Attention on Adolescent Mental Disorders: The Long-Term Effects on Labor Market Outcomes

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Abstract: According to a presidential task force about national college health in 2005, 14.9% of college students have been diagnosed with depression or anxiety disorders. Almost 75% of them experienced mental health problems during their early childhood or adolescence. Specifically, this paper examines the longitudinal effects of learning disability and attention disorder, and behavior disorder, of children born in 1980 – 1984, on their labor market outcomes as young adults. This study applies data from the National Longitudinal Survey of Youth 1997 (NLSY97), which documents the transition from school to work, and from adolescence to adulthood. By applying a family fixed effects model with Heckman selection procedure and multinomial logistic regression, the research results show that experiencing mental health illness during childhood is associated with a decreased risk of employment, an increased risk of unemployment, and decreased weekly paid working hours. This effect is strong and significant for males, and barely discernible for females. Hence, childhood mental disorder is an important determinant of individual's labor market outcomes. Targeting the improvement for boys' mental illness situation might be beneficial for improving their labor market participation.

Keywords: Mental Health; Labor Market; Sibling Fixed Effects; SEM; MIMIC

JEL Classification: I10, J60

1. Introduction

The prevalence and importance of child mental health problems have been increasingly recognized in recent years. The U.S. Surgeon General Reports, published by the U.S. Department of Health and Human Services in 1999, stated that one in five U.S. youngsters exhibit the symptoms of mental or behavior disorders. Child mental health problems often lead directly to adult mental health problems. A presidential Task Forces on Mental Health on College Campuses, published by the American Psychiatric Association in 2005, reported that more colleges are reporting increases in severe psychopathology in students, and campus mental health centers are prescribing more medications. Adulthood mental health problems are one of the major reasons for lost work time and increased health care costs. Ettner et al. (1997) demonstrate that psychiatric disorders reduce employment and earnings among both men and women. The labor market consequences of mental health problems are large relative to the consequences of physical health problems (Currie and Madrian, 1999).

Early childhood mental disorders (such as, depression, anxiety, attention disorders, etc.) are crippling illnesses that have been shown to be strongly related to several adulthood outcomes, including education and employment (Currie and Stabile 2006, Fletcher 2009). Mental disorder

substantially reduces physical, social, and cognitive functioning (Berndt, et al., 2000). Fletcher (2008) utilizes a standard model of human capital accumulation due to Rosen (1997) and hypotheses that depressive symptoms could increase the difficulty of studying or expending academic efforts and might reduce the expected length of employment. For example, in the case of Attention Deficit Hyperactivity Disorder (ADHD), there are several recent studies showing its potential long-term consequences. ADHD is one of the most prevalent and fastest-growing mental health problems facing children in the United States, affecting between 2% and 10% of school-aged children, and there are almost 8% of parents with children between the ages of 3 and 17 report that a doctor has told them their child has ADHD (Bloom, Cohen and Freeman 2011).

Mental disorders are associated with unemployment, lower earnings, work absences, reduced labor supply, and lower on-the-job productivity (Ettner, Frank and Kessler 1997, Chatterji, et al. 2011, Marcotte and Wilcox-Gok 2003, Ojeda, et al. 2010, Hamilton, Merrigan and Dufresne 1997). The studies from the economic literature on mental illness and labor market outcomes test whether the observed association between mental illness and labor market outcomes reflects a causal relationship. Mental disorder may be endogenous to labor market outcomes, if the outcomes are determined simultaneously, or if there are difficulties in measuring characteristics, for example, family background, which are related to mental illness and also directly correlated with labor market outcomes. Prior researchers have addressed this potential endogeneity problem using a variety of approaches. Most of the recent economic studies in this area are based on state-of-the-art surveys, which include fully-structured, diagnostic psychiatric interviews. Those studies typically use an indicator variable (such as 1, if individuals meet diagnostic criteria for a particular mental disorder, and 0, otherwise) as the regressor of primary interest. Binary indicators are easy to explain, and in epidemiology, dichotomous indicators are useful for measuring and tracking changes in disease prevalence.

There are gender differences on mental health influences. While women are likely to be diagnosed with common mental disorders, there are widespread mental distress in men. There is considerable debate about the true level of common mental health disorders in men and whether larger numbers of men than women may be undiagnosed (Men's Health Forum 2016). In 2016 survey by Opinion Leader for the Men's Health forum, fewer than 20% of men would take time off work to get medical help for anxiety or feeling low, which is much lower than female. My research also would like to test whether mental illness would have more significant longitudinal effects on male rather than female.

