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DOES EDUCATION SHIELD AGAINST COMMON MENTAL DISORDERS?

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ABSTRACT: The paper examines the causal effect of education on common individual mental disorders in adulthood. We use a representative population health survey and instrumental variable methods. The estimates point to mostly insignificant effects of education on common mental disorders. We find that the length of education reduces the BDI (*Beck Depression Inventory*) measure at the 10% significance level, but has no effect when using the GHQ-12 (*12-item General Health Questionnaire*) or the probability of severe depression as a measure of mental health. These results cast doubt on the view that the length of formal education would be a particularly important determinant of common mental disorders later in life.

JEL-Classification: I12, I21
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1. Introduction

Since Grossman's (1972) classic article on the health returns to education, an empirical literature on this issue has emerged over the years (see Grossman, 2006; Cutler and Lleras-Muney, 2008, for surveys).[1] In this research, various measures of individual health have been used, for instance, self-assessed health and mortality. This variability in measures used no doubt has occasionally been due to data availability concerns but also owing to the fact that individual health is made up of various domains. All in all, it is fair to say that the evidence is mounting in favour of the existence of a causal relationship going from education to better health.[2]

The causal effect of education on individual mental health, however, has not been investigated much. This is the case despite the fact that mental health is a very important domain of person's overall health. Indeed, depression was the fourth leading cause of disease burden in the world in 2000, accounting for 4.4% of total disability adjusted life years and it also causes the largest amount of non-fatal burden, accounting for almost 12% of all total years lived with disability worldwide (Ustun et al., 2004). Common mental disorders, in turn, spill over negative effects to other important domains of health. To take an example, Kivimäki et al. (2009) have shown that there is association between common mental disorders and obesity over the adult life course.

[1] Recent contributions to this literature include Lleras-Muney (2005), Lundborg (2008), Albouy and Lequien (2009), Bratti and Miranda (2009), Fletcher and Frisvold (2009), Jürges et al. (2009), and Silles (2009). Oreopoulos and Salvanes (2009) provide a comprehensive up-to-date assessment of the literature on non-pecuniary returns to schooling.

[2] There are several possible mechanisms for this effect (see Cutler and Lleras-Muney, 2008, p. 45-51). For instance, education is related to the general level of information, ease of adopting new information, valuable personal characteristics such as self-control, position in work, and income and wealth level.

Chevalier and Feinstein (2006) examine whether there is a causal effect of education on mental health in the UK. They use data from the British Child Development Survey and instrumental variable methods and find that the effect of education on the malaise score, a measure of common mental disorders, is negative. Thus, they find a positive causal relationship going from the length of education to better mental health.

In this paper we also investigate whether more education decreases the prevalence of common mental disorders. Our paper differs from that of Chevalier and Feinstein (2006) because we use a larger number, and more accurate measures of common mental disorders. These are the *Beck Depression Inventory Index*, the GHQ-12 (*12-item General Health Questionnaire*) measure, and the CIDI (*Composite International Diagnostic Interview*) diagnose of severe depression. Thus, we are able to provide a broad view of mental health, as well as information on very severe outcomes of common mental disorders.

Methodologically, we identify the causal effect of formal education on mental health in adulthood by using instrumental variable techniques, where education is treated as an endogenous variable in regressions explaining common individual mental disorders. Parental education levels are used as instruments for an individual's education.[3] Parental mental problems and other childhood illnesses are variables that are included in the equation explaining individual mental health but not individual education.

[3] Parental education has been used frequently in the literature on the pecuniary return to education (e.g. Callan and Walker, 1999; Dearden, 1999; Levin and Plug, 1999). Using Finnish data, Uusitalo (1999) observes that instrumental variables estimates that take advantage of family background variables as instruments produce estimates of the return to schooling that are roughly 60% higher than the least squares estimates. Card (1999) has argued that family background may not be a valid instrument, because it may not completely absorb the effect of omitted measures of ability.

The data comes from Finland's Health 2000 data set. This is a representative cross-section comprising some 10,000 Finns, and includes very detailed health information. For instance, the data includes the results of clinical health examinations as well as a very large number of other variables regarding, for instance, childhood circumstances. Thus, the data set is in many respects more than a cross-section, as it contains a lot of retrospective information.

