Summer 8-1-2017

Essays On Working From Home And Maternal Employment On Children's Well-being

Kwan Lun Julian Kwok

Summer 8-1-2017

Essays On Working From Home And Maternal Employment On Children's Well-being

Kwan Lun Julian Kwok

ABSTRACT

ESSAYS ON WORKING FROM HOME AND MATERNAL EMPLOYMENT ON
CHILDREN'S WELL-BEING

BY

KWAN LUN JULIAN KWOK

AUGUST 2017

Committee Chair: Charles Courtemanche

Major Department: Economics

This dissertation contains three essays. They explore the potential policies that can help maternal employment and its heterogeneous effects on adolescent's risky health behaviors. The first essay examines the relationship between working from home and the time parents spend on childcare. This study uses data from the American Time Use Survey (ATUS) to investigate a potential solution to the side effects of maternal employment: working from home. Parents who work from home contribute significantly more time to child-care activities than parents working outside the home. Working from home offsets the reduction in total primary-child-care time associated with maternal and paternal employment and secondary childcare contributes the most to the increase of child-care time. Using the amount of selection on the observables as a guide to the amount of selection on the unobservables, I find a robust association between working from home and the time parents spend child-care time.

The second essay is to investigate the heterogeneous effects (in terms of adolescents' personalities) of maternal employment on adolescents risky health behaviors. Using the National Longitudinal Study of Adolescent to Adult Health (Add Health), I examine whether the effects of maternal employment are greater on less conscientious, more neurotic, or more

extroverted adolescents. OLS estimates show that maternal employment has more adverse effects on less conscientious adolescents and extroverted adolescents in terms of smoking days. More neurotic and less neurotic children respond similarly. Individual fixed-effects models eliminate the statistical significance, but the magnitudes of the estimates remain large. Maternal employment effects are the same for all adolescents with respect to weight-related outcomes, eating and exercise behaviors, alcohol-related behaviors, and drug-related behaviors.

The third essay examines the heterogeneous effects of maternal employment on academic outcomes. Using the Add Health data, I examine how the effects of parental employment differ between more conscientious and less conscientious adolescents. In general, results from OLS and individual fixed-effects models show that conscientious and less conscientious adolescents do not have different changes in GPA when their parents increase their work hours. The differences of parental employment effects on academic outcomes are mostly small and statistically insignificant.

Index Words: Working from home, Maternal Employment, Paternal Employment, Personality traits, Risky health behaviors, Academic outcomes

ESSAYS ON WORKING FROM HOME AND MATERNAL EMPLOYMENT ON

CHILDREN'S WELL-BEING

BY

KWAN LUN JULIAN KWOK

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree
of
Doctor of Philosophy
in the
Andrew Young School of Policy Studies of
Georgia State University

GEORGIA STATE UNIVERSITY
2017

ACCEPTANCE

This dissertation was prepared under the direction of Kwan Lun Julian Kwok's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics in the Andrew Young School of Policy Studies of Georgia State University.

Dissertation Chair: Dr. Charles Courtemanche

Committee: Dr. Barry T. Hirsch
               Dr. Robert D. Latzman
               Dr. Rusty Tchernis

Electronic Version Approved:

Sally Wallace, Dean
Andrew Young School of Policy Studies
Georgia State University
August, 2017

ACKNOWLEDGMENTS

Table of contents

List of Figures

List of Tables

Chapter 1

THE RELATIONSHIP BETWEEN WORKING FROM HOME AND THE TIME PARENTS SPEND ON CHILDCARE

1.1 Introduction

In the last half-century, the United States has undergone several structural changes in its labor force, all of which have had consequences. One obvious change is the rise in womens participation in the labor force, which increased from 33 percent to 56 percent from 1950 through 2015.[1] As a result of this increase, the percentage of children living in households in which both parents are full-time workers increased from 24.6 percent in 1968 to 48.3 percent in 2008 (Romer, 2011). The increase of womens participation in the labor force can have various consequences on childrens outcomes. Theoretically, researchers have argued that maternal employment can benefit children through increased income or harm children through decreased supervision (Aughinbaugh and Gittleman, 2004; Fertig et al., 2009; Cawley and Liu, 2012; Mendolia, 2016).