This paper examines the links between adolescent mental health disorder symptoms and labor market outcomes during their adulthood, based on Fletcher's (2014) first evidence of this relationship. To estimate the association between childhood mental disorder on adulthood labor market outcomes, this paper follows the reduced-form sibling fixed effects model used by Currie and Stabile (2006) and Fletcher (2010), estimating the effects of mental illnesses.

The data come from the National Longitudinal Survey of Youth 1997 (NLSY97), which documents the transition from school to work and from adolescence to adulthood, and represents U.S. residents in 1997 that were born during the years 1980 through 1984. I study the impact of mental illness on two labor market outcomes (employed/unemployed v.s. not in the labor force, and number of weeks worked for pay in the past 12 months among employed individuals) to

account for the various effects of mental illnesses. The mental illness measures include 2 psychiatric disorders, ADHD (learning disability/attention disorder) and behavior disorders (emotional/mental/behavior problem). In addition, to address the potential endogenous nature of the mental illness variable, I use an external instrument in the SEM with MIMIC framework.

The main contribution to the existing literature is in two dimensions. First, this research demonstrates the significant influence of childhood mental disorder on adulthood employment outcomes. Second, this research tests the different effects of mental illness by gender. I estimate the influence of two mental disorder symptoms on employment reduction, and paid working hours per week, by applying multinomial logistic regression and Heckman selection procedure with family fixed effects, to illustrate the difference across genders.

2. Background and Literature

The influences from childhood emotional depression and behavior disorder, for both individuals and societies, are estimated to be very large. The World Health Organization (WHO) has categorized depression as among the most disabling clinical diagnoses in the world, ranking fourth behind lower respiratory infections, diarrheal diseases, and conditions arising during the perinatal period. Whereas the treatment rate of emotional depression increased by 50%, the economic burden still rose by approximate 7%, going from 77.4 billion dollars in 1990[1] to 83.1 billion dollars in 2000, of which 26.1 billion dollars (31%) were direct medical costs, 5.4 billion dollars (7%) were suicide-related mortality costs, and 51.5 billion (62%) were workplace costs (Greenberg, et al., 2003). Early-onset depression (before the age of 21) was associated with 12 – 18% lower earnings in women than late onset depression (Berndt, et al., 2000).

There are several works that have linked childhood mental illness, or mental disorder symptoms, to labor market outcomes, using data from outside the US. Gregg and Machin (1998), using British National Child Development Survey (NCDS) data, found that behavioral problems at age 7 are related to poorer educational attainment at age 16, which in turn is associated with poor labor market outcomes at ages 23 and 33. A study of a cohort of all children born between 1971 and 1973 in Dunedin, New Zealand, found that those with behavior problems at ages 7 to 9 were more likely to be unemployed at age 15 to 21 (Caspi, Wright, Moffitt, & Silva, 1998). Fletcher (2014) examined the potential labor market outcomes for children experiencing ADHD, using Add Health data, and demonstrated the importance of childhood ADHD on adulthood employment in the United States.

There are also several research studies focusing on educational attainment or other long-term consequences, including Fletcher's study of 2010, using sibling fixed effects. Currie and Stabile (2006) used both Canadian and U.S. National Longitudinal Survey of Youth 1979 (NLSY79) data, with sibling effects, to show an association between behavioral symptoms consistent with ADHD and grade repetition, low test scores in mathematics, and special education placement. Fletcher and Wolfe (2008) followed this work using the Add Health data with sibling comparisons to show the associations between ADHD and later educational outcomes, such as high school grade point average. Additionally, Currie and Stabile (2009) extended their work further by using the Canadian and US NLSY data sets to show that the hyperactive symptoms reported by parents are associated with poorer educational outcomes, as well as delinquency, and Fletcher and Wolfe (2009),

applying sibling fixed effects models, show an association between childhood ADHD symptoms and criminal activities as young adults.

