

The effect of education on mental health

Marthe Johnsen

A thesis presented for the degree of
Master in Economics



Department of Economics
Norwegian University of Science and Technology
Trondheim, Norway
June 2019

Foreword

With this thesis I complete my Master's Degree in economics at the Norwegian University of Science and Technology. It has been two meaningful years which have maintained my interest for economics as well as that I have learned about my own boundaries. I have been inspired by my professors and my fellow students.

The process of writing this thesis have been both challenging and rewarding, and I am glad I got to immerse myself in something that fascinates me deeply. In retrospect I do not mind devoting my hours and days into this project.

I would like to thank my supervisor, professor Colin Green at the Department of Economics. Without his experience and knowledge this would have been hard to accomplish. I thank the UK Data Service for providing the data set assessed. I also thank my patient family who supported me through this process. Without their consideration, it would have been difficult to complete my degree.

Abstract

This masters thesis evaluates the, often observed strange, relationship between education and mental health, which can often be characterized as non-intuitive. Initially, I perform a regular OLS analysis that is progressively more extensive and find a positive educational effect on mental health. This educational effect falls in size and significance when the analysis control for labour market status. Furthermore, I use an instrument variable approach to assess the importance of a one-year increase in years of schooling in secondary school, and use a British compulsory schooling law to achieve this. I find negative results, which at best are slightly significant. This, somewhat odd relationship, may be the result of essentially two effects - direct and indirect effects. Since it is considered unlikely that the relationship is a result of elements such as increased income and social status, the focus is turned towards the indirect effects. The negative ratio is estimated to be partly due to an increased trend in self-reporting as a result of the reform, which produces negative estimates. Increased reporting of mental health issues can be a result of increased utilisation of knowledge, as people with more education tend to be better at using their cognitive functions.

Abstrakt

Denne masteroppgaven ser på det ofte observerte forholdet mellom utdanning og mental helse, som kan karakteriseres som lite intuitivt. Initielt utfører jeg en vanlig OLS-analyse som blir stegvis mere omfattende og finner gjennom denne en positiv utdanningseffekt på mental helse. Denne effekten faller i størrelse og signifikans når det kontrolleres for arbeidsmarkedsstatus. Videre benytter jeg en instrument variabel-analyse til å vurdere viktighetsgraden av ett år ekstra utdanning på ungdomsskolenivå, og bruker en britisk reform til å oppnå dette. Jeg finner negative resultater, som i beste fall er svakt signifikante. Dette, noe underlige forholdet, kan være resultatet av i hovedsak to effekter - direkte og indirekte effekter. Da det vurderes som lite sannsynlig at forholdet er et resultat av elementer som økt inntekt og sosial status vendes fokus mot de indirekte effektene. Det negative forholdet anslåes å være delvis grunnet en økt rapporteringstrend som følge av reformen, noe som produserer negative estimater. Økt rapportering av mentale helseutfordringer kan komme som et resultat av økt kunnskapsutnyttelse, da mennesker med mere utdanning tenderer mot å være flinkere til å utnytte sine kognitive funksjoner.

Contents

Foreword	iii
Abstract	v
Abstrakt	vii
1 Introduction	1
2 Literature Review	7
2.1 Education-health gradient	8
2.2 Educational effects on health	11
2.3 Educational effects on mental health	15
2.4 Relevance and further research	19
3 Data	21
4 Methodology	25
4.1 Estimating the gradient	25
4.2 Estimating using compulsory schooling laws	29
5 Results	33
5.1 The education-mental health gradient	33
5.2 Causality of compulsory schooling laws	41

6 Discussion

45

Bibliography

49

Chapter 1

Introduction

There is a growing literature on the topic of education economics over the last decades and the importance of education itself is well documented. The traditional focus in education economics have been on areas such as productivity, earnings and so on. A popular goal has been to see how a marginal increase in years of schooling can influence a individual's performance in the labour market. A huge literature has developed on this subject (see for instance Walker and Zhu [1, 2003] and Becker and Chiswick [2, 1966]).

More recently the focus has shifted from productivity and earnings to examine wider effects of education, such as health and other social outcomes. For instance, Clark and Royer [3, 2013] research the effect of education on health and mortality. The effect of education on wider outcomes is a topic of interest because of the role that education takes in early socialisation and the large expenditures, both in time and money, devoted to education. There is a matter of debate on the exact effect of educational attainment on health, both physical and mental. Previous research has found both positive and negative effects (see chapter 2 on literature review for a further discussion).

One main focus is the role of compulsory schooling, which takes up roughly a decade of a persons life. At the same time, individuals increasingly stay longer and pursue higher levels of education beyond the compulsory

years. In their formative years children are easily affected by their surroundings, which is why the educational effect on their mental health in this period might be strong. The impact it will make on their lives is in some cases difficult to measure, and it is exactly this issue that makes the effect on health outcomes interesting. Recent numbers from UNICEF show that over 90% of all children in the world attend primary education of some sort and hopefully the number is increasing. With more children completing basic education the positive effects of said education should start showing in a couple of years, and would be thought to lead to lower death rates, lower disease count and higher overall well-being.

Health is an important component of well-being, and a key determinant of the quality of life. The general health of the worlds population has increased during the last century resulting in people living longer with fewer diseases and complications than earlier. Science and the flow of information has been a crucial factor in increased life expectancy and, for instance, a reduced number of child deaths and cases of stillborns. The increased information flow has also lead to people being able to make more informed choices regarding their own general health, and it is natural to believe that this might apply to mental health as well. Overall, people increasingly take health based precautions as a means to live longer and have a more healthy and fulfilling life. A couple of examples are measures against lifestyle diseases such as diabetes, COPD and hyperlipidemia, among others. Also, the prevention of sexually transmittable diseases such as HIV and AIDS in developing countries is a positive result of information dissemination through education [4, 2000].

We also care about health because it is a expensive item in the national budget. In 2018, in Norway, the total health expenses amounted to 359 billion NOK, 10,2% of GDP [5, 2019]. That gives NOK 67 770 per capita, which is an increase of about NOK 2000 from the previous year. If we are able to lower these costs by improved health decisions through better

education, the money saved can be used in other items of the national budget, or allocated better within the health sector's expenditure item. This in turn leads to socio-economic returns. Another possible outcome is spillover effects from expenditures in the educational sector onto the general health in the population, thus having implications for national expenditures in the form of leeway. Apart from the economic aspect of good health and well-being it is also plausible that increased education contributes to a better mental health, and hence also lowers the costs associated with that post. Through this train of thought educational attainment could be useful in a variety of ways.

Mental health is in itself challenging to measure in terms of survey data. One often has to rely on subjective interpretation from the individual experiencing their own mental health or a professional's more objective interpretation of the individual's symptoms and statements. This can cause problems because both of the interpretations may potentially be biased. Mental health is among the most expensive areas in our society because of costs of treatment and loss of productivity [6]. An individual's mental health is challenging to measure, and equally challenging to treat considering the complexity of the human brain. There are, of course, some treatments that are preferred above others, but it is generally a major expense to diagnose a mental disorder, yet alone find a suitable treatment. As of 2013, the estimated cost of welfare linked to mental disorders amounted to approximately NOK 70 billion [7], those mainly concern security, treatment and social costs. According to Kringlen et. al. [8, 2001], the amount of people in Norway suffering from some sort of mental disorder over the life cycle, regardless of severity, is around 50% where the prevalence among of women is slightly larger than among men. These numbers seem high, but bear in mind that it include all sorts of mental illnesses from light acrophobia to severe schizophrenia.

For the individual, basic information regarding physical and mental health is easy to access. One can use any internet search monitor and find infor-

mation on different topics in an instance. There are also commercials on television, on social media and on other general internet sites advocating small changes everyone can make to strengthen their own health. The Norwegian government, like many national governments, have published a couple of advised health practises that is believed to raise the general health in the population - like the "5 in a day"-recommendation concerning the intake of 5 doses of 100 grams of fruits and/or vegetables each day, or the advised 30 minutes of physical activity each day. Since information is easy to obtain, the perceived increased ability to acquire knowledge one gets from education would enable us to utilize this information at a higher degree than without education.

We know that more educated people have, on average, better general health and the question boils down to if this relationship is causal or not. There is also the case where healthier children might find it easier to acquire education. Other cases include richer parents having healthier children, richer parents investing in more education, and well educated parents having well educated children. These points may explain the motivation in using reforms, i.e. that the forced additional educational attainment may yield positive results in the treated group's health. Since this make sense, and this is generally thought to be the norm, the results from Clark and Royer are surprising since they find that increased education lead to increased mortality. I will discuss this further in chapter 2.