Nonetheless, much empirical evidence shows that maternal work can lead to negative outcomes, such as obesity, in children (Anderson et al., 2003; Ruhm, 2008; Courtemanche, 2009). It can also lead to reduced cognitive development (Ruhm, 2004, 2008) through a decrease in the amount of parental caregiving (Cawley and Liu, 2012; Fertig et al., 2009). For

---

[1]https://research.stlouisfed.org/fred2/series/LNS11300002

example, some research finds that mothers who work outside the home spend less time caring for children; less time eating, and playing with children; less time cooking; and fewer minutes on grocery shopping (Cawley and Liu, 2012; Fertig et al., 2009). Other research demonstrates that maternal employment is associated with obesity through a lack of supervision (Fertig et al., 2009).

Although both the availability and the quality of childcare are improving, an increase in womens participation in the labor force still implies a greater struggle between work and family responsibilities and a pressing need to achieve work-life balance. Fortunately, another structural change in the US labor force-the gradual increase in the number of employers adopting working-from-home policies-might provide a solution to the work-versus-home conflict. The development of telecommunication and computers is increasingly making it more plausible for parents to work at home (Oettinger, 2011). Further, the number of individuals working from home is increasing. According to a report by the U.S. Census Bureau, the percentage of workers who worked at least one day per week at home increased from 7 percent in 1995 to 9.5 percent in 2010 (Mateyka et al., 2012). The percentage of workers working exclusively at home during the same period also increased from 4.8 to 6.6 percent (Mateyka et al., 2012).

One of the possible benefits of parents working from home is that it enables parents to achieve a better work-life balance. For example, researchers have concluded that working from home reduces work-family conflict (Thomas and Ganster, 1995; Madsen, 2003; Gajendran and Harrison, 2007). Therefore, working from home can potentially lead to parents investing more time at home and alleviating the negative consequences of parental employment on children.

Furthermore, from an economics point of view, working from home can increase parents' efficient use of time. Employees who have the option of working from home can weigh the cost and benefit of where they work and choose the optimal solution for themselves. Forcing

employees to work at certain locations might decrease or eliminate the employees ability to adjust their time use. For example, the ability to work from home might be a better option for workers residing in cities with heavy traffic or undergoing severe weather.

Nonetheless, research about working from home is scarce. Research has identified several factors that are associated with working from home. Family considerations, job characteristics, transportation access, and vehicle ownership are the leading reasons for working from home (Presser and Bamberger, 1993). Further, the higher cost of working on-site increases the probability that women will work from home, where cost reflects factors such as caring for both children and elders at home, living in rural areas, and having a long commute (Edwards and Field-Hendrey, 2002). Further, women and African Americans have less access to flexible working hours than do others (Golden, 2008), and occupations with the greatest use of information technology have the largest proportion of home-based workers (Oettinger, 2011).

Other studies examine the effects of working from home. For example, research suggests that working from home reduces work-family conflicts (Gajendran and Harrison, 2007; Madsen, 2003; Thomas and Ganster, 1995) and increases productivity (Baltes et al., 1999), job satisfaction (Baltes et al., 1999; Gajendran and Harrison, 2007), and performance (Gajendran and Harrison, 2007). On the other hand, working from home can lead to poor co-worker relationships (Gajendran and Harrison, 2007). In economics, research finds that the wage penalty for working from home has decreased over time and had fallen to zero by 2000 (Oettinger, 2011). Another study conducted a randomized field experiment among employees at a travel agency in China, finding that working from home raised worker productivity, increased work satisfaction and decreased attrition rate by half without lowering the quality of work (Bloom et al., 2015).

However, little evidence exists about how working from home is associated with the time that workers spend on child-care activities. Also, evidence is lacking on home-based work's

3

effect on secondary-child-care activities. One paper that does examine this effect uses a limited amount of data and finds that home-based work has little significant effect on total child-care time (Wight and Raley, 2009). Compared to Wight and Raley (2009), this paper instead focuses on child-specific activities including secondary activities, uses a much larger data set; and examines the association between parents working from home and the time spent on childcare activities.

