are close, there is a larger proportion of participants in LMT with a proportion of time in unemployment close to one.

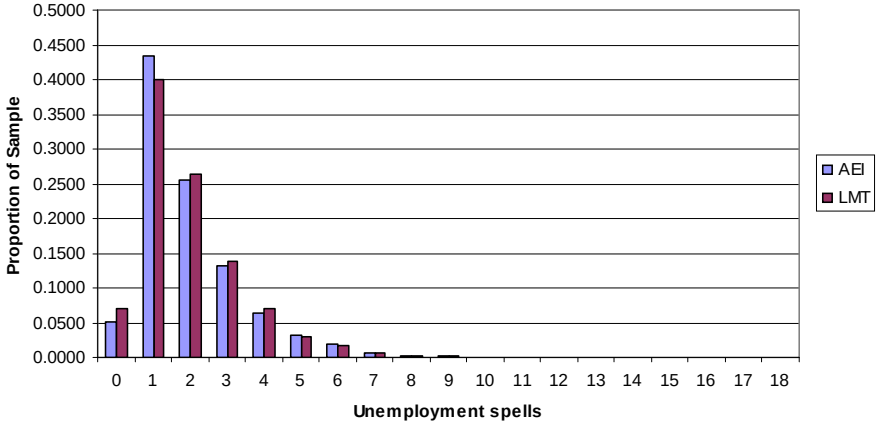
The mean value of the number of unemployment spells for the entire sample is 1.97. The descriptive statistics indicate small differences between most of the subsamples. A small decrease in the number of unemployment spells with age is indicated, though. Individuals with zero days of unemployment in 1996 have relatively few spells, as do the disabled. Men have a slightly larger number of spells in unemployment than females.

In addition to the variables described above, the county unemployment rate during the quarter when the individual ended the program is also used as an explanatory variable. It serves as an indicator of competition for available jobs in the region. The individuals' wage earnings 1996 are also included in the set of covariates. Dummies will be used for individuals with 366 days of unemployment, or zero days of unemployment during 1996 to catch potential nonlinear effects on the number of unemployment days. In the empirical analysis, we will also control for the sector of employment[9] in 1996.

This paper also analyzes the number of spells in unemployment from the end of the program until the date of observation. *Figure 3* shows the relative frequency of the number of unemployment spells. Both groups have a peak at one spell of unemployment. Participants in the LMT have an average number of spells amounting to 1.98. The corresponding figure for participants in the AEI is 1.97. The maximum number of spells observed among participants in LMT is 13, and

[9]The sectors are *Agriculture*, including forestry and fishing; *Manufacturing*, including mining; *Electricity*, including gas and water supply; *Construction*; *Retail*, including wholesale and communication; *Finance*, including financial intermediation and business activities; *Education* including research and development; *Health* including social work; *Personal service* including cultural activities and sanitation; and *Public administration*.

*Figure 3:* Post program unemployment spells




for individuals in the AEI it is 18.

# 3 Econometric strategy

This section presents the evaluation problem, the outcome variables of interest and the estimation methods employed in the empirical analysis. For the purpose of analyzing the amount of post program unemployment, we use two alternate methods, logit and matching. The number of spells in unemployment is estimated using a count data model based on the Poisson distribution.

## 3.1 Evaluating program effects

When evaluating the relative effects of two alternative programs, individuals are assumed to be in one of two different states. The potential outcome for treatment (in this case participation in the AEI) is $Y_1$ and for "no treatment" (in this study participation in an alternative program, LMT) $Y_0$. For each individual**,** there is

then a *pair* of outcomes, but only one of these can be observed. Let $D$ be an indicator variable denoting participation in the AEI. The observed outcome is then

$$Y = DY_1 + (1 - D) Y_0.$$

The average treatment effect on the treated can be expressed as

$$E[Y_1 - Y_0|D = 1] = E[Y_1|D = 1] - E[Y_0|D = 1].$$

Since $E[Y_0|D = 1]$ cannot be observed, the outcomes of non-participants ($E[Y_0|D = 1]$) must serve as an estimate of what outcome the participants would have had, had they not participated. This will create a bias $b$

$$b = E[Y_0|D = 1] - E[Y_0|D = 0].$$

The problem here is whether this bias can be eliminated by controlling for observables or if it is related to unobservable characteristics of the individual. The unobservable characteristics can be both time invariant and varying over time. Unemployment and income in the past are probably correlated with certain unobserved idiosyncrasies affecting labor market outcomes. In this study, this type of heterogeneity is taken into account by incorporating individuals' pre-program unemployment and income as explanatory variables.

