Does the cyclicality of school enrollment depend on parental education?

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Hans Henrik Sievertsen[*]

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Abstract

Yes, but only in the short-run!

Public expenditure on education soaks a large part of government budgets around the world. To follow up on these expenses, target levels are set and evaluated. Although school enrollment rates have been increasing over the last decades in most countries, substantial year-to-year fluctuations are observed.

Empirical research has shown that these fluctuations are correlated with changes in labor market conditions. In economically bad times, high unemployment rates reduce the opportunity costs of schooling leading to an increased demand for education.

This paper contributes to literature with two important aspects. Firstly, I analyze whether this counter-cyclicality of school enrollment is heterogeneous with respect to parental education. Secondly, I distinguish between short- and long-run effects.

Using Danish longitudinal data on all high-school graduates from 1984 to 1999 I find that the effect of local unemployment on demand for schooling can be divided into two parts. One; a relatively large short-run effect that is heterogeneous with respect to parental background. Two; a much smaller - but still significant - long-run effect which is homogeneous with respect to parental education. I find evidence of a small short-run effect for daughters of lowly-educated parents; but there is no sign of a long-run effect.

1 Introduction

Education is important for long-run economic growth (Lucas, 1988), technological change (Romer, 1990) and social development (Wolfe and Haveman, 2002). But education is expensive; in 2008 OECD countries on average spent 5.9 per cent of national income on educational institutions (OECD, 2011). It is therefore not surprising that governments set targets for educational attainment. In Denmark for instance the official objective is that at least 60% of a youth-cohort completes post secondary education (The National Reform Programme - Denmark, 2012).[1]

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[*]SFI - The Danish National Centre for Social Research & The Department of Economics, University of Copenhagen. E-mail: `hhs@sfi.dk`.

[1]National educational targets are also set in England, Ireland and Australia.
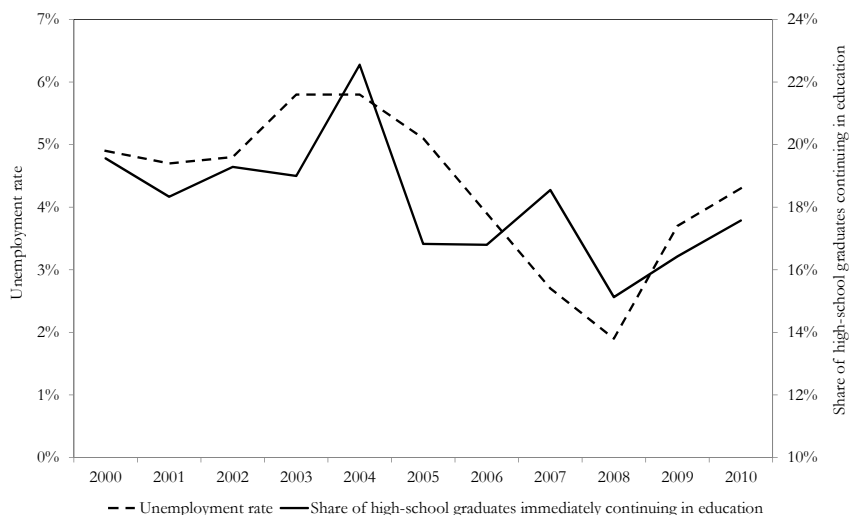
Figure 1.1: Continued education after high-school and unemployment in Denmark 2000-2010

In order to obtain these targets, we must understand what drives the educational decision. One decisive factor may be the opportunity costs in terms of foregone earnings. In periods with low unemployment, the probability of finding a job and thus the opportunity costs are high, making education less attractive. Figure 1.1 shows the share of high-school graduates immediately continuing in education and the unemployment rate for Denmark during the last decade. Both rates peaked in 2004, when unemployment was six percent and almost every fourth continued in education. In 2008 - just before the financial crisis hit the economy - unemployment was at two percent and less than every sixth continued in education immediately after high school. This *correlation* is in good line with empirical literature, which finds indication of a *causal* relationship between low unemployment to low demand for education (Pissarides (1981); Fredriksson (1997); Card and Lemieux (2000); Petrongolo and San Segundo (2002)).

Although empirical literature on the cyclicality of schooling is rich, two important points are missing. Firstly; is the the effect permanent or is it only a question about timing. A delayed entry essentially replaces a few high-productivity year with less-productive years in an individual's lifetime. If the cyclicality has permanent effects, lifetime productivity is reduced. Secondly; is the counter-cyclicality of schooling heterogeneous with respect to parental background? Governments can only increase national average educational level if children of unskilled parents obtain more education than their parents.

This paper sets out to bridge these gaps by answering two research questions: Firstly, is schooling postponed or skipped in good times? Secondly, is the the cyclicality of school enrollment heterogeneous with respect to parental background?

This is done by exploiting Danish longitudinal register data on all high-school

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graduates from 1984-1999. I evaluate the first research question by analyzing continued education immediately, one, two and up to six years after high-school. I find that a one percentage point increase in local unskilled unemployment reduces the probability of immediate continued education by 0.2 percentage points. The effect is considerably reduced after two to three years. In other words the cyclicality of school enrollment has a permanent effect, it is however considerably smaller than the temporary effect. Regarding the second research question I find that if at least on parent has a bachelors degree, I find a significantly larger short-run effect, while the permanent effect seems to be homogeneous with respect to parental background.

The remaining part of the paper is structured as follows: Section two provides a very brief review of literature on the cyclicality of schooling. A simple theoretical model is derived in section three. In section four I present my empirical strategy. The data is described in section five and results are provided in section six. Section seven concludes this paper.

2 A brief review of literature

Economic theory provides ambiguous predictions on the relationship between business cycle fluctuations and demand for education. An economic recession reduces the opportunity cost of education in terms of foregone earnings, making demand for schooling counter-cyclical, but at the same time it may reduce the ability to pay for education, which would make education pro-cyclical (Dellas and Sakellaris, 2003; Dellas and Koubi, 2003).

Empirical evidence on the other hand has shown that education is counter-cyclical. Literature can be divided into three categories. The first group consists of time-series studies using *national* labor market conditions and enrollment rates (Pissarides, 1981; Fredriksson, 1997; McVicar and Rice, 2001; Dellas and Sakellaris, 2003; Ewing et al., 2010). Identification is however critical in these studies as the effects of labor market fluctuations hardly can be separated from other macroeconomic shocks and interventions. Fredriksson (1997) for instance has to deal with a major university reform which can only be handled by a break in the time-series reducing the variation substantially.

The second and largest group consists of studies considering *local* labor market conditions and exploiting variation in enrollment and unemployment across local areas (Rice, 1999; Albert, 2000; Card and Lemieux, 2000; Petrongolo and San Segundo, 2002; Dellas and Sakellaris, 2003; Giannelli and Monfardini, 2003; Bedard and Herman, 2008; Flannery and O'donoghue, 2009). Identification requires local labor market conditions to be exogenous. Most papers handle this by controlling for regional or local fixed effects (see table 2.1), but only a few studies use fixed effects at the same level as the measure of labor market conditions.

The last group consists of micro-studies exploiting national unemployment rates. Middendorf (2007) uses micro-data covering nine European countries, but finds no effect of labor market conditions on school enrollment.

Heterogeneous effects

Dellas and Sakellaris (2003) find that the cyclicality is similar across gender, but not across ethnicity. Pissarides (1981); Card and Lemieux (2000); Petrongolo and San Segundo (2002) and Bedard and Herman (2008) on the other hand find that men react more on business cycle fluctuations. Rice (1999) finds that the cyclicality

decreases with individual school attainment, while Bedard and Herman (2008) finds that the cyclicality of postgraduate schooling is driven by those with the highest GPA.

Rice (1999) finds that the effects are strongest in recession periods; Dellas and Sakellaris (2003) on the other hand concludes that the cyclicality is symmetric in economic recessions and contractions.

Persistence

Dellas and Sakellaris (2003) observe that the increase in college enrollment in recession periods is driven by new high-school graduates, indicating that the effects are persistent.

Summary

Summing up, there is ample evidence that school enrollment is counter-cyclical. This is valid from post-secondary schooling (e.g. Rice (1999)) throughout to post college schooling (Bedard and Herman, 2008). There is some indication that the cyclicality varies with respect to gender, ethnicity, state of the business cycle and ability.

Evidence on the persistence of the cyclicality of schooling - with the exception of Dellas and Sakellaris (2003) - and on whether there is heterogeneity across parental background is however missing.

The main empirical contributions and recent developments in literature are summarized in table 2.1.

3   Theory

Before moving to the empirical analysis I present a very simple model that explains why demand for education is expected to be counter-cyclical. I consider the case of a young individual who is choosing between no more education or more education. The individual only receives utility from consuming goods $v(c)$, where the utility function has the usual properties ($v'(\cdot) > 0$ and $v''(\cdot) < 0$). The future consists of two periods. In the first period the individual can either study or work, in the second period the individual can only work. The expected income as an low-educated worker is a product of the probability of getting a job (one minus the unemployment rate among low-educated workers, $(1 - une_u)$) times the wage rate W_u for low-educated workers. In case the individual choose to study in the first period, the income will be zero (there might be income from a study grant, sub), but I assume that schooling is costless. In the second period the individual receives an expected income of $(1 - une_s)W_s$. There is no credit market, all income is consumed in the same period. The value of the second period is discounted with a rate $\beta < 1$.

The individual thus has to choose between two utility paths:

$$\text{Without education:} \quad V_u = v_1((1 - une_u)W_u) + \beta v_2((1 - une_u)W_u) \tag{3.1}$$

$$\text{With education:} \quad V_s = v_1(sub) + \beta v_2((1 - une_s)W_s) \tag{3.2}$$

I define the objective function $\Omega = V_s - V_u$ The individual chooses education if:

$$\Omega \geq 0$$
$$\Rightarrow \quad v_1(sub) + \beta v_2((1 - une_s)W_s)$$
$$- v_1((1 - une_u)W_u) - \beta v_2((1 - une_u)W_u) \geq 0 \tag{3.3}$$

Table 2.1: Empirical findings on the counter-cyclicality of schooling

Study	Type	Data	Outcome	Cyclicality Measure	Fixed effects	Heterogeneity	Is schooling counter-cyclical?
Pissarides (1981)	Time-series	UK; nat; 1955-1978	Schooling aged 16	Unemployment (youth & general)	NA	Gender	Yes[H]
Fredriksson (1997)	Time-series (W2SLS)	SWE; nat; 1967-1991	Schooling aged 22	Unemployment & wages (skilled & unskilled)	NA	No	Yes
Rice (1999)	Micro-level (Logit)	UK; loc; 1988,1990, 1991	Schooling aged 16-17	Unemployment	Region	Gender; GCSE; Up/downturn	Yes[H]
Albert (2000)	Micro-level (Logit)	ESP; reg; 1987-1998	Schooling aged 19-24	Unemployment (skilled & unskilled)	Year	No	Yes
Card and Lemieux (2000)	Micro-level (WLS)	US/CAN; reg; 1971, 1981, 1991	Schooling aged 19-24	Employment	Region & Year	Gender	Yes[H]
McVicar and Rice (2001)	Time-series (CVAR)	UK; nat; 1954-1994	Schooling aged 16	Unemployment	NA	Gender	Yes[H]
Petrongolo and San Segundo (2002)	Micro-level (Logit)	ESP; reg; 1987,1991;1996	Schooling aged 16-17	Employment	Region	Gender	Yes[H]
Dellas and Koubi (2003)	Time-series	US; reg; 1950-1990	Schooling aged 16-35	Unemployment, wages, interest rates	NA	Age groups	Yes[H]
Dellas and Sakellaris (2003)	Micro-level (probit)	US; reg; 1968-1988	Schooling aged 18-22	Unemployment	State, trends	Up/downturn, Gender, Ethnicity	Yes[H]
Giannelli and Monfardini (2003)	Micro-level (Mult. probit)	ITA; reg; 1995	Schooling aged 18-32	Unemployment & Life-time earnings	Region	Gender	Yes[H]
Middendorf (2007)	Micro-level (Ord. probit)	EUR; nat: 1994-2001	Schooling aged 15-24	Unemployment	Country	Gender	No
Bedard and Herman (2008)	Micro-level (probit)	US; reg; 1993-2001	Postgraduate schooling	Unemployment	State & year	GPA, Gender, Major, Programme	Yes[H]
Flannery and O'donoghue (2009)	Micro-level (logit)	IRE; reg; 1994-2001	Schooling aged 17-22	Employment & Life-time earnings	Region & wave	No	Yes
Ewing et al. (2010)	Time-series (VAR)	US; national; 1963-2004	College enrollment	Growth and inflation	Na	Gender	Yes[H]

This table does by no means cover all contributions, but only highlights the main trends and recent developments.
[H] indicates that cyclicality is found to be heterogeneous.

The probability that the individual enrolls in education is increasing in low-educated unemployment and decreasing in high-educated unemployment.

$$\frac{\partial \Omega}{\partial une_s} = -\beta v_2' W_s < 0 \tag{3.4}$$

$$\frac{\partial \Omega}{\partial une_u} = (v_1' + \beta v_2') W_u > 0 \tag{3.5}$$

Demand for education is increasing (decreasing) in low-educated (high-educated) unemployment.

Heterogeneity

It is seen form (3.4) and (3.5) that the cyclicality of schooling is decreasing in the discount rate. If you are very impatient (low β) you don't care about the second period and therefore only the opportunity costs of education matter. It is further seen that individuals who expect a lower wage for a given educational level due to discrimination on the labor market, for instance individuals with foreign origin (Nguyen and Taylor, 2003) and women may react less to fluctuations in unemployment rates.

I consider four channels of parental influence: ability, information, preferences and financial resources. Higher ability would tend to make individuals more cyclical, if they expect higher wages given educational level (Giannelli and Monfardini, 2003). Preferences for schooling may be correlated across generations, and children of educated parents may therefore receive a greater non-pecuniary gain from education (Wolfe and Haveman, 2002), moreover there is evidence of so called relative risk aversion (Holm and Jæger, 2008). These non-pecuniary aspects may come into play, before the pecuniary trade-off between opportunity costs and returns is evaluated, making children of educated parents behave less cyclical. Finally financial resources may enable parents to compensate children for the "lost" income and therefore rule out the probability of unemployment and make individual behavior less cyclical. Summing up, three out four channels push towards less cyclical behavior among educated children.[2]

4   Empirical strategy

To identify the effect of business cycle fluctuations I exploit the variation in unemployment between Danish municipalities over time. I consider a linear probability model in which the dependent variable takes the value of one if the individual is enrolled in an education:

$$en_{imt} = \alpha_0 + \alpha_1 une_{mt} + \beta_0 X_{imt} + \varepsilon_{imt} \tag{4.1}$$

Where en_{imt} is the enrollment indicator for individual i living in municipality m graduating from high school in June year t. The variable une_{mt} is the unemployment rate for young individuals with at most a high-school degree in municipality m in *May* year t. X_{imt} is a vector of controls.

As a reaction to high unemployment rates governments may design policies that makes schooling more attractive. To separate these effects from unemployment I control for year fixed effects with a set of annual dummies T. It is not random who

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[2]TBD: Extend a model to include these effects. And think more about them!

lives where, and variation in unemployment may be due to variation in income, educational level, abilities and ambitions across regions. I handle this problem by including municipality fixed effects M. As a robustness check I allow municipals to change by including a municipality specific trend $Trend$ as well as regional annual fixed effects. The resulting model is:

$$en_{imt} = \alpha_0 + \alpha_1 une_{mt} + \beta_0 X_{imt} + \beta_1 M_m + \beta_2 Trend_m + \beta_3 T_{rt} + \varepsilon_{imt} \quad (4.2)$$

Education is counter-cyclical if $\alpha_1 > 0$. I.e. the probability enrollment increases in local unemployment.

Persistence

To answer my first research question I estimate seven separate versions of (4.2), in which the dependent variable takes the value of one if the individual continues in education immediately, one, two, three, four, five or six years after leaving high-school, respectively. If $\alpha_1 > 0$ in all these models the cyclicality of schooling is persistent over six years.

Heterogeneous effects

In order to answer my second research question I extend model (4.2) to include an interaction effect between unemployment and parental education, par:

$$\begin{aligned} en_{imt} =& \alpha_0 + \alpha_1 une_{mt} + \alpha_2 par_{imt} \\ & + \alpha_3 par \times une_{mt} + \beta_0 X_{imt} + \beta_1 M_m + \beta_2 T_t + \varepsilon_{imt} \end{aligned} \quad (4.3)$$

The cyclicality of schooling is heterogeneous if $\alpha_3 \neq 0$.[3]

High-educated unemployment

The simple theoretical model presented in the previous section showed that low-educated and educated unemployment rates have counter-acting effects on school enrollment. Excluding one of them could therefore bias the estimate towards zero if the rates are correlated. I therefore also estimate model (4.2) and (4.3) including both skilled and unskilled unemployment.

TBD: Parents!

Identifying assumptions

The effect of unemployment on enrollment can only be identified if the variation in unemployment is orthogonal to the error term. For example ambitious students may not move to areas with good labor market conditions. To evaluate this issue the moving pattern in my data shown in figure 4.1 I define a movers as the share of individuals that did non live in the same municipality the last year of high-school as the year before they went to high-school. Throughout 1984-1999 on average 12 percent of the high-school graduates lived in a different municipal at the time of graduation than before entering high-school. The picture clearly shows that the mobility is driven by individuals moving into municipality with high-schools. I specify the individuals' hometown as the municipality the individuals lived in the year before starting high-school. Having municipality fixed effects, regional annual fixed effects, municipality trends and by using lagged residential information I claim that this assumption is satisfied.

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[3]I also test whether the cyclicality is heterogeneous with respect to gender and origin.
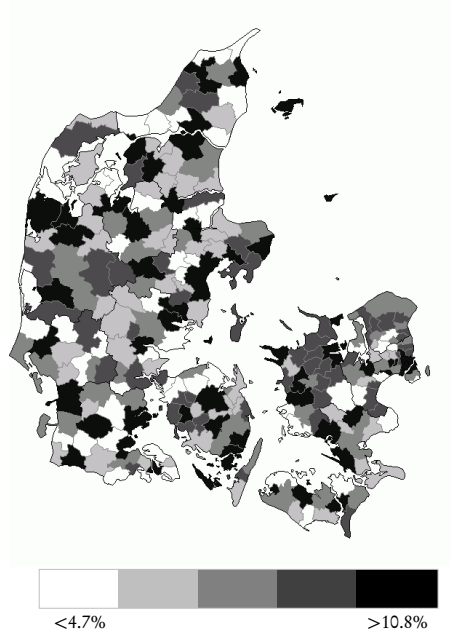
<4.7%   >10.8%

Figure 4.1: Geographic distribution of movers. A person is defined as a mover if
he lives in a different municipality in his last high-school year than the year before
entering high-school.

5 Data

The applied dataset is a longitudinal register data covering all high school grad-
uates in Denmark from the period 1984 to 1999, for eleven years. Educational en-
rollment is measured measured with one year delay, so that I am able to track each
students schooling track up to six years after leaving high-school. I only consider
the first degree for each individual and only individuals whose parents and origin
is known are included. Furthermore almost 90,000 observations are removed be-
cause the lagged municipality is unknown. An overview of the sample selection is
presented in figure 5.1.

Table 5.1: Sample selection

All Danish high-school graduates 1984-1999	516,086
Only consider first high-school degree	-31,905
Both parents unknown	- 2,908
Both parents education unknown	- 6,957
Municipality unknown	-3,485
Estimation sample:	470,831

Variables

For the baseline estimations, the dependent variable equals one if the individual
is enrolled in an education in October after high-school graduation in June. To asses
the persistence of the cyclicality, I also measure whether the individual is enrolled
in an education in October one, two, three, and up to ten years after leaving high-
school.

Local unemployment in May is measured by the number of benefit claimants
(social assistance and unemployment benefits) aged 16 to 29 with at most a high-
school degree relative to the total number of individuals with these characteristics

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that are not enrolled in education. Parents are defined as skilled if at least one of them has a bachelors degree. I further include a dummy for gender, non-western origin, mother's and father's labor market status in November (employed, pension receiver, manager, etc.), parental wealth and a measure of whether the parents were unemployed in May, as controls.

The timing of when the variables are recorded is crucial for this analysis. I record unemployment just before the individual makes his educational decision while he is still in high-school in order to (1) ensure that he is *not* included in the unemployment measure (a reverse causality issue) and (2) to ensure that the labor situation is captured just at the time of the individual decision. Residence is measured in December the year before entering high-school in August to avoid any selection as explained above. Figure 5.1 illustrates the timing of my variables.
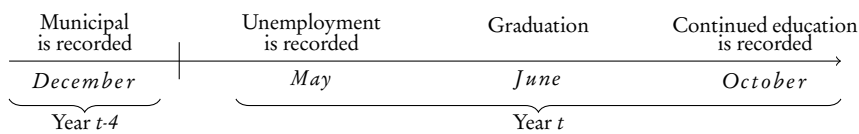
Municipal is recorded	Unemployment is recorded	Graduation	Continued education is recorded
December	*May*	*June*	*October*
Year *t-4*		Year *t*	

Figure 5.1: Timing of events and measurement

Descriptives

Variable means are provided in table 5.2. It is seen that the share of high-school graduates with skilled parents has been increasing through the period, while the share of female graduates is more or less constant. The share of individuals continuing directly in further education was at its lowest at the end of the 1990's when only every fourth high-school graduate continued in education.

6   Results

Graphical illustration

Before turning to the estimation results, it is fruitful to evaluate the two plots presented in figure 6.1. The positive relationship is clearly seen in both images. Removing the fixed effects, does however make the picture much less clear.

Short-run effects

The short-run estimation results are shown in table 6.1. Column one presents the simplest model with only unemployment, municipality and year fixed effects. It is seen that a one percentage point increase in local unskilled unemployment increased the probability of continued schooling by 0.15 percentage points. Including controls does not affect this estimate as column two reveals.

The results presented in column three indicate that women are less cyclical in their school enrollment behavior, while column four shows that there is no sign of heterogeneity with respect to origin. Research question two is answered in column five. Children of educated parents are not affected by fluctuations in local unskilled unemployment. Column six shows that sons of low-educated parents are the most cyclical, and their probability of continued education is reduced by about one-fifth percentage point following an increase in the unskilled unemployment rate of one percentage point.

Table 5.2: Descriptive statistics

Year	HS-leavers	une_u	enroll0	enroll10	par	fem	ori
1984	30110	7.1	31.4	84.6	10.5	58.1	0.6
1985	29594	6.5	33.6	88.7	10.5	57.8	0.5
1986	28746	5.5	30.2	86.9	10.7	59.2	0.5
1987	26676	6.7	28.7	88.8	11.2	57.9	0.5
1988	25993	7.9	27.3	89.5	11.8	57.8	0.5
1989	27263	8.3	27.8	90.3	11.9	58.2	0.5
1990	28588	6.7	27.9	91.3	12.7	57.8	0.6
1991	31101	7.4	29.2	92.0	12.0	58.0	0.5
1992	30867	9.7	26.7	92.5	12.5	57.8	0.5
1993	30497	11.3	25.7	92.4	12.4	57.8	0.6
1994	31031	11.3	23.7	91.9	12.4	57.4	0.7
1995	31635	8.9	22.9	93.5	12.6	58.2	0.6
1996	29962	6.0	22.8	94.5	12.7	58.3	0.6
1997	29737	6.5	22.5	94.9	13.0	57.1	0.6
1998	30405	5.4	23.0	94.9	13.2	57.5	0.7
1999	28626	4.6	22.3	95.1	13.9	58.3	0.7

Variable definitions are provided in the appendix.
HS-leavers: Number of high-school graduates.
une: May unemployment rate; at most a high-school degree aged under 30.
enroll0: share of HS-leavers immediately enrolling in an education.
enroll10: share of HS-leavers enrolling in an education within ten years after leaving HS.
par: share of HS-leavers where at least one parent has bachelors degree.
female: share of female HS-leavers.
origen: share of HS-leavers with a non-western origin.

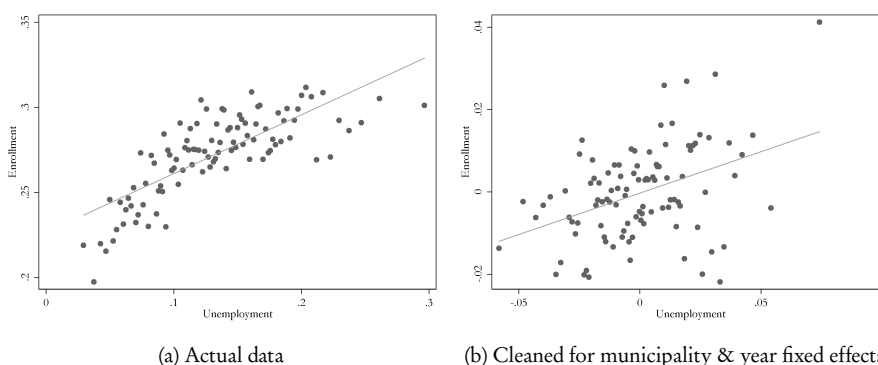(a) Actual data   (b) Cleaned for municipality & year fixed effects

Figure 6.1: The residuals from regressing unemployment and enrollment on municipality and year dummies. The plots shows the means of 100 equally sized bins.

Are effects permanent?

To evaluate whether individuals who are affected by unemployment skip or postpone education, equation (4.2) is estimated separately eleven times. In the first estimation the dependent variable takes the value of one if the individual enrolls immediately after high-school, in the second if he enrolls within one year, in the third within two years and and in the eleventh within ten years. The results are shown in

Table 6.1: Short - run cyclicality

Dependent variable: continued schooling immediately after high-school

	(1) Basic	(2) Full	(3) Gender	(4) Parents	(5) All
unemployment	0.13**	0.19**	0.28**	0.20**	0.29**
	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)
female		-0.07**	-0.05**	-0.07**	-0.05**
		(0.00)	(0.00)	(0.00)	(0.00)
parents w. bach.		-0.00	-0.00	0.01	0.01
		(0.01)	(0.01)	(0.01)	(0.01)
female × unemployment			-0.15**		-0.16**
			(0.03)		(0.03)
parents w. bach. × unemployment				-0.11**	-0.12**
				(0.04)	(0.04)
Observations	470,831	470,831	470,831	470,831	470,831
Groups	4,336	4,336	4,336	4,336	4,336
Test 1			0.06		0.04
Test 2				0.42	0.02
Test 3					0.46
Fixed effects					
Municipal	✓	✓	✓	✓	✓
Year	✓	✓	✓	✓	✓
Controls	✗	✓	✓	✓	✓

municipality and year clustered standard-errors in parenthesis.

** and * denote significance on a 1% and 5% level respectively.

Test 1: P-value for H0: une_us+fem×une_us=0

Test 2: P-value for H0: une_us+par×une_us=0

Test 3: P-value for H0: une_us+fem×une_us+ori×une_us+par×une_us=0

figure 6.2. The effect drops significantly after a couple of years. The heterogeneity with respect to parental education is only significant within the first four years.

There is only evidence of a small short-run effect for daughters of lowly-educated parents, as 6.2c reveals.

Finally a range of robustness regressions are presented in table 6.2. All results should be compared to column six in table 6.1. Column one presents an estimation of the full 1984-2004 sample without any sample selection. Column two presents estimates as in the baseline case, but without any high-school graduates with a business or science major (these programs were changed/ introduced during the sample period). In the third and fourth column results from estimating with changes to the deterministic specification are shown. Adding a municipality specific trend and regional year fixed effect reduces the coefficients size, but they remain significant on a one percent level. The significance disappears in the family fixed effects shown in column five, while using regional instead of municipality unemployment (and regional fixed effects) increases the size of the effect, as shown in column six.
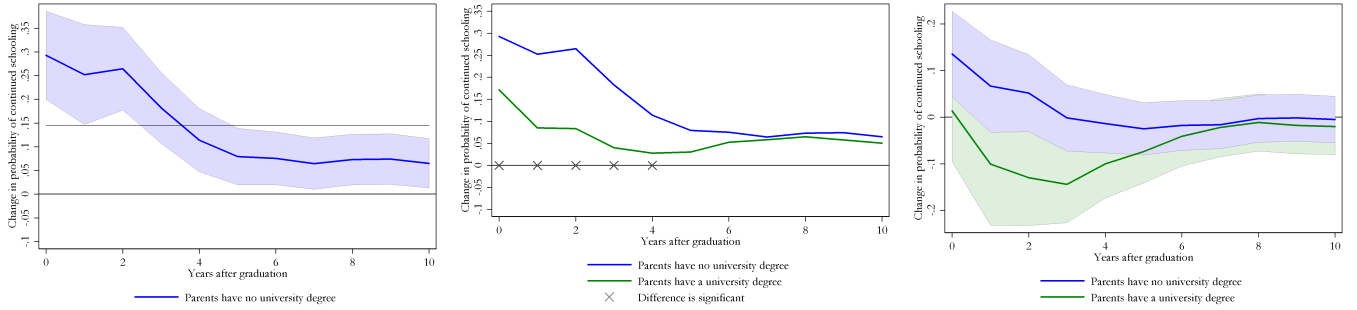
(a) Sons of parents that don't have a bachelor degree.   (b) Sons   (c) Cleaned for municipality & year fixed effects

Figure 6.2: The marginal effect of a one-percentage point increase in local unskilled unemployment on the probability of enrolling in an education within zero to ten years after leaving high-school. The shaded areas depict the 95% confidence intervals.

Table 6.2: Robustness

Dependent variable: continued education immediately after high-school

	(1) Full	(2) No HHX	(3) Muni trends	(4) Reg-Year	(5) All unsk	(6) Regional	(7) Det
unemp	0.25**	0.27**	0.23**	0.21**	0.46**	0.69**	0.22**
	(0.04)	(0.05)	(0.05)	(0.05)	(0.10)	(0.09)	(0.05)
female	-0.02**	-0.05**	-0.05**	-0.05**	-0.06**	-0.06**	-0.05**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ori	0.06**	0.02	0.02	0.02	-0.02	-0.02	0.04**
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
parents-bachelor	-0.01*	0.02*	0.01	0.02	0.03**	0.02	0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
female× unemp	-0.27**	-0.22**	-0.15**	-0.15**	-0.08	-0.08	-0.15**
	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
ori× une_u	-0.17	0.27	0.11	0.10	0.57*	0.60*	
	(0.11)	(0.16)	(0.16)	(0.16)	(0.23)	(0.23)	
parents-bachelor× unemp	-0.02	-0.09*	-0.13**	-0.14**	-0.32**	-0.23**	-0.14**
	(0.03)	(0.04)	(0.04)	(0.04)	(0.06)	(0.06)	(0.04)
Observations	657424	349735	470831	470831	470831	470831	470831
Test 1	0.07	0.16	0.74	0.91	0.01	0.00	0.15
Fixed effects							
Municipal	✓	✓	✓	✓	✓	✓	✓
Year	✓	✓	✓	✗	✓	✓	✓
Year×region	✗	✗	✗	✓	✗	✗	✗
Municipal trends	✗	✗	✓	✓	✗	✗	✗
Controls	✓	✓	✓	✓	✓	✓	✓

Municipality and year clustered standard-errors in parenthesis.

** and * denotes significance on a 1% and 5% level respectively.

Test 1: P-value for H0: une_us+fem×une_us+ori×une_us+par×une_us=0

7 Concluding remarks

Using Danish data on high-school graduates from 1984 to 1999 I find that a higher local unemployment level is associated with a higher probability of continued education after high-school. The effects are strongest for sons of lowly-educated parents, whose probability of continued education increase by about 0.3 percentage point when the local unskilled unemployment rate goes up by one percentage point.

This paper contributes to literature in two aspects. One, I show that the cyclicality of school enrollment primarily is a short-run effect. After about three years the effect drop significantly, but remains positive and significant at a constant level within a ten year period. Two, I show that the effect is heterogeneous with respect to parental background in the first four years.

Comparing my results to literature, my estimates are relatively small. This is not surprising: firstly because my econometric specification is among the most conservatives and secondly because of the level of welfare benefits and study grants in Denmark, which limits the variation in opportunity costs. I show that using regional instead of municipality unemployment increases the effect considerably. Studies exploiting variation in local unemployment are likely to provide a lower bound of the cyclicality effect, since national macro-shocks are removed. This is highlighted by the predictions shown in figure 7.1 using the estimates from column six in table 6.1. In these predictions (the dashed line) the unemployment is fixed at the 1994 level for all municipals. Holding the unemployment rate constant, only affects the fluctuations slightly. The variations in my model are mainly captured by year fixed effects. Whether these fixed effects are unemployment shocks or other macroeconomic effects can hardly ever be identified.

(a) Immediate enrollment   (b) Enrollment within six years

Figure 7.1: Actual and predicted (dashed) enrollment rates, if all municipals had a constant unskilled unemployment rate at the 1994 level.

Looking at numbers: the predictions in figure 7.1a show that a if unemployment had been at the 1994 level throughout the period, about 6,800 students more would enroll directly in an education after leaving high-school. As figure 7.1b shows the permanent (e.g. withing ten years) effect is around 1,500 individuals. Policy makers could minimize the cyclical demand for education by making educational subsidies, income taxation or unemployment benefits depend on the stage of the business cycle.

13

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A Appendix

Variable definitions

Table A.1: Variable definitions

Variable	Definition
une_u	Unskilled unemployment in May
une_s	Skilled unemployment in May
enroll0	= 1 if the individual enrolls in education immediately after high-school.
enroll0	= 1 if the individual enrolls in education within then years after high-school.
par	= 1 if at least one parent has a college degree.
ori	= 1 if the individual is of non-western origin.
female	= 1 if the individual is a female.

To do:

- Rewrite everything

- Clarify education, schooling, skilled