From Boom to Bust: Unfolding the association between business cycles and the mental health of Swedish children

By:

Thilda Horvath

Maja Juväng

Department of Economics

Abstract

An extensive body of literature links macroeconomic conditions to mortality and diverse health outcomes in adulthood, but largely ignores the impact on children. Sweden is currently at the verge of an economic downturn, while mental health disorders and psychosomatic problems are the most common health issue amongst children. In this paper, we examine the relationship between business cycles and children's mental health in Sweden's 21 regions from 2006 to 2019. The number of patients per thousand inhabitants younger than 18 that expedited an antidepressants prescription is our measure of children's mental health status, whereas unemployment rate is our proxy for business cycles. Using a fixed effects model on a quarterly level, we find a procyclical association between the mental illness of children and unemployment rate. The positive relationship between antidepressant consumption and unemployment is only driven by boys, while girls seem less sensitive to business cycles fluctuations. We conclude that further empirical research and theoretical extensions is required to explore the robustness of our results and to understand the operating channels behind it. Given the individual and societal costs of mental illness during childhood, understanding how contemporary aggregate economic conditions influence the mental health of children is crucial for optimal policy response and countercyclical investments.

Keywords: Child mental health, Mental health, Health economics, Business Cycles, Unemployment rate, Regional, Fixed effects model, Sweden

Table of contents

1. Introduction

The effect of macroeconomic conditions on health outcomes is a widely explored research area among health economists, where the literature relates business cycle fluctuations, recessions or shocks to diverse physical and mental health outcomes in adulthood. Children's health, however, has received much less attention with regard to the relationship between business cycles and one, if not the most, concerning health issues amongst children; mental health (Folkhälsomyndigheten, 2022a).

Sweden has, during the last decades, witnessed a surge in child mental health disorders and psychosomatic problems related to anxiety, depression, and stress (Folkhälsomyndigheten, 2022b). Since 2006, the share of children and young people that have been diagnosed with depression or anxiety has tripled (Socialstyrelsen, 2021) and approximately 10% of the Swedish children suffer from psychosomatic problems. In addition, over 40% of the 15 year old Swedish girls have felt low more than once a week for the last six months (Folkhälsomyndigheten, 2018).

Besides the deterioration of individual life quality and well-being, numeros studies shed light on the costs of mental health problems in childhood for socioeconomic- and health outcomes in adolescence (See Case, Fertig & Paxson, 2005; Currie, 2009; Goodman, Joyce & Smith, 2011). It affects attainment of education and risk of suicides along with long term societal consequences such as human capital accumulation and future labor market outcomes (Currie & Stabile, 2006; 2009). Kuh and Wadsworth (1993) highlight the extent to which health deprivation in early life indirectly affects adult health by restraining educational attainment and directly by the illness itself. Similarly, Goodman, Joyce and Smith (2011) specifically finds that childhood psychological problems account for a 28% lower net family income by the age of 50, where adult mental problems as a consequence of childhood mental illness is the main identified pathway.

Seminal studies by Hans Brenner (1973; 1975; 1979), relating business cycles and adult health showed that health in terms of cardiovascular diseases, suicide, mortality, infant mortality and other cases of lethal character decrease as the economy expands. His use of methods were nonetheless questioned, as Ruhm (2000) found a procyclical variation between mortality and unemployment in the United States by a fixed effects model and aggregate state

level panel data. Following the results and statistical methods of Ruhm (2000), others found a similar relationship across OECD- (Gerdtham & Ruhm, 2006) and Asia-Pacific countries (Lin, 2009) over diverse time horizons. Beyond mortality rates, adult mental health has been found to worsen during recessions, where economic recessions proxied by unemployment rates and fluctuations in the local labor market have been linked to increased stress-related mental illness, demand for antidepressant drug and suicide rates (Ruhm, 2000; Charles & DeCicca, 2008; McInerney & Mellor, 2012; 2013; Golberstein, Gonzales & Meara, 2016).

There exists a substantial gap in the literature with respect to child rather than adult mental health, and the impact of business cycles. Golberstein, Gonzales and Meara (2016) analyze the effect of unemployment rate and child mental health in a state level context of the United States. Another study by Adhvaryu, Fenske and Nyshadham (2019) uses cocoa prices at the time of birth as an economic shock variable to study early life mental illness. There is however, to the best of our knowledge, no study that has analyzed the effect of business cycles on child mental health at a Swedish regional level. Simultaneously, the sources and contributing factors to the rise of Swedish children's mental health problems are multidimensional. Oftentimes traced to segregation, income gaps, and stress related to education and changing labor market conditions (Socialstyrelsen, 2021).

The aim of this study is to investigate whether there is a relationship between children's mental health status and business cycles, proxied by unemployment rate, on a Swedish regional level stretching from 2006 to 2019. As Sweden is on the verge of an economic downturn combined with accelerating mental health disorders, the research gap is substantial and relevant to gain insights of child mental health production. Additionally, exploring and comparing any regional differences that might influence children's mental health enlighten the efficiency challenges for a future, sustainable health care system.
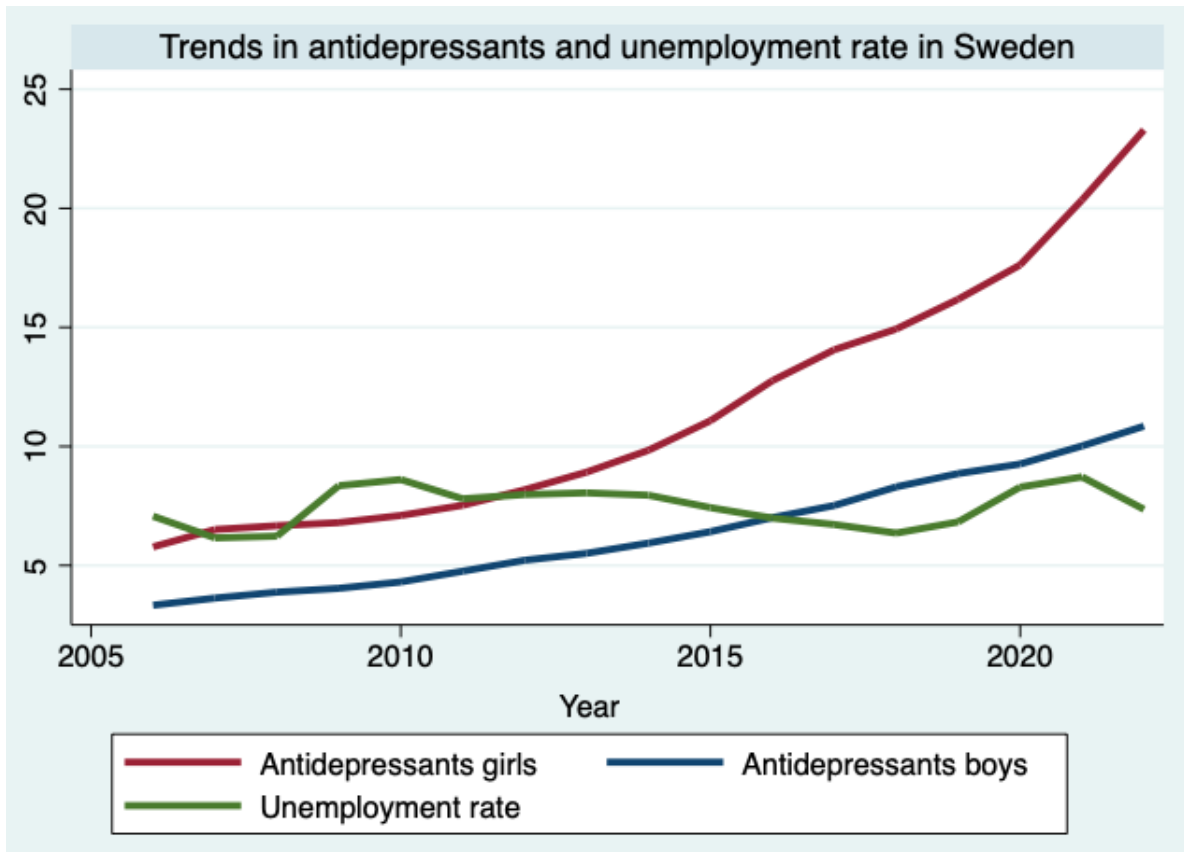
Figure 1: Trends in antidepressants prescriptions under 18 and unemployment rate in Sweden.
Source: Author's own figure.
Data: Socialstyrelsen database (2023) and Statistiska Centralbyrån (2022a).

To analyze the relationship between economic conditions and children's mental health, we estimate a fixed effects model using panel data at the quarter level for Swedish regions. The data covers all 21 of the Swedish regions from 2006 to 2019. The proxy for children's mental health is the number of patients per thousand inhabitants under 18 years old that expedited an antidepressants prescription at a pharmacy, separated amongst boys and girls. Whereas the regional unemployment rate is used as a measure of business cycles in line with previous studies (See Ruhm, 2000; Golberstein, Gonzales & Meara, 2016; Charles & DeCicca, 2018). As a robustness check we run further regressions on an annual rather than quarterly level, including two regional control variables of the number of physiotherapists and Swedish children with parents who are foreign born. Additionally, two specification tests have been performed to strengthen the validity of the study.

Section 2 provides explanations on the main variables of interest, children's mental health and business cycles. Section 3 summarizes previous findings on business cycles and health

outcomes, including the mechanisms and operating channels linking unemployment rate and children's mental health. Section 4 presents the empirical model of this study, including descriptions and justifications of the selected variables. Section 5 presents the empirical results of the study, whereas section 6 elaborates on the result and findings. Lastly, section 7 concludes and highlights the main result of this study. At the end, the list of references and appendix are included. The appendix presents the result of the specification tests.