This dissertation explores the link between education and mental health. There is much uncertainty regarding the education-mental health gradient due to a relatively small literature. The small body of literature that exist reveals conflicting results. This thesis starts out by building an increasingly comprehensive model which aims to explain how a marginal increase in schooling affect the individuals' mental health. I find a statistically sig-

nificant positive educational effect from this. When the model includes the respondent's labour market status the size of the educational effect decreases and it seems that the status is largely responsible. When tested only for those in the labour market a marginal increase in education give next to zero effect on the dependent variable. This suggest that a large part of the effect of education on mental health is through the probability of getting employment. Further I seek to retrieve the causal effect of education on mental health by applying a instrument variable approach. I use a British compulsory schooling reform as a tool in assessing how a marginal increase in years of schooling influence mental health. I find negative results. These are surprising, but fit with previous research on this relationship. The thesis aims to help fill the gap where there is not an abundance of research yet.

This thesis is organized as follows. Chapter 2 present the existing literature on the field and try to link these together in order to discuss strengths and weaknesses. Chapter 3 describe the data set and explain how mental health is calculated. In chapter 4 the methodology is presented with a explanation on how the instrument variable approach was conducted. The results are shown in chapter 5 following the method presented in the methodology chapter. Chapter 6 sums the thesis up with a discussion on results and findings.

Chapter 2

Literature Review

There is a large body of research that looks at the effect of education on earnings (see for instance Walker and Zhu [1, 2003], Becker and Chiswick [2, 1966] and Mincer [9, 1974]). For instance, Grenet [10, 2013] find evidence, when examining the 1972 Raising Of School Leaving Age (ROSLA) in Great Britain, for a one-year increase in education having a positive effect on earnings of around 6%. Contrary to this discovery, Clark and Royer found no evidence of a positive education effect on earnings. The thesis will not focus on the differences in the design of each studies, neither comment any further. Nevertheless, it is safe to say that there are major contradictions within the field depending on where one look for information. Generally it is found that education increases earnings, although there is much debate about the size of the effect. The fundamental issue lies in that earnings rely on individual specific characteristics and choices, meaning that what leads to individuals earning different amounts may also be the very factors influencing every other aspect of their life, including educational choice. Therefore, two individuals may not have the same prerequisites for professional success in their life due to their individual specific characteristics being different. Since they have different characteristics, some unobservable to the researcher, their earnings will most likely also be different, which in turn may carry over to other as-

pects in life, including health. Under this train of thought it is possible to expand the thought of individual specific characteristics to mainly concern health, meaning that health differ between individuals due to their utility functions. Most of the existing health research touch this problem, although the existing literature focus mainly on physical health with little on mental health.

2.1 Education-health gradient

Throughout the education economics literature on health the focus have been on the so-called *education-health gradient*. The education gradient is the estimated effect of a marginal increase in education on some measure of individual health, thus the education-health gradient provide the marginal rate of return on health as education increases. It is this coefficient that is the focus of research concerning the relationship between education and health. Several researchers mentioned in the following chapter address this coefficient in their research stating that it is the object of interest. When running regressions it is possible to calculate the education gradient in association with other variables of interest to see how much of a importance the years of schooling have when influencing the dependent variable. There will be shown further examples on this later in the thesis when analyzing the data set, additionally will it be commented on the importance of the education gradient in the research.

One can easily think that the general health among the population is mostly determined by the health care system and by thus increasing the health care system in size or expenditure one receive revenue on the population health. In this train of thought it is also possible to think that it is mainly the health related education in school and the wider media that improve the general health of people. These associations might be problematic because of the limited effect schooling and media actually have on a

person. The determination of the impact of a increase in size or expenditure is also hard to pin down. These associations may not be that informative since the size of an expenditure item or how comprehensive a curriculum or an commercial is does not exactly tell us anything about the health of the people receiving these services. A health care system that is perceived as good might not be causally linked to good general health in an area as good health may result in people delaying or reducing the time window where they need to use the health care system. It can, for example, be that people live longer, hence might not need elderly care until later in life, or take health related precautions so that they reduce the degree of help needed. Health related education in school and from media might not be causal to health either because it is limited how much an individual can manage to remember from school curriculum and ads on the television. We therefore think there is another connection between education and health and that this is not related to the curriculum, but to the change that happens in an individual when they learn how to utilize their knowledge. We can use reforms to measure this since the impact is believed to come from each year of schooling the student undergoes. This is a better explanatory factor because it is highly measurable and can also be compared across regions for a causal effect. We care about the causal effect as this, hopefully, tells us something about the effect of increasing education levels on overall health. That is, if a marginal increase in education increase health, this will the correct measure to take to ensure increased general health.

A natural starting point when discussing research on the link between education and health is Lleras-Muney's work. The study regarding education, health and mortality [11, 2005] has been subsequently reviewed by many researchers, including Kemptner et al. [12, 2011] and Mazumder [13, 2008]. Lleras-Muney uses compulsory schooling laws from the early 1900's and demonstrates a positive correlation between education and health - that

individuals that had higher education levels lived longer. Lleras-Muney also produces evidence that the educational effect on health is causal, and that the probability of mortality over the next 10 years decreases with an additional year of schooling. Through the IV estimates the effect strengthens, although it is unclear what the transmission mechanism is. On the topic of a causal effect Mazumder revisits Lleras-Muney's 2005 article stating that *a causal interpretation is unwarranted* [13, p.14]. He claims that the causal interpretation is invalid due to the fact that the effect of education is not statistically robust when including state-specific time trends. This suggests that the positive effect cannot be justified as reflecting compulsory schooling law changes, and the effect reflects trends in state level health that coincide with changes in education.

Lleras-Muney has a working paper in collaboration with David M. Cutler on theory and evidence on education and health [14, 2006]. This paper highlights the established difficulty in determining exactly where the health effect comes from, i.e. the challenge in figuring out if the educational effect on health is direct - due to information acquisition, or indirect - due to characteristics that the individual acquires as a result of schooling, for example increased earnings. Also, there are no differences between genders or race according to the authors. The authors summarise that education affects income and occupation along with information acquisition, thinking skills and ways to cope with life in general. But exactly what is the transmission mechanism that leads to health is uncertain. However, Lleras-Muney and Cutler summarize the most relevant indirect effects which I interpret to show that education affects core behaviour. With education affecting labour market, rank in society and preferences, among others, the causal effect seems substantial.

Conti et. al. [15, 2010] report a strong effect of education on health that they interpret as causal, although the estimates are larger for men than for

women. They also find that adult health is strongly influenced by personal factors established before the age of 10. These factors include those related to the child themselves (such as cognitive and non-cognitive endowments) along with their family's characteristics, and can contribute in predicting differences in their health and working capacity at the age of 30. However, the authors find a different educational effect than Lleras-Muney and Cutler do. Conti et. al. find that there are significant differences between the genders, and also that what personality traits one controls for plays a major part in the precision of the gradient.

2.2 Educational effects on health

More broadly, a body of research has developed that uses compulsory schooling laws as a source of endogenous variation in education to examine its effect on health related outcomes. Reforms are used as natural experiments where the main goal is to estimate the causal effect of education on health outcomes. There have been several reforms throughout the years in different countries. The most often utilised reforms in this literature are the changes in compulsory schooling laws in England and Wales in 1947 and 1972 called "Raising of School Leaving Age" - ROSLA and the French "Berthoin Decree" which was introduced in 1967. In Norway there are mainly five reforms that have formed the educational system to what it is today; M74, M87, Reform 94, Reform 97 and Kunnskapsløftet.

In theory, the local average treatment effect (LATE) of compulsory schooling laws is the causal effect of a increase in school leaving age on the health outcomes of compliers. The treated cohorts, that are called compliers, were basically those who were forced to attain one extra year of schooling, whereas they would have had the option to drop out before the increase. This was the goal with the 1972 ROSLA, which was implemented and raised the minimum

school leaving age in Britain from 15 to 16 affecting the 1957 birth cohort and later. British compulsory schooling laws differ from schooling laws in the US, since they are nation wide, whereas the American compulsory schooling laws are state-regulated. The British compulsory schooling laws specify the maximum years a child can be before starting school along with the minimum age a person can leave school. The 1972 Education Act followed earlier Acts regarding the educational system in Britain dating back as far as to when compulsory schooling were first introduced in England and Wales. The former legislative move on the educational front was the 1944 Education Act which increased compulsory schooling from the earlier 14 years of age to a new threshold of 15 years.