## 3.2 Proportion of post program unemployment

The main issue to be examined in this paper is the potential effect of education on the total time spent in unemployment after the end of the program. For this purpose, program effects are analyzed in forms of a fractional response variable. The dependent variable is the proportion of days unemployed since the end of the program until the time of observation. In this setting, define $U_i$ as the number of days that individual $i$ is unemployed and $D_i$ as the number of days since individual $i$ ended his program. Then, $p_i$ is defined as the proportion of days in unemployment $p_i = U_i/D_i$, where $0 \leq p_i \leq 1$.

The estimation can be approached with a couple of different suitable methods. Two similar methods of estimation are Logit and Probit. These methods are described in this context in *e.g.* Greene (2002 ch. 19), Finney (1971), and Maddala (1993). In this study, the Logit model is used as a parametric method of estimating the effect of AEI on $p_i$.

An alternative approach is the method of matching, which is based on the assumption that the bias can be eliminated by conditioning on a set of observables. This is also true for traditional regression approaches but, in this case, matching has two advantages. First, it is non-parametric, which means that no assumption regarding functional form is required. Second, matching highlights the problem of self selection, by explicitly considering potential problems with common support, *i.e.* only comparing treated observations with similar untreated observations (based on the observables)[10]. A more thorough description of matching method is found in *e.g.* Heckman *et al.* (1998b) and Rosenbaum and Rubin (1983). The present study follows Rosenbaum and Rubin (1985) by first obtaining an estimate

[10]Note that matching does not solve the selection due to *unobserved* heterogeneity, see *e.g.* Smith and Todd (2005).

of the propensity score using the entire sample and then matching individuals in the AEI with individuals in LMT based on the propensity score. The matching estimation technique is Kernel estimation, described in Heckman *et al.* (1998a).

One of the advantages of the approach of using proportions is that it takes into account the problem with different population sizes. Here, this problem arises from the fact that the individuals have ended their program at different times, and therefore have a different total number of days from the end of program up to the date of observation.

When using proportional data in this manner, it would be convenient to assume the observed proportions to be the true proportions when time approaches infinity. However, this seems to be a relatively strong assumption. The results may, in reality, be conditioned on the day the data ends. One way of investigating whether this is a problem is to estimate the model for different dates of observation and compare the estimates of the parameter of main interest. For this purpose, we will use ending dates in November 2002 and November 2001, respectively, for this comparison.

## 3.3 Spells of unemployment

In addition to the proportional model, the number of spells in unemployment is also analyzed. This can be done by using a statistical model of counts (nonnegative integers). The model used in this study is a standard log-linear model based on the assumption of an underlying Poisson distribution.[11] In this case, the dependent variable is the number of unemployment spells from the end of program until the

[11] See *e.g.* Greene (2002 ch. 19) and Hausman *et al.* (1984) for a thorough explanation of this model.

time of observation.

The sign on the Poisson estimate is not easily interpreted on its own. Given that at least one spell is observed, is it better to have many or few spells of unemployment? The answer substantially depends on how much time is spent in unemployment. If a group has little time in unemployment, few spells might be interpreted as something good. The individuals are then seldom unemployed and they are unemployed in a relatively short period of time. A negative estimated effect of treatment on the number of spells of unemployment, combined with a positive estimated effect on the time spent in unemployment is, on the other hand, more difficult to interpret.

# 4 Results

This section presents the estimation results of the effect of participation in the AEI, compared with LMT, on time spent in unemployment and the number of unemployment spells. First, we present the results from the logit model and the matching estimates of the unemployment proportion. Then follows a presentation of the Poisson regression estimates of unemployment spells. Hypothetically, the effects of education may differ between groups of participants. For this reason, results from separate estimations pertaining to males and females and other subsamples are presented.

