Higher Education and the Determination of Aggregate Male Employment by Age

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Abstract

This paper studies the determinants of age-speci…c employment rates among Swedish males, focusing on the e¤ect of education on employment. We use cohort speci…c data for the time period 1984-1996 covering cohorts aged 21-45. Two states of the labour market are compared; the high employment period 1984-90 and the recent downturn 1991-96. It is found that aggregate age-group speci…c employment rates increase with the proportion of the cohort with an academic degree. The e¤ect is stronger in the downturn period as compared to the boom period. However, we do not …nd any strong evidence in favour of the hypothesis that the e¤ect of higher education on employment is declining with age. Estimations to capture crowding out e¤ects between age-groups indicate larger e¤ects in times of high employment when the own cohort e¤ect is weaker.

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1. Introduction

One characteristic feature of most labor markets is that the unemployment rate is lower for skilled workers as compared to unskilled workers. For instance, Jackman et al. (1991) report that unemployment rates for 'highly' educated workers are in the range of one third to one …fth as low as those for 'less' educated people when measured among the European countries. Microevidence on the determinants of unemployment points to the same conclusion. Well educated individuals are less likely to experience unemployment than those with lower educational levels (see e.g. Ashenfelter & Ham (1979), Pedersen & Westergaard-Nielsen (1993), Nickell (1979)) which suggests that education is a good way to hedge against unemployment risks and that unemployment risks may be an important part of the private returns to schooling.

It is a di¤erent question to what extent education a¤ects employment at the aggregate level of the economy. Since the early part of the 1990's a number of theoretical studies addressing questions of aggregate employment and education have emerged (Saint Paul 1994, 1996a, 1996b, Fields 1993, Jackman et al. 1991, chapter 6, McKenna 1996 and Gregg & Manning 1997). The general conclusion is that an increase in the relative supply of skilled workers has an ambiguous e¤ect on the aggregate employment rate in the short run. Saint Paul (1996a) contains one example of the di¤erent e¤ects involved. A larger fraction of educated workers changes the composition of the labor force such that a larger fraction of the workers face a lower unemployment rate. This is referred to as the composition e¤ect. However, in his model, the technology is speci…ed in such a way that increased education also decreases the physical demand for skilled and unskilled workers. Therefore, in the short run, the aggregate unemployment rate may move in either direction when educational attainment increases.

Another line of literature, rendering additional uncertainty to the e¤ects of education on employment, has put the emphasis on the crowding out e¤ects from education. Presumably, one of the important e¤ects of education is that it may lead to substitution of workers among di¤erent groups. Thurow (1972)

advances a hypothesis of job competition where the best quali…ed workers are in the front of the job queue, and in the event of an excess supply situation, the quali…ed may crowd out employment opportunities for those with less quali…-cations. Okun (1981) instead proposes that it may be optimal for employers to increase educational requirements during recessions if wages are downward rigid, leading to the same observation. Empirical studies of crowding out e¤ects include Teulings & Koopmanschap (1989) and van Ours & Ridder (1995). Both studies …nd evidence of crowding out between educational groups. However, van Ours & Ridder …nd less crowding out as they their de…nition of crowding out is limited to new-hirings whereas Teulings & Koopmanschap also include lay-o¤s.

To our knowledge, there is no systematic study of the educational e¤ects on the aggregate employment level. This paper is a …rst attempt to study this question. Using Swedish cohort speci…c data of higher education and of employment from 1984 to 1996, covering age-groups aged 21-45, the employment e¤ects of increased educational attainment are estimated. Educational attainment is measured as the proportion of a cohort that has received an academic degree and employment as the fraction of the cohort that is employed. The estimation of the educational e¤ects is divided in two parts, the economic boom 1984-90 and the recent recession 1991-96. Controlling for other observable characteristics, our results show that educational attainment has a positive e¤ect on cohort speci…c employment rates. Moreover, we test formally for di¤erences in the magnitudes of the e¤ects over time and across age-groups. Evidence is found that the e¤ects of education on employment is more important in times of low employment. This is consistent with the view that composition e¤ects are important in explaining the short-run impact of educational attainment on aggregate employment. However, the evidence on di¤erences in e¤ects across age-groups is less conclusive. Finally, using a measure of relative education between the own cohort and neighboring cohorts, it is found that the negative e¤ects from other cohorts increasing educational level are larger in the period of high employment, i.e. when the own cohort e¤ect is less important.