When studies do not utilise compulsory schooling laws, or similar sources of variation, as natural experiments in the research they evaluate the education gradient in the absence of this treatment. The education gradient provides us with the general relationship of a marginal increase in years of schooling since the studies producing these gradients usually compare the years of education across the samples. These studies look at the amount of years of education each respondent have chosen to possess and draw conclusions based on this. The education gradient from these studies therefore provides the effect of education along with the forces that drive the respondent to their unique education choice.

Studies using compulsory schooling laws aim to remove the individual component, that is individual choice, in order to find the causal effect of a increase in schooling. Compulsory schooling laws can be used to isolate the effect of increased schooling on the compliers to the treatment. These individuals would not have chosen to increase their years of education had it not been for the reform.

Clark and Royer investigate the link between education and health and mortality. To do so they use the 1972 reform, ROSLA, in England and Wales.

They, perhaps surprisingly, find a small, and statistically insignificant educational effect on health and health behaviours. This suggests that the often found positive relationship between education and health is not causal, i.e. that there are other forces, and that these might be driven by selection into more education. The authors point out that education can influence health in different ways, mentioning that both direct and indirect effects are of interest, and hence fitting with the empirical evidence from Lleras-Muney. The direct effects are specified as the immediate result of taking more education, i.e. earnings, better qualified for jobs and the ability to acquire knowledge, among others. Indirect effects represent the forces that change as a result of a change in the direct effects. Earnings, for example, will make the individual more likely to surround themselves with healthier peers. It will also strengthen their purchasing power so that they can buy healthier foods, safer cars, insurance and treatments - which all contribute to increasing general health. In addition, being better qualified in the labour market yields jobs that might not be manual labour, hence safer jobs. These jobs might also come with health care and insurance covered by the workplace, along with higher expectations to the worker (i.e. that they show up on time and behave in a respectful manner whilst at work, that they do not get caught up in illegal or dangerous activities, and so on), leading them to make better health related decisions. However, the authors find an effect of educational attainment that is weak at best. To sum up; more educated people work in safer environments, they have a tendency to be more patient and therefore engage in healthier behaviours. They could have a higher rank in society or be exposed to healthier peers. It should be stressed that these points are based on limited data. The authors use mortality rates as a ultimate health parameter in order to distinguish between good and bad health. The advantage of this approach is that the only action necessary is to take a “inventory count” and check who is diseased and who is alive. It is relatively easy to measure health this way. A potential drawback of using mortality

as a health measurement is that the grey scale of health is not taken into account, for instance quality of life and all over health outcomes. A more nuanced measure is better based on the fact that one can make poor health related choices as a result of poor education without dying from them. If the authors had taken into account the grey scale, they might have found direct effects that were statistically significant because they lead to poor health but ultimately not death.

The idea that education affects health through indirect effects is a view that has fascinated other researchers. Fujiwara and Kawachi [16, 2009] explore the connection between education and health in a twin study conducted with 1995-1996 data from the National Survey of Midlife Development in the United States. They use monozygotic twins and dizygotic twins who have the same gender in an attempt to retrieve the causal effect of education on health behaviours and health outcomes. The general thought behind this approach is that twins are very similar in nature, meaning that their DNA closely resembles each others - the degree of resemblance depending on whether they are monozygotic or dizygotic. By comparing twins with different education levels one can look at the causal effect of the nurture effect with the nature effect controlled for since their nature is taken to be identical. Again they find that the positive effect on health related outcomes may not be the result of a causal relationship between education and health. Twin studies point to the positive relationship being a result of effects that are unobservable in their data set, supporting the theory about indirect effects, which Fujiwara and Kawachi call unobserved third variables in their paper.

2.3 Educational effects on mental health

Although the research on the effect of educational attainment on physical health is a growing and now well established field, research on the effect of educational attainment on mental health is not so thoroughly explored. This may partly be due to the relatively increase in research on mental health in the last decades. The other part might be due to empirical difficulties regarding reverse causality. Just as education affects mental health, it also work the other way around so that mental health influences the amount of education an individual takes. Struggling with mental health issues can make any task more difficult and challenging to complete. This can make education, which is challenging to begin with, seem almost impossible for certain individuals. For a parson with mental health issues the challenges of education might drive them to drop out, or only finish the mandatory amount of schooling. For instance, Cornaglia et. al. [17, 2015] find that teenagers are more prone to dropping out of school if they suffer from mental health issues (and that a simple screening device can help predict this).

When discussing mental health research the exact terminology to use can be tricky, especially since researchers use different measures for mental health depending on what data is available. One popular option is to use depression rates. Depression is a natural diagnose to focus on due to its prevalence and societal cost, hence it is the single most common mental health condition examined in the literature. One problem with depression is that it may reflect professional diagnoses. This in turn may reflect treatment seeking by individuals. Instead this thesis focuses on the 36-Item Short Form Health Survey (SF-36) (see chapter 3 for a thorough explanation). Therefore, I note the term *mental health* when discussing existing research and effects. In an attempt to clarify, mental health is here viewed as how strong a individual is mentally, i.e a mix of how well they handle challenges in their day-to-day life and their mental well-being. Mental illnesses, including depression,

are expensive for the society along with the fact that it deprives otherwise physically healthy individuals of opportunities, and in the worst case scenario can lead to death. Nevertheless, treatment is a very complicated post due to the fundamental issues regarding mental illnesses: they are difficult to detect.

One recent paper that estimates the effect of education on mental health is Avendano et. al. [18, 2017]. They test the causal relationship between education and mental health using the 1972 ROSLA in Great Britain. To examine the relationship they use data from the Annual Population Survey (short: APS), and view observations collected from April 2004 through March 2016. Since the APS does not include data on depression and mental health the authors use data from the Adult Psychiatric Morbidity Survey conducted in 2007 as their mental health measure. They find rather surprising results, namely that a one year increase in compulsory school leaving age increased the prevalence of mental health conditions and depression in adults by respectively 4,9 and 3,7 percentage points. These results point to a rather strange relationship between education and the mental health parameter that is counter-intuitive to what one would generally assume. One might think that the reform itself did not increase the prevalence of mental health conditions so that the increase in those conditions may somehow come from the individuals becoming better at self-reporting their mental issues. This can come as a result of better educated individuals being better at acquiring information and utilize this. As touched upon when assessing the effect of education on physical health, this is a plausible explanation (see also Li and Powdthavee [19, 2015]). Although when testing this association, Avendano et. al. found no indication that educational attainment increased the probability of self-reporting symptoms of mental disorders. Another explanation for the boost in prevalence is that the reform could have impacted the individual's health-related knowledge, however the authors find no evidence for this either. This puts us back at the starting point in figuring out the rela-

tionship between education and mental health. Further, the authors examine stress as a likely factor of interest. The stress experienced by a student who was better off under the old system can induce depression or mental health issues due to them not being able to do what they feel is in their best interest.

Contrary to evidence from Grenet, who found a positive educational effect on earnings using the same reform, Avendano et. al. finds no effect of education on earnings - or at best, an uncertain earnings effect. They go on to explain that part of the stress can be rooted in the fact that the compliers unwillingly complete the compulsory years of schooling without getting a raise in earnings in return. There is also the factor of unrealised expectations as a plausible reason behind the issue. I shall not reproduce this part of the paper too much, although the mindset deserve a comment. The authors refer to a couple of psychologists' views and link this to the events that might have followed the reform. The concept of deprivation is in my opinion something that subconsciously affect the test subjects and can affect the prevalence of depression and other mental health conditions. Getting ones hopes up can be a crucial factor in the way it affects life in general. In retrospect, this could be a interesting topic to do further research on - namely the effect of forced schooling on the well-being of a individual. Back to the topic, depriving students, that might be better of working (or simply not being in an academic environment), from the liberty to choose what is best for them can have unintended consequences. It might be the effect of these hidden consequences that surfaces within the analysis.

Sironi [20, 2012] paints a different picture regarding the effect of education on mental health. The research in this paper, covering Europe as a whole, looks at the prevalence of mental health conditions across countries. The author use the third edition of the European Social Survey (short: ESS), from 2006, which was conducted in 25 countries in Europe. One limitation is the cross-sectional nature of the data. The author make an attempt to bypass this limitation by using parents education as an instrument for the

education of the individual. The goal of this instrument variable is to take into account the link between the individuals education and their mental health. Sironi find results contradictory to the paper of Avendano et. al. in that there is a positive effect of educational attainment on mental health. The author divides education into three parts; *primary education level or less*, *secondary education level* and *tertiary education level*. It is also shown that the prevalence of mental health conditions is larger in women and the elderly. The study show that a overall one-year increase in education leads to a 0.6 percent reduction in the degree of mental health issues. Relative to primary education, this reduction increases to 7 percent for those with secondary or tertiary education. Along with educational attainment, also practising religion, being employed or having a partner reduced the prevalence of mental health conditions. According to Sironi [20, 2012, p. 95], any of these factors combined with another factor also contributing towards reduced prevalence worked additively, which as an example would lead to a employed person with secondary education living with a partner to have a 17 percent lower score than a person with the opposite.