## 4.1 Unemployment proportion

The results from the Logit model of time spent in unemployment are given in *table 2.* The parameter estimates on *AEI* indicate there to be no significant difference

*Table 2:* Logit estimates of the proportion of time spent in unemployment.

| Dependent variable: proportion of days in unemployment, $p_i$ | | | | |
|---|---|---|---|---|
| | Males | | Females | |
| $N_m$=9,007 $N_f$=14,080 | Coeff. | $\|t$-value$\|$ | Coeff. | $\|t$-value$\|$ |
| AEI | 0.0675 | 1.37 | 0.0507 | 1.21 |
| Days of unemployment in 1996 | 0.00104 | 2.90 | 0.000361 | 1.37 |
| 366 days of unemployment in 1996 | 0.113 | 1.51 | 0.178 | 2.97 |
| Zero days of unemployment in 1996 | -0.0586 | 0.54 | -0.225 | 2.93 |
| Wage earnings 1996 | -0.00128 | 3.17 | -0.00208 | 5.87 |
| Age | 0.0322 | 11.38 | 0.0183 | 8.16 |
| Two-year upper secondary school | -0.0762 | 1.31 | -0.129 | 1.13 |
| Three-year upper secondary school | -0.102 | 1.27 | -0.224 | 3.35 |
| Post secondary schooling | -0.144 | 1.83 | -0.275 | 4.01 |
| Scandinavian, not Swedish | -0.0569 | 0.33 | -0.129 | 1.13 |
| European | -0.279 | 2.77 | -0.0782 | 0.77 |
| Non European | 0.181 | 1.90 | 0.116 | 0.90 |
| Disabled 1997 | 0.579 | 8.89 | 0.274 | 4.66 |
| Agriculture | -0.0342 | 0.18 | -0.247 | 1.12 |
| Manufacturing | -0.100 | 1.17 | -0.0312 | 0.35 |
| Electricity | -0.0292 | 0.08 | 0.279 | 0.57 |
| Construction | -0.426 | 4.32 | -0.229 | 1.07 |
| Retail | -0.0859 | 1.04 | 0.0252 | 0.37 |
| Finance | -0.0680 | 0.67 | -0.0911 | 1.11 |
| Education | 0.0530 | 0.45 | -0.100 | 1.08 |
| Health | -0.0192 | 0.19 | -0.0502 | 0.95 |
| Personal service | 0.0353 | 0.36 | 0.0964 | 1.27 |
| Public administration | -0.00927 | 0.07 | -0.237 | 2.26 |
| Unemployment rate | 0.0243 | 1.04 | 0.0345 | 1.97 |
| Stockholm | -0.483 | 3.97 | -0.532 | 5.26 |
| East Mid | -0.235 | 1.05 | 0.204 | 2.40 |
| Småland | -0.230 | 1.75 | 0.239 | 2.33 |
| South | -0.180 | 1.77 | 0.181 | 2.19 |
| West | -0.123 | 1.17 | 0.275 | 3.22 |
| North Mid | -0.0489 | 0.46 | 0.415 | 4.83 |
| Mid Norr | 0.0176 | 0.14 | 0.195 | 1.89 |
| Constant | -1.932 | 7.42 | -0.825 | 6.79 |

Note: Reference categories are: Individuals with elementary or compulsory level education as their highest education attainment, Swedish citizens, residents in Upper North

in the proportion of unemployment between participants in the AEI and LMT. The point estimates are small in magnitude**;** the marginal effect for participating in the AEI instead of LMT is 1.5 percentage points for males, whereas it is 1.2 percentage points for females.[12]

Individuals who experienced more unemployment in 1996, and those with low wages in 1996, are worse off in terms of unemployment proportions than those with high income and little or no unemployment prior to program participation. In accordance with the descriptive statistics in *table 1*, post program unemployment seems to increase with age and is relatively higher for the disabled.

Regarding the differences between males and females, the only differences in the signs of significant estimates are for the regional dummies. Females residing in Stockholm or in the upper North have relatively shorter time in unemployment. The relationship seems to be different for males. The point estimates have the opposite sign as compared to females but in most cases, they are not significant at the five-per cent level. The negative effect of the individual's educational attainment before the program seems to be relatively stronger among females than males. Even though most parameter estimates have the same signs for both males and females, there seem to be enough differences to justify that they should be estimated separately.

The results from using the entire sample (males+females) are presented in *table 7*, in the appendix. The estimated coefficient on *AEI* indicates a small and significant difference between the two programs. The marginal effect for participating in the AEI instead of LMT is an increase in the proportion of unemployment by 1.5 percentage points. These estimates indicate a higher proportion of unemployment for females.