There are not many empirical researches providing evidences of the importance of focusing on male mental health. Boys are around three times more likely to receive a permanent or fixed period exclusion than girls (UK Department of Education 2013). Boys are also performing less well than girls at all level of education. In 2013, only 55.6% of boys achived 5 or more grade A*-C GCSEs including English and mathematics, compared to 65.7% of girls. (UK Department of Education 2013). The adult male may be possible to fail to recognize or act on mental illness warning signs, and unable or unwilling to seek help from support services. A survey conducted by a UK mental health foundation in 2016 reports that 28% of men had not sought medical help for the last mental health problem they experienced compared to 19% of women. A third of women (33%) who disclosed a mental health problem to a friend or loved one did so within a month, compared to only a quarter of men (25%). At the further end of the spectrum they may rely on unwise, unsustainable self-management strategies that are damaging not only to themselves but also to those around them. Paying attention on male mental health is equally important as that on female mental illness.

The most similar paper to the current study is that of Fletcher (2014), who uses a longitudinal national sample, including sibling pairs, to show the important labor market outcome consequences of ADHD. Fletcher (2014), using sibling fixed effects, found that it was associated with an employment reduction of between 10 and 14 percentage points, an earnings reduction of approximately 33%, and an increase in social assistance of 15 percentage points. My research not only demonstrates this particular relationship between childhood mental disorders and adulthood labor market outcomes, but also introduces illustrates the different influences to boys and girls.

The remainder of this paper is organized as follows. I introduce briefly the National Longitudinal Survey of Youth 1997, and explain how I modify the dataset, in Section 3. In Section 4, I describe the empirical econometric models applied in this paper, which are a linear probability regression and Heckman two-step selection model with family fixed effects. In Section 5, I present the empirical research results. And I close with a conclusion and discussion in Section 6.

3. Data and Descriptive Statistics

I use data from the National Longitudinal Survey of Youth 1997 (NLSY97). The NLSY97 documents the transition from school to work and from adolescence to adulthood. The survey sample is designed to represent U.S. residents in 1997 who were born during the years 1980 through 1984. The majority of the oldest cohort members (age 16 as of December 31, 1996) were still in secondary school during the first survey round, and the youngest respondents (age 12) had not yet entered the labor market. The original sample includes 8,574 respondents. I restrict the sample to those children between the ages of 12 and 16 in 1996, since only parents of children in this age range completed the mental health survey, and the children who had not entered the labor market reported their employment status in 2006. This restriction yields 996 children. Sample sizes are reduced a lot by this criterion, because in 1997 only a few families reported their children's mental health status. The initial sample with which I began had 996 individuals from NLSY97. I

excluded individuals with missing values for the work status variables (n=468). The final sample which I work with consists of 524 individuals[2]; 194 women and 330 men.

The dependent variables are measures of labor market outcomes at the time of the survey (2006): paid weekly working hours and employment status. Paid weekly working hours measures the total working hours for which the individual receives payment each week, which is a continuous indicator. Employment status is a binary indicator for whether the individual is currently employed, unemployed, or out of the labor force. Both of these variables are created from a survey question about the individual's current work status.

The measurement of mental disorder is the key for our analysis. The measures available in our surveys, as in most of surveys, are responses to questions that are asked to parents about whether their children have ever been diagnosed with learning disability/attention disorder, or emotional/mental/behavior disorder. In the NLSY97, parents were also asked whether their children had any conditions that limited their normal activities. If they answered in the affirmative, parents were asked to identify the limitation[3].

Besides the measurement of mental disorder, I also include several control variables, including demographic variables (such as, age, gender, race/ethnicity, region, family structure, household size, number of siblings, and urban/rural area). Table 1 shows the details about how I measure those variables. One important variable is adulthood education level. Institutionally, education level is an important factor influencing employment status. I use education level in 1997 in the regression by quantifying the different levels of education. In the original survey, there are 8 categories to indicate adulthood education level: (1) None (0 year); (2) GED (0 – 12 years); (3) High School Diploma (12 years); (4) Associate/Junior College (14 years); (5) Bachelor's Degree (16 years); (6) Master's Degree (18 years); (7) Ph.D. (21 – 24 years); (8) Professional Degree, such as, M.D., J.D., Phar.D., etc. (21 – 22 years). I create the "education" variable by applying the schooling years, which have been indicated in the brackets in each category. The details about dependent and independent variables are listed in Table 1.