The outline of the paper is as follows. Section 2 discusses the data set used and presents some rudimentary facts about cohort employment and higher educational attainment in Sweden. Section 3 sets up an empirical model of employment determination and discusses di¤erent hypotheses regarding the effects of higher education on the aggregate employment rate. Section 4 presents the empirical analysis and Section 5 concludes.

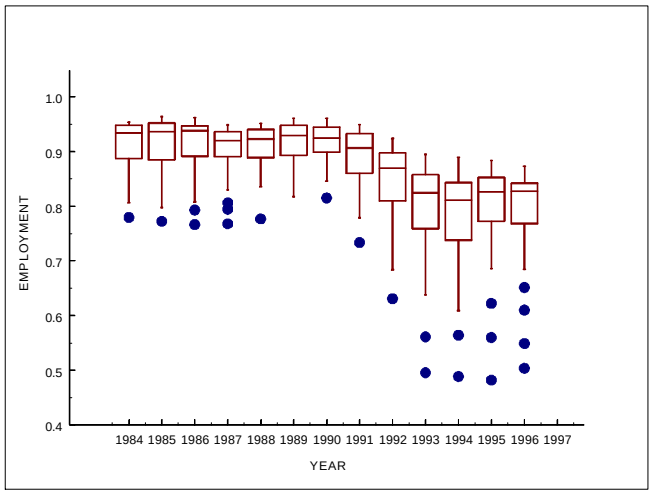
2. Description of the Data

The empirical analysis in this paper uses Swedish data on employment and college level degrees among males. Data are reported on a cohort speci…c level of ages 21 to 45 years old for the period 1984-1996. The employment data are taken from the Labor Force Surveys (Arbetskraftsundersökningar, AKU), executed by Statistics Sweden (Statistiska Centralbyrån, SCB). The observations are yearly averages based on labor market …gures that have been surveyed on a monthly basis. The surveys were made through telephone interviews, with sample sizes varying between 16,000 and 24,000 individuals. The sample has continually been rotated so that one eighth has been substituted by new individuals on each occasion of an interview.

The employment data is speci…ed such that the population is divided into those participating in the labor force and those who are outside the labor force. The labor force is in turn divided in three subgroups consisting of unemployed, employed and absentees. People involved in labor market training programs are reported as outside the labor force while people participating in relief works are considered as employed. Full time students are considered outside the labor force, but it is su¢cient to have worked for one hour in the preceding week to be reported as employed. In addition, students that are on temporary leave from their work are included among the absentees. The fact that students are reported both outside and inside the labor force makes it potentially inappropriate to use the labor force to scale the employment …gures. To avoid this we de…ne the employment rate as the number of employed divided by the cohort population.

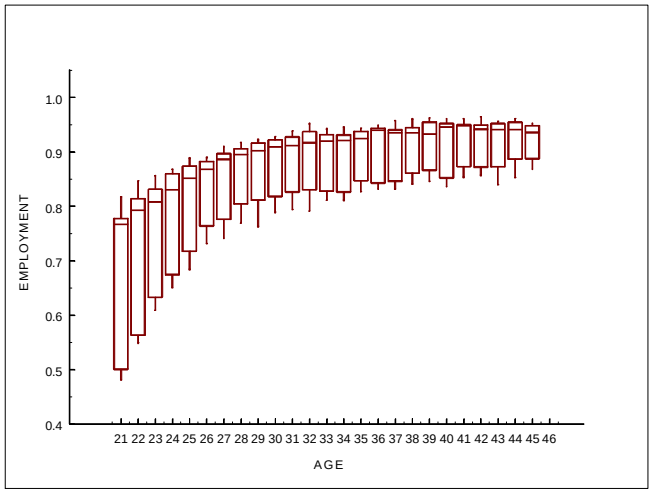
The educational data are provided by Statistics Sweden. These data report the number of male persons that have attained at least one academic degree. For reasons to be explained, the educational data are reported with a lag, i.e. the individuals that got their degree during the course of year t are reported as educated for the …rst time at t+1. The educational ratio of a cohort is de…ned as the accumulated number of persons that have attained at least one academic degree divided by the cohort population.

Figure 2.1: Relative employment among 21-45 year olds over time



The variation of the employment ratio over time and across age-groups is shown in the form of box-plots in Figures 2.1 and 2.2 respectively. In Figure 2.1 the most important characteristic is the general di¤erence in employment levels between the 1980's and the 1990's, re‡ecting the economic recession that hit Sweden in 1991. Note also how the variation within each year is larger in recessional years. The median employment ratios emphasize the non-stationarity of the employment distribution over time and the yearly distributions appear to be skewed over age-groups. This asymmetry is apparent in Figure 2.2 where it can be seen that the age-groups with median employment rates, approximately 31-35 years old, are much closer to the age-groups at the top employment rates

Figure 2.2: Relative employment 1984-1996 across age-groups



than to the bottom ones. The low employment rates among the young is well known and usually explained by their lack of working experience.[1] Here, the low youth employment levels are also due to the full time students who are reported as outside the labor force. Figure 2.2 shows furthermore, in a pattern reminiscent of the one we saw over time, that lower median employment rates appear in combination with larger variations.