We find a positive relationship between unemployment rates and child mental health, which is stronger for boys. Children's mental health seems to move procyclical in relation to the unemployment rate since it deteriorates as the economy contracts. This is driven by boys only, while girls seem less responsive to economic conditions. Worsen psychological well-being during early life has spillover effects on society above the outcome of individual suffering and repercussions on educational attainment (Adhvaryu, Fenske & Nyshadham, 2019). Along with new understandings of the business cycle and child mental health linkages, our findings have significance in terms of potential policy response to labor market contractions. Given the short- and long term consequences of mental disorders and stress during childhood, extending countercyclical investments in mental health resources specifically for children may decrease individual as well as societal costs.

2. Background

Before addressing the stipulated objective of this paper, this section aims to cover the relevant theoretical knowledge of children's mental health and business cycle theory.

2.1 Children's mental health

According to The World Health Organization (2022), mental health is "a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn and work well, and contribute to their community" (World Health Organization, 2022). According to Folkhälsomyndigheten (2022c), several factors influence children and young adults mental health in Sweden. Common factors are socioeconomic status, well-being of parents and the social environment at home and school (Folkhälsomyndigheten, 2022c). Mental illnesses impede on everyday life, although the extent may have short- or long term consequences, varying between different disorders and the level of symptoms. It follows that some symptoms and patients are treated with antidepressants medications or therapy, whereas

other mental disorders remain untreated (Kunskapsguiden, 2022). This study uses the number of patients under 18 per thousand inhabitants that expedited an antidepressants prescription at a pharmacy as an approximation for children's mental health.
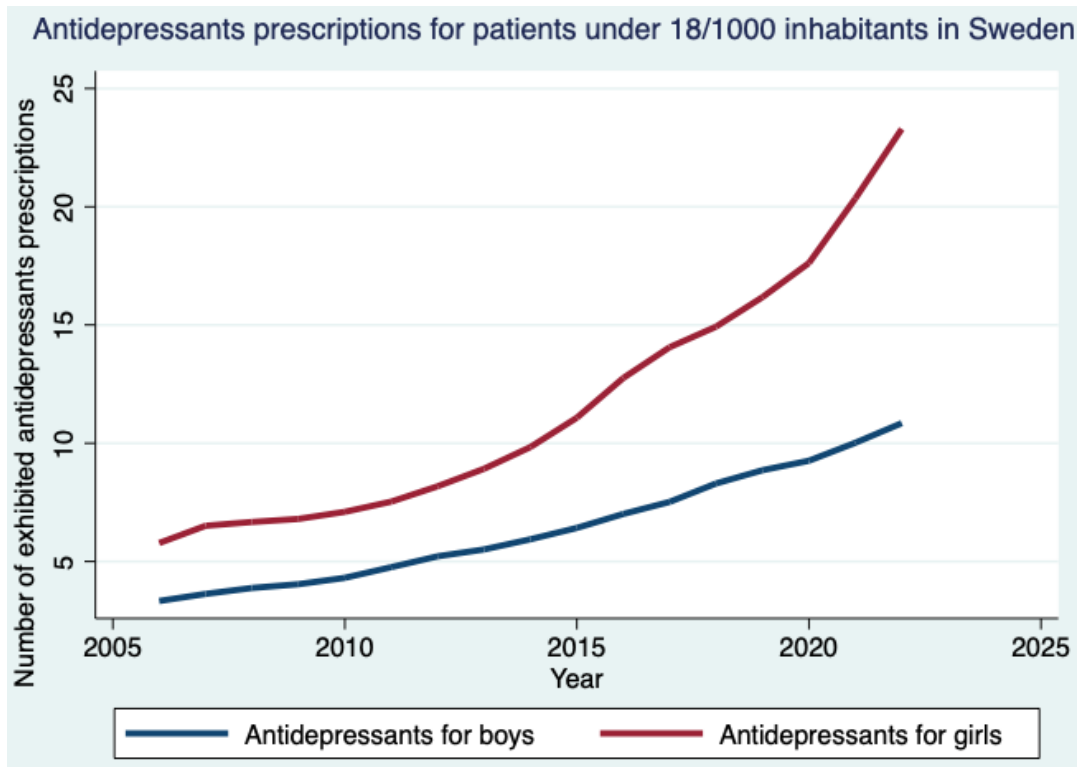

Figure 2: Number of redeemed antidepressants prescriptions for patients younger than 18 per 1000 inhabitants in Sweden.
Source: Author's own figure.
Data: Socialstyrelsen database (2023).

Sweden is above average in relation to other Nordic-, European- and North American countries with regards to repetitive psychosomatic issues. The share of schoolchildren who report having at least two psychosomatic symptoms every week has doubled since the 1980s, where teenage girls constitute the largest share. During 2020, 5,5% of boys and 3.1% of girls between 10-17 seeked psychiatric care, where the most common diagnosis and reason for seeking help was related to ADHD (Folkhälsomyndigheten, 2022d). Girls are, however, overrepresented in the use of antidepressants, as seen in Figure 2.

Psychological problems and mental health disorders impact on both the academic achievement and social development for children and adolescents (Pastor, Reuben & Duran, 2012). Using data from Canada and the United States, Currie and Stabile (2006) study

children diagnosed with ADHD and their subsequent outcomes in terms of health and education. They find that child mental health disorders affect the ability of learning and gaining knowledge, skills and education which consequently has a negative impact on the accumulation of human capital. There are no differences in the achievement level of test scores between gender for mild level symptoms of ADHD. However, boys with severe levels of symptoms of ADHD have a lower test score than girls. Currie and Stabile (2006) states that the mental health problems often follow into adulthood, affecting potential future earnings and employment. Moreover, Goodman, Joyce and Smith (2011) assessed the effect of childhood mental problems on the socioeconomic status in adult life using longitudinal data from 1958 on children in Great Britain. The result is consistent with Currie and Stabile (2006) study; mental illness in early stages in life affects ability on the labor market negatively, evident by reduced earnings in adulthood. The net family income is 28% lower by the age of 50 years old for individuals that exhibited psychological problems during childhood (Goodman, Joyce & Smith, 2011).

2.2 Business cycles

Business cycles are defined as fluctuations in an aggregate macroeconomic variable, where one cycle consists of two main phases; expansion and contraction. During an expansion, the economy moves from a through towards a peak whereas the actual GDP rate grows faster than potential GDP. This implies that income and sales rise which creates a larger production that requires employees. The labor market is therefore characterized by a low unemployment rate under an expansion. The expansion ends at a peak and is followed by a recession, during which output, sales and production declines which lowers the labor demand under contractions. Thus normally, there is lower economic activity and higher unemployment rate during the recessionary phase (Investopedia, 2022). By this, and in line with previous research on business cycles and health (See Brenner, 1973; 1975; 1979; Ruhm, 2000; McInerney & Mellor, 2012; Golberstein, Gonzales & Meara, 2016), we use unemployment rate on a regional level as an approximation of business cycles.

Considering the business cycle in Sweden, the outset of this research is one year before The Global Financial Crisis. During this time, Sweden's GDP rate dropped over 4% along with an increased unemployment rate. The economy recovered in the following years, characterized by an expansion with high GDP growth rate between 2014 and 2017. Due to the COVID-19 pandemic in the beginning of 2020, the economy faced a downturn again (Statistiska

centralbyrån, 2022b). The time period of this study includes one boom and two troughs, along with the expansions and downturns of the business cycles. In the present, Konjunkturinstitutet estimates that the Swedish economy enters a recession during 2023, which is expected to last for a few years (Ekonomifakta, 2023).
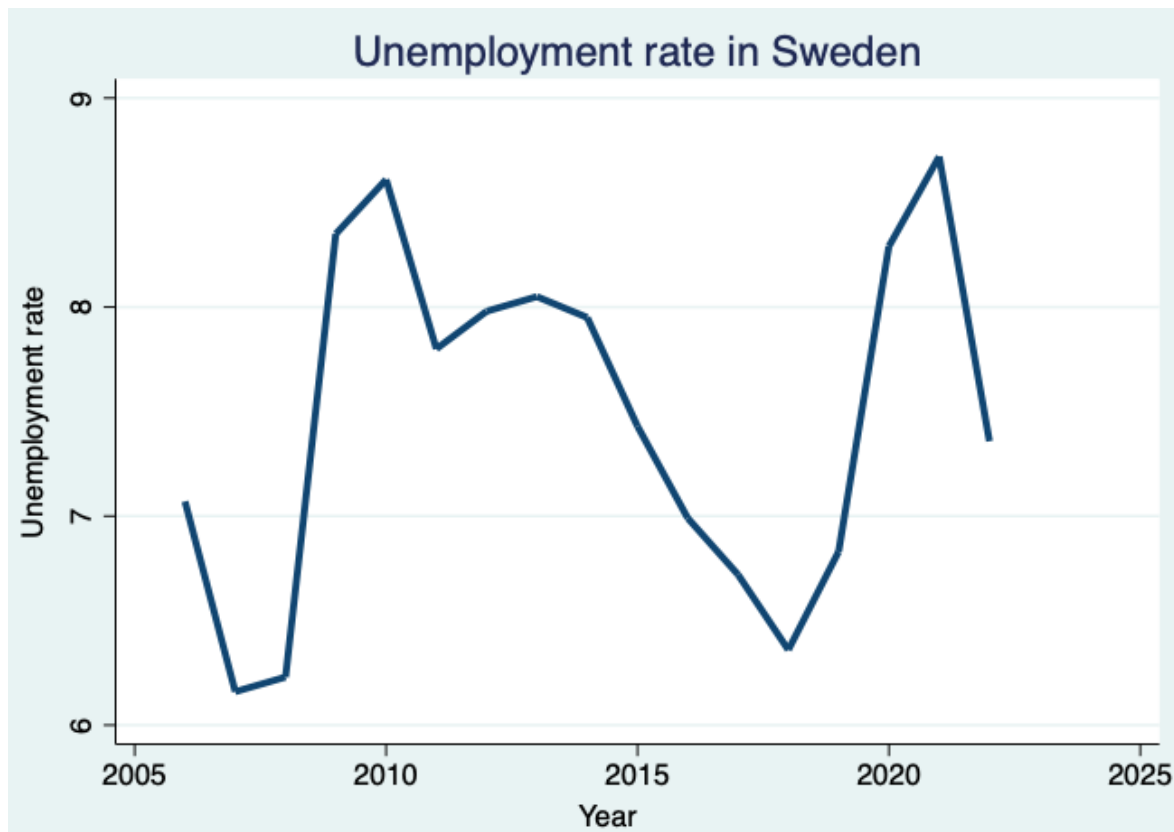
Figure 3: Sweden's unemployment rate.
Source: Author's own figure.
Data: Statistiska Centralbyrån (2022a).