Our results differ from those of Chevalier and Feinstein (2006). We find mostly insignificant effects of education on common mental disorders. Only in the case of the *Beck Depression Inventory Index* we discover some weak evidence of a positive causal effect of formal education on mental health. On the other hand, regarding the effect of education on the probability of having a severe depression, we find no significant effects.

2. Data and variables

This study is based on the 'Health 2000' population survey dataset (see Aromaa and Koskinen, 2004). This dataset has been constructed in order to give a comprehensive picture of the health and functional ability of the working-age and old-aged Finnish population. The basic dataset comes from a random sample of 10,000 individuals from the entire country, and the information has been collected between September 2000 and June 2001 by means of personal interviews, telephone interviews, and professional health examinations. Supplementary information has been obtained from various administrative registers.

Due to the fact that the dataset includes results from clinical examinations, the sampling design had to include regional clustering. A stratified two-stage sampling design was used

with local Health Center Districts (comprising one or several municipalities) forming the first-stage sampling units (i.e. regional clusters). There were a total of 249 regional clusters in the population. A total of 15 certainty strata (the 15 largest towns) were first formed as clusters with the probability of one. The remaining 234 clusters were then divided into five regional strata, covering the whole (mainland) Finland. A total of 65 clusters were drawn from these strata by systematic PPS sampling with inclusion probabilities proportional to the size of the target population in a cluster. Thus, the total number of strata and first-stage sample clusters was 20 and 80, respectively (Aromaa and Koskinen, 2004). The second-stage sample (8,028 people aged 30 years or over) was allocated proportionally to the strata. People aged 80 or over were over-sampled with a double inclusion probability relative to the younger age groups. Finally, individual persons were selected from each stratum with systematic sampling from an implicitly stratified frame register.

88% of the sample persons were interviewed, 80% attended a comprehensive health examination and 5% attended a condensed examination at home. The most essential information on health and functional capacity was obtained from 93% of the subjects. The stratified sampling framework is accounted for in our empirical analyses, as we use survey data methods and appropriate weights in all estimations.

In this paper we consider three different measures of common mental disorders. The *Beck Depression Inventory* (BDI) is a series of questions developed to measure the intensity, severity, and depth of depression in patients with psychiatric diagnoses (American Psychiatric Association, 2000). Its long form is composed of 21 questions, each designed to assess a specific symptom common among people with depression. Aaron T. Beck, a pioneer in cognitive therapy, first designed the BDI. In our empirical analysis, we use the BDI both as a

continuous variable as well as a dichotomous variable with the cut-off point at a value of 20. A value of 20 or more indicates that the individual has at least moderate depressive symptoms (e.g. Seggar et al., 2002).

The *GHQ-12* score is a score that measures mental well-being or "disutility". It covers two major areas: inability to carry out usual day living tasks, and the experience of new and distressing symptoms. The *GHQ-12* assesses an individual's present state rather than life-long patterns of difficulties. This measure has been used to some extent in economics previously (e.g. Oswald, 1997), and is very widely used in psychology.

The probability of *major depression* (during lifetime) is measured by a *Composite International Diagnostic Interview* (CIDI) diagnosis. CIDI is a fully structured diagnostic interview designed for administration by non-clinicians, which can generate psychiatric diagnoses according to the definitions in the fourth edition of the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) or the tenth revision of the World Health Organization's *International Classification of Diseases* (ICD-10).

In Table 1 some descriptive statistics for our three measures on common mental disorders are shown. Table 1 is divided according to the length of education such that those with more than 9 years of education are in the first column and those with less than 10 years of education are in the second column. At a first glance it seems that there is a difference between the two groups regarding common mental disorders, as those with more than 9 years of education have lower averages on both the BDI and the *GHQ-12* indices. Thus, the length of formal education appears to correlate positively with mental health. However, regarding the probability of major depression, measured by CIDI, no clear difference can be spotted from Table 1.

Table 1
Descriptive statistics of the variables.