Turning now to the variation in the educational variable Figure 2.3 shows how the number of newly graduated has varied across age-groups. It reveals that the vast majority of academic degrees are attained before the age of 30 and it also gives an idea of how the age of graduated individuals is distributed for a typical year.

Figure 2.4 and Figure 2.5 show the accumulated educational ratio across age-groups and over time respectively. In Figure 2.4 education is de…ned as a cumulative ratio and naturally increases with age. Here as well as in Figure 2.3 it is striking how little variation there is between the di¤erent cohorts within each age-group, i.e. between for example the 21 year olds in 1984 and 1996.

[1] For an overview of the topic see Freeman and Wise (1982).

Figure 2.3: Number of graduated in each age-group 1984-1996

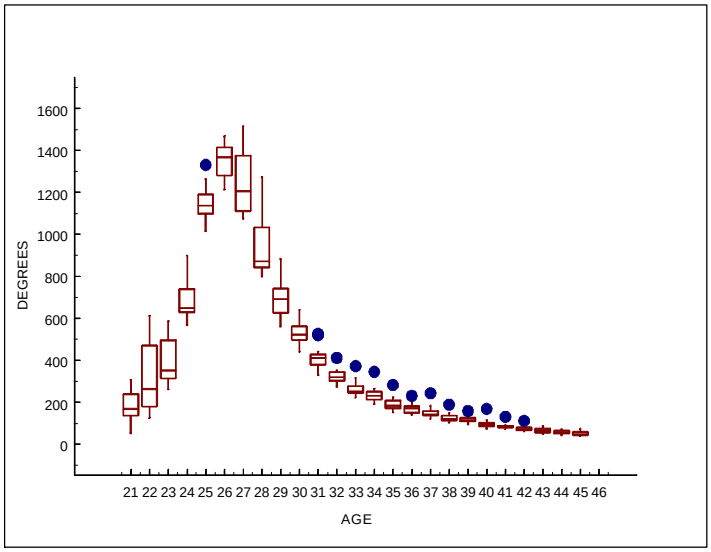
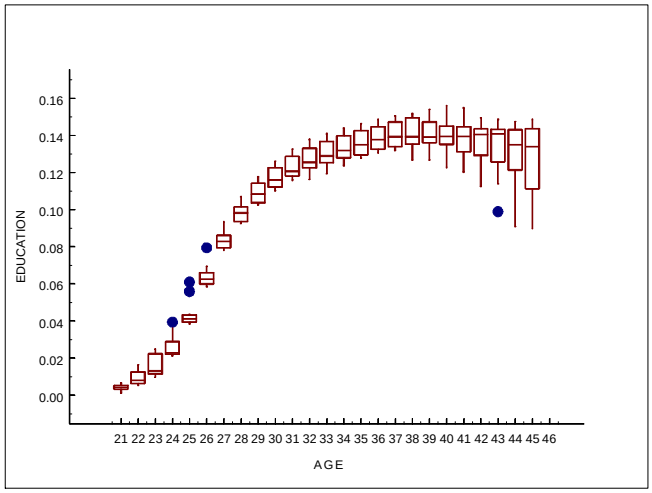
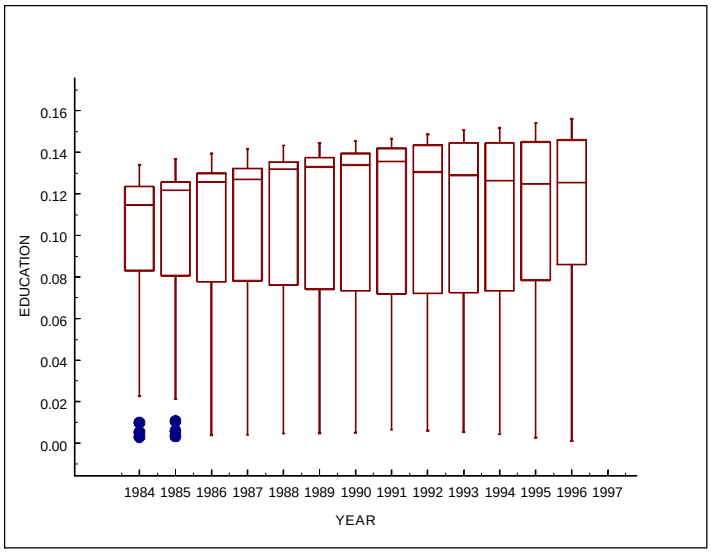