[12] Evaluated as $P|1 - P|0$.

In *table 3*, the estimates of the propensity score matching are presented for males and females separately for three different time points of observation. Generally, the results indicate small effects, especially for the sample of females. A tendency of a diminishing difference between the two programs over time is evident for males. This is not the case for females, however. The estimated effects are very close to the marginal effects estimated in the Logit model. An average treatment effect on the treated of 1.5 percentage points for males corresponds to about eleven days more of unemployment for participants in the AEI as compared to participants in LMT. This calculation applies for the whole post program period of five years, and it is evaluated at the mean of the unemployment proportion. The corresponding figure for females is eight additional days of unemployment. This is the total of days in unemployment, including weekends and holidays, which makes the effect even smaller in terms of working days.

*Table 3:* Matching estimates of the effect of the AEI on post-program unemployment

| Outcome variable: proportion of days in unemployment, $p_i$ | | | | |
|---|---|---|---|---|
| $N_m$=9,014 | | | | |
| $N_f$=14,090 | Males | | Females | |
| | Estimate | std. err. | Estimate | std. err. |
| Observation in 2001 | 0.0341 | 0.0079 | 0.0221 | 0.0064 |
| Observation in 2002 | 0.0213 | 0.0067 | 0.0198 | 0.0067 |
| Observation in 2003 | 0.0174 | 0.0069 | 0.0140 | 0.0068 |
| Note: Kernel estimation with a biweight kernel, a bandwith of 0.06, common support and three per cent trimming. The standard errors originate from bootstrapping with 100 repetitions. | | | | |

The conditional mean independence assumption requires that the outcome variable must be conditionally mean independent on the propensity score, see *e.g.* Smith and Todd (2005). To test whether this assumption holds, we test for each dependent variable if the conditional mean of each variable after matching differs

significantly between the treated and the untreated populations in the matched samples. For the female sample, the tests indicate that the null hypothesis of no significant difference cannot be rejected for any variables except the *post-secondary schooling* dummy. As for the male sample, the tests indicate no significant difference between the groups in the matched samples.

The results from the propensity score matching based on the whole sample (males + females) are presented in *table 8*, in the appendix. These results confirm that the difference in post-program unemployment between the two groups is very small. The point estimate for 2003 is close to the marginal effect calculated from the Logit estimates in *table 7*. The results indicate that the treatment effect may be decreasing over time.

The estimated difference between the AEI and LMT for individuals with different periods of time spent in unemployment 1996 is presented in *table 4*. Overall, the estimates indicate no or small differences between the two programs, with the possible exception for individuals who have been unemployed the entire year in 1996. Even in this case, the difference is relatively modest, 24 days evaluated at the sample mean for individuals with 366 days of unemployment in 1996.

The literature suggests that there may be differences in the treatment effects, depending on the regional labor market situation (see *e.g.* Heckman *et. al.* 1999). *Table 5* gives the results for subsamples stratified by the level of the unemployment rate in the county of residence in the quarter in which the individual finished the program. Although there seem to be some differences in the treatment effects with respect to the level of the regional unemployment rate, there is no clear pattern in these estimates.

*Table 4:* Matching estimates of the proportion of time spent in unemployment, stratifiction by pre-program unemployment

| Outcome variable: proportion of days in unemployment, $p_i$ | | | |
|---|---|---|---|
| | N | Estimate | std. err. |
| 0 days of unemployment in 1996 | 3,033 | 0.0023 | 0.0116 |
| 1-81 days of unemployment in 1996 | 2,172 | 0.0059 | 0.0232 |
| 82-163 days of unemployment in 1996 | 2,365 | 0.0116 | 0.0150 |
| 164-274 days of unemployment in 1996 | 3,188 | 0.0168 | 0.0129 |
| 275-365 days of unemployment in 1996 | 2,524 | 0.0075 | 0.0149 |
| 366 days of unemployment in 1996 | 9,822 | 0.0247 | 0.0081 |
| Note: Kernel estimation with a biweight kernel, a bandwith of 0.06, common support and three per cent trimming. The standard errors originate from bootstrapping with 100 repetitions. | | | |