4. Empirical Model

Following much of the literature on human capital accumulation (Currie & Stabile, Child mental health and human capital accumulation: The case of ADHD, 2006; Fletcher J. , 2010), I begin with baseline Heckman Selection model and multinomial logistic regression (MLR) model. Labor market outcomes are assumed to be a function of individual, family, and community characteristics.

$$E^* = f(I, F, C) \tag{1}$$

where E^* is a labor market outcomes indicator, either a discrete variable (employment status) which has three categories, employed, unemployed, and not in labor force, or a continuous variable (weekly paid working hours); I represents individual characteristics; F represents family characteristics; and C represents community characteristics. These broad categories are chosen based on Haveman and Wolfe's (1995) review of the most important determinants of children's human capital attainment from a social science perspective. Given that the discrete dependent variable – employment status – has three categories, I begin by estimating Multinomial Logistic

Regression (MLR) models of the relationship between mental health in 1997 and employment status outcomes in 2006. I then applied a Heckman Selection Model to estimate the relationship between mental disorders and weekly working hours, controlling for a wide range of other potentially confounding variables, including children's age of interview, gender, region, urban/rural area, family structure, maternal health status, highest schooling years (2006), household size, and number of siblings in the household.

The basic model above has the detailed form:

$$Outcome_{i,t} = \beta Mental_{i,t-1} + \delta X_i + \theta Family_i + \mu Community_i + \varepsilon_i \quad (2)$$

where $Outcome_{i,t}$ is one of the outcomes described above, $Mental_{i,t-1}$ is children's mental disorder activity, including learning disability/attention disorder, or an emotional/mental/behavior problem, and X_i is the vector of covariates described above. If mental illnesses are positively related to other factors that have a negative effect on child outcomes, then these estimates will overstate the true effect of mental illness.

The fixed effects method helps to sweep away time-invariant unobservable effects. So, I next attempt to control for unobserved heterogeneity by estimating a family fixed effects model

$$Outcome_{i,f,t} = \beta Mental_{i,f,t-1} + \delta Z_{i,f} + \mu_f + \varepsilon_{i,f} \quad (3)$$

In this model, the Z vector is similar to X in equation (2) but omits factors common to both siblings, and the f subscript indexes family. A comparison of (2) and (3) will indicate whether baseline estimates are driven by omitted variable bias at the family level (Currie & Stabile, Child mental health and human capital accumulation: The case of ADHD, 2006; Fletcher J. , 2010).

One way to judge the importance of measurement error is to compare the MLR and fixed effects estimates. If part of the true effect of mental disorders is persistent between siblings, then the within family variation may more "noisy" than the between family variation. In this case, I might expect increased attenuation bias in the fixed effects estimates. However, as we show below, these estimates are very similar, suggesting that, in practice, measurement error (or potential spillover effects, as noted above) may not be such an important problem.

One potential problem is selection bias of the estimation of paid weekly working hours as the dependent variable. The basic selection problem arises in that the sample consists only of individuals who are employed, and these individuals may differ in important unmeasured ways from those who are not in the labor force. To estimate this relationship between paid weekly working hours and childhood mental disorders, I apply Heckman's Two-Step Procedure: Step 1, estimate the logistic model by maximum likelihood estimation (MLE) to obtain estimated coefficients of family and community characteristics. For each observation in the selected sample, compute the inverse Mills ratio. Step 2, estimate β by OLS.

Besides paid weekly working hours, I also consider wages for Heckman selection model. Choosing paid weekly working hours instead of wage is because of lack of information from the dataset. In NYSL97, wage for employed people is categorized into 7 groups ("1 – 5,000", "5,001 – 10,000",

"10,001 – 25,000", "25,001 – 50,000", "50,001 – 100,000", "100,001 – 250,000", "250,000 +") with different ranges for each group. To treat it as dependent variable, I need to convert this categorized variable into continuous variable. Different and increasing ranges for each group make this converting process difficult and unreliable. Besides, only few individuals experiencing learning disability/attention disorder or emotional/mental /behavior problems during their childhood report their wage after updating their employment status, which makes the whole regression process even more unreliable.

5. Results

Table 2 presents baseline estimates and family fixed effects, using the Heckman Two-Step procedure, of the effects of learning disability/attention disorder (Symptom 1) and Emotional/Mental/Behavior problems (Symptom 2) on weekly paid working hours. Detailed regression results can be found in Appendix. The number in each cell represents the changes of weekly paid working hours if there are any changes of those independent variables.