Figure 2.4: Fraction of educated in each age-group 1984-96



The variation is clearly more important across age-groups than over time (or within age-groups). The slightly larger variations among the age-groups over 40 are due to an increase in the education in the 1960's when the generation of the baby boom after the second world war entered higher education. In Figure 2.5 the impression of a small variation over time is con…rmed. The fall in the median value between 1991 and 1992 actually re‡ects a fall in educational ratios among younger age-groups at the start of the 1980's. This seemed to happen as a consequence of a second baby boom (after the one that followed the second world war) that took place in the 1960's which was not followed by a subsequent increase in educational attainment. Quite on the contrary to what can be seen from the median values, an important increase in the fraction of enrolled in higher education began in 1988. In fact, the number of enrolled students rose by more than 50 per cent between 1988 and 1995 and in Figure 2.5 it can be discerned in the decreasing variation within each year in the 1990's.

Figure 2.5: Fraction of educated over time



3. Empirical Model

The purpose of this section is to discuss how aggregate age-group speci…c employment rates are a¤ected by changes in the educational composition and to devise an empirical model suitable for an analysis of the determinants of age-group speci…c employment rates in the short run. For our purposes, a convenient starting point is to decompose the age-group speci…c aggregate employment, N_i, as follows

$$N_i = N_i^e + N_i^u + N_i^s \tag{3.1}$$

where N_i^e denote employment of those with a university degree, N_i^u is employment of the uneducated and N_i^s is the number of employed students. Assume that the uneducated workers share a common labor market with students while only a (…xed) proportion of the students, ®, are active job-seekers. Let footindex j indicate other cohorts, i.e. $i \neq j$, and let us express the aggregate age-group speci…c employment rate of cohort i as

$$n_i = e_i n_i^e(e_i; e_j; ¢) + (u_i + ®s_i)n_i^u(u_i + ®s_i; u_j + ®s_j; e_i; e_j; ¢) \tag{3.2}$$

where e_i is the proportion educated within the population of cohort i and n_i^e is the employment rate of the educated. u_i is the proportion uneducated and s_i is the proportion of students, consequently $(u + ®s)$ is the proportion uneducated attached to the labor market. The employment rate among the uneducated labor force is denoted by n_i^u. The education speci…c employment rates should be viewed as 'reduced forms' of demand functions including factors that a¤ect demand directly as well as indirectly through wage bargaining. The latter channel may (but does not necessarily) imply that the educational composition itself a¤ects the education speci…c employment rates. This is why we have indicated that the employment rates depend on, inter alia, educa-

tional composition. Note that the uneducated employment rate depends on the supply of both educated and uneducated labor. This assumption re‡ects an asymmetry in working opportunities as the educated can seek for jobs in both employment markets (a similar thought can be found in McKenna (1996)).

The data from which the empirical analysis departs consist of the fraction of degrees and the employment rate within age-groups. This means that we do not control for the in‡ow into education. Given that we are not able to estimate how the in‡ow into education a¤ects employment, the empirical analysis most closely corresponds to a case where the fraction of educated men increases and the fraction of students decreases holding the fraction of uneducated non-students constant. Given the de…nition in (3.2), a larger fraction of educated men in a cohort, conditional on the fraction of uneducated non-students, a¤ects the aggregate age-speci…c employment rate according to

$$\frac{@n_i}{@e_i} j_{u_i} = [n_i^e \ ¡ \ ®n_i^u] + e_i \frac{@n_i^e}{@e_i} + (u_i + ®s_i) \frac{@n_i^u}{@e_i} \ ¡ \ ®(u_i + ®s_i) \frac{@n_i^u}{@(u_i + ®s_i)} \quad (3.3)$$

which is ambiguous in sign. The term within square brackets is a composition e¤ect. Given that employment is higher among the educated than among uneducated, the composition e¤ect will contribute to a positive dependence between employment and educational attainment. A small ® will contribute to increase the composition e¤ect as it means that a larger fraction of the students was not attached to the labor market. The three …nal terms on the right hand side of (3.3) contain the behavioral responses from changes in the educational composition of the age-group. The second term re‡ects the increasing supply of educated workers on their own labor market. The third term re‡ects that educated workers will take work opportunities from uneducated workers and the …nal term re‡ects how this e¤ect is reduced with ® as it represents the fraction of the newly graduated that was already in the labor market of the uneducated.