*Table 5:* Matching estimates of proportion of time spent in unemployment, stratification by regional unemployment

| Outcome variable: proportion of days in unemployment, $p_i$ | | | |
|---|---|---|---|
| Unemployment rate | N | Estimate | Std. err. |
| <5.60 | 4,301 | 0.0011 | 0.0128 |
| 5.60-7.75 | 11,720 | 0.0262 | 0.0067 |
| >7.75 | 6,743 | 0.0146 | 0.0095 |
| Note: Kernel estimation with a biweight kernel, a bandwith of 0.06, common support and three per cent trimming. The standard errors originate from bootstrapping with 100 repetitions. | | | |

## 4.2 Spells of unemployment

Now I turn to the estimation of the number of spells in unemployment. In these estimations, the same set of independent variables is used as in the Logit model for the unemployment proportion, with the addition of a variable measuring the logaritm of the number of days from the end of the program until the date of observation. This variable is used to capture the effect of differences between individuals as concerns the length in time when there can be transition into and out of unemployment.

The Poisson regression results are presented in *table 6*. One of the possible problems with a Poisson model is overdispersion and underdispersion, respectively. Cameron and Trivedi (1990) suggest a regression-based test for this. The null hypothesis for the overdispersion test is that the conditional variance equals the conditional mean or, more formally, that $\alpha = 0$ in $Var[y_i] = \mu + \alpha g(\mu_i)$, where the test-statistica is $t$-distributed. This is tested for $g(\mu_i) = \mu_i$ and $g(\mu_i) = \mu_i^2$, respectively. The test-statistica for the first variant is -1.948 and for the second variant, it is 1.051. The null hypothesis cannot be rejected for either of the two specifications of $g(\mu_i)$, so that the test does not indicate any overdispersion problem. For both males and females, participants in the AEI are indicated to have more spells of unemployment than participants in LMT. This difference is very small, though.

The number of spells seems to decrease with age and schooling. On the other hand, the proportion of time spent in unemployment is decreasing with schooling and increasing with age. This indicates that previous schooling affects the attachment to the job market in a positive direction, while the case is the opposite with age (*table 2*). Disabled individuals seem to have relatively fewer spells of

*Table 6:* Poisson model estimates.

| Dependent variable: number of spells in unemployment | | | | |
|---|---|---|---|---|
| | Males | | Females | |
| $N_m$=9,007 $N_f$=14,080 | Coeff. | $\|t$-value$\|$ | Coeff. | $\|t$-value$\|$ |
| AEI | 0.0659 | 3.97 | 0.0647 | 5.17 |
| Days of unemployment in 1996 | 0.000563 | 5.13 | 0.0000552 | 0.61 |
| 366 days of unemployment in 1996 | -0.126 | 5.45 | -0.0156 | 0.76 |
| Zero days of unemployment in 1996 | -0.0994 | 2.91 | -0.124 | 4.69 |
| Wage earnings 1996 | -0.000443 | 3.37 | -0.000610 | 4.98 |
| Age | -0.00480 | 5.22 | -0.0127 | 15.69 |
| Two-year upper secondary school | -0.00898 | 0.49 | -0.0409 | 2.64 |
| Three-year upper secondary school | -0.0759 | 2.93 | -0.0308 | 1.34 |
| Post secondary schooling | -0.169 | 6.47 | -0.0558 | 2.34 |
| Scandinavian, not Swedish | 0.130 | 2.46 | 0.0353 | 0.93 |
| European | -0.0606 | 1.86 | 0.00796 | 0.23 |
| Non European | 0.0828 | 2.27 | 0.122 | 2.99 |
| Disabled 1997 | -0.158 | 7.00 | -0.124 | 5.68 |
| Agriculture | 0.139 | 2.51 | -0.0171 | 0.22 |
| Manufacturing | 0.0110 | 0.41 | 0.0288 | 0.94 |
| Electricity | 0.0724 | 0.67 | -0.0774 | 0.42 |
| Construction | 0.0857 | 2.98 | -0.128 | 1.64 |
| Retail | -0.0270 | 1.03 | -0.0174 | 0.74 |
| Finance | -0.0218 | 0.69 | 0.00840 | 0.30 |
| Education | -0.0791 | 1.95 | 0.0223 | 0.70 |
| Health | -0.0588 | 1.78 | -0.0616 | 3.32 |
| Personal service | 0.0726 | 2.37 | 0.0551 | 2.15 |
| Public administration | -0.130 | 2.78 | -0.919 | 2.45 |
| Unemployment rate | 0.0102 | 1.36 | 0.141 | 2.19 |
| Stockholm | -0.129 | 3.39 | -0.0364 | 1.06 |
| East Mid | -0.216 | 6.53 | -0.121 | 4.07 |
| Småland | -0.162 | 3.89 | -0.122 | 3.34 |
| South | -0.145 | 4.61 | -0.106 | 3.71 |
| West | -0.215 | 6.49 | -0.181 | 6.02 |
| North Mid | 0.0214 | 0.68 | -0.0139 | 0.48 |
| Mid North | -0.135 | 3.34 | -0.0693 | 3.90 |
| Log time | 1.489 | 10.21 | 1.102 | 9.74 |
| Constant | -10.382 | 9.39 | -7.253 | 8.52 |