From Table 2, weekly working hours are decreased by 1.682 hours with one unit increase of probability of experiencing learning disability/attention disorder, by 2.418 hours with one unit increase of probability of experiencing behavior problems, both significantly. Weekly working times are decreased by 1.754 hours for women a 1.653 hours for men with experiencing learning disability/attention disorder during childhood, by 2.498 hours for women and 1.974 hours for men with experiencing behavior problems. The effect is larger for women than men, but is statistically significant for men. The fixed effects results shown in the table tell a similar story. For the full sample, a one-unit increase in the probability of experiencing learning disability/attention disorder during childhood may decrease weekly paid working hours by a significant 1.779 hours. This particular effect is larger for women than for men, but significant for full sample and men, rather than women. Both models show this effect is larger for women than for men, and the difference is especially large in the family fixed effects specification. Compared to boys, girls have higher probability of experiencing emotional disorder, which may be carried to their adulthood and have large and significant effects on women's weekly working hours.

Table 3 demonstrates both the baseline multinomial logistic regression and family fixed effects estimates of the effects of adolescent mental health disorder on the employment situation. The number in each cell represents the odds ratios of the estimates. The first row in the table show that the odds ratio for "employed v.s. not in labor force" (0.174, not significant) is less than the odds ratio for "unemployed v.s. not in labor force" (0.865, significant). This means that for the adolescents who experienced learning disability and attention disorder in 1997, the ratio of the probability of being unemployed in 2006 divided by the probability of not being in the labor force ($e^{0.865} = 2.375$) is larger than the ratio for being employed ($e^{0.174} = 1.19$). The results from family fixed effects change the estimated odds ratios only a little, with similar significance. The results from the fixed effects estimation are robust and consistent with the baseline multinomial logistic regression. The results in row 2 demonstrate that compared with the probability of not being in the labor force, for the adolescents who experienced emotional/mental/behavior problems in 1997, the probability of being employed ($e^{-0.969} = 0.379$) is slightly smaller than the probability of being unemployed ($e^{-0.761} = 0.467$). The odds ratios for both are statistically

significant. Family fixed effects estimation for Symptom 2 illustrates a similar situation, showing robustness.

Table 4 examines the relationship between two mental health symptoms and employment status, differentiated by gender. As before, I first present baseline estimates before moving on to family fixed effects. For Symptom 1, the results in Table 4 indicate that for those experiencing learning disability/attention disorder during their childhood, mental disorder does have negative effects on being employed in the future; meanwhile, both MLR and family fixed effects show that mental disorder also has significant effects on the employment status of men, but not women. Table 4 shows that the odds ratios for "employed v.s. not in labor force" are smaller than that for "unemployed v.s. not in labor force"; in other words, compared with not being in the labor force, men who have experienced learning disability/attention disorder have a far lower odds of being employed during adulthood ($e^{0.679} = 1.972$) than that of being unemployed ($e^{2.104} = 8.198$). The fixed effects estimates are very similar. For Symptom 2, the odds ratio for "employed vs. not in the labor force" is slightly less than that for "unemployed vs. not in the labor force" ($e^{1.297} = 0.273 < 0.280 = e^{-1.273}$), men with emotional/mental/behavior problems during their childhood have a lower probability of being employed than being unemployed during adulthood. My results show similar effects by applying family fixed effects ($e^{-1.411} = 0.244 < 0.291 = e^{-1.235}$), and this effect is significant for men, not for women for both MLR and family fixed effects analysis.

6. Conclusion and Discussion

In this paper, I examine the association between childhood mental disorders and adulthood labor market outcomes, using NLSY97 data for 1997 and 2006. To evaluate the relationship between two mental illness symptoms and working hour indicator, I use a Heckman selection model (Heckman two-step procedure), without and then with family fixed effects. To estimate the relationship between two mental illness symptoms and employment status, this research uses a multinomial logistic regression, without and with family fixed effects, for employment status and participation. Based on the research results, I may conclude that poor mental health during an individual's childhood decreases the likelihood of being employed, and increases the likelihood of being unemployed. The effect is strong for males, and barely discernible for females. In the case of continuous outcomes, I find childhood mental illness to reduce number of hours worked for both men and women, but more significantly for men than for women.