There is a difference between the data sets used in Avendano et. al. and Sironi, and potentially this very difference that leads to the contradictory results. Having mentioned this, the variables that each data set contributed to the researcher might have been different. The two data sets could capture different forces of educational attainment considering one is from a union of few countries whereas the other represents the results from 20-something countries - i.e. we view England and Wales versus Europe. Generally compulsory school leaving papers find different effects on earnings in different countries (for instance Pischke and von Wachter find zero effect of a one-year increase in education on earnings in Germany [21, 2008]). Hence, perhaps the same is possible for health. The first survey is smaller in terms of observations than the latter. One could think that the time frame has something to do with the contradictory results, although the data for ESS were collected

in 2006 and the data for APS were collected between 2004 and 2016. The data sets were collected around the same time which reduces the threshold for time-specific preferences from affecting the studies. Another important factor might be the design of the surveys and how the regression analysis were conducted in order to extract the results. The bottom line is that there is no consensus on the effect of education on mental health from the small literature that exists. This make ground for further research in the area.

2.4 Relevance and further research

Going through the news recent years one can detect an increased prevalence of cases concerning the mental health of students as young as elementary school age. It is argued that they meet too much pressure in terms of schooling and can not cope with the expected high performance in all aspects of their life, being school, after school activities and friends/family life. Hewitt et. al. [22, 2002] dive into the impact childhood perfectionism have on the prevalence of anxiety and depression in a sample of 114 children aged 10 to 15. They found that the self-oriented perfectionism in a child could, combined with other personality traits, help predict anxiety and depression. With admission levels in secondary school, and further into college and university, being increased all the time, childrens' demands to themselves increase simultaneously, thus increasing stress levels. There is also an increased focus on doing well in school, getting good grades and excelling in all aspects of live - not only for the children, but for all of us. We feel a stronger pressure towards perfectionism and the source to this pressure is widely debated in forums and more public areas.

Apart from this thesis using compulsory schooling laws as an instrument to detect effects of education on mental health, there are other ways to go about with this train of thought. Further research could carry forward the thoughts presented here to look at how a marginal increase in education

affect mental health. Also intriguing is the concept of how important each level of education is for the mental health, along with the marginal increase in each level. By level of education I mean qualifications such as GCSE, A-Level, or having a Bachelors or a Masters Degree. Also of interest is the discipline of the degree, i.e. if it is a degree in technical fields or theoretical subjects, and how this have affects the educational attainment associated with the individuals mental health.

Chapter 3

Data

The main source of data used in this thesis is a longitudinal panel survey available (under license) to the public from the websites of UK Data Service [23], called the British Household Panel Survey (BHPS), and that evolved into Understanding Society (UKHLS) [24] in 2009. The BHPS consist of panel data from 5500 households ranging from 1991 to 2008 including 18 waves - one wave each year. Throughout the years there have been some 3500 additions in form of households from new countries to the panel, making it suitable for UK-wide research. In 2008, during the wave 18 of the BHPS, all the participants were asked if they were interested in joining the new longitudinal study, Understanding Society, which is a continuation of the BHPS in some form. More than three fourths of the panel agreed to do so, and along with participants not recruited from the BHPS the UKHLS is still ongoing and consist of more than 40000 households. The BHPS includes the 36-Item Short Form Health Survey (hereby referred to as SF-36) for determining physical and mental health status developed by RAND Corporation [25]. The SF-36 consists of 36 items where the individual rate their physical and mental state of health. This practise relies on self-reporting. The respondent are to answer a set of questions relating to their everyday life and how challenging certain tasks are to perform. These individual assessment

short forms exist in three main lengths, 12- 20- and 36-item long.

A number of researchers have used the short forms as a measure of mental health. Many have also used it as a happiness measure. Hays et. al. [26, 2000] uses it to assess the physical and mental health of people infected with HIV disease, and find indicators that people with the virus have both poor physical and mental health. Oswald and Clark [27, 1994] use the SF-12 in their study on the link between unemployment and happiness. Perneger et. al. [28, 2004] take it a step further and combine the two when looking into how self-reported happiness correlate with physical and mental health. They found that self-reported happiness was a strong indicator for mental health, but a poor indicator for physical health. However, it is broadly agreed upon that the short form is a reliable and effective measure for both mental and physical health.

The variable of interest is the mental health of the participants. The distribution of this is shown in table 3.1 and figure 3.1. One can measure the mental health using several approaches. One way, and the approach this thesis has chosen, is based on the score of the SF-36, which the data set provides. Initially this variable ranges in value from 0 to 36, where 0 is the lowest score one can get and indicate that the assessed respondent do not have any mental or physical issues or challenges. A score of 36 points is the highest score that can be obtained, indicating the respondent struggle to perform everyday tasks and also suffer from severe mental issues. For the sake of simple calculation the mental health variable is inverted in the data set that this thesis use, meaning that the higher the score is, the better the overall quality of life calculated from the individual - the higher, the better. The mental health variable consist of the aggregated value from the 36 variables in the SF-36 survey. Looking at the statistics for this variable we find that the majority of respondents are fairly well. 50% of the respondents have a score of 26 or higher, with a mean of almost 25 points. From both table 3.1 and figure 3.1 one can see that the distribution is negatively skewed with

the majority of respondents having a score between 20 and 31 points. This would make sense in terms of the majority of the population not suffering from severe mental health issues and fits with broader empirical evidence.

Table 3.1: Summary statistics for SF-36 score, BHPS/UKHLS 1991-2016

Percentiles		Descriptive statistics	
1%	5	Observations	418 076
5%	13	Mean	24,832
10%	17	Standard dev.	5,499
25%	23	Variance	30,248
50%	26	Skewness	-1,403
75%	29		
90%	30		
95%	31		
99%	34		

I want to explore the link between education and mental health - and use the mental health variable in the process. This is done by using the level education that the respondent has to estimate a effect. The data set provides a variable consisting of the highest qualification the respondents possesses, and these can further be computed into dummy variables on having a General Certificate of Secondary Education, Ordinary Level, Advanced Level, HND/HNC or a degree or higher. I focus on the GCSEs, A-levels and higher education. For clarification: the GCSE is the same as having completed the Norwegian ungdomsskole, A-level are roughly the same as having completed videregående skole and higher education is a minimum of a 3-year university education.

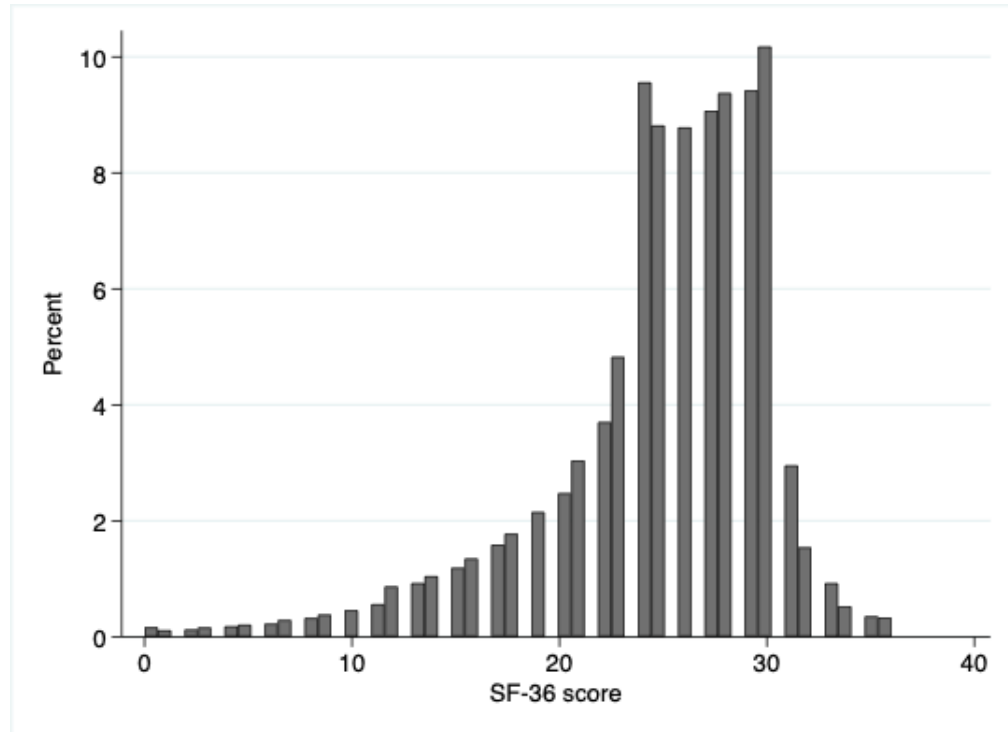


Figure 3.1: Distribution of mental health score from the BHPS 1991-2016, ages 18-65.