unemployment. However, this group has a relatively high portion of post-program unemployment. Presumably, in this case, fewer unemployment spells are an indicator of lower transition into employment rather than a lower risk of reentrance into unemployment.

Days of unemployment in the year prior to program participation seems to increase the number of spells after the program. The effect is not linear, though. Individuals with 366 days of unemployment in 1996 have relatively fewer spells of unemployment. Combined with a larger proportion of time in unemployment according to the results in *table 2*, this result indicates that individuals with a loose connection to the labor market prior to the program remain detached from the labor market also after program participation.

# 5 Conclusions

This paper evaluates the effects of comprehensive adult education of the unemployed as compared to vocational training as a means of reducing unemployment. For this purpose, I use data from Sweden comprising a large sample of unemployed participants in the Adult Education Initiative (AEI) and Labor Market Training (LMT). The two programs have similar target groups and aims. The outcome variables examined are the proportion of time individuals spend in unemployment from the end of the program to the observation in November 2003, and the number of unemployment spells during this period.

The results indicate that the AEI and LMT are by and large equally efficient as an instrument for reducing unemployment. The difference between them seems negligible in terms of the proportion of time spent in unemployment, as well as

the number of spells in unemployment. The results in the present study are in line with Axelsson and Westerlund (2001) and Stenberg (2003), who find no effects on the duration of unemployment. However, these studies indicate a lower probability of participants in AEI registering as unemployed in the short run after the end of the program.

It should be noted, though, that this is only a partial study and does not take into account general equilibrium effects. It compares two different kinds of programs, and the volume of one of the programs might affect the probability of employment of nonparticipants.

Moreover, one of the goals with AEI was to promote transition into higher education. Individuals enrolling in higher education are not included in the present study. Labor market outcomes among these individuals constitute an interesting topic for future research.

# A Varibable definitions and additional results

*Age*; Age measured Dec. 31, 1997.

*Children*; 1 if any children under the age of 18 resides at the individual in 1997, 0 otherwise.

*Days of unemployment*; Number of days spent in any of the search categories, including unemployment and labor market programs defined by the Swedish National Labor Market Board.

*Disabled*; 1 if classified with a working disability in 1997, 0 otherwise.

*Non-married*; Not married or divorced Dec. 31, 1997.

*Married*; Married Dec. 31, 1997.

*Swedish*; Swedish citizen Dec. 31, 1997.

*Scandinavian*, not Swedish; Citizen of a Scandinavian country, except Sweden Dec. 31, 1997.

*European*; Citizen of a European country, except Scandinavia Dec. 31, 1997.

*Non European*; Citizen of a country outside of Europe Dec 31, 1997.

*Stockholm*; Resident within the Stockholm county Dec. 31, 1997.

*East Mid*; Resident within Uppsala, Södermanland, Östergötland, or Västmanland county Dec. 31, 1997.

*Småland*; Resident within Jönköping, Kronoberg, Kalmar, or Gotland county dec. 31, 1997.

*South*; Resident within Blekinge, or Skåne county dec. 31, 1997.

*West*; Resident within Halland or Västra Götaland county dec. 31, 1997.

*North Mid*; Resident within Värmland, Dalarna, or Gävleborg county dec. 31, 1997.

*Mid North*; Residents within Västernorrland, or Jämtland county dec. 31, 1997.

*Upper North*; Residents within Västerbotten, or Norrbotten county dec. 31, 1997.

*Students per 1000 inhabitants*; Number of students at universities and university collages in county of residence 1998.

*Unemployment rate*; Unemployment rate in county of residence 1998.