A few theoretical studies mentioned in the introduction have explicitly analyzed behavioral responses and the consequences for aggregate (un)employment. The behavioral responses hinges crucially on the assumptions made. The stan-

dard case, as provided by Jackman et al. (1991), appears to be that a larger proportion of educated will tighten the low skill labor market, leading to a higher low-skill employment rate and an upward pressure on the low-skill wage. Conversely, a larger proportion of educated will lead to a downward pressure on the high-skill wage and a lower high-skill employment rate.

Saint-Paul (1996a) provides another example by assuming perfect substitutability and rigid relative wages between the two skill groups. In his model, the technology is speci…ed in a way such that a larger fraction of skilled workers decreases the physical demand for skilled and unskilled workers. In the short run, therefore, the behavioral responses are negative. In Saint-Paul (1996b) assumptions concerning labor market rigidities are made within a search model. He shows that the total e¤ect on the aggregate employment rate is a non-linear function of the fraction of skilled workers. Assuming a Cobb-Douglas production function, simulations of his model indicate that unless the fraction of skilled workers is very high, around 80 per cent, employment is a decreasing function of education.[2] Gregg & Manning (1997) study wage and unemployment consequences of skilled-biased technological change. They provide a useful taxonomy regarding the long-run where their general focus is on the supply elasticity of skills and relative wage behavior. Following changes in technology, the aggregate employment rate may move in either direction as supply of skills respond.

For completeness of our exposition, let us also consider the employment e¤ects of an increase in other cohorts educational level e_j, given by

$$\frac{@n_i}{@e_j}\,\mathrm{j}_{u_j} = e_i\frac{@n_i^e}{@e_j} + (u_i + \mathbb{R}s_i)\frac{@n_i^u}{@e_j} \;\mathrm{¡}\; \mathbb{R}(u_i + \mathbb{R}s_i)\frac{@n_i^u}{@(u_j + \mathbb{R}s_j)} \qquad (3.4)$$

where the terms have interpretations similar to the …nal three terms of (3.3). The terms can all be interpreted as crowding out e¤ects across cohorts where

[2] One should bear in mind that Saint-Paul (1996a,1996b) studies the case where the fraction of educated is increased unconditional on the number of uneducated non-students. In his case the total e¤ect can be expressed as $@n_i=@e_i = [n_i^e(¢) \mathrm{¡} n_i^u(¢)] + e_i@n_i^e(¢)=@e_i + (1 \mathrm{¡} e_i)@n_i^u(¢)=@e_i$.

the second term is also a crowding out e¤ect between educational levels, ® again dampens this e¤ect. With the discussion above in mind we could expect the …rst two terms to be negative and the third term positive, possibly dominating.

To sum up, theory suggests that the employment response to a larger fraction of college-level degrees in the population is not necessarily positive. The composition e¤ect may be outweighed by behavioral responses and crowding out e¤ects (between educational levels and across cohorts).

Turning now to our empirical model of aggregate employment determination we emphasize some important features regarding how employment rates vary with educational attainment. First, the derivatives in (3.3) and (3.4) depend on the state of the labor market. It is well known that the skilled-unskilled employment di¤erence is higher in downturns than in boom years, suggesting that even though the underlying behavioral relationships (the education speci…c demand functions) may be stable over time, the total e¤ect is not. To be speci…c, we expect the composition e¤ect to be larger in times of recession. Second, as employment di¤erences with respect to educational attainment is larger among the young than among the old we expect the composition e¤ect to di¤er across age-groups as well. Third, the attachment to the labor market among students, re‡ected by ®, can reasonably be expected to be smaller in times of recession making the composition e¤ect more in‡uential. In our empirical model presented below, we will allow the e¤ect of educational composition on employment to vary over time and across age-groups. We also believe that educational attainment is most likely determined jointly with employment. Foremost, students' choice of graduation date can cause simultaneity problems as they may hang on to school a little longer during downturns. To take account of the simultaneity problem, education is de…ned with a one year lag (see section two), and we also estimate versions of the model where educational attainment has been instrumented. The instrumenting equations are further discussed in the next section.