Note: The histogram is copied from STATA and show the true distribution of the mental health score. The x-axis show the SF-36 score, and the y-axis show the percentage of the total sample with each score.

Chapter 4

Methodology

4.1 Estimating the education-mental health gradient

The first aim of this dissertation is to estimate the effect of schooling on mental health, i.e. the education-mental health gradient. The chosen data set does not provide the exact amount, or years, of schooling that the respondent possess. Instead it provide the highest completed degree of education which, is either a GCSE, O-level, A-level, HND/HNC or a degree or higher. To make summary statistics easier a variable for the highest educational level is generated, which then is computed into a range of values where each value represent one of the three educational levels of interest. The variable for the highest education level =0 if the respondent have no completed education level, =1 if a general certificate of secondary education (GCSE) is the highest completed level of education, =2 if advanced level is the highest completed level of education, =3 if degree or higher is the highest completed level of education.

The initial approach is to estimate the effect of schooling on the mental health of an individual. This is accomplished by estimating a series of re-

gressions with increasing number of controls. The aim by this approach is to see how the different effects on mental health change, both in size and significance. Most important is the effect of education on mental health and how the education variables change in the presence of other factors. The following equation start off by using the dummies for the three qualifications, leaving no obtained education out as a control variable:

$$y_i = \alpha_0 + \alpha_1 \Gamma_i + \varepsilon_i \quad (4.1)$$

Where y_i is the variable of interest, i.e. the SF-36 score, for an individual i in this data set. Γ_i is a vector of educational variety, indicating what level of schooling individual i possess. In the model this variable will be replaced by the qualification dummies. α_0 is the constant and ε_i is the error term, which denotes all other determinants of mental health with the individual. The parameter of interest is α_1 , which provides the association between educational attainment and a individual's mental health.

The data set offer variables for each region that the respondents resided in when the survey was conducted. These are included as dummies. Northern Ireland, Scotland and Channel Islands, which did not experience the compulsory schooling laws this thesis assess, being three of the thirteen regions. The exogenous variable of age as well as a squared term of this is also included:

$$y_i = \alpha_0 + \alpha_1 \Gamma_i + \alpha_2 X_i + \varepsilon_i \quad (4.2)$$

Where X_i include the following variables; the region variable indicating where the individual was residing when the survey was conducted; the age variable of individual i measured in their age at responding the survey; the squared age of the individual which is included because it is believed that the age effect change at a certain point. The parameter of interest is still α_1 , which give the strength of educational attainment based on qualification

- but now controlling for the effect of the other included variables. The unexplained variables remain as previously referred to.

The model in the second equation can be further expanded into a model which takes into account more variables and links between, and to, mental health and education. With including exogenous variables concerning the individuals labour market status the model capture the effect of what might influence people the most - what they spend the majority of their week doing.

$$y_i = \alpha_0 + \alpha_1\Gamma_i + \alpha_2X_i + \gamma_1\Pi_i + \varepsilon_i \quad (4.3)$$

Where Π_i is a set of dummies concerning what type of occupation the respondent currently has, i.e employed, unemployed, student and so on. The general thought is that occupation is likely to influence both mental and physical health through a series of factors mentioned earlier and in this sense be important for the mental health of the respondent. Education, however, affect labour market choice, thus being a key factor in the ultimate pay-off.

Next, the goal is to elaborate the model further with looking at the mental health score of the respondents that are currently employed. When looking at those employed the effects of income and hours can be included to capture the effect these have on mental health, along with the other variables. The following equation 4.4 holds the employment dummy constant as true and test for the variables on mental health:

$$y_i = \alpha_0 + \alpha_1\Gamma_i + X + \delta_1\Xi_i + \varepsilon_i \quad (4.4)$$

Where Ξ_i concern dummies on the respondents labour market characteristics, being earnings, hours and job title.

The goal is to include as much relevant information as possible in the analysis in order to calculate a educational effect on mental health that is

statistically significant. Since the main goal is to find the causal effect of education on mental health and to see if this effect truly is positive, a simulated analysis where the information is as comprehensive as possible is desirable. An interesting point of view is therefore the differences between the genders, since one can apply a dummy on the data set to see the effect of being a man or a woman on mental health. Our dummy therefore take the value of 0 if the respondent is female and 1 if the respondent is male. It is interesting to look at the difference between the genders because the sociological values in our society are somewhat different for each gender. This paves the way for a development of the already existing models and provide a further analysis of each model based on the effect of being a man or a woman.

As commented on in chapter 2, section 2.1, the education gradient show what effect a marginal increase in education has on the dependent variable. What is attempted in the current section is to establish a framework in order to find the education-mental health gradient. This exercise reveal the aggregated effect of having the several qualifications on the SF-36 score, but also that there is some part of the score that is not explained by the model. The model also does not tell how a marginal increase in the years of schooling affected the respondent, since that was not controlled for. We should be careful when assessing the results due to underlying effects that do not surface in the data set. There might be *some* correlation that is not visible and which can produce false indicators. Caution should the exercised in interpreting these parameters as causal.

4.2 Estimating the education-mental health gradient using compulsory schooling laws

Since this dissertation ultimately use the ROSLA as a tool to assess the causal effect of educational attainment on mental health, there is no control group within the treated cohort. The ROSLA was a nation wide policy, and affected both England and Wales. There is although the opportunity to use Scotland and Northern Ireland as a control group. This would make sense because these regions lie within the United Kingdom, and the people living here experience approximately the same conditions and environment as the treated cohorts, yet still have not been treated with the ROSLA. Nevertheless, this is not the approach that was ultimately settled for. To examine the effect of the ROSLA I compare England and Wales before and after the reform in order to find differences within the nation. I use a instrument variable approach to determine the effect of the treatment that is the ROSLA.

The idea behind using a instrument variable model in detecting the effect of education on mental health is that it is thought to be elements that influence education from adolescence. There also might be elements that affect both health and education, which can not be controlled for by using a simple OLS regression. It is also worth to mention that the ROSLA affected cohorts so that they got their GCSEs because they had to, not because they necessarily wanted to get the qualification. This is covered to an extent under chapter 2 when discussing educational effects on both physical and mental health. Although the students were imposed to not leave school until they turned 16 years old I do not believe that this extra year increased the likelihood of those students pursuing higher education, this is supported by Clark and Royer [3, 2013]. This mind set exclude the effect of education on mental health on the always-takers in the data set - those who would have pursued a higher level of education regardless of the reform. Based on this the ones

with qualifications above GCSE are dropped from the sample.

Since the educational system in England and Wales is based on birth month, it is difficult to control for this using the data set provided. The students start school the September following their 4th birthday, with some exceptions for certain months and parents who want their children to start a year later. To bypass this issue (and lack of birth month) the data for the birth year of 1957 is dropped from the sample.

As mentioned, Northern Ireland, Scotland and the Channel Islands were not affected by the ROSLA. In the isolated analysis these observations are dropped from the sample to concentrate on the sole effect of the ROSLA on the affected cohorts.

This leads to the method for the instrument variable approach after following the precautions stated above. The goal is to facilitate true estimates from the regression. Here, the ROSLA is used as an instrument variable for GCSE in the mental health equation, whereas the remaining explanatory variables are treated as uncorrelated with the error term in the mental health equation. This give:

$$GCSE_i = \tau_0 + \tau_1 ROSLA_i + \tau_2 Z_i + \eta_i \quad (4.5)$$

$$SF - 36_i = \kappa_0 + \kappa_1 GCSE_i + \kappa_2 Z_i + \omega_i \quad (4.6)$$

Where Z include the following exogenous variables: age when interviewed and a square term of this (due to the belief that the age effect changes sign at one time or another); interview wave (range from first wave in 1991 to twenty-fifth wave in 2016); the gender dummy, 1 if male, 0 if female; labour market status with unemployed being left out as a reference category. $ROSLA_i$ is the dummy for being treated by the ROSLA or not.