*Wage earnings 1996*; Gross wage income, measured in thousands of SEK the year of 1996.

*Table 7:* Logit estimates of proportion of time spent in unemployment

| Dependent variable: proportion of days in unemployment, $p_i$ | | |
|---|---|---|
| N=23,209 | Coeff. | $\lvert t$-value$\rvert$ |
| AEI | 0.0401 | 2.07 |
| Days of unemployment in 1996 | 0.000325 | 2.52 |
| 366 days of unemployment in 1996 | 0.102 | 3.57 |
| Zero days of unemployment in 1996 | -0.110 | 2.92 |
| Wage earnings 1996 | -0.00105 | 6.76 |
| Age | 0.146 | 13.64 |
| Two-year upper secondary school | -0.0396 | 1.84 |
| Three-year upper secondary school | -0.0965 | 3.09 |
| Post secondary schooling | -0.127 | 4.05 |
| Female | 0.119 | 6.14 |
| Scandinavian, not Swedish | -0.0739 | 1.28 |
| European | -0.126 | 2.92 |
| Non European | 0.0928 | 1.78 |
| Disabled 1997 | 0.255 | 9.49 |
| Agriculture | -0.0869 | 0.99 |
| Manufacturing | -0.460 | 1.25 |
| Electricity | 0.526 | 0.30 |
| Construction | -0.257 | 5.10 |
| Retail | -0.0136 | 0.43 |
| Finance | -0.0532 | 1.39 |
| Education | -0.0309 | 0.69 |
| Health | -0.0226 | 0.83 |
| Personal service | 0.0456 | 1.24 |
| Public administration | -0.100 | 1.98 |
| Unemployment rate | 0.0189 | 2.20 |
| Stockholm | -0.299 | 6.34 |
| East Mid | 0.0205 | 0.51 |
| Småland | 0.0389 | 0.79 |
| South | 0.0259 | 0.66 |
| West | 0.0743 | 1.83 |
| North Mid | 0.141 | 3.44 |
| Mid North | 0.0744 | 1.51 |
| Constant | -1.034 | 10.74 |

*Table 8:* Matching estimates of proportion of time spent in unemployment

| Outcome variable: proportion of days in unemployment, $p_i$ | | |
|---|---|---|
| N=23,104 | ATT | Std. err. |
| Observation in 2001 | 0.0254 | 0.0058 |
| Observation in 2002 | 0.0205 | 0.0049 |
| Observation in 2003 | 0.0153 | 0.0055 |

*Table 9:* Comparison with end dates at November 1 2002 and 2001.

| Dependent variable: proportion of days in unemployment, $p_i$ | | | | |
|---|---|---|---|---|
| N=23,209 | 2002 | | 2001 | |
| | Coeff. | $\|t$-value$\|$ | Coeff. | $\|t$-value$\|$ |
| AEI | 0.0498 | 2.58 | 0.0672 | 3.49 |
| Days of unemployment in 1996 | 0.000358 | 2.81 | 0.000462 | 3.67 |
| 366 days of unemployment in 1996 | 0.105 | 3.71 | 0.0921 | 3.26 |
| Zero days of unemployment in 1996 | -0.111 | 3.00 | -0.119 | 3.29 |
| Wage earnings 1996 | -0.00108 | 7.00 | -0.00104 | 6.97 |
| Age | 0.0158 | 14.82 | 0.0177 | 16.51 |
| Two-year upper secondary school | -0.0420 | 1.96 | -0.0403 | 1.87 |
| Three-year upper secondary school | -0.103 | 3.32 | -0.100 | 3.25 |
| Post secondary schooling | -0.138 | 4.42 | -0.150 | 4.85 |
| Female | 0.138 | 7.15 | 0.144 | 7.51 |
| Scandinavian, not Swedish | -0.0702 | 1.26 | -0.0420 | 0.74 |
| European | -0.114 | 2.68 | -0.0957 | 2.27 |
| Non European | 0.103 | 1.99 | 0.107 | 2.08 |
| Disabled 1997 | 0.252 | 9.32 | 0.240 | 8.65 |
| Agriculture | -0.0998 | 1.15 | -0.148 | 1.72 |
| Manufacturing | 0.0619 | 1.69 | -0.0750 | 2.07 |
| Electricity | 0.0574 | 0.33 | 0.0286 | 0.17 |
| Construction | -0.257 | 5.17 | -0.248 | 5.17 |
| Retail | -0.0231 | 0.73 | -0.0359 | 1.14 |
| Finance | -0.0627 | 1.65 | -0.0719 | 1.91 |
| Education | -0.302 | 0.68 | -0.0260 | 0.59 |
| Health | -0.000426 | 0.02 | -.0277 | 1.01 |
| Personal service | 0.0299 | 0.82 | 0.0162 | 0.44 |
| Public administration | -0.0958 | 1.92 | -0.710 | 1.44 |
| Unemployment rate | 0.0172 | 2.01 | 0.0145 | 1.70 |
| Stockholm | -0.311 | 6.66 | -0.281 | 6.11 |
| East Mid | 0.0353 | 0.88 | 0.0481 | 1.20 |
| Småland | 0.0574 | 1.17 | 0.0876 | 1.79 |
| South | 0.0335 | 0.86 | 0.0466 | 1.20 |
| West | 0.0858 | 2.13 | 0.0947 | 2.36 |
| North Mid | 0.152 | 3.74 | 0.148 | 3.61 |
| Mid North | 0.0908 | 1.85 | 0.106 | 2.16 |
| Constant | -0.998 | 10.44 | 0.802 | 8.42 |