3. Theoretical framework and literature review

This section covers the theoretical reasons why we expect an association between business cycles and child mental health in particular. The chapter includes a section on theory, the operating mechanisms between macroeconomic conditions and children's mental health and previous empirical results.

3.1 Theoretical framework

Explanation of labor market contractions and its subsequent impact on health is generally twofold, and traced to behavioral or structural channels which are neither mutually exclusive nor fully exhaust the mechanisms through which macroeconomic conditions affect health outcomes. One should, moreover, note that the arguments below can be used conversely, which further highlights the need for empirics and statistical tools (Charles & DeCicca, 2008).

The behavioral explanation propagates that the impact on health is due to modified behavior of individuals in relation to their economic environment. As the unemployment rate increases, both on the extensive and intensive margin, it lowers the opportunity costs of engaging in other activities such as household production. One strain of household production is the actual production of health, in terms of exercise, attending preventive medical appointments, producing and later consuming homemade meals. Due to the lower time-cost, individuals can simply undertake time consuming activities that either improve or worsen their physical and mental health. If the time is invested in healthy activities, a procyclical relationship between health and unemployment may arise, while engaging in risk-taking behavior may induce a countercyclical one (Charles & DeCicca, 2008).

The second channel between labor market fluctuations and health is related to the economic stress hypothesis. It states that uncertainty and anticipation of present or future income losses may increase psychological stressors, which raise the likelihood of both mental and physical illness. Realized income losses can additionally have direct effects on the capacity to finance goods that improve health such as "healthy" food or a gym card. Note, however, that the argument can be used conversely, as a constrained budget also leads to reductions in "unhealthy" varieties of normal goods, such as fast food restaurants (Catalano & Dooley, 1983; Charles & DeCicca, 2008).

3.2 Operating channel between business cycles and child mental health

Since the question of interest is whether unemployment rates have an impact on child mental health, the following paragraphs will explore possible mechanisms and channels linking a causal relation between the two variables by relevant theory and empirics. The features of an economic downturn, -such as the mere threat of unemployment, actual job loss or a reduction

in the hours worked, financial constraints and loss of wealth- may affect the health and thereby development of the child through two primary processes; family- investments and emotions (Weiland & Yoshikawa, 2012; Kalil, 2013). The former related to the behavioral explanation, while the latter to the economic stress hypothesis.

The mechanism of family investment is closely related to a realized income loss, hence an actual change in employment status or reduction in working hours, rather than the anticipation of financial losses. As a key feature of economic recession, loss of income reduces the economic resources of the household and their subsequent ability to consume or produce goods and services which may be critical for child development (Kalil, 2013). Stephens (2001) as well as Yeung and Hofferth (1998) showed that US households experiencing permanent income losses are especially prone to cut expenditures and reduce consumption. These cuts in consumption may in turn revolve around food, insurances, education or other factors linked to psychological functioning and well-being (Kalil, 2013).

The second perspective emphasizes how parental psychological stressors can cause ineffective parenting, inhibiting parental warmth and engagement and thereby straining the parent-child relation (Kalil, 2013). On the verge of a recession, households may simply face increased social- and psychological stress due to the salient consequences of an economic downturn (Charles & DeCicca, 2008; Golberstein, Gonzales & Meara, 2016). Whether a realized or anticipated income loss, the attendant stress factors will naturally influence social relations, cohesion in the neighborhood and parent-child interactions. Consequently give rise to inter- or intra-family conflicts and disruptive events, causing poorer health and achievement during childhood (Conger & Donnellan, 2007; Weiland & Yoshikawa, 2012; Kalil, 2013; Golberstein, Gonzales & Meara, 2016).

Drawing from the review of Conger and Donnellan (2007), Weiland and Yoshikawa (2012) and Kalil (2013), there are plausible theoretical reasons for a causal link between unemployment rate and child mental health. Aggregate economic conditions affect parental behavior which in turn exerts an impact on child development and mental well-being. The effect may, moreover, be especially significant for subgroups particularly vulnerable to labor market conditions, such as low-skilled parents and disadvantaged socioeconomic groups (Conger & Donnellan, 2007).

3.3 Review of empirical literature

Turning from theory to empirics, a pioneer of connecting the two, priorly separated fields, of macroeconomic conditions and health, is Brenner (1973; 1975; 1979) who utilized time series data to point out the countercyclical relationship of health and business cycles in the United States. He finds health to improve as the economy expanded, showing a decrease in mortality rates, cardiovascular diseases and suicide. In a similar fashion, as societies were faced by rising unemployment rates and the threat of constrained economic conditions, the admissions to mental health hospitals rose and mortality rates increased as households experienced the psychological stress of joblessness, loss of insurance and engaging in risk-taking behavior (Brenner, 1973; 1975; 1979; Ruhm, 2000). Although intuitively appealing, Brenner's (1973; 1975; 1979) findings were disputed as several authors (See Gravelle, 1981; Wagstaff, 1985) questioned the robustness of his econometric analysis and reasoning, while others finding the relation between mortality and business cycles to be pro- rather than countercyclical (Ruhm, 2000).

Applying the panel data technique of a fixed effects model to times series data at the US county level, the influential paper by Ruhm (2000) demonstrates how mortality rates show a significant procyclical variation in relation to unemployment rates. As the economy deteriorates, the health of those particularly exposed to labor market conditions improves. In contrast to Brenner's (1973; 1975; 1979) reasoning, Ruhm (2000) claims that as the economy deteriorates, the health of those particularly exposed to labor market conditions (age 20-44) improve as a result of decreased risk-taking behavior and a greater undertaking of time-intensive healthy behavior. Simply put, consumption of several normal goods, such as smoking, drinking and driving, and its combination of alcohol induced vehicle fatalities, work related stress and injuries may decrease, as well as the opportunity cost of undertaking exercise and medical checkups (Ruhm, 2000).

Ruhm's (2000) work on mortality received additional support as several authors applied similar econometric techniques to diverse time horizons and settings. A procyclical variation between mortality and unemployment rates have been found in several European countries using aggregate data on a country level (Neumayer, 2004; Granados, 2005; van den Berg, Gerdtham, Von Hinke, Lindeboom, Lissdaniels, Sundqvist, Sundqvist, 2017), in addition to Ruhm (2015; 2016) himself who found renewed evidence for his previous work. One

important exception in his work on mortality is, however, the fatality rates due to suicide which lack any procyclical variation in relation to recessions.

Economic recessions, primarily proxied by unemployment rates, have indeed been linked to a greater demand for psychotic drugs, as well as an increase in suicide rates and stress-related mental illness among adults (Ruhm, 2000; McInerney & Mellor, 2012; 2013; Golberstein, Gonzales & Meara, 2016). McInerney and Mellor (2012) found that a 1% increase in unemployment rates increased the likelihood of elderly reporting inferior health by up to 11.2%. A year later, the same authors found that the stock market crash of 2008 reduced subjective measures of mental health and increased demand for antidepressants drugs for those experiencing reduced wealth (McInerney, Mellor & Nicholas, 2013). Ruhm (2000) priorly provided similar evidence of a 1% increase in unemployment rate increasing fatal suicide by 1.3 percentage points. These studies do, however, dismiss the health outcomes of children leaving a gap of relevant issues unanswered.

To the best of our knowledge, only two articles explore potential linkages to children rather than adults. We find the articles by Golberstein, Gonzales and Meara (2016) and Adhvaryu, Fenske and Nyshadham (2019) especially relevant for our case of child mental illness and its long term effects. The former paper examines the effect of household prices and unemployment rates in the United States on mental health, in addition to the use of special educational services for emotional issues among children specifically (Golberstein, Gonzales & Meara, 2016). Golberstein, Gonzales and Meara (2016) applied a fixed effects model to annual cross sectional data from the National Health Interview survey (NHIS), stretching from 2001 to 2013. NHIS particularly assesses child mental health by a psychopathology questionnaire (The Strengths and Difficulties Questionnaire), where the received score is shown to be highly predictive of mental illness and subsequent medical treatment. The overall model specification estimates the effect of the aggregate economic variable on child mental health, within states as well as over time.

Golberstein, Gonzales and Meara (2016) finds that for each percentage increase in unemployment rates, the probability of clinical mental health problems increase by 6.9-10.4% among children. Consistent with these findings, the use of special education services increased by 3.6- 4.2%. In contrast to above cited studies however, there is no evidence that households particularly exposed to the risk of unemployment are worse off than others.

Instead the mere threat of job- and income loss accompanying an economic downturn may be the primary mechanism behind their result, rather than the parents facing the greatest risk of unemployment.