Equation 4.5 reflect the first-stage estimates, and give the probability

of getting a GCSE. The fact of being treated by the reform should have a positive influence here. Equation 4.6 show the effect of the GCSE probability computed from equation 4.5 along with the other variables, thus producing the second-stage estimates in the IV approach.

Chapter 5

Results

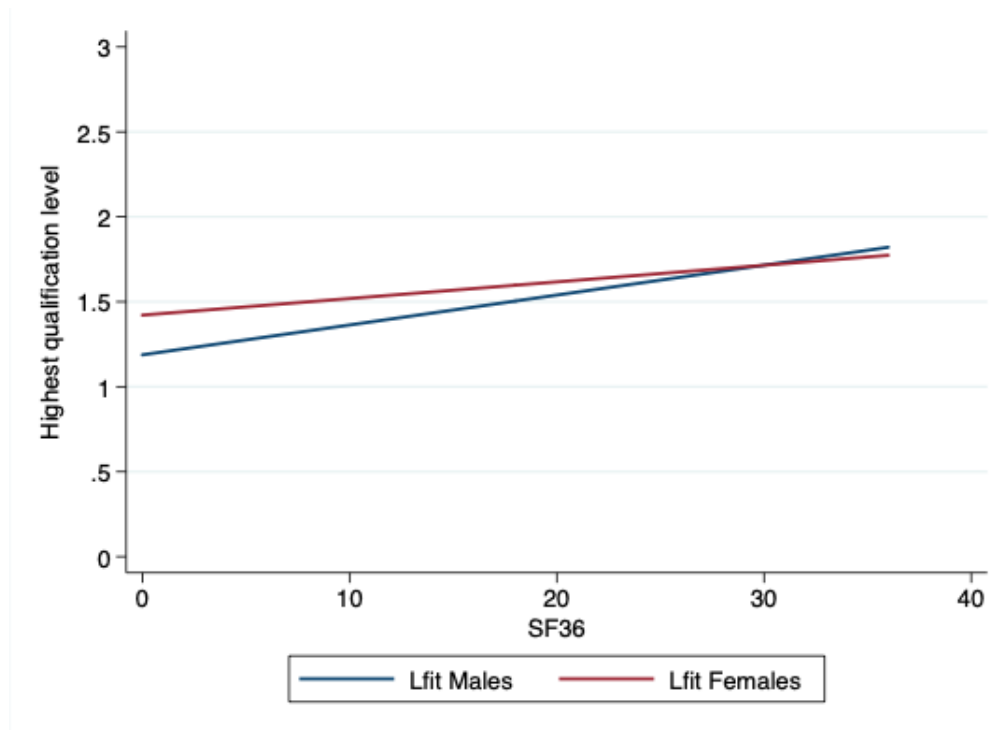
5.1 The education-mental health gradient

In chapter 3, the variable used to measure mental health (SF-36) and its distribution were discussed. The main interest lies in the effect of education on mental health, where focus is on the highest qualification level of the individual. Table 5.1 provides SF-36 score based on this. Summary statistics split by gender give:

Table 5.1: Mean SF-36 score by qualification level, divided by gender

	Mean	
	Men	Women
No qualification	24,863	23,358
GCSE	25,521	24,070
A-level	25,545	24,310
Degree or higher	25,598	24,775
Average	25,412	24,180
Observations	156 834	193 616

Figure 5.1: Mean SF-36 score by qualification level, divided by gender



Note: The graph shows the distribution of mental health score by qualification level. Whereas level 0 = no qualification; 1 = GCSE; 2 = A-Level; 3 = Degree or higher. The x-axis show the SF-36 score, and the y-axis show the highest qualification level of the respondent.

These estimates show that men typically have higher reported mental health than women. Mental health increases with educational qualifications for both men and women. One theory is that society form men into suppressing their mental issues to the point where depression and other mental health issues seem not as prevalent in men as in women, another is that men generally are better at coping with hard times and therefore do not suffer as badly from mental health issues as women do.

Starting with the basic model in equation 4.1, a OLS regression with the qualification dummies' effect on mental health yield the following results:

Table 5.2: Effect of education on SF-36 score, BHPS/UKHLS 1991-2016

	(1)	(2)	(3)
	All	Men	Women
GCSE	0,401 (0,025)	0,475 (0,036)	0,322 (0,035)
A-level	0,658 (0,025)	0,499 (0,035)	0,562 (0,036)
Degree	0,955 (0,026)	0,593 (0,036)	1,144 (0,036)
Constant	24,282 (0,016)	25,046 (0,024)	23,748 (0,022)
R^2	0,004	0,002	0,005
Observations	350 451	156 834	193 616

Values in parenthesis denote standard errors.

We see that the model explains little of the variations in the dependent variable. The interesting parameters are the effect of highest qualification included in the model, and that mental health is increasing as the amount of schooling increase. The constants in this table being slightly lower than the mean values shown in table 5.1 is a good sign. Looking at column (2) and (3)

we get the same results when adding in the respective qualification estimates on the constant as in table 5.1. It is also observable that each of the variables are statistically significant along with low standard errors. Separated by gender the regression yields roughly the same estimates although the effect of having a degree for women is twice the size as it is for men. As expected for a model with few variables, the coefficient of determination is pretty low and anticipated to rise during the expansion of the model.

Equation 4.2 include additional controls for age, age squared and region of residence. Also here OLS is used when approaching the data:

Table 5.3: Effect of education and exogenous variables on SF-36 score, BHPS/UKHLS 1991-2016

	(1) All	(2) Men	(3) Women
GCSE	0,3660 (0,0259)	0,4078 (0,0371)	0,3126 (0,0355)
A-level	0,5019 (0,0264)	0,3221 (0,0356)	0,4317 (0,0386)
Degree	0,9750 (0,0269)	0,6150 (0,0374)	1,1680 (0,0378)
Age	-0,1817 (0,0047)	-0,2006 (0,0064)	-0,1626 (0,0066)
Age ²	0,0020 (0,0000)	0,0022 (0,0000)	0,0018 (0,0000)
Constant	27,8575 (0,1858)	28,7685 (0,2583)	27,1505 (0,2606)
R^2	0,0094	0,0022	0,0095
Observations	350 451	156 834	193 616

Controls for region of residence (13 dummies) also included, although not reported.

Now region of residence and age of the respondent is included in the regression. As expected, this increases the explained variance in the dependent

variable. One thing I noticed right away was that only one of the included region dummies were statistically significant, as well as that almost all of the p-values were very high. This suggest that region of residence is not a strong determinant of adult mental health. It is also noteworthy that the inclusion of the additional controls does not substantially affect the qualification coefficients. These stay stable around the same values as in table 5.2.

Interesting enough, the age effect is negative. Looking at how the age affected mental health when age was the only independent factor, I still got the result in this having a negative effect. This suggest that this effect is independent of education. One possible explanation for this occurrence is that the SF-36 survey include questions on general health as well as questions on mental health. These questions are for example: *How much bodily pain have you had during the past 4 weeks?* and *Does your health now limit you in the following activities? If so, how much?*, followed by a range of activities and a rating going from *Yes, limited a little.* to *No, not limited at all.* The general impression is that the body functions somewhat worse, or with more pain, the older a person is, and it might be these observations that contribute to the negative effect of age on mental health along with psychological factors. The negative age effect on mental health is also supported by evidence from Gaitz and Scott [29, 1972] where they look at the explicit effect of age on mental health, along with Blanchflower and Oswald [30, 2008] on the U-shape of well-being over the life cycle.

Table 5.4: Effect of education, labour market status and exogenous variables on SF-36 score, BHPS/UKHLS 1991-2016

	(1)	(2)	(3)
	All	Men	Women
GCSE	0,1859 (0,0255)	0,2112 (0,0363)	0,1681 (0,0352)
A-level	0,1585 (0,0263)	0,0439 (0,3517)	0,1283 (0,0388)
Degree	0,5480 (0,0263)	0,2529 (0,0368)	0,7717 (0,0379)
Age	-0,3061 (0,0050)	-0,3596 (0,0070)	-0,2521 (0,0071)
Age ²	0,0036 (0,0000)	0,0043 (0,0000)	0,0030 (0,0000)
Employed	2,4981 (0,0230)	3,1154 (0,0361)	1,9499 (0,0304)
Student	1,5494 (0,0517)	2,1214 (0,0735)	1,1802 (0,0720)
Self employed	2,7699 (0,0372)	3,0612 (0,0475)	2,1118 (0,0641)
Constant	28,2830 (0,1867)	29,0590 (0,2584)	27,4782 (0,2634)
R^2	0,0438	0,0563	0,0308
Observations	350 451	156 834	193 616

Controls for region of residence (13 dummies) also included, although not reported.