In the previous literature, Fletcher (2014) presents evidence of a 5 percent reduction in adult employment, and approximately 20% reduction in earnings, as a consequence of adolescent depression. Currie and Stabile (2006) demonstrate the large negative effects of ADHD on test scores and schooling attainment, which might have dampening effects on adolescent future labor market outcomes. My research results show that the effects of two mental illness symptoms, childhood learning disability/attention disorder and emotional/mental/behavior problems, decrease an individual's weekly working hours, and the probability of getting hired. These effects are much more significant for men than for women.

Although not conclusive, these results could be policy relevant along at least two dimensions. First, the results suggest that childhood mental disorder is an important determinant of certain labor market outcomes, such as the probability of being employed and hours worked, and also improving

our understanding of labor market outcomes determination may allow additional policies to be suggested to better off potential labor market outcomes of the population experiencing mental disorder during childhood. Second, the results suggest that childhood mental disorders may have more significant effects for men than for women, and targeting the improvement for men's mental illness situation might be beneficial for improving their labor market participation, or hours worked more significantly than for women.

However, there are several potential limitations exist in the research. First, diagnosed mental illness usually follows regular medical assistant. For example, treatment for ADHD generally consists of drug treatment (with stimulants such as methylphenidate or amphetamines), psychiatric counseling for parents and children aimed at behavioral modification, or both. Drug therapy is effective in improving behavior for approximately 70% - 80% of children.

There is limited information about the treatment in NLSY sample. Also, Swanson et al. (1998) indicate that there is little evidence that drug treatment consistently improves cognitive performance on academic tasks in a lab setting. Currie and Stabile also support Swanson's conclusion with empirical research on both Canada and US in 1996. Second, the measures of mental health problems are based on parental reports. There may be substantial and potential non-random measurement error of random selection. In particular, less advantaged families are less likely to be aware of these conditions and those parents may not report such diagnoses due to stigma. Unfortunately, I was not able to gather other measurements over the NLSY dataset. I believe, if possible, accessing more resources and information about mental illness measurements would be an extended research of this article.

Endnotes

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1. The economic burden of depression was estimated to be 43.7 billion dollars in 1990. To make comparison with 2000, this number has been inflation adjusted to 77.4 billion dollars.
2. There are some observations with missing values in more than one category. Therefore, the total number of missing observations is greater than the number of observations excluded from the sample.
3. I code children as having been diagnosed with learning disability/attention disorder if the parent identifies any of following conditions: "minimal brain dysfunction, minimal cerebral dysfunction, attention deficit disorder", or "hyperkinesia, hyperactivity". Minimal brain dysfunction is a term that was used to described learning disability/attention disorder when the leading theory was that the disorder was caused by brain damage in infancy.).

References

American Psychological Association. (2005) Report of the 2005 Presidential Task Force on Evidence-Based Practice, American Psychological Association.

Berndt, E. R., Koran, L. M., Finkelstein, S. N., Gelenberg, A. J., Korstein, S. G., Miller, I. M., . . . Keller, M. B. (2000). Lost Human Capital From Early-Onset Chronic Depression. *American Journal of Psychiatry, 157*, pp. 940-947.

Bloom B., Cohen, R.A., Freeman, G. (2011). Summary health statistics for U.S. children: National Health Interview Survey, 2010. National Center for Health Statistics. *Vital Health Stat,* 10 (250).

Caspi, A., Wright, B. R., Moffitt, T. E., & Silva, P. A. (1998). Early failure in the labor market: childhood and adolescent predictors of unemployment in the transition to adulthood. *American Sociological Review, 63*, pp. 424-451.

Chatterji, P., Alegria, M., & Takeuchi, D. (2011). Psuchiatric disorders and labor market outcomes: Evidence from the National Comorbidity Survey-Replication. *Journal of Health Economics, 5*, pp. 858-868.

Chatterji, P., Alegria, M., Lu, M., & Takeuchi, D. (2007). Psychiatric disorders and labor market outcomes: evidence from the National Latino and Asian American Study. *Health Economics, 16*, pp. 1069-1090.

Childless, A. C., & Berry, S. A. (2012). Pharmacotherapy of attention-deficit hyperactivity disorder. *Drugs, 72*(3), pp. 309-325.