Adhvaryu, Fenske and Nyshadham (2019) focus on how the experience of a price shock in early life has a lasting impact on human capital formation and psychological health in Ghana. As the country serves as a key exporter of cocoa, its real producer price is a prime determinant of income in producing regions. Cocoa prices are thereby inducing variations in early life experiences by affecting household income in cocoa producing regions. By exploiting time series data of real cocoa producer price and national household surveys, they show that low producer prices at birth amplify incidence of mental distress disorders. A one standard deviation decrease in prices increases the probability of mental distress for cohorts born in producing regions by 3%, relative to those born in other districts. The operating channels are deemed to be maternal nutrition, adult circumstances and child investments in the sense of increased vaccination rates and breastfeeding. Adhvaryu, Fenske and Nyshadham (2019) study is thereby closely related to a strain of economic literature where long run outcomes of health (Currie, 2009), educational attainment (Bleakley, 2007) and labor market success (Almond, 2006) are traced to fetal- and early life nutrition. But also the findings by Persson and Rossin-Slater (2018), who show that acute maternal stress in early pregnancy increases the usage of drugs related to mental disorders by those exposed in the womb.

Altogether, presented theory and cited studies highlight the importance of examining the literature gap within the field of health economics and child mental health. The empirical evidence demonstrates that economic impacts in early life have long term consequences, suggesting that early interventions may spare individuals from later economic and psychological distress. Our work complements these studies in the sense of examining early economic life experiences in relation to children's mental health in Sweden.

4. Data, descriptive statistics and empirical approach

This section presents the empirical model of this research, including the estimation strategies of the data to explore the effect of business cycles on childhood mental illness in Sweden between 2006-2019. It further presents the used variables with respective data sources.

4.1 Data and descriptive statistics

Our analysis is based on aggregate panel data between 2006-2019 from all of Sweden's regions: Blekinge, Dalarna, Gotland, Gävleborg, Halland, Jämtland, Jönköping, Kalmar, Kronoberg, Norrbotten, Skåne, Stockholm, Södermanland, Uppsala, Värmland, Västerbotten, Västernorrland, Västmanland, Västra Götaland, Örebro and Östergötland. The data for our dependent variable and psychotherapists is collected from the statistical database of Socialstyrelsen, whereas our independent variable of the unemployment rate and the control of children with foreign born parents is collected from Statistiska Centralbyrån. As both sources are government authorities providing publicly available data we deem them reliable and with minimized subjective bias. Our variables are presented in Table 1 with their quarterly summary statistics plus Table 2 with annual summary statistics.

Table 1: Quarterly summary statistics

Variable	Mean	Std. dev.	Min	Max	Observations	
CMH Total	2.288	1.237	0.493	9.087	N =	1176
CMH Girls	2.930	1.555	0.650	11.067	N =	1176
CMH Boys	1.683	1.011	0.277	7.253	N =	1176
Unemployment rate	7.380	1.758	2.800	13.400	N =	1176

Table 2: Annual summary statistics

Variable	Mean	Std. dev.	Min	Max	Observations	
CMH Total	8.395	4.092	2.600	27.820	N =	294
CMH Girls	10.658	5.023	3.740	36.020	N =	294
CMH Boys	6.229	3.361	1.290	20.890	N =	294
Unemployment rate	7.379	1.460	4.100	11.000	N =	294
Therapists	223.772	372.598	18.000	1786.000	N =	294
FP	9.003	4.664	1.350	19.440	N =	294

4.2 Dependent variable: Children's mental health

Children's psychological well-being can be measured in various ways. This study uses the number of patients per thousand inhabitants that redeemed an antidepressants prescription at a pharmacy as the chosen approximation for children's mental health, restricted to ages 0-17. Note that it is not possible to capture the frequency of a specific age within this interval since it is confidential information. The variable is separated for boys and girls in Sweden to investigate if differences between the sexes are statistically significant. We manually calculated the average for every three months in order to receive quarterly level data. The differences in the population size of the regions is accounted for as Socialstyrelsen has divided the number of patients with the total population in each region, and then multiplied with 1000. The population size is measured January 1, every year.

Antidepressant medicines could be used for several disorders and symptoms. The measurement includes all types of expedited antidepressant medicines, hence, medicines that are used for pain, anxiety or premenstrual syndrome. However, the statistics do not state the specific cause of the prescription which means that there is no certainty of the number of patients using antidepressants for a specific symptom (Socialstyrelsens statistical database, 2023). Using antidepressants prescriptions to proxy child mental health might introduce some measurement error. For example, individuals that do not need prescription medicines as well as medicines received directly from a hospital or health care center are not included in the statistics. The measure does not naturally capture children that do not seek health care, that receive another treatment than antidepressants or those who receive the prescription but never

16

expedite it at a pharmacy. It follows that there may be more children and adolescents suffering from mental illness than our variable captures. In addition, the raise of awareness of mental health problems in Sweden contributes to seeking health care being less stigmatized, which has to be accounted for when analyzing the development over the years. The limitations of the dependent variable should not be an issue unless they are changing differently across regions over time.

In Table 3 summary statistics of child mental health by region are presented. The region of Gotland exhibits the highest value of antidepressants prescriptions of approximately 9.1, as well as the highest mean of 5.2 prescriptions. Jönköping and Kronoberg, on the other hand, exhibit the lowest mean value of approximately 1.3. In terms of this study's objective, note that a higher value indicates regions with greater child mental illness. Hence, Gotland is the region where child mental illness is the worst relative to other Swedish regions, whereas Jönköping and Kronoberg exhibit the lowest frequency of mental health incidence.

Table 3: Child mental health by region

Variable	Mean	Std. dev.	Min	Max
Blekinge	2.810	1.311	1.000	5.813
Dalarna	2.447	1.082	1.287	4.643
Gotland	5.224	1.936	1.133	9.087
Gävleborg	2.757	1.139	1.273	5.487
Halland	2.375	0.741	1.280	3.847
Jämtland	1.885	0.955	0.863	4.660
Jönköping	1.331	0.565	0.657	2.667
Kalmar	1.862	0.478	1.150	2.987
Kronoberg	1.314	0.630	0.493	2.873
Norrbotten	2.305	1.076	1.070	4.617
Skåne	1.776	0.634	0.963	3.243
Stockholm	1.908	0.911	0.673	3.707
Södermanland	2.206	1.052	0.820	3.993
Uppsala	3.064	0.659	1.917	4.630
Värmland	1.847	0.777	0.753	3.610
Västerbotten	2.667	1.007	1.173	4.343
Västernorrland	2.108	0.993	0.873	4.313
Västmanland	2.303	0.879	1.350	4.383
Västra Götaland	2.149	0.798	1.203	3.817
Örebro	1.706	0.669	0.770	3.383
Östergötland	2.007	0.725	1.097	3.870

4.3 Explanatory variable: Unemployment rate

Business cycles, or fluctuations in the aggregate economic activity, are generally measured by GDP growth- or unemployment rate. This study follows previous researchers, (See Brenner, 1973; 1975; 1979; Ruhm, 2000; McInerney & Mellor, 2012; Golberstein, Gonzales & Meara, 2016) by using the unemployment rate per region as an approximation for the business cycle. The data is collected per quarter and region from the database by Statistiska Centralbyrån in Sweden, which estimates unemployment as a percentage of the labor force, between 15-74 years old. The unemployment rate is thus used to indicate and capture the underlying economic conditions of each region. In Table 4 summary statistics of unemployment rate by region are shown. Within regions the difference between minimum- and maximum level of

unemployment rate throughout the time period also exhibits a greater dispersion relative to child mental health.

Table 4: Unemployment rate by region

Variable	Mean	Std. dev.	Min	Max
Blekinge	8.480	1.856	4.6	13.0
Dalarna	7.366	1.322	4.2	11.5
Gotland	6.286	1.605	2.8	10.3
Gävleborg	8.652	1.657	4.8	11.8
Halland	5.802	1.370	3.4	8.7
Jämtland	7.021	1.505	3.9	10.3
Jönköping	5.823	1.257	3.6	8.6
Kalmar	6.963	1.745	2.9	11.7
Kronoberg	6.859	1.485	3.6	10.3
Norrbotten	7.386	1.945	3.2	12.3
Skåne	8.754	1.117	6.0	11.4
Stockholm	6.398	0.762	5.1	7.8
Södermanland	8.264	1.683	3.3	11.2
Uppsala	6.475	1.182	3.8	9.4
Värmland	7.470	1.783	3.8	11.7
Västerbotten	6.970	1.521	4.2	10.9
Västernorrland	7.627	1.739	4.4	12.8
Västmanland	8.291	1.497	5.3	12.1
Västra Götaland	7.150	1.308	5.0	9.9
Örebro	8.513	1.618	5.6	11.7
Östergötland	8.439	1.352	6.4	13.4

4.4 Control variables

4.4.1 Foreign born parents

To investigate the mechanisms behind the impact of economic conditions on children's mental health, we include the percentage share of children with foreign born parents per region as a control. Although the difference decreases over time, foreign born Swedish residents have a lower median income than those born in Sweden (SCB, 2019). It follows that children with two foreign born parents may be especially sensitive to aggregate labor market conditions in line with Conger and Donnellan's (2007) research. They state that the effect of

economic conditions on the well-being of children might be specifically significant for subgroups of low-skilled parents or disadvantaged socioeconomic groups. Children in households with lower socioeconomic status or asylum seekers also face an increased risk of mental issues (Kunskapsguiden, 2022). Migration as well as belonging to a ethnic minority is a risk factor for diverse mental disorders, yet, it is also worthwhile to point out that the stigma of seeking mental health care may vary across ethnic or national groups (Hollander & Dalman, 2020). The variable is collected from Statistiska Centralbyrån per region and year between 2006-2019, estimated December 31th every year. Since this study is based on quarterly data, the annual number of foreign born parents is added respectively for each quarter.

Table 5 presents the correlation matrix between the children's mental health, separated for girls and boys, and the two control variables. There is a negative correlation between children with foreign born parents and children's mental health, irrespective of gender on a regional level. This suggests that as the number of children with parents that are foreign born increases, the number of patients that redeem prescriptions of antidepressants falls, and vice versa.