The purpose of this paper is to provide new evidence on the association between working from home and the time workers spend on childcare. This paper also shows that working from home might potentially alleviate the adverse effects of maternal and paternal employment. Using data from the ATUS, I find that mothers and fathers working from home spend significantly more time on the physical care of children, grocery shopping, cooking, playing with children, reading to children, and travel time involving children, as well significantly less time purchasing prepared food, than do parents working away from home. In all, working from home is significantly associated with increases of 176.4 minutes per day of total primary- and secondary-child-care time for mothers and 132 minutes per day for fathers.

Working from home offsets approximately 36.2 and 48.3 percent of the loss of total primary child-care minutes associated with the employment for mothers and fathers. It offsets approximately 62.6 and 54.5 percent of the loss of total primary- and secondary-child-care minutes for mothers and fathers, respectively.

The associations of working from home and secondary child-care activities are another set of results. Working from home is associated with an increase of secondary-child-care minutes of 152.9 and 107.8 minutes for mothers and fathers, respectively. More than 80 percent of the increase of total child-care minutes comes from secondary childcare. Parents increase their secondary childcare primarily during working, eating, and drinking. Also, mothers are more likely to engage in secondary childcare while they perform social and household activities.

4

Moreover, results show that mothers, but not fathers, tend to shift more primary-child-care activities to secondary care when working from home.

To assess the endogeneity issue, I use selection on observables to assess the bias from the selection on unobservables. I find robust associations of working from home with physical care, secondary childcare; and primary-, secondary- and total child-care minutes.

This paper contributes to the literature in two ways. First, it illustrates the extent to which benefits actually accrue to other family members. One of the leading arguments for working from home is to improve the quality of family life, so it is vital to know the extent of the benefit. Moreover, related literature finds that maternal work can reduce parental care-giving (Cawley and Liu, 2012; Fertig et al., 2009), ultimately leading to obesity (Anderson et al., 2003; Ruhm, 2008; Courtemanche, 2009) and reduced cognitive development (Ruhm, 2004, 2008) among children. By studying the association between working from home and the time parents allocate to childcare, I evaluate whether home-based work could potentially mitigate these adverse effects by increasing the time that parents spend on childcare.

Second, this paper shows that secondary childcare is an important source of an increase in total childcare associated with working from home. For example, results show that more than 80 percent of the increase in total child-care time comes from secondary childcare. Further, the ratio of secondary-child-care time over primary-child-care time is positively associated with mothers, but not fathers, working-from-home minutes and negatively associated with parental employment. This finding implies that working from home facilitates secondary childcare, whereas employment outside the home deters employees from the ability to perform secondary childcare. Future researchers who examine the effect of working from home or flexible work should pay attention to secondary childcare. Simply focusing on primary childcare would lead to an underestimation of the effect of working from home.

1.2 Data

Data used for this paper are from the National Longitudinal Study of Adolescent to Adult Health (Add Health). It is a longitudinal study of a nationally representative sample of adolescents with minority over-sampled. The study contained four waves: wave I in 1994 and 1995, wave II in 1996, wave III in 2001 and 2002, and wave IV in 2008 and 2009. The focus of this paper will be mainly on wave I. In wave I, respondents were in grades 7 to 12. A total of 20,745 adolescents were interviewed at home and at school. One parent of each adolescent was interviewed at home in wave I. Most of these respondents were resident mothers, but some of them were resident fathers. School administrators were also interviewed at school to provide school characteristics.

Variable of Interest

The main variable of interest is dichotomous and indicates, defined as workers who perform at least 50 percent of their work hours during nonholiday weekdays at home and who work at home more than 60 minutes per day. For example, a person who works eight hours a day in the office and two more hours at home is not working from home because the worker performs less than 50 percent of the work at home. This definition thus excludes people who bring work home but who do not generally work from home.

Dependent Variables

The main outcome variables in this study are the number of minutes parents spend in total time[2] for childcare[3], physical care[4], grocery shopping, cooking, purchasing prepared food, playing with children, reading to children, talking and listening to children, helping

---

[2]Table 1.7 lists all examples of child-care activities.

[3]Table 1.8 shows that total time for childcare includes all the child-care subitems in 03 of the two-digit activity code.