Conley, D., & Glauber, R. (2006). Gender, body mass, and socioeconomic status: new evidence from the PSID. *Health Economics and Health Services Research*(17), pp. 253-275.

Currie, J., & Madrian, B. (1999). Health, Health Insurance and the Labor Market. In O. C. Ashenfelter, & D. Card, *The Handbook of Labor Economics* (Vol. 3c, pp. 3309-3407). Amsterdam, North Holland.

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

Currie, J., & Stabile, M. (2009). Mental health in childhood and human capital. In J. Gruber, *The problems of disadvantages youth: An economic perspective* (pp. 115-148). University of Chicago Press.

Dehejia, R. H., & Wahba, S. (2002, 2). Propensity score matching methods for nonexpenrimental causal studies. *The Review of Economics and Statistics, 84*(1), pp. 151-161.

Ettner, S. L., Frank, R. G., & Kessler, R. C. (1997). The impact of psychiatric disorders on labor market outcomes. *Industrial and Lbaor Relations Review, 51*(1), pp. 64-81.

Fletcher, J. (2010). Adolesent depression and educational attainment: Results using sibling fixed effects. *Health Economics, 2010*, pp. 855-871.

Fletcher, J. M. (2008). Adolescent depression: diagnosis, treatment, and educational attainment. *Health Economics, 17*, pp. 1215-1235.

Fletcher, J. M. (2014, 2). The effects of childhood ADHD on adult labor market outcomes. *Health Economics, 23*(2), pp. 159-181.

Fletcher, J. M., & Wolfe, B. L. (2008). Child mental health and human capital accumulation: the case of ADHD revisited. *Journal of Health Economics, 27*(3), pp. 794-800.

Fletcher, J. M., & Wolfe, B. L. (2009). Long-term consequences of childhood ADHD on criminal activities. *Journal of Mental Health Policy Economics, 27*(3), pp. 119-138.

Goldberger, A. S. (1972). Structural equation models in social sciences. *Econometrica, 6*, pp. 979-1001.

Goldman, L. S., Genel, M., Bezman, R. J., & Slanetz, P. J. (1998). Diagnosis and treatment of attention-deficit/hyperactivity disorder in children and adolescents. *The Journal of the American Medical Association, 279*(4), pp. 1100-1107.

Greenberg, P. E., Kessler, R. C., Birnbaum, H. G., Leong, S. A., Lowe, S. W., Berglund, P. A., & Corey-Lisle, P. K. (2003). The economic burden of depression in the United States: how did it change between 1990 and 2000? *Journal of Clinical Psychiatry, 64*(12), pp. 1465-1475.

Gregg, P., & Machin, S. (2000). Child Development and Success or Failure in the Youth Labor Market. In D. G. Blanchflower, & R. B. Freeman, *Youth Employment and Joblessness in Advanced Countries* (pp. 247-288). University of Chicago Press.

Hamilton, V., Merrigan, P., & Dufresne, E. (1997). Down and Out: Estimating the replationship between mental health and unemployment. *Health Economics, 4*, pp. 397-406.

Haveman, R., & Wolfe, B. (1995). The determinants of children's attainments: a review of methods and findings. *Journal of Economic Literature, 4*, pp. 1829-1878.

Marcotte, D., & Wilcox-Gok, V. (2003). Estimating earnings losses due to mental illness: a quantile regression approach. *The Journal of Mental Health Policy and Economics*, pp. 123-134.

Men's Health Forum. (2016). Key data: mental health, statistics on mental health and men. https://www.menshealthforum.org.uk/key-data-mental-health.

Ojeda, V., Frank, R., McGuire, T., & Gilmer, T. (2010, 4). Mental illness, nativity, gender and labor supply. *Health Economics, 4*, pp. 396-421.

Rosen, S. (1989). Human Capital. *Social Economics*, pp. 136 - 155

Swanson, J.M., Wigal, S., Greenhill, L.L., Browne, R., Waslik, B., Lerner, M., Williams, L., Flynn, D., Agler, D., Crowley, K., Fineberg, R., Baren, M., Cantwell, D.P., (1998). Analog

classroom assessment of Adderall® in children with ADHD. *Journal of the American Academy of Child & Adolescent Psychiatry*, 37 (5), pp. 519-526

U.K. Department of Education. (2013). Permanent and fixed period exclusions from schools and exclusion appeals in England, 2011/12, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/22 4893/SFR29-2013.pdf

U.S. Department of Health and Human Services. (1999). *Mental Health: A Report of the Surgeon General*, Rockville, MD: U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administrative, Center for Mental Health Services, National Institutes of Health, National Institute of Mental Health.