4.4.2 Psychotherapists

The number of psychotherapists working in both the public and private sector per region is also controlled for. The variable is collected from Socialstyrelsen's statistical database, which estimates the annual number of employed psychotherapists in every November during 2006-2019. To receive quarterly data, the annual number of psychotherapists is added respectively for each quarter. This means that a correct interpretation of the development over quarters within a year can not be made. Due to this, the control variables are both included on quarterly and annual level data between 2006-2019.

Psychotherapists offer therapy, but do not have any rights to prescribe antidepressants medications in Sweden (Ahum, 2021). Statistics of the number of psychiatrists that can prescribe medications for children is not available in Sweden, and hence can not be included as a control variable. By first looking at the data of psychotherapists, it shows an increase of the number of psychotherapists for all regions over time. Table 5 shows a negative correlation around -0.1 irrespective of gender between psychotherapists and our dependent variables, which implies a small negative comovement of the variables. As the number of

psychotherapists increases, the number of patients that redeem prescriptions of antidepressants falls. One explanation for this could be that as the number of psychotherapists increases, the waiting time when seeking health care in the form of therapy is shorter. Thus, therapy is easier accessible for the childrens in these regions, rather than prescribed medications and consequently antidepressants. Note, nonetheless, that a correlation simply shows a certain movement between two variables and does not provide any information about the causal relation.

Table 5: Pairwise correlation

Variable	CMH Total	CMH Girls	CMH Boys	U	FP	P
CMH Total	1.000					
CMH Girls	0.980	1.000				
CMH Boys	0.966	0.892	1.000			
U	-0.213	-0.218	-0.194	1.000		
FP	-0.090	-0.053	-0.124	0.07	1.000	
P	-0.105	-0.102	-0.099	-0.092	0.584	1.000

4.5 Empirical approach

In line with previous studies by for example Ruhm (2000) and Golberstein, Gonzales and Meara (2016), we use panel data on a regional level with a fixed effects model to examine the relationship between children's mental health and business cycles. The variables are logged to simplify further analysis and inference. Our panel data follows the outcomes and characteristics of the regions respectively at every quarter from 2006 until 2019. The results are thereby derived from differences between the regions along with differences over time within each region. A fixed effects model controls for observed and unobserved regional differences which are constant over time or factors that vary over time but not across regions. As a result, the omitted variable bias due to heterogeneity in the data is reduced by eliminating the time and/or region specific effects. The main regression equation is presented below:

$$CMH_{r,t} = \alpha_t + \gamma_r + \beta_1 U_{r,t} + \beta_2 FP_{r,t} + \beta_3 P_{r,t} + \varepsilon_{r,t}$$

where the subscripts r represents the region and t represents each quarter. All variables are measured in the natural logarithm to easily understand and interpret the result of the coefficients. The dependent variable is $CMH_{r,t}$, which is short for children's mental health. The intercept α_t captures the quarter-specific effects which are constant on children's mental health for all of the regions in that specific time. Intercept γ_r accounts for region-specific characteristics that differ between the regions but are constant over time. The main explanatory variable is $U_{r,t}$ which represents the unemployment rate in each region at each quarter. Thus, β_1 is the main coefficient of interest for this study. The following two terms are control variables: $FP_{r,t}$ stands for Swedish children with both foreign born parents and $P_{r,t}$ represents the number of psychotherapists. The control variables are included both quarterly and annually as robustness checks. Finally, $\varepsilon_{i,t}$ captures the unobserved errors, which by assumption, is independent of the covariates.

The data is balanced for all included variables in the analysis. Before performing the main analysis, we run a Hausman test to conclude that the fixed effects model is preferable. Additionally, we look at the distribution of residuals for both a log-log regression and a linear. The results are presented in the Appendix, where the log-log model is deemed to fit a normal distribution to a greater extent than a linear one, which will also ease interpretation of results. As robustness checks we run additional regressions by including the control variables on both quarterly and annual level data, and by including an interaction dummy of region-specific linear trends to allow for more flexibility in the model. Standard errors are clustered at the regional level to allow observations within one region to be correlated over time. Additionally, the p-value of the wild bootstrapped standard errors are added to each regression since it corrects for the relatively small number of clusters, in our case, regions.

5. Empirical results

This section presents the results of the estimates of business cycle on child mental health between 2006-2019, with and without the control variables. The section also provides robustness checks by using annual rather than quarterly level data and by including the region-specific linear trends.

5.1 Main results

Table 6 presents the main result of the association between unemployment rate and child mental health between 2006-2019. From the baseline equation, six regressions are estimated separately by firstly controlling for region fixed effects and secondly for both region- and quarter fixed effects. When controlling for region fixed effects in specification one (1), three (3) and five (5), all estimates are negative irrespective of gender. By using region- and quarter fixed effects in specification two (2), four (4) and six (6), the estimates are positive. It suggests that when only controlling for regional heterogeneity, the association between prescriptions of antidepressants and unemployment rate is negative, whereas controlling for both time trends in the variables and regional differences constant over time, the relationship is positive.

Table 6: Baseline Results from 2006-2019 (Quarterly)

	(1) Total	(2) Total	(3) Girls	(4) Girls	(5) Boys	(6) Boys
Unemployment rate	-0.276*	0.097*	-0.350**	0.022	-0.145	0.232**
	(0.133)	(0.052)	(0.125)	(0.053)	(0.154)	(0.086)
N	1176	1176	1176	1176	1176	1176
R²	0.015	0.917	0.015	0.902	0.011	0.880
P-value Boottest	0.064	0.972	0.019	0.893	0.345	0.848
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects	No	Yes	No	Yes	No	Yes

Clustered standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

In Table 6, the unemployment rate coefficient when estimating region- and quarter fixed effects are statistically significant at the 10% level when considering child mental health in general seen in specification (2). The coefficient is positive but insignificant for girls (4), while the estimate for boys in column (6) is significant at a 5% level. Accounting for time- and region specific heterogeneity, Table 6 suggests that a 1% increase in unemployment rate increases the number of patients that redeemed antidepressants by 9.7% for the total while it increases by 23.2% for boys. The adjusted R-square shows a value of approximately 0.9 when controlling for region- and quarter fixed effects in all subgroups, whereas it exhibits a significantly lower value when only region fixed effects are controlled for. It implies that quarterly fixed effects, the average effect of factors related to time shared across regions,

account for a substantial part of the variation in our dependent variable. Our further analysis will focus on the specifications of region- and time fixed effects since these estimations are controlled for time trends in children's mental health.

Table 7: Results from 2006-2019 with controls (Quarterly)

	(1) Total	(2) Total	(3) Girls	(4) Girls	(5) Boys	(6) Boys
Unemployment rate	-0.076*	0.096*	-0.139***	0.024	0.038	0.227**
	(0.041)	(0.052)	(0.040)	(0.054)	(0.059)	(0.081)
Foreign-born parents	1.437***	0.237	1.496***	0.250	1.362***	0.201
	(0.115)	(0.158)	(0.109)	(0.162)	(0.144)	(0.187)
Therapists	0.665***	0.040	0.526**	-0.102	0.891***	0.250
	(0.214)	(0.193)	(0.223)	(0.193)	(0.227)	(0.246)
N	1176	1176	1176	1176	1176	1176
R^2	0.006	0.919	0.002	0.905	0.011	0.881
P-value Boottest	0.066	0.629	0.003	0.496	0.491	0.788
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects	No	Yes	No	Yes	No	Yes

Clustered standard errors in parentheses
* $p<0.1$, ** $p<0.05$, *** $p<0.01$

Table 7 presents the estimates of the baseline equation per quarter between 2006-2019 when including the control variables. By using region- and quarter fixed effects for total child mental health in specification (2), the estimate is significant at a 10% level indicating that as the unemployment rate increases by 1% child mental health increases by approximately the same amount as in Table 6, by 9.6%. By studying for heterogeneity by genders, the unemployment rate coefficient when estimating region- and quarter fixed effects are still statistically significant at the 5% level for boys (6). This strengthens the result that boys are the only driver of the procyclical relationship between children's mental health and unemployment rate. The adjusted R-square measure presented in Table 7 remains high when controlling for both region- and quarterly fixed effects.

As shown in Table 7, the estimations of foreign-born parents are positive but insignificant when controlling for both regional- and quarterly fixed effects in column (2), (4) and (6). Similar to the coefficients of unemployment rate and therapists, the estimates of foreign born parents differ when controlling for only region- versus region- and quarter fixed effects. It

suggests that there exists time-varying circumstances that influence the relationship between the variables in question over time. It suggests the presence of trends and time-varying characteristics affecting the relation. The variable of therapists is insignificant when controlling for both regional- and quarterly fixed effects in all specifications. None of the included controls noticeably alter the coefficients of unemployment rate, implying that neither control is a confounder causing a spurious relationship between the variables of interest.

The p-values from the wild-bootstrap standard errors are higher than the p-values with clustered standard errors in all specifications, but especially for the region- and quarter fixed coefficients in both Table 6 and 7. From the bootest, all of the specifications are insignificant and the interpretation of the robustness of our result should, consequently, be made with caution. There are almost no differences in the clustered standard errors in specification (2), (4) and (6) in Table 7 with controls relative to Table 6 without control variables. However, the p-values from the boottest are smaller by using control variables.

5.2 Sensitivity checks

To examine the robustness of the baseline estimates two procedures are taken: In Table 8 by estimating the baseline equation on annual data between 2006-2019 with the controls, and in Table 9 by including an interaction dummy of region-specific linear trends.