[4]Examples of physical care include bathing children, feeding children, and getting children ready for bed.

with homework, supervising children, picking up or dropping off children and travel time involving children. The ATUS also includes the time parents spend on secondary childcare. This is the time used on childcare activities while working on other non-childcare activities. The survey question asks about the child-care activities relating only to children who are 13 years old or younger. Therefore, in the analyses for these secondary outcomes, I restrict the data to the respondents who have at least one child who is less than 13 years old. For the secondary-child-care activities, I include the following variables: simultaneously working and performing secondary childcare, participating in social activities and performing secondary childcare, performing household activities and performing secondary childcare; and eating and drinking while performing secondary childcare. These dependent variables can show the activities that parents are working on while taking care of their children.

Furthermore, I construct several summary-dependent variables: total time for primary childcare, total time for secondary childcare, total time for primary and secondary childcare, and the proportion of secondary-child-care minutes over total child-care minutes. Finally, spending extra time on childcare implies a decrease in the time parents spend on other activities. For example, working-from-home respondents can reduce travel time to and from work and grooming time because they need not go to an office. I therefore also include commuting time and grooming time as outcomes, along with a catch-all category for other types of time use.

Control Variables

Table 1.2 shows the list of control variables in the analysis.[5] The demographic variables are age, race, gender, and marital status. The controls also include educational and labor-market characteristics, including occupation, average work hours per week, minutes worked

---

[5]Time and geographic dummies are also included as control variables but not shown in Table 1.2 in order to save space.

on the diary day (zero for those who do not work), average work hours during the previous week, and self-employment status. The sample includes individuals who do not work, who receive a value of zero for these variables; removing these individuals yields similar results.

Family-related controls include number of children, number of family members, the age of the youngest child, and annual and weekly income. The analysis also includes a dummy for household-owned businesses or farms and a dummy for whether the respondent has done some unpaid work in a family business or a farm.

Moreover, the working hours and employment status of spouses can be sources of endogeneity. For example, parents with a newborn might decide that one parent should work longer hours outside the home to increase family income and provide a better division of labor within the family. The other parent might work from home and thus have more responsibilities at home. Therefore, the controls include the spouses presence or lack thereof, working status, employment status, and work hours.

The family-income and weekly-earnings controls may be controversial because family income and weekly earnings are endogenous to employment status and working hours. Note, however, that excluding these variables does not meaningfully change the estimates. Self-employed and unemployed respondents lack weekly earnings. I impute weekly earnings of self-employed respondents using the actual wages of the employed respondents with similar potential wages and attributes. The analysis fills the weekly earnings of unemployed respondents with zeros.

If children are sick on a diary day, parents must work from home to care for their children. Not controlling for this variable might bias the estimates. Consequently, the analysis uses the time that parents take care of childrens health to construct a dichotomous variable for childrens health. If, for example, they spend one minute on taking care of childrens health, then 1 indicates that their children might be sick, and 0 might indicate otherwise.

8

Last, the analysis uses time indicators, including year dummies and indicator variables for the day of the week, as control variables. They aim to capture the unobserved heterogeneity arising from different years and weekdays.

Summary Statistics

Table 1.1 shows the summary statistics for the dependent variables. Physical care, with 32.7 minutes, and cooking, with 31.3 minutes, respectively, represent the first- and second-highest number of minutes parents spend caring for children. Respondents spend the most time on social activities and household activities when doing secondary childcare. Total time for primary childcare is approximately 83.6 minutes per day for the full sample, and total time for secondary childcare is 276 minutes. The percentage of total child-care time that is secondary is approximately 70.7 percent. As for the potential saved time from working from home, respondents on average spend 27.1 minutes on commuting to and from work and 39.1 minutes on grooming time.

Mothers spend more time on all childrens activities than do men. They also spend more time on both primary- and secondary-child-care activities. Women also account for less travel time to work than do men, perhaps because only 66.1 percent of women are employed. Grooming time for women is longer than for men.