	Education > 9 years		Education < 10 years	
	Mean	St. dev.	Mean	St. dev.
Beck Depression Inventory (BDI)	6.16	6.57	8.83	7.57
BDI score over 19	0.05		0.09	
GHQ-12	1.76	2.78	1.99	3.11
Major depression	0.13		0.15	
Years of education	13.73	3.07	7.29	1.70
Female	0.55		0.55	
Age	46.06	11.70	62.76	13.27
Age squared	2258.57	1219.34	4115.09	1673.36
One-parent household	0.08		0.12	
Father: mental problems	0.03		0.02	
Mother: mental problems	0.04		0.02	
Childhood sickness	0.05		0.08	
Father: alcohol problems	0.16		0.13	
Mother: alcohol problems	0.02		0.01	
Father: university education	0.06		0.00	
Mother: university education	0.03		0.00	
Father: vocational education	0.24		0.05	
Mother: vocational education	0.23		0.06	
N	3825		2388	

The explanatory variables used in this study are reasonably straightforward (Table 1). Childhood sickness refers to whether the individual was severely ill or had a long-time illness during childhood. Information on parents' education is captured by the dummy variables indicating whether the mother or the father had a vocational or university education. (The omitted category consists of those parents with compulsory education only.) Comparing those with less than 10 years of education with those who have more than 9 years of education, it is evident that those with more education themselves also had better educated parents.

3. Results

Table 2 presents the results from our estimations where the BDI is the dependent variable. The BDI score is treated as a continuous variable. The first column presents the estimates of a simple OLS regression where education is treated as exogenous. The coefficient of education is significantly negative, implying that the length of formal education decreases the prevalence of common mental disorders. The female dummy is negative and statistically

significant, pointing out that women, on average, have more common mental disorders than men, measured by the BDI. Further, having been raised in a one-parent household, having had parents that had mental or alcohol problems also is strongly associated with higher BDI scores, i.e. more common mental disorders. However, the dummy variables describing parental education levels do not explain the BDI in this regression. This is essential for our identification strategy.

Table 2
Determinants of Beck Depression Inventory (BDI).

	OLS	1st stage OLS	IV
Years of education	-0.156**		-0.108+
	(0.026)		(0.064)
Female	1.435**	0.423**	1.434**
	(0.171)	(0.082)	(0.165)
Age	-0.004	-0.055**	0.006
	(0.041)	(0.020)	(0.040)
Age squared	0.001*	-0.001**	0.001*
	(0.000)	(0.000)	(0.000)
One-parent household	0.659*	0.162	0.703*
	(0.290)	(0.139)	(0.296)
Father: mental problems	3.376**	0.054	3.267**
	(0.517)	(0.247)	(0.677)
Mother: mental problems	2.588**	0.295	2.550**
	(0.491)	(0.235)	(0.761)
Childhood sickness	3.346**	-0.137	3.495**
	(0.359)	(0.172)	(0.457)
Father: alcohol problems	1.076**	0.008	1.103**
	(0.243)	(0.116)	(0.255)
Mother: alcohol problems	2.162**	-0.242	2.056*
	(0.735)	(0.351)	(0.877)
Father: university education	-0.412	3.840**	
	(0.521)	(0.244)	
Mother: university education	0.744	2.124**	
	(0.751)	(0.358)	
Father: vocational education	0.004	1.964**	
	(0.248)	(0.116)	
Mother: vocational education	0.365	1.103**	
	(0.247)	(0.117)	
Constant	5.014**	15.319**	4.144*
	(1.200)	(0.540)	(1.609)
N	6254	6254	6254
Hansen J statistic			2.92
p-value of Hansen J statistic			0.40
Partial R2 for excluded instruments			0.12
F-statistic for excluded instruments			205.71

Note: Robust standard errors in parentheses. ** denotes significance at the 1% level, * denotes significance at the 5% level, and + denotes significance at the 10% level.

In the second column we present the results from the first-stage regression in a two-stage least squares (2SLS) estimation.[4] This regression thus explains the number of years of completed

[4] The estimations were performed using the ivreg2 command and the STATA programme version 10.1.

schooling for the individual. As can be seen from this regression it is the case that women are better educated than men in Finland. Importantly, we can also see that none of the childhood circumstance measures that were highly significant in the OLS regression in the first column are significant in this first-stage regression. On the other hand, the dummies that describe parental education are highly significant in explaining the individual's education level.