Table 8: Results from 2006-2019 with controls (Annual)

	(1) Total	(2) Total	(3) Girls	(4) Girls	(5) Boys	(6) Boys
Unemployment rate	-0.142*	0.174*	-0.248***	0.067	0.253	0.333**
	(0.076)	(0.096)	(0.073)	(0.098)	(0.101)	(0.133)
Foreign-born parents	1.274***	0.258*	1.320***	0.275*	1.210***	0.230
	(0.104)	(0.132)	(0.096)	(0.143)	(0.132)	(0.921)
Therapists	0.581***	-0.042	0.406*	-0.211	0.796***	0.176
	(0.193)	(0.143)	(0.207)	(0.149)	(0.188)	(0.162)
N	294	294	294	294	294	294
R²	0.011	0.935	0.004	0.926	0.015	0.910
P-value Boottest	0.074	0.595	0.005	0.452	0.798	0.775
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects	No	Yes	No	Yes	No	Yes

Clustered standard errors in parentheses
* p<0.1, ** p<0.05, *** p<0.01

Table 8 presents the baseline regression on the annual rather than quarterly data between 2006-2019 with controls. These estimations are performed to study the impact of including the number of psychotherapists and children with foreign born parents, which in the database is measured per year. By comparing Table 8 based on annual data with Table 7 on quarterly data, there are no differences in the significance level in unemployment rate. However, the coefficients are higher in Table 8 by using annual level data which might be caused by short time dynamics. It implies that effects of short term fluctuations in the quarterly data disappears as the data is aggregated to an annual basis, consequently resulting in higher estimates. As a conclusion from the annual data, children's mental health still moves in procyclical patterns. Foreign-born parents become significant in Table 8 compared to Table 7, while psychotherapists are still insignificant.

When adding region-specific linear trends to all regressions in Table 9, the coefficients of unemployment rate as well as the clustered standard errors remain largely the same as in Table 7. It suggests that the interaction term of time and region specific aspects does not significantly impact the estimates of the variable of interest and that regional heterogeneity and time trends were captured by the baseline equation. P-values for the boottest are significantly lower when adding a region-specific linear trend to the regression, but they are

still suggesting that our variables are insignificant when controlling for both types of fixed effects.

Table 9: Results from 2006-2019 with controls and region-specific linear trends (Quarterly)

	(1) Total	(2) Total	(3) Girls	(4) Girls	(5) Boys	(6) Boys
Unemployment	-0.064 (0.049)	0.087* (0.051)	-0.138*** (0.048)	0.012 (0.051)	0.070 (0.070)	0.224** (0.083)
N	1176	1176	1176	1176	1176	1176
R^2	0.006	0.919	0.002	0.906	0.010	0.882
P-value Boottest	0.200	0.3003	0.006	0.424	0.320	0.238
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Region-specific linear trend	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter fixed effects	No	Yes	No	Yes	No	Yes

Clustered standard errors in parentheses
* $p<0.1$, ** $p<0.05$, *** $p<0.01$

6. Discussion

By exploring the association between business cycles and children's mental health in Sweden, the result differs depending on the regression specifications and our dependent variable (CMH Total, CMH Girls or CMH Boys). Firstly, by considering children's mental health irrespective of gender in the baseline estimates with no controls using region- and quarter fixed effects, the coefficient is significant. The result is that children's mental health irrespective of gender moves procyclicality in relation to unemployment rate. By studying heterogeneity by gender, it indicates that the only driver behind the aggregate estimate are boys. This implies that the mental health for young boys worsens during economic downturns, while girls seem not to be as sensitive to macroeconomic conditions. By using region- and quarter fixed effects for only girls, the coefficient of unemployment rate remains insignificant throughout the analysis. Similarly, the results for boys when controlling for regional- and quarterly fixed effects is significant at a 10% level even in the face of adding a

region-specific linear trend as a robustness check, or considering annual rather than quarterly data.

Adding control variables to our fixed effects model requires finding variables that vary across regions, quarters and that may influence child mental health, but is not intrinsically a consequence of business cycles. The share of children with foreign born parents per region fit this description since they are, generally, a disadvantaged socioeconomic group (SCB, 2019), which increases likelihood of child mental stress and illness. The share of this subgroup per region is not necessarily connected to contemporary aggregate labor market conditions. We do not, however, find the variable statistically significant although it is positive throughout the analysis. The coefficients of therapists exhibit less consistency across the tables. Including controls into our analysis does not seem to affect the coefficient of unemployment rate as much, since the coefficients are similar with the inclusion of controls. This suggests that the number of psychotherapists and foreign-born parents are not important cofounders of the relationship between unemployment and children's mental health.

Relating our results to previous empirical findings, we find that the estimates for children's mental health is consistent with the results of Golberstein, Gonzales and Meara (2016), McInerney, Mellor and Nicholas (2013) on adults and Ruhm (2000) in terms of suicide rates. In relation to the study by Golberstein, Gonzales and Meara (2016) in the United States, we see a procyclical pattern between unemployment rate and child mental health when using boys or both sexes as our dependent variable. Prior research by McInerney, Mellor and Nicholas (2013) also found increased prescriptions of antidepressants for adults in the face of reduced wealth. We find that our estimate for aggregate child mental health across genders in Sweden is within the range of Golberstein, Gonzales and Meara (2016) estimates in the United States. Note however that they measure children's mental health differently, using a dependent variable constructed by SDQ questionnaire (The Strengths and Difficulties Questionnaire), and reported by self-estimates of parents or guardians. This measurement comes with limitations, since it reflects parents' belief of their children's well-being, whereas our measure shows statistics over redeemed antidepressants for children. In conclusion, the SDQ questionnaire in Golberstein, Gonzales and Meara (2016) study might overestimate the true effects while our measure might underestimate them. The SDQ questionnaire might capture milder mental health disorders, whereas our dependent variable might show more severe mental health problems among the Swedish children.

There might be several explanations of our result in relation to theirs. Golberstein, Gonzales and Meara (2016) investigates the mechanisms behind the effects of business cycles on children's mental health, where parental employment and socioeconomic status is emphasized. By stratifying their sample into lower- and higher income families, they find a statistically significant connection between unemployment rate and child mental health in single-parent families, whereas an insignificant effect in two-parents households where both parents are employed. Although it should not be considered a sole determinant, lower socioeconomic households are more vulnerable to job losses during economic downturns, which bears implications for household children. Parental employment is, moreover, closely related to mechanisms of economic stress hypothesis and parental use of time underlined by Kalil (2013).

The connection between our result and Ruhm's (2000) work is ambiguous. He finds that the mortality rate decreases as unemployment rises, implying that we are, in some sense, engaging in healthier living with increasing joblessness. In spite of that, an interesting exception of Ruhm's (2000) study is that suicides shows procyclical fluctuations which is the sole variable related to mental health in his study. That mental well being decreases, is on the other hand consistent with our findings for boys. Although Ruhm (2000) investigates the relationship for adults, it is intriguing that our study finds boys' mental health rather than girls to be the driver behind our, in general, procyclical result. Ruhm (2000) traced his findings of a procyclical variation to the opportunity costs, where he argues that the opportunity cost of investing in one's health decreases as unemployment increases. This is, nonetheless, not directly applicable to the lives of children as the parents' employment status does not affect children's opportunity costs of healthy investment to the same extent. The opposite may be more likely, that children are able to engage in sports and healthy food habits when parents are employed rather than unemployed and financially constrained.

In terms of relating our results to theory, the framework of the economic stress hypothesis by Catalano and Dooley (1983) might explain some of our estimated results. The economic stress hypothesis expresses that income losses cause mental illnesses due to the rise of psychological stress, which is applicable in our study for boys. The previous research by Catalano and Dooley (1983) does focus on adults, but it is arguable to suspect that their conclusions operate on children's well-being who are likely influenced by psychological

stresses of adults. The psychological stressors experienced by parents may also strain the parent-child relation in terms of reduced engagement, ineffective parenting and increased intra-family conflicts (Conger & Donnellan, 2007; Weiland & Yoshikawa, 2012; Kalil, 2013; Golberstein, Gonzales & Meara, 2016). The reason why our estimations differ between the genders is however difficult to evaluate with respect to theory and prior empirical research.

Research has shown biological differences between male and female brains, which are related to mood and emotions. The part of the brain that is associated with inhibitory control has been shown to develop faster for girls. In addition, there are variations in the sex hormones across genders which turns out to affect social relationships negatively for boys (Pan & Bertrand, 2013). Besides these genetic differences, Pan and Bertrand (2013) observe that boys' faces increase likelihood of acting out when faced with lower parental engagement or raised by a single mother. Higher levels of parental investments may, however, prevent behavioral problems. Altogether, they found that boys' in general seem more sensitive to negative shocks and disruptive family events relative to girls, which may offer a partial explanation of our result.

Besides limitations of our dependent variable discussed above, the limitations regarding unemployment rate, a fixed effects model, and clustered versus wild-bootstrapped standard errors should be discussed and considered. One limitation of using aggregate unemployment rates is that the likelihood of having an unemployed parent differs across three different employment groups according to Golbenstein, Gonzales and Meara (2016). They find that for highly predicted employment groups, which are not necessarily the highest income group, the likelihood of unemployment is not affected by regional unemployment rates, whereas in middle and lower predicted employment groups the probability of unemployment increases. The implication for our study is that regional unemployment rates may have heterogeneous psychological and behavioral effects on households within a region depending on labor market conditions unrelated to actual unemployment rates.

The main advantage of the fixed effects model is that some sources of biases are reduced. One potential concern is the unobserved, time-varying heterogeneity that may occur in many applications. In such a case, there could still be omitted variables which would not provide any causal effect of the fixed effects estimator. To mitigate this problem, we include the control variables foreign born parents and psychotherapists. We find that the inclusion of

controls does not change the value of our main coefficient of interest, implying that the controls are not important confounders in the relationship between child mental health and unemployment rate. In addition, one should note that our fixed effects model might account for a large degree of the variation in children's mental health status, but we can not state which part of lifestyle choices related to children's well-being that the model captures if lifestyle is assumed to be relatively time-invariant. Some variation in children's mental health is for example determined genetically (Pan & Bertrand, 2013).