Table 1.2 shows that 4.5 percent of the total respondents work from home. 4.4 percent of female respondents work from home, and 4.6 percent of male respondents work from home. Table 1.2 also displays the summary statistics for all the control variables. The average age in the sample is 38.1 years old, with men slightly older than women. The average number of children is 1.95, and the average number of family members is approximately 4.2. Only 8.4 percent of workers in the full sample are self-employed. The control variables try to capture the average working hours in a week and the work hours in a day. In the full sample, the average work hours per week are approximately 31.1 hours. Men work approximately 40.4

hours per week, and women work 23.6 hours per week. Daily work minutes divide into two parts: the main job and other jobs. On average, respondents work 308 minutes per day in the main job and 5.4 minutes per day in other jobs. Men work 406 minutes, and women work 228 minutes at their main jobs.

1.3 Econometric Methods

Working from Home Versus Child-Care Minutes

The following ordinary-least-squares (OLS) regression estimates the association of working from home and childcare activities and compares them with maternal or paternal employment (Equation 1.1):

$$Minutes_i = \alpha_0 + \beta_{WFH}WFH_i + \beta_{WM}\text{WM}_i + \beta_{employ}\text{employ}_i + \beta_X X_i + \tau_t + \epsilon_i \qquad (1.1)$$

where WFH_i is an indicator for working from home, and WM_i is a continuous variable indicating the work minutes of the respondent. The indicator employ_i is for employment status with 1 indicating employed and 0 indicating unemployed. X_i is a vector of the control variables in Table 1.2, and τ_t is a set of time dummies. $Minutes_i$ indicates minutes on the diary day for the aforementioned time-use outcomes.

To compare the relationship between working from home and child-care activities for men and women, the model runs the same set of regressions separately for men and women.[6] Maternal employment involves a decrease in the time that parents spend on childcare. This paper also evaluates the association between working minutes and time use, adding the estimate for working from home. Equation 1.2 shows the total association among working-from-home parents:

---

[6]I have also run separate regressions for the self-employed respondents but the results were inconsistent and uninformative due to small sample size. Therefore the results are not included here but available upon request.

$$A_{WFH_i} = \widehat{\beta}_{WFH} \; X \; 1 \; if \; working \; from \; home + \widehat{\beta}_{WM} \; X \; 1 \; unit \; of \; full \; day \; work \quad (1.2)$$

where A stands for the total association between time use on childcare activities and working minutes if parents work a full day at home. $\widehat{\beta}_{WFH}$, $\widehat{\beta}_{WM}$ stand for the estimates of working from home and working minutes, respectively; one unit of full-day work refers to eight hours of work.

1.4   Results

Working from Home Versus Childcare Minutes

Table 1.3 and 1.4 show the results of Equation 1.1 for mothers and fathers, respectively. The first two columns of both tables show the coefficient estimates of Equation 1.1 for working from home and work minutes (in units of 480), respectively. The last column of both tables shows the results of Equation 1.2, which are the total associations between time use on childcare activities and the employment at 480 minutes per day for mothers or fathers who work at home.

Column 1 shows that working from home is associated with an increase in the parents involvement in most child-care activities. If an employed mother works from home for one full day (480 minutes), then physical care adds 7.6 minutes for mothers and 11.4 minutes for fathers; grocery shopping adds 1.6 minutes for mothers and 0.7 minutes for fathers, estimates that are not statistically significant; cooking adds 9.4 minutes for mothers and 3.7 minutes for fathers; purchasing prepared food subtracts 0.4 minutes for mothers and 0.3 minutes for fathers; playing with children adds 5.5 minutes for mothers and 3.2 minutes for fathers, estimates that are not statistically significant; and reading to children adds 1

11

minute for mothers and 0.9 minutes for fathers. Work-at-home fathers spend 3.1 added minutes traveling for helping children, but time for mothers has no significant increase in this regard.