The third column of Table 2 finally presents the results of the regression of the BDI where education has been treated as endogenous, i.e. the second stage of the 2SLS regression. The coefficient for the years of education variable becomes smaller, and the standard error becomes substantially larger, compared to Column 1, and the coefficient is significant only at the 10% level. The other coefficients remain very similar to those in the first column.

Our IV research strategy seems to work well. The test for overidentifying restrictions (i.e. the Hansen J statistic) indicates that we cannot reject the hypothesis that the instruments are valid (Table 2, Column 3). Furthermore, our instruments explaining the completed years of schooling of the individual in the first-stage of the 2SLS are powerful predictors of a person's own education level. The partial R-squared is 0.12, and the F-test testing whether the instruments jointly have no explanatory power in the regression is also rejected by a very large margin (Table 2, Column 3).[5]

In Table 3 the regressions where the BDI score is treated as a dichotomous variable with the cut-off point at 20 are presented. A BDI score of 20 or more indicates that the individual has at least moderate depressive symptoms. The results for these regressions are similar to those presented in Table 2, i.e. we find a significant correlation by using OLS in Column 1, and the

[5] The F-statistics is substantially higher than the threshold of 10 proposed by Staiger and Stock (1997) for a weak instrument.

coefficient becomes smaller in the IV estimation in Column 3. Thus, more education seems to help against depressive symptoms, at least to some degree.

Table 3
Determinants of BDI score over 19.

	OLS	1st stage OLS	IV
Years of education	-0.010**		-0.006*
	(0.001)		(0.002)
Female	0.007	0.423**	0.024**
	(0.008)	(0.082)	(0.006)
Age	-0.025**	-0.055**	-0.002
	(0.002)	(0.020)	(0.001)
Age squared	0.000**	-0.001**	0.000+
	(0.000)	(0.000)	(0.000)
One-parent household	0.041**	0.162	0.008
	(0.014)	(0.139)	(0.011)
Father: mental problems	0.062*	0.054	0.093**
	(0.026)	(0.247)	(0.026)
Mother: mental problems	0.048+	0.295	0.095**
	(0.025)	(0.235)	(0.029)
Childhood sickness	0.007	-0.137	0.093**
	(0.018)	(0.172)	(0.019)
Father: alcohol problems	-0.031*	0.008	0.035**
	(0.012)	(0.116)	(0.010)
Mother: alcohol problems	-0.022	-0.242	0.006
	(0.038)	(0.351)	(0.031)
Father: university education	0.017	3.840**	
	(0.026)	(0.244)	
Mother: university education	0.040	2.124**	
	(0.037)	(0.358)	
Father: vocational education	-0.008	1.964**	
	(0.012)	(0.116)	
Mother: vocational education	-0.013	1.103**	
	(0.012)	(0.117)	
Constant	0.835**	15.319**	0.149**
	(0.057)	(0.540)	(0.057)
N	6898	6254	6254
Hansen J statistic			1.50
p-value of Hansen J statistic			0.68
Partial R2 for excluded instruments			0.12
F-statistic for excluded instruments			205.71

Note: Robust standard errors in parentheses. ** denotes significance at the 1% level, * denotes significance at the 5% level, and + denotes significance at the 10% level.

In Table 4 the regressions where *GHQ-12* is the dependent variable are presented. In Column 1, the OLS results reveal no relationship between GHQ scores and the number of the years of formal education. The same pattern prevails for the IV estimates in Column 3. Otherwise, the results look very similar to those in Table 2, i.e. women have significantly higher GHQ scores than men, indicating worser mental health. Parental mental problems also are very important determinants of *GHQ-12.*

Table 4
Determinants of GHQ-12.