Reverse causality is another limitation of the fixed effects model. In this study, we are interested in the effect of economic conditions on children's mental health using a quarterly panel. We can not state if that is the case, or reversely if children's mental health may impact on the unemployment rate due to for example parents staying home caring for sick children. We know that both variables change over the quarters, but we do not necessarily know which of the variables that drive the effect. In our setting, we believe that the direction of the causal effect is reasonably clear, in other words, that the issue with reverse causality is unlikely.

Inference of our results should be made with caution, since applying clustered standard errors to our setting of merely 21 clusters, may lead to a tendency of over-rejecting the null hypothesis. That is, since high correlations within a cluster combined with few clusters induce low statistical power due to the tightened confidence intervals. It subsequently causes estimates to exhibit significance (Özler, 2012). With this in mind, we also display p-values retrieved from using wild-bootstrapped standard errors rather than clustered. This puts our results into question as no regression exhibits a significance even at a 10% significance level. The wild-bootstrap procedure may conversely to clustered standard errors be to conservative as it can cause an under-rejection of the null hypothesis (MacKinnon & Nielsen, 2023).

7. Conclusion

This study set out to explore the impact of business cycles on child mental health within Sweden, by applying a fixed effects model to panel data stretching from 2006-2019. The data is collected from the Swedish authorities of Statistiska centralbyrån and Socialstyrelsen. There exists a substantial amount of literature on the subject of business cycles and health, where the procyclical relation between mortality and unemployment rate are rather well

established. Adult mental health has, however, been shown to deteriorate in the face of recessions, rising unemployment rates and loss of income. Besides this body of literature, we have presented theoretical and empirical reasons to believe that child mental health worsens as aggregate unemployment rate increases. Our analysis suggests that a 1% increase in our proxy of business cycles, unemployment rate, increases mental health problems for boys, whereas the impact on girls is not statistically significant. A 1% increase in unemployment rate increases the number of patients that redeemed antidepressants by 9.7% for both sexes, while 23.2% for boys in the baseline regression.

Understanding how aggregate economic conditions influence children's mental health is not only valuable for the literature within health economics in general, but also crucial for the implementation of policies in response to economic fluctuations and recessions. The main contribution of our study is that we begin to unfold the relation between business cycles and child mental health within Sweden, by finding a procyclical relationship between unemployment rate and children's mental health, which is only driven by boys. This indicates that as the economy contracts, boys' mental health deteriorates. Pan and Bertrand (2013) partially explain these findings, it might be due to biological differences or that boys are in general more sensitive to negative shocks in childhood. Our findings of a rise in prescribed antidepressants in the face of increasing unemployment rates, also aligns with the research by Golberstein, Gonzales and Meara (2016) who features the study most comparable to ours in the context of the United States. We are, nonetheless, cautious in interpreting the robustness and mechanisms behind our results. Further empirical research and theoretical extensions are required to fully understand this complex relationship in question, where one may utilize other measurements of child mental health to trace the causal links between the variables.

References

Adhvaryu, A., Fenske, J., & Nyshadham, A. (2019). Early Life Circumstances and Adult Mental Health, In Journal of Political Economy, Vol. 127, Issue. 4, pp. 1516-1549.

Ahum. (2021). Vad är skillnaden mellan en psykolog, psykoterapeut och psykiatriker? Available online:
https://www.ahum.se/bloggen/vad-ar-skillnaden-mellan-en-psykolog-psykoterapeut-och-psykiater/ [Accessed 20230508]

Almond, D. (2006). Is the 1918 Influenza Pandemic Over? Long-Term Effects of In Utero Influenza Exposure in the Post-1940 U.S. Population, In *Journal of Political Economy,* Vol 114, Issue. 4, pp. 672-712.

Bleakley, H. (2007). Disease and Development: Evidence from Hookworm Eradication in the American South, In *The Quarterly Journal of Economics*, Vol. 122, Issue. 1, pp. 73-117.

Brenner, M.H. (1973). Mental Illness and the Economy, In *Harvard University Press*, Cambridge.

Brenner, M.H. (1975). Trends in alcohol consumption and associated illnesses: some effects of economic changes, In *American Journal of Public Health*, Vol. 65, Issue. 12, pp. 1279-1292.

Brenner, M.H. (1979). Mortality and the national economy, In *The Lancet*, Vol. 314, Issue. 8142, pp. 568-573.

Case, A., Fertig, A. & Paxson, C. (2005). The lasting impact of childhood health and circumstance, In *Journal of Health Economics*, Vol. 24, Issue. 2, pp. 365-389.

Catalano, R. & Dooley, D. (1983). Health effects of economic instability: a test of the economic stress hypothesis, In *Journal of Health and Social Behavior*, Vol. 24, pp. 46-60.

Charles, K. K. & DeCicca, P. (2008). Local labor market fluctuations and health: Is there a connection and for whom?, In *Journal of Health Economics*, Vol. 27, Issue. 6, pp. 1532-1550.

Conger, R. D., & Donnellan, M. B. (2007). An interactionist perspective on the socioeconomic context of human development, In *Annual Review of Psychology*, Vol. 58, pp. 175-179.

Currie, J., & Stabile, M. (2006). Child mental health and human capital accumulation: The case of ADHD, In *Journal of Health Economics,* Vol. 25, Issue. 6, pp. 1094-1118.

Currie, J. (2009). Healthy, Wealthy, and Wise: Socioeconomic Status, Poor Health in Childhood, and Human Capital Development, In *Journal of Economic Literature*, Vol. 47, Issue. 1, pp. 87-122.

Currie, J., & Stabile, M. (2009). Mental Health in Childhood and Human Capital. An Economic Perspective on the Problems of Disadvantaged Youth, In *University of Chicago Press for NBER*.

Ekonomifakta. (2023). Högkonjunktur eller lågkonjunktur? Available online: https://www.ekonomifakta.se/Fakta/Ekonomi/Tillvaxt/hogkonjunktur-eller-lagkonjunktur/ [Accessed 20230331]

Folkhälsomyndigheten. (2018). Psykisk hälsa bland 11-, 13- och 15-åringar. Available online: https://www.folkhalsomyndigheten.se/contentassets/824a11afcebe432f87f231bd5a16b9e2/psykisk-halsa-11--13-15-aringar-18050-webb.pdf [Accessed 20230412]

Folkhälsomyndigheten. (2022a). Därför ökar psykisk ohälsa bland unga. Available online: https://www.folkhalsomyndigheten.se/livsvillkor-levnadsvanor/psykisk-halsa-och-suicidprevention/vad-ar-psykisk-halsa/darfor-okar-psykisk-ohalsa-bland-unga/ [Accessed 20230402]

Folkhälsomyndigheten. (2022b). Hälsa hos barn och unga. Available online: https://www.folkhalsomyndigheten.se/livsvillkor-levnadsvanor/halsa-i-olika-grupper/barn-och-unga/ [Accessed 20230331]

Folkhälsomyndigheten. (2022c). Faktorer som påverkar den psykiska hälsan hos barn och unga. Available online: https://www.folkhalsomyndigheten.se/livsvillkor-levnadsvanor/psykisk-halsa-och-suicidprevention/vad-ar-psykisk-halsa/vad-paverkar-var-psykiska-halsa/barn-och-unga--hemmiljo-forskola-och-skola/ [Accessed 20230412]

Folkhälsomyndigheten. (2022d). Statistik psykisk hälsa: Barn under 18 år. Available online: https://www.folkhalsomyndigheten.se/livsvillkor-levnadsvanor/psykisk-halsa-och-suicidprevention/statistik-psykisk-halsa/statistik-om-barns-psykiska-halsa/ [Accessed 20230517]

Gerdtham, Ulf-G. & Ruhm, C. (2006). Deaths rise in good economic times: evidence from the OECD, In *Economics & Human Biology*, Vol. 4, Issue. 3, pp. 298-316.

Goodman, A., Joyce, R. & Smith, J. P. (2011). The long shadow cast by childhood physical and mental problems on adult life, In *Proceedings of the National Academy of Sciences of the United States of America.* Vol. 108, Issue. 15, pp. 6032-6037.

Golberstein, E., Gonzales, G. & Meara, E. (2016). Economic Conditions and Children's mental health, In *National Bureau of Economic Research*, Working Paper no. 22459.

Gravelle, H.S.E., Hutchinson, G. & Stern, J. (1981). Mortality and unemployment: A critique of Brenner's time series-analysis, In *The Lancet*, Vol. 26, pp. 675-679.

Hollander. A-C., & Dalman. C. (2020). Utrikesfödda använder mindre psykiatrisk vård än svenskfödda de första åren i Sverige, In Läkartidningen, Issue. 117, Available online: https://lakartidningen.se/klinik-och-vetenskap-1/artiklar-1/temaartikel/2020/01/utrikesfodda-anvander-mindre-psykiatrisk-vard-an-svenskfodda-de-forsta-aren-i-sverige/ [Accessed 20230510]

Investopedia. (2022). Business Cycle: What It Is, How to Measure It, the 4 Phases. Available online: https://www.investopedia.com/terms/b/businesscycle.asp [Accessed 20230411]

Kalil, A. (2013). Effects of the Great Recession on Child Development, In *The Annals of the American Academy of Political and Social Science*, Vol. 650, Issue. 1, pp. 232-249.

Kuh, D. J., & Wadsworth, M.E. (1993). Physical health status at 36 years in a British national birth cohort, In *Social Science And Medicine*, Vol. 37, Issue. 7, pp. 905-916.