Equation 4.3 introduce controls for employment status, making the explanatory factor stronger than with previous approaches. R^2 increase from 0.009 to 0.044. In the case for men the turning-point for the age effect is at 83.63 years old, and for women it is at 82.35 years. The negative effect of age on mental health is essentially decreasing across life, which is supported by Banchflower and Oswald [30, 2008].

Compared to table 5.2 the effect of qualifications have shifted and the estimates for each of the qualifications are now smaller than in the previous models. Further, neither of the regions are statistically significant measures, although some regions become significant with a t-value around roughly ± 2.5 when estimating separately for either of the genders. As a matter of fact, when running the same regression, but dropping the controls for GCSE, A-level and a degree, the pattern of established significance of the regions stay roughly the same.

Next, controls are included as per equation 4.4 to make table 5.5. These are labour market characteristics and cover whether the respondent work normal hours, if they are a manager or a supervisor and what their wage is. The wage parameter is reported in logarithms for easier estimation. When including the labour market characteristics controls I also set the employment dummy to positive, meaning that when controlling for characteristics only applicable to those who work, I only assess those who actually work. This naturally create a smaller sample. The qualification dummies have dropped in significance, and neither of the coefficients are now high enough in t-value to be considered reliable estimates. When controlling for labour market characteristics these variables correlate with qualification (since the labour market characteristics variables are functions of education), hence removing some of the effect the qualification dummies possess, and in the same process strengthening the significance of the labour market variables. When including labour related variables education might not matter as much since one mainly need some set of qualifications to get a job in the first place.

Table 5.5: Effect of education, labour market characteristics and exogenous variables on SF-36 score, BHPS/UKHLS 1991-2016

	(1)	(2)	(3)
	All	Men	Women
GCSE	-0,0175 (0,0327)	0,0549 (0,0447)	-0,0726 (0,0469)
A-level	0,0000 (0,0335)	-0,1210 (0,0447)	-0,0082 (0,0503)
Degree	-0,0599 (0,0344)	-0,3085 (0,0468)	0,1701 (0,0496)
Age	-0,1935 (0,0070)	-0,2363 (0,0093)	-0,1487 (0,0103)
Age ²	0,0022 (0,0000)	0,0027 (0,0001)	0,0016 (0,0001)
Normal hours	0,0251 (0,0013)	0,0125 (0,0021)	-0,0093 (0,0020)
Manager/supervisor	0,0476 (0,0256)	0,0513 (0,0338)	0,0708 (0,0379)
Pay (log)	0,0995 (0,0132)	0,0920 (0,0168)	0,1555 (0,0208)
Constant	27,6930 (0,2426)	29,1869 (0,3219)	27,5514 (0,3590)
R^2	0,0087	0,0102	0,0049
Observations	182 869	87 207	95 661

Controls for region of residence (13 dummies) also included, although not reported.

The more variables one include, the more variance in the dependent variable the model explain. At the same time the strength of the relationship between education and mental health decreases. Compared to table 5.2 the size and significance of qualifications in table 5.4 is now non-existent. In fact, throughout the development of the models one can see that the significance of education is decreasing as more variables are included in the analysis. The

education-mental health gradient might partly reflect the effect of education on labour market status, and at best, may suggest a small positive education-mental health gradient that is only significant in the cases not controlling for employment characteristics.

5.2 The causal effect of compulsory schooling laws

Now that the foundation is built, further analysis focuses on the use of the ROSLA as a tool to retrieve the causal effect of education on mental health. In preparation to this some sample restrictions are conducted in order to make the interpretation of the results as straightforward as possible. From the data set a dummy for the ROSLA is established. This variable, when taking the value 1, exclude all born before 1957 (the non-treated cohort). Further, the respondents born in 1957 is dropped from the sample in order to distinguish between the treated and the non-treated cohorts due to the lack of birth month from BHPS and UKHLS. This is done because British schooling laws separate those born early and late in the year as two different cohorts, and consequently when operating only with birth year this can cause some unintended difficulties.

To conduct the instrument variable estimation respondents having qualifications above a GCSE are dropped from the sample, meaning that the following analysis does not look at those having the qualifications of A-levels or of a Degree. Interview wave is included in the analysis to detect any time-specific trends in mental health. In practise there does not seem to be any. The wave variable take the value 1 for the 1991 sample, value 2 for the 1992 sample, and so on and so forth until wave 25 in 2016. Table 5.6 presents the first-stage estimates where what one can interpret as the probability for obtaining a GCSE is regressed on the shown variables along with the gender

and student dummy. Table 5.7 presents the second-stage data from the instrument variable approach and show the regression of mental health on the gender and student dummy in addition to the estimates shown in the table.

Table 5.6: First-stage estimates for ROSLA on SF-36 score

	(1)	(2)	(3)
	All	± 10 years	± 5 years
ROSLA	0,030 (0,002)	0,027 (0,004)	0,015 (0,006)
Age	-0,010 (0,000)	-0,012 (0,001)	-0,023 (0,003)
Age ²	0,000 (0,000)	0,000 (0,000)	0,000 (0,000)
Employed	0,084 (0,002)	0,106 (0,003)	0,098 (0,005)
Self employed	0,095 (0,004)	0,104 (0,006)	0,102 (0,008)
Interview wave	0,003 (0,000)	0,003 (0,000)	0,009 (0,001)
Constant	0,665 (0,011)	0,694 (0,040)	1,003 (0,094)
F test	108,02	36,72	5,59
Observations	191 304	94 748	46 448

Table 5.7: Second-stage effect for ROSLA on SF-36 score

	(1)	(2)	(3)
	All	± 10 years	± 5 years
GCSE	-2,958 (1,159)	-8,818 (2,441)	-3,751 (5,222)
Age	-0,354 (0,013)	-0,666 (0,043)	-0,410 (0,141)
Age ²	0,003 (0,000)	0,006 (0,000)	0,004 (0,000)
Employed	2,876 (0,102)	4,046 (0,266)	3,688 (0,519)
Self employed	2,931 (0,122)	4,146 (0,270)	3,871 (0,548)
Interview wave	0,001 (0,005)	0,025 (0,014)	-0,027 (0,061)
Constant	30,561 (0,793)	39,777 (1,951)	31,717 (5,761)
R^2	0,946	0,918	0,942
UnderID test	107,969	36,707	5,590
Observations	191 304	94 748	46 448

R^2 tab show uncentred R^2 values.

Column (1) in table 5.7 show the regression without any further restrictions than those previously mentioned. Column (2) show the IV regression restricted with a ± 10 year bandwidth and column (3) does the same with a ± 5 year bandwidth. The intention with using these bandwidths is to see if there is a defined trend within the restricted cohorts.

The IV approach is generally viewed as more reliable than the OLS approach since one take into account both the forces working on the instrument variable and the dependent variable. This can be seen in table 5.7 where the model now explains roughly 90% of the variation in the dependent variable. Column (3) can be viewed upon as non significant since the under-identification test yield a 5,590 score, lower than what is considered a reliable model.

As the regression calculate the results from the ± 10 year bandwidth in column (2) the GCSE coefficient increase in absolute value, yet still have a negative impact on mental health. Nevertheless, since the constant is statistically insignificant at the 70% level the estimates yielded by the regression should be taken with a grain of salt.

This table is, as mentioned, built on the foundation of dropping the ones with A-levels and a Degree simply to attempt to recreate the causal effect of having a GCSE. In practise, if the qualification variables are not dropped, the sign, rough size and statistical significance of the main estimates remains essentially unchanged. This can point in the direction of the GCSE effect being causal after all.

Chapter 6

Discussion

Previous research is divided on the effect of educational attainment on mental health. This dissertation does two things. It finds a positive education-mental health gradient, and a negative causal effect of GCSE on mental health. The analysis then reflects both sides found in the literature - the positive, and the negative effect of education on mental health.