The proportion employed in age-group i at time t, n_{it}, is assumed to be

given by

$$n_{it} = d_t + \left[\sum_{T=1}^{2} z_{it}' \beta_T + \gamma_T n_{it-1} + \delta_T \frac{e_{it}}{e_{jt}} + \left[\sum_{m=1}^{k} \alpha_{mT} e_{it} \right] \right] + \varepsilon_{it} \qquad (3.5)$$

where we condition on lagged employment, n_{it-1}. In equation (3.5) d_t denote year dummies, the row vector z_{it} denote other characteristics assumed to influence the employment rate of the age-group and β_T is a vector of parameters. $\frac{e_{it}}{e_{jt}}$ is a measure of the relative level of education which in accordance with equation (3.4) is supposed to capture other cohorts detrimental effect on the own cohort employment. e_{it} is the proportion with an academic degree in the own cohort and ε_{it} is an error term assumed to be normally distributed with mean zero and constant variance. We further assume that the vector z_{it} includes age and the size of the age-group relative to the male population aged 21-45. The term e_{jt} in the relative measure of educational attainment is constructed as an average of the four age-groups around each observed cohort i, i.e. $\frac{1}{4}(e_{i-2} + e_{i-1} + e_{i+1} + e_{i+2})$. Since there are reasons to expect that the effect of educational attainment is not stable over time, we divide the sample into subperiods (denoted by T). For our purposes, using data over the period 1984-1996, the sample is divided into two subperiods, the high employment period 1984-1990 (T = 1), and the recent downturn 1991-1996 (T = 2). All parameters are allowed to vary between the subperiods, and we can test various special cases simply by imposing the relevant parameter restrictions. For the own cohort effects the sample is also divided into age-groups of equal span, denoted by subscript m. We take five year intervals, meaning that there are k = 5 groups defined over the ages 21-25, 26-30, 31-35, 36-40 and 41-45 years of age. The parameters $(\alpha_{1T}; ...; \alpha_{5T})$ will reveal any age-pattern of the effects of educational attainment in period T.

4. Results

The estimation results of equation (3.5) are presented in Table 4.1. In the first column are the results from ordinary least squares estimation and in the

second column those of the instrumental variable estimation. In the latter version we have instrumented the absolute number of attained college-level degrees for each observation and it has then been accumulated and scaled in the same way as the original measure. The instruments chosen are the lag of the number of males within the cohort with an academic degree, the gross domestic product and its square, age and age squared, a time trend, absolute cohort size and the fourth and …fth lag of the number of males enrolled in …rst year university studies. The instrumental variable estimation is presented in appendix (Table A.1).[3]

Analyzing the results in Table 4.1 we observe that the coe¢cients of the lagged dependent variable are positive and highly signi…cant for both subperiods.[4] We also see that they are quite di¤erent in magnitude from one period to the other. The parameters of the age variable are positive and, during the economic boom, also signi…cant at the conventional …ve per cent level. As the age variable captures both age per se and work experience the parameter sign is according to expectations. However, it is contrary to expectations to …nd the parameters of relative cohort size positive.[5] Large cohorts should sti¤en the competition for work and, at least in the short run, decrease the employment level (e.g. Wachter & Kim (1982), Welch (1979), Zimmermann (1991)). One explanation for this peculiar result is that, in the panel we study, the relative population sizes are larger for older age-groups than for younger age-groups. This is a consequence of the baby-boom that followed the second world war and coincided with the birthyears of the older part of our sample.

Turning now to the educational parameters we expect them to be more in‡uential in the years of recession when job-opportunities are scarce. The relative level of education, though, have coe¢cients with the reverse pattern,

[3] Cohort sizes and the Swedish GDP have been collected from Statistisk Årsbok, Statistics Sweden, various issues. For the new entrants to higher education the actual numbers have speci…cally been ordered from Statistics Sweden.

[4] The inclusion of yeardummies and a lagged dependent variable alone creates an R^2 - value of 0.977. However, an F-test that other variables should be of no explanatory power is rejected with a p-value of 0.00005.

[5] Cohort sizes are constructed as fractions of the population aged 21-45 in each year.