Kunskapsguiden. (2022). Vad är psykisk ohälsa? Available online: https://kunskapsguiden.se/omraden-och-teman/psykisk-ohalsa/psykisk-ohalsa-hos-barn-och-unga/vad-ar-psykisk-ohalsa/ [Accessed 20230412]

Lin, S-J. (2009). Economic fluctuations and health outcome: a panel analysis of Asia-Pacific countries, In *Applied Economics*, Vol. 41, Issue. 4, pp. 519-530.

MacKinnon. J.G., And Nielsen. M. (2023) Cluster-robust inference: A guide to empirical practice, In *Journal of Econometrics*, Vol. 232, Issue. 2, pp. 272-299.

McInerney, M, & Mellor, J. M. (2012). Recessions and seniors' health, health behaviors, and healthcare use: Analysis of the Medicare Current Beneficiary Survey, In *Journal of Health Economics*, Vol. 31, Issue. 5, pp. 744-755.

McInerney, M., Mellor, J. M. & Nicholas, L. H. (2013). Recession depression: Mental health effects of the 2008 stock market crash, In *Journal of Health Economics*, Vol. 32, Issue. 6, pp. 1090-1104.

Neumayer, E. (2004). Recessions lower (some) mortality rates: evidence from Germany, In *Social Science & Medicine*, Vol. 58, Issue. 6, pp. 1037-1047.

Pan. J., & Bertrand. M. (2013). The trouble with Boys: Social Influences and the Gender Gap in Disruptive Behavior, In *American Economic Journal: Applied Econometrics*, Vol. 5, Issue. 1, pp. 32-64.

Pastor, P. N., Reuben, C. A. & Duran, C. R. (2012). Identifying Emotional and Behavioral Problems in Children Aged 4-17 Years: United States, 2001-2007, In *National Health Statistics Reports*, Vol. 48, pp. 1-17.

Persson, P. & Rossin-Slater, M. (2018). Family Ruptures, Stress, and the Mental Health of the Next Generation. In *The American Economic Review,* Vol. 108, Issue. 4-5, pp. 1214-52.

Ruhm, C. J. (2000). Are recessions good for your health?*,* In *Quarterly Journal of Economics*, Vol. 115, Issue. 2, pp. 617-650.

Ruhm, C. J. (2015). Recessions, healthy no more?, In *Journal of Health Economics*, Vol. 42, pp. 17-28.

Ruhm, C. J. (2016). Health Effects of Economic Crises, In *Health Economics*, Vol. 25, Issue. S2, pp. 6-24.

Socialstyrelsen. (2021). Långsiktiga konsekvenser av att få depression eller ångestsyndrom som ung. Available online:
https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/ovrigt/2021-12-7721.pdf [Accessed 20230331]

Socialstyrelsens statistical database. (2023). Available online:
https://www.socialstyrelsen.se/statistik-och-data/statistik/statistikdatabasen/ [Accessed 20230421]

Statistiska centralbyrån. (2019). Utlandsföddas medianinkomst stiger kraftigt med tiden. Available online:
https://www.scb.se/hitta-statistik/artiklar/2019/utlandsfoddas-medianinkomst-stiger-kraftigt-med-tiden/ [Accessed 20230518]

Statistiska centralbyrån. (2022a). Befolkningen 15-74 år (AKU) efter region, arbetskraftstillhörighet och kön, tidigare definitioner. Kvartal 2005K2 - 2020K4. Available online:
https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__AM__AM0403__AM0403N/NAKUBefolkningLKTD/?fbclid=IwAR1eODkybgMy2GVrQdCWDez6WstLJ4d9-wp7qwKngPl0ImuhcfoVqY8qEVg [Accessed 20230506]

Statistiska centralbyrån. (2022b). Sveriges BNP. Available online:
https://www.scb.se/hitta-statistik/sverige-i-siffror/samhallets-ekonomi/bnp-i-sverige/
[Accessed 20230331]

Statistiska centralbyrån. (2022c). Barn och unga 0-21 år med svensk och utländsk bakgrund efter region, kön och ålder. År 2002-2021. Available online:
https://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__LE__LE0102__LE0102A/LE0102T16N/ [Accessed 20230517]

Stephens, M. (2001). The long-run consumption effects of earnings shocks, In *The Review of Economics and Statistics*, Vol. 83, Issue. 1, pp. 28-36.

Tapia Granados, J. A. (2005). Recessions and Mortality in Spain, 1980–1997, In *European Journal of Population*, Vol. 21, Issue, 4, pp. 393-422.

van den Berg, G. J., Gerdtham, U-G., von Hinke, S., Lindeboom, M., Lissdaniels, J., Sundquist, J. & Sundquist, K. (2017). Mortality and the business cycle: Evidence from individual and aggregated data, In *Journal of Health Economics,* Vol. 56, pp. 61-70.

Wagstaff, A. (1985). Time series analysis of the relationship between unemployment and mortality: A survey of econometric critiques and replications of Brenner's study, In *Social Science & Medicine,* Vol. 21, Issue. 9, pp. 985-996.

Weiland, C. & Yoshikawa, H. (2012). The Effects of Large-Scale Economic Change and Policies on Children's Developmental Contexts and Developmental Outcomes, In *Child Development Perspectives*, Vol. 6, Issue. 4, pp. 342-350.

World Health Organization. (2022). *Mental health.* Available online:
https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response
[Accessed 20230411]

Yeung, W. J. & Hofferth, S. (1998). Family adaptations to income and job loss in the U.S, In *Journal of Family and Economic,* Vol. 19, Issue. 3, pp. 255-283.

Yeung, W. J., Linver, M.R. & Brooks-Gunn, J. (2002). How money matters for young children's development: Parental investment and family processes, In *Child Development,* Vol. 73, Issue. 6, pp. 1861-1879.

Özler. B. (2012). Beware of studies with a small number of clusters, Available online: https://blogs.worldbank.org/impactevaluations/beware-of-studies-with-a-small-number-of-clusters [Accessed 20230524]

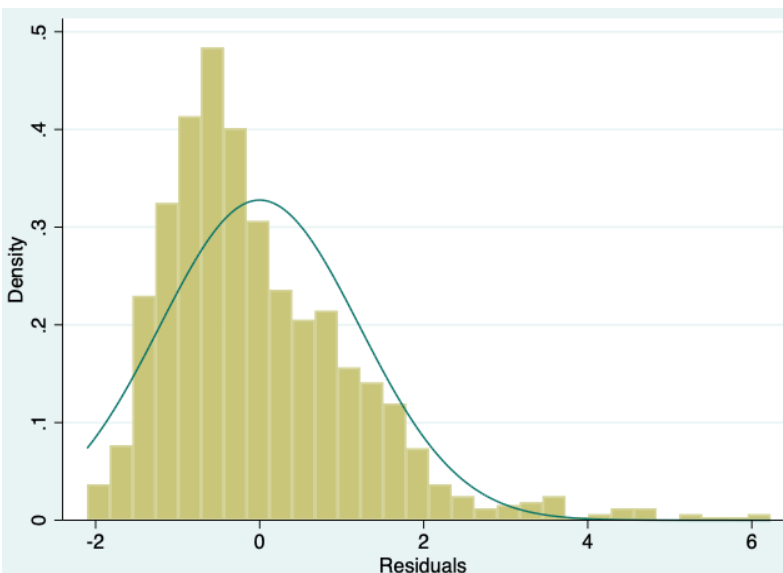# Appendix

Appendix A: Statistical specifications

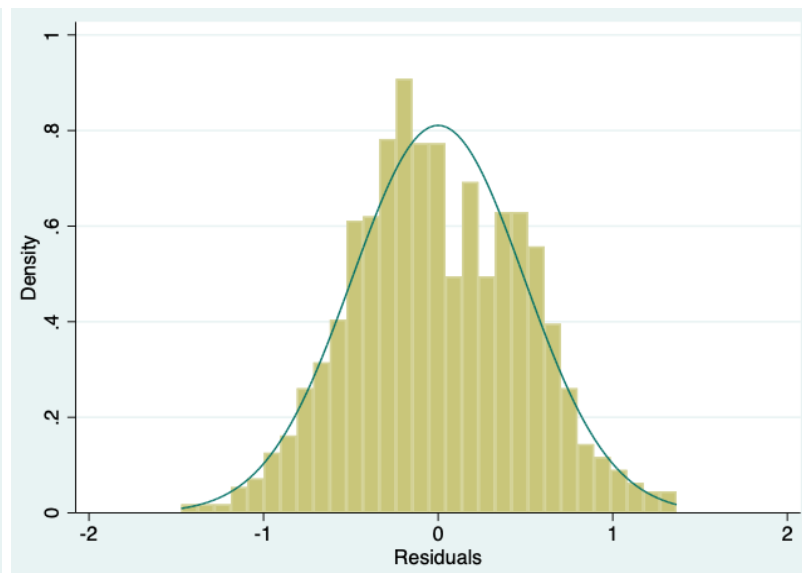*Figure 5: Histogram of linear residuals.*   *Figure 6: Histogram of log residuals.*

Figure 5 presents the histogram of the residuals using a linear regression of our baseline estimate without control variables. Respectively, Figure 6 shows the residuals of the log-log regression. The log-log model is deemed to fit a normal distribution to a greater extent than a linear regression, and further simplifies the interpretation of the results.

Table 10 shows the result of the Hausman test for children's mental health and unemployment rate. The Hausman test assists whether to use a fixed och random effects model in a panel data setting. From the result in Table 10, we reject the null hypothesis which suggests that a fixed effects model is preferred.

Table 10: Hausman test for CMH Total and Unemployment rate

	(b) Fixed	(B) Random	(b-B) Difference	Std. err
Unemployment rate	-0.125	-0.125	-0.000	0.002
rob > Chi2	0.00			
Chi2	0.9853			