Working from home does not have a statistically significant association with the time fathers or mothers spend talking and listening to children, helping with homework, and supervising children. However, both mothers and fathers experience an economically significant increase in the time they spend helping with homework and supervising children. Helping with homework adds 1.4 minutes for mothers and 0.6 minutes for fathers; supervising children adds 2.1 minutes for mothers but only 0.4 minutes for fathers. Interestingly, working from home decreases by 0.8 minutes the time that mothers spend picking up or dropping off children but increases by 0.5 minutes the time for fathers. A decrease in pickup and drop-off times may be due to the fact that working from home decreases the need for daycare or babysitting services.[7]

For secondary childcare, working from home increases all four items but at different magnitudes. If an employed mother works from home for one full day, the increase in the amount of secondary childcare while working is 119.6 minutes. For fathers, the increase is approximately 94.3 minutes. The increase in the amount of secondary care involving social activities is approximately 8.2 minutes for mothers and 0.7 minutes for fathers, with the estimate not being statistically significant for fathers.

The increase in the amount of secondary childcare parents perform while performing household activities is approximately 15.6 minutes for mothers and 2.9 minutesnot statistically significantfor fathers. Further, the increase in the amount of secondary childcare while eating and drinking is approximately 8.3 minutes for mothers and 8.2 minutes for fathers. In all, working from home is associated with an increase in time parents spend on secondary childcare. Because mothers are involved in more social and household activities, however,

---

[7]Please see Table 1.7 for examples of picking up and dropping off children.

working from home might cause an increase in child-care activities for them. Also, working from home might make it easier for parents to have meals at home; thus, both mothers and fathers can take care of their children while eating and drinking.

Working from home is also associated with an increase in total time for primary childcare, secondary childcare, and the total of the two for both fathers and mothers. The associations, respectively, are 19.1 minutes, 152.9 minutes, and 176.4 minutes for mothers and 19.5, 107.8, and 132.1 minutes for fathers. Interestingly, working from home is associated with an increase of 5.2 percent of the proportion of secondary childcare over total childcare for mothers. For fathers, the magnitude is smaller and insignificant. Parents spend more than 80 percent of total child-care minutes performing secondary childcare, implying that secondary childcare is a vital part of total child-care time and that mothers shift part of the total child-care activities to secondary childcare.

Results from OLS regressions show that working-from-home fathers enjoy a greater decrease in travel time to and from work than mothers: 30.6 minutes versus 22.3 minutes for mothers. However, working-at-home mothers save 13.6 minutes for grooming versus 11.8 minutes for fathers. The estimates for other time use show that the associations between working from home and other time use are positive for both mothers and fathers.

Maternal Employment Versus Child-Care Minutes

Comparing the columns 2 and 3 of Table 1.3, working-from-home mothers suffer fewer negative effects on childcare time than those who work outside the home. Working from home is estimated to reduce the harmful association between maternal employment and the time mothers spend on physical care from 23.2 minutes to 15.6 minutes, or 32.6 percent; grocery shopping from 7.2 minutes to 5.6 minutes, or 22.6 percent; cooking from 18.5 minutes to 9 minutes, or 51.1 percent; playing with children from 13.6 minutes to 8.1 minutes, or 40.6 percent; reading to children from 1.2 minutes to 0.2 minutes, or 85.8 percent; helping with

13

homework from 1.8 minutes to 0.4 minutes, or 79.7 percent; and supervising children from 3.5 minutes to 1.5 minutes, or 59 percent.

The OLS shows that maternal employment is associated with an increase in secondary childcare while working. This result suggests that an increase in maternal employment increases the number of hours mothers work, which contributes to an increase in simultaneously working and taking care of children. Adding the estimates of working-from-home, the total association is approximately 143.2 minutes per day. On the other hand, maternal employment is associated with a reduction in the time spent simultaneously participating in social activities and performing childcare, performing both household activities and childcare, and eating and drinking and performing childcare. Working from home alleviates these reductions by 10, 23.2, and 37.4 percent, respectively.

Table 1.3 shows that working from home decreases the harmful association between maternal employment and total primary-child-care time from 52.6 minutes to 33.4 minutes, or 36.2 percent; total secondary-child-care time from 218.9 minutes to 66 minutes, or 69.8 percent; and total time for primary and secondary childcare from 281.9 minutes to 105.5 minutes, or 62.6 percent. Thus, working at home results in a large reduction in the time mothers spend on secondary childcare. Maternal employment outside the home also reduces the proportion of secondary childcare by 5.1 percent. The increase associated with working from home compensates for this reduction.

Paternal Employment Versus Child-Care