Table 4.1: Estimation results

	OLS		IV	
Parameter	Coe¢cient	SE	Coe¢cient	SE
Constant	.385	.028	.335	.040
1984-90				
Age	$.152£10^{i2}$	$.397£10^{i3}$	$.130£10^{i2}$	$.397£10^{i3}$
Relative Cohort size	.384	.434	.282	.440
Employment lagged	.464	.034	.537	.042
Relative Education	.041	.014	.034	.014
Education 1984-90				
$\bar{}_{11}$ Age-group 21-25	.192	.160	.267	.168
$\bar{}_{21}$ Age-group 26-30	.111	.064	.119	.069
$\bar{}_{31}$ Age-group 31-35	.116	.057	.099	.062
$\bar{}_{41}$ Age-group 36-40	.112	.063	.097	.067
$\bar{}_{51}$ Age-group 41-45	.065	.073	.057	.075
1991-96				
Age	$.465£10^{i3}$	$.103£10^{i2}$	$.864£10^{i3}$	$.103£10^{i2}$
Relative Cohort size	1.697	.947	1.771	.970
Employment lagged	.629	.037	.626	.032
Relative Education	$-.893£10^{i2}$	.018	$.335£10^{i2}$	.020
Education 1991-96				
$\bar{}_{12}$ Age-group 21-25	.841	.334	.595	.335
$\bar{}_{22}$ Age-group 26-30	.634	.137	.549	.140
$\bar{}_{32}$ Age-group 31-35	.565	.127	.481	.128
$\bar{}_{42}$ Age-group 36-40	.528	.138	.442	.139
$\bar{}_{52}$ Age-group 41-45	.570	.172	.473	.174
R^2	.9854		.9851	
LogL	1001.44		998.38	

Note: The number of observations is 324. Standard errors are heteroscedastic consistent. Period speci…c e¤ects are included in the regressions.

signi…cant for the economic boom period but not for the recession, perhaps indicating that the relative level of education of a cohort is more important when the composition (own-cohort) e¤ect is weaker. However, the inconsistency between the two subperiods makes us feel uncertain about the correct interpretation. For the own cohort e¤ects, the parameters from the years of recession are more proli…c and, contrary to the 1980's, they are all signi…cantly determined at the …ve percent level. The parameters are all positive in both subperiods and for all age-groups, generally declining with age. Comparing the OLS and the IV estimates there are some di¤erences in the parameters estimated, most notably for the own cohort e¤ects of the recessional period, but the two versions of the model give the same impression about how education a¤ects employment.

In Table 4.2, we present Wald-tests of the relationships between educational level and employment. The …rst row in the table tests the null hypothesis that educational e¤ects on employment are the same for all age-groups and over the entire estimation period. Using the …ve per cent level of signi…cance as the cut-o¤ we can reject the null hypothesis in row one, meaning that parameter stability in general can be rejected. Row two of Table 4.2 tests the null hypothesis of no di¤erences in educational e¤ects between the two subperiods allowing for di¤erences across age-groups. This hypothesis is also rejected. Row three tests age dependent education coe¢cients allowing for di¤erences between subperiods. Rows four and …ve of Table 4.2 test age dependence for the subperiods 1984-90 and 1991-96. As can be seen from the table, it is not possible to reject the null of no di¤erences.[6]

Summing up we …nd evidence in favor of the hypothesis that the short-run e¤ect of educational composition on employment di¤ers between the subperiods. The interpretation is that education has a more important short-run e¤ect on employment in recessions than during economic booms. It is tempt-

[6] The inclusion of the level of education of cohort i in the relative education measure necessarily changes the own cohort e¤ects of table 4.1. However, the implications of table 4.2 rest unchanged if we instead of the relative measure use the residual of the regression $e_{jt} = ® + \bar{}e_{it}$ or if we exclude any measure of the other cohorts educational level.

Table 4.2: Testing di¤erences in e¤ects across age-groups and over time

		OLS		IV	
	Null hypothesis	Chisq	P-value	Chisq	P-value
1)	No di¤erence in e¤ects between age-groups and subperiods[a]	27.13	.001	23.77	.005
2)	No di¤erence in e¤ects between sub-periods; each age-group separated[b]	19.27	.002	16.74	.005
3)	No di¤erence in e¤ects between age-groups; whole sample period[c]	15.05	.058	11.92	.155
4)	No di¤erence in e¤ects between age-groups; subperiod 1984-90[d]	9.40	.052	6.77	.148
5)	No di¤erence in e¤ects between age-groups; subperiod 1991-96[e]	5.64	.227	5.14	.273

Note: The null hypotheses formulated in terms of the parameters (see Table 1) are given by: a: $\bar{}_{11} = ::: = \bar{}_{51} = \bar{}_{12} = ::: = \bar{}_{52}$:
b: $\bar{}_{11} = \bar{}_{12}$; $\bar{}_{21} = \bar{}_{22}$; $\bar{}_{31} = \bar{}_{32}$; $\bar{}_{41} = \bar{}_{42}$; $\bar{}_{51} = \bar{}_{52}$:
c: $\bar{}_{11} = ::: = \bar{}_{51}$; $\bar{}_{12} = ::: = \bar{}_{52}$: d: $\bar{}_{11} = ::: = \bar{}_{51}$: e: $\bar{}_{12} = ::: = \bar{}_{52}$:

ing to conclude that a large part of the di¤erences between subperiods found regarding the short-run is due to the composition e¤ect. In the 1980's, the employment rates were relatively high for university graduates as well as for those with lower educational attainment, so the composition e¤ect should have been relatively modest. When the labor market is tight as was the case in the 1980's, it is also easier for students to …nd part-time jobs. Therefore, the proportion of students that were attached to the labor market was probably larger during the 1980's. In the 1990's, the di¤erences in employment rates between educational groups widened, o¤ering a larger scope for composition e¤ects.