Specifically with the OLS regression I find a positive relationship between education and mental health. Early in reviewing the results there is signs of the education-mental health gradient being larger for women than it is for men across qualification levels, although the overall mental health score is lower for women than it is for men. This might indicate that the effect of education work on multiple levels and that women process education differently than men. Although the education-mental health gradient initially is positive it drop in size and significance when controlled for labour market status. This suggest that, at least part of the positive association between education and mental health works through the labour market. Education influences labour market status, and in turn labour market status influences mental well-being. However, through the IV approach I provide negative estimates that are relatively robust. I find an overall negative effect of the probability of having a General Certificate of Secondary Education

that increase in absolute value as bandwidths are narrowed. The negative effect found in the data analysis is empirically difficult to accept based in the convincing evidence that show that there are positive effects of additional education. I therefore interpret the idea of indirect effects of additional education being the cause of the negative outcome. It is generally thought that more educated people better utilise their knowledge and better comprehend information when presented to them. My empirical approach is based on this, and is that more educated people are better at seeking help if needed. This help-seeking trend is what is causing the increased prevalence in mental health issues as the probability of having a GCSE goes up. Also, when consulting a professional one would usually be presented with some explanatory traits that would make the occasion of self-diagnosis oneself with depression, anxiety of other mental health diagnoses more plausible. If one seek out a psychiatrist for generally gloomy thoughts on day-to-day life one will most likely also identify with having depression or a phase of depressing thoughts.

All-over the age effect is negative, giving that with older age comes more mental health issues. One theory to this negative impact of age is that as we grow older our perception of ourselves and the situations around us become more realistic, and we might tend to differentiate our subjective values better than we do when we are younger. With this I mean that the positive data from the younger respondents might not be as realistic as the data from the older respondents. Another theory is that as we grow older we worry more, since one has more baggage, and this worrying manifests in us and make us less mentally healthy. Another valuable point is that the mere composition of the SF-36 is not weighted in favour of older audiences since bodily pain is, unfortunately as it is, a part of the ageing process.

Historically speaking, a positive outcome of the ROSLA was that the schooling became more comprehensive since all students were to complete a GCSE. Although this is positive for those who would have completed a GCSE

either way, it might have a negative impact on the ones that would have dropped out - the compliers. Ergo, the external validity of the analysis does only apply to the compliers, who might have had negative outcomes from a additional year of schooling being forced upon them. They might be better off otherwise, and deprivation theory suggest they might feel disappointed by the non-rise in earnings and rewards as a result of the extra schooling. Although the effects of getting a A-level or a Degree might have positive effects on mental health, one can not draw any conclusions based on the data from the analysis. Future research may find a relationship between education and mental health by reconciling both the OLS and the IV approach to find a source of variation across all education levels.

Bibliography

- [1] Walker, I. Zhu, Y. (2003). *Education, earnings and productivity: recent UK evidence*. Labour Market Trends. ResearchGate.
- [2] Becker, G. S. Chiswick, B. R. (1966). *Education and the Distribution of Earnings*. The American Economic Review 56 (1), 358-369. Jstor.
- [3] Clark, D. Royer, H. (2013). *The effect of education on adult mortality and health: evidence from Britain*. American economic review 103 (6), 2087-2120. American economic association.
- [4] Vandemoortele, J. Delamonica, E. (2000). *The "Education Vaccine" Against HIV*. Current Issues in Comparative Education 3(1).
- [5] Statistics Norway. 14.03.2018. *Helseregnskap*. <https://www.ssb.no/helsesat/> [Accessed 23. May 2019]
- [6] Kinge, J. M. Sælensminde, K. Dieleman, J. Villset, S, E. Norheim, O, F. (2017). *Economic losses and burden of disease by medical conditions in Norway*. Health Policy 121 (6), 691-698. Elsevier.
- [7] Regjeringen. Helse- og omsorgsdepartementet. (n.d.). *Prop. 1S (2012-2013) 764, 187*. <https://www.regjeringen.no/contentassets/7df13d2ea4eb447e93cdf3f7e42b2/no/pdfs/prp201220130001hodddpdfs.pdf> [Accessed 11. February 2019]

- [8] Kringlen, E. Torgersen, S. Cramer, V. (2001). *A Norwegian psychiatric epidemiological study*. The American Journal of Psychiatry 158 (7), 1091-1098. American Psychiatric Association.
- [9] Mincer, J. (1974). *Schooling, experience, and earnings*. National Bureau of Economic Research.
- [10] Grenet, J. (2013). *Is extending compulsory schooling alone enough to raise earnings? Evidence from French and British compulsory schooling laws*. Scandinavian Journal of Economics 115 (1), 176-210.
- [11] Lleras-Muney, A. (2005). *The Relationship Between Education and Adult Mortality in the United States*. The Review of Economic Studies 72 (1), 189-221. Oxford Academic.
- [12] Kemptner, D. Jürges, H. Reinhold, S. (2011). *Changes in compulsory schooling and the causal effect of education on health: Evidence from Germany*. Journal of health economics 30, 340-354. Elsevier.
- [13] Mazaumder, B. (2008). *Does education improve health? A reexamination of the evidence from compulsory schooling laws*. Economic Perspective. Federal Reserve bank of chicago.
- [14] Lleras-Muney, A. Cutler, D. M. (2006). *Education and health: evaluating theories and evidence*. Working paper. National Bureau of economic research. <http://www.nber.org/papers/w12352>
- [15] Conti, G. Heckman, J. Urzua, S. (2010). *The education-health gradient*. American Economic Review 100 (2), 234-238. American Economic Association.
- [16] Fujiwara, T. Kawachi, I. (2009). *Is education causally related to better health? A twin fixed-effect study in the USA*. International journal of epidemiology 38, 1310-1322. Oxford university press.

- [17] Cornaglia, F. Crivellaro, F. McNally, S. (2015). *Mental Health and Education Decisions*. Labour Economics 33, 1-12. Elsevier.
- [18] Avendano, M. de Coulon, A. Nafilyan, V. (2017). *Does more education always improve mental health? Evidence from a British compulsory schooling reform*. Health, econometrics and data group. University of York.
- [19] Li, J. Powdthavee, N. (2015). *Does more Education Lead to Better Health Habits? Evidence from the school reforms in Australia*. Social Science and Medicine 127, 83-91. Elsevier.
- [20] Sironi, M. (2012). *Education and Mental Health in Europe: School Attainment as a Means to Fight Depression*. International Journal of Mental Health 41 (3), 79-105.
- [21] Pischke, J-S. von Wachter, T. (2008). *Zero Returns to Compulsory Schooling in Germany: Evidence and Interpretation*. Review of Economics and Statistics 90 (3), 592-598.
- [22] Hewitt, P. L. Caelinan, C. F. Flett, G. L. Sherry, S. B. Collins, L. Flynn, C. A. (2002). *Perfectionism in children: associations with depression, anxiety, and anger*. Personality and Individual Differences 32 (6), 1049-1061.
- [23] UK Data Service. (n.d.). *UK Data Service, Series*. <https://beta.ukdataservice.ac.uk/datacatalogue/series/series?id=200005> [Accessed 06. May 2019]
- [24] Understanding Society. (n.d.). *Main Survey*. <https://www.understandingsociety.ac.uk/documentation/mainstage> [Accessed 06. May 2019]

- [25] RAND Health Care. (n.d.). *36-Item Short Form Survey (SF-36)*. https://www.rand.org/health-care/surveys_tools/mos/36-item-short-form.html [Accessed 05. March 2019]
- [26] Hays, R. D. Cunningham, W. E. Sherbourne, C. D. Wilson, I. B. Wu, A. W. Cleary, P. D. McCaffrey, D. F. Fleishman, J. A. Crystal, S. Collins, R. Egan, F. Shapiro, M. F. Bozzette, S. A. (2000). *Health-related quality of life in patients with human immunodeficiency virus infection in the United States: results from the HIV Cost and Services Utilization Study*. The American Journal of Medicine 108 (9), 714-722. Elsevier.
- [27] Oswald, A. J. Clark, A. E. (1994). *Unemployment and unhappiness*. The Economic Journal 104 (424), 648-659. Jstor.
- [28] Perneger, T. V. Hudelson, P. M. Bovier, P. A. (2004). *Health and happiness in young Swiss adults*. Quality of Life Research 13 (1), 171-178. Kluwer Academic Publishers.
- [29] Gaitz, C. M. Scott, J. (1972). *Age and the Measurement of Mental Health*. Journal of Health and Social Behaviour 13 (1), 55-67. American Sociological Association.
- [30] Blanchflower, D. G. Oswald, A. J. (2008). *Is well-being U-shaped over the life cycle?* Social Science & Medicine 66, 1733-1749. Elsevier.
- [31] Psacharopoulos, G. (1994). *Returns to investment in education: A global update*. World Development 22 (9), 1325-1343. Elsevier.