YouGov for the Mental Health Foundation. (2016). Survey of people with lived experience of mental health problems reveals men less likely to seek medical support. http://www.mentalhealth.org.uk/news/survey-people-lived-experience-mental-health- problems-reveals-men-less-likely-seek-medical

Table 1 Descriptive Statistics

Continuous Variables				
	Observations	Mean	Min	Max
Weekly working hours	5,232	34.9	0	112
Youth's highest schooling years (06)	6,751	11.2	0	23
Age at Interview (97)	8,547	14.3	12	18
Mother's birth age	8,547	22.8	15	52
Household size	8,547	4.6	1	16
# of siblings	8,547	2.5	0	12
Discrete Variables				
Employment Status	5,232	1. Employed 2. Unemployed 3. Not in the labor force		
Learning disability/Attention disorder	996	0. None 1. True		
Emotional/Mental/Behavior Problems	996	0. None 1. True		
Gender	8,547	0. Female 1. Male		
Area	8,547	0. Rural 1. Urban		
Region	8,547	1. Northeast 2. North Central 3. South 4. West		

Family structure	8,547	1. Both Bio-parents 2. Two Parents 3. Single Parent 4. No parents, living with 5. other relatives
Race/Ethnicity	8,547	Others 1. Black 2. Hispanic 3. Mixed (Non-Hispanic) 4. Non-Black (Non-Hispanic)

Table 2 Baseline and Family Fixed Effects Estimation for Weekly working hours

Outcomes	Baseline			Family Fixed Effects		
Weekly working hours	Full Sample	Female	Male	Full Sample	Female	Male
Symptom 1	-1.682* (0.168)	-1.754 (0.751)	-1.653* (0.567)	-1.779* (1.153)	-2.210 (1.719)	-1.295* (0.549)
Symptom 2	-2.418** (0.410)	-2.498* (0.106)	-1.974*** (0.932)	-2.388* (1.379)	-5.124* (0.030)	-0.218* (0.881)
Gender (for Symptom 1)	-3.653*** (1.200)	----	---	-3.896*** (1.179)	---	---
Gender (for Symptom 2)	-3.291*** (0.189)	---	---	-3.479*** (1.678)	---	---

*** p<0.01, ** p<0.05, * p<0.1

Table 3 Baseline and Family Fixed Effects Estimation for Employment Status

	Baseline		Family Fixed Effect	
Outcomes (Full Sample)	Employed v.s. Not in Labor Force	Unemployed v.s. Not in Labor Force	Employed v.s. Not in Labor Force	Unemployed v.s. Not in Labor Force
Symptom 1	0.174	0.865*	0.192	0.849*

	(0.279)	(0.443)	(0.272)	(0.436)
Symptom 2	-0.969** (0.302)	-0.761** (0.489)	-0.899*** (0.293)	-0.769 (0.480)
Gender (for Symptom 1)	-0.129 (0.285)	-0.029 (0.426)	-0.169 (0.278)	0.018 (0.416)
Gender (for Symptom 2)	-0.128 (0.284)	-0.108 (0.423)	-0.151 (0.277)	-0.042 (0.413)

*** p<0.01, ** p<0.05, * p<0.1

Table 4 Gender Differences for Employment Status Estimation

	Employed v.s. Not in Labor Force	Unemployed v.s. Not in Labor Force	Employed v.s. Not in Labor Force	Unemployed v.s. Not in Labor Force
Baseline	Female	Female	Male	Male
Symptom 1	-0.456 (0.465)	-0.363 (0.699)	0.679* (0.359)	2.104*** (0.709)
Symptom 2	-0.091 (0.556)	-0.611 (0.903)	-1.297*** (0.392)	-1.273*** (0.653)
Family Fixed Effects	Female	Female	Male	Male
Symptom 1	-0.588 (0.439)	-0.553 (0.439)	0.722** (0.351)	2.081*** (0.696)
Symptom 2	0.214 (0.516)	-0.241 (0.811)	-1.411*** (0.376)	-1.235 (0.612)

*** p<0.01, ** p<0.05, * p<0.1