*Table 10:* Poisson model estimates.

| Dependent variable: number of spells in unemployment<br>N=23,209 | Coeff. | $\lvert t$-value$\rvert$ |
|---|---|---|
| AEI | 0.0619 | 5.49 |
| Days of unemployment in 1996 | 0.000251 | 3.65 |
| 366 days of unemployment in 1996 | 0.0641 | 4.17 |
| Zero days of unemployment in 1996 | -0.115 | 5.52 |
| Wage earnings 1996 | -0.000562 | 6.35 |
| Age | -0.950 | 15.71 |
| Two-year upper secondary school | -0.0290 | 2.46 |
| Three-year upper secondary school | -0.0484 | 2.83 |
| University | -0.111 | 6.29 |
| Female | -0.102 | -9.70 |
| Scandinavian, not Swedish | 0.0704 | 2.29 |
| European | -0.0309 | 1.30 |
| Non European | 0.0944 | 3.47 |
| Disabled 1997 | -0.139 | 8.84 |
| Agriculture | 0.0885 | 1.97 |
| Manufacturing | 0.0198 | 0.99 |
| Electricity | 0.0461 | 0.50 |
| Construction | 0.0831 | 3.32 |
| Retail | -0.0237 | 1.35 |
| Finance | -0.00911 | 0.44 |
| Education | -0.0168 | 0.67 |
| Health | -0.0685 | 4.43 |
| Personal service | 0.0597 | 3.04 |
| Public administration | -0.112 | 3.83 |
| Unemployment rate | 0.106 | 2.16 |
| Stockholm | -0.0820 | 3.22 |
| East Mid | -0.166 | 7.55 |
| Småland | -0.146 | 5.35 |
| South | -0.128 | 6.04 |
| West | -0.203 | 9.14 |
| North Mid | -0.0156 | 0.73 |
| Mid North | -0.103 | 3.86 |
| Log time | 1.27 | 14.26 |
| Constant | -8.50 | 13.38 |

*Table 11:* Poisson estimate for male, subsamples according to proportion and total time after program

| Outcome variable: proportion of days in unemployment, $p_i$ | | |
|---|---|---|
| | $\leq$2040 days since end of program | $>$2040 days since end of program |
| Proportion $\leq 0.30$ | 0.083 (2.03) | -0.039 (1.07) |
| $0.30 <$ Proportion $< 0.70$ | -0.033 (0.80) | 0.174 (0.49) |
| Proportion $\geq 0.70$ | 0.006 (0.10) | 0.075 (1.48) |

*Table 12:* Poisson estimate for female, subsamples according to proportion and total time after program

| Outcome variable: proportion of days in unemployment, $p_i$ | | |
|---|---|---|
| | $\leq$2040 days since end of program | $>$2040 days since end of program |
| Proportion $\leq 0.30$ | -0.014 (0.31) | 0.108 (3.03) |
| $0.30 <$ Proportion $< 0.70$ | 0.018 (0.44) | 0.709 (2.31) |
| Proportion $\geq 0.70$ | 0.010 (0.20) | 0.023 (0.53) |

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