Given that the composition e¤ect is a main driving force behind our results, we should also expect to …nd age-group di¤erences as there are important di¤erences in employment levels between young and old. Although we …nd di¤erences across age-groups, formal testing cannot reject the null hypothesis of no di¤erences. To explain the absence of a larger composition e¤ect across age-groups let us focus on the two factors that make 20 year olds less employed than 40 year olds, the lack of education and the lack of experience. Possessing education when young probably creates a substantial advantage as individuals

around their age lack experience. As the cohort grows older there will still be an advantage for the educated but it will now be less important when most of their age-group have work experience as a means of competition and the overall employment level will have risen. The role of education is thereby played down with age and it would mean that employment moves in favor of the non-educated as the cohort grows older. This decreases the anticipated di¤erence in composition e¤ect once a cohort has reached a certain experience level. Coe¢cients in Table 4.1 testify to this as the educational e¤ects appear to be similar for the groups above the age of 30.

5. Conclusion

We have analyzed aggregate cohort speci…c data on Swedish male employment and education. Employment is measured as the fraction of the cohort employed and education as the fraction with at least one academic degree. Our results show a signi…cant e¤ect of education on employment for all age-groups during the years of recession 1991-96. Formal testing shows that the e¤ects are signi…cantly more noticeable during the economic recession compared to the economic boom 1984-90, but one can not reject the hypothesis of no di¤erences across age-groups in either period. The absence of di¤erences in e¤ects across age-groups implies that relative employment should move in favor of the non-educated as the cohort grows older, or in aggregate labor force data, if the population grows older. As for policy, the results tell us that as a short-run devise to increase aggregate employment during downturns, education appears rather attractive. However, the data does not allow us to interpret the long-run consequences of a higher level of educational attainment in the population. Most importantly, a higher level of educational attainment among, say, the old age-groups is likely to increase their competitiveness relative to younger age-groups, meaning that some of the positive e¤ects of education will probably spill over to the younger age-groups so that their employment rates are adversely a¤ected. Tentative estimations using a measure of relative education indicate that crowding out e¤ects between age-groups is most important when

own cohort e¤ects are weak, i.e. in periods of high employment. It must be stressed that age-groups may not be the ideal dimension to measure crowding out e¤ects. However, if the distribution of employment among age-groups is a big concern, education may nevertheless give the young a relative advantage.

Appendix

Table A.1: OLS of instrumental variable. Determinants of the number of graduated college-students

Parameter	Coe¢cient	S.E.
Constant	-521.0	3449
Lagged No of graduated	1.007	.0176
GDP	.0016	.0042
GDP squared	$.068 \pounds 10^{i8}$	$.158 \pounds 10^{i8}$
Trend	2.326	4.864
Age	-7.035	48.77
Age squared	-.126	.6704
Cohort size	.0005	.0028
4th lag of 1st yr enrolled at college	.0067	.0216
5th lag of 1st yr enrolled at college	.3973	.0440

R^2 = :9979

Note: The number of observations is 350.
Standard errors are heteroscedastic consistent.

Table A.2: Descriptive statistics

	Max	Mean	Min	S.E.
	1984-90 (175 obs)			
Employment	.964	.912	.767	.048
Cohort size	70223	61736	50273	4748
Educated 1984-90				
Age 21-25	.044	.017	.003	.014
Age 26-30	.126	.097	.061	.021
Age 31-35	.144	.131	.116	.007
Age 36-40	.143	.135	.123	.005
Age 41-45	.145	.124	.090	.015
Total	.145	.101	.003	.046
	1991-96 (150 obs)			
Employment	.949	.811	.482	.099
Cohort size	69565	61859	56046	3442
Educated 1991-96				
Age 21-25	.061	.023	.001	.016
Age 26-30	.116	.092	.059	.018
Age 31-35	.146	.129	.116	.009
Age 36-40	.156	.146	.137	.005
Age 41-45	.155	.144	.136	.004
Total	.156	.107	.001	.048

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