	OLS	1st stage OLS	IV
Years of education	-0.017		0.038
	(0.011)		(0.030)
Female	0.236**	0.441**	0.195**
	(0.073)	(0.081)	(0.071)
Age	-0.062**	-0.061**	-0.046**
	(0.017)	(0.019)	(0.017)
Age squared	0.001**	-0.001**	0.001**
	(0.000)	(0.000)	(0.000)
One-parent household	0.039	0.141	0.036
	(0.122)	(0.136)	(0.117)
Father: mental problems	1.059**	0.095	1.022**
	(0.224)	(0.248)	(0.267)
Mother: mental problems	0.795**	0.286	0.740*
	(0.213)	(0.236)	(0.312)
Childhood sickness	1.079**	-0.102	1.123**
	(0.155)	(0.171)	(0.195)
Father: alcohol problems	0.463**	0.023	0.455**
	(0.105)	(0.116)	(0.114)
Mother: alcohol problems	0.668*	-0.232	0.670*
	(0.316)	(0.350)	(0.333)
Father: university education	0.083	3.857**	
	(0.221)	(0.241)	
Mother: university education	0.204	2.143**	
	(0.319)	(0.352)	
Father: vocational education	0.135	1.969**	
	(0.106)	(0.115)	
Mother: vocational education	0.041	1.139**	
	(0.106)	(0.116)	
Constant	2.952**	15.415**	1.793*
	(0.506)	(0.527)	(0.713)
N	6398	6398	6397
Hansen J statistic			0.44
p-value of Hansen J statistic			0.93
Partial R2 for excluded instruments			0.13
F-statistic for excluded instruments			212.01

Note: Robust standard errors in parentheses. ** denotes significance at the 1% level, * denotes significance at the 5% level, and + denotes significance at the 10% level.

Finally, we turn to Table 5 where the results of the regressions where the probability of *major depression* (during lifetime) is the dependent variable are presented. Also in this case we fail to find any significant effects of education on mental health. This goes both for the OLS and IV estimates. Otherwise, the results are also quite different compared to those in Tables 2-4, as fewer of the childhood circumstance variables are of any relevance for this measure of common mental disorders. In the IV estimation presented in Column 3, the female dummy and the dummy for father's mental problems are particularly significant determinants of the probability of major depression.

Table 5
Determinants of the probability of major depression.

	OLS	1st stage OLS	IV
Years of education	0.002		0.003
	(0.001)		(0.003)
Female	0.044**	0.425**	0.043**
	(0.007)	(0.084)	(0.007)
Age	0.002	-0.053**	0.002
	(0.002)	(0.021)	(0.002)
Age squared	-0.000+	-0.001**	-0.000*
	(0.000)	(0.000)	(0.000)
One-parent household	0.014	0.142	0.012
	(0.012)	(0.142)	(0.012)
Father: mental problems	0.117**	0.016	0.115**
	(0.021)	(0.252)	(0.031)
Mother: mental problems	0.048*	0.358	0.048
	(0.020)	(0.241)	(0.030)
Childhood sickness	0.008	0.055	0.007
	(0.015)	(0.181)	(0.016)
Father: alcohol problems	0.012	-0.015	0.014
	(0.010)	(0.119)	(0.012)
Mother: alcohol problems	0.035	-0.307	0.031
	(0.030)	(0.355)	(0.039)
Father: university education	-0.009	3.843**	
	(0.022)	(0.251)	
Mother: university education	-0.004	2.015**	
	(0.031)	(0.366)	
Father: vocational education	0.010	2.005**	
	(0.010)	(0.119)	
Mother: vocational education	0.000	1.060**	
	(0.010)	(0.121)	
Constant	0.017	15.342**	-0.012
	(0.050)	(0.565)	(0.076)
N	5953	5953	5953
Hansen J statistic			1.19
p-value of Hansen J statistic			0.76
Partial R2 for excluded instruments			0.12
F-statistic for excluded instruments			195.43

Note: Robust standard errors in parentheses. ** denotes significance at the 1% level, * denotes significance at the 5% level, and + denotes significance at the 10% level.

4. Conclusions

The individual health returns to education are of considerable importance. If they are large, the case for public support for education is substantially strengthened. In this paper we have investigated whether a causal link going from the length of formal education to an important domain of health, namely mental health, exists. This has been done using a representative

population health survey from Finland, which includes relevant and properly measured measures of common mental disorders.

Our estimates point out to mostly insignificant effects of education on common mental disorders. We discover that the length of education reduces the BDI (*Beck Depression Inventory*) measure at the 10% significance level, but no effects using the GHQ-12 (*12-item General Health Questionnaire*) or the probability of severe depression as an outcome. These results cast doubt on the view that the length of formal education would be a particularly important determinant of mental health later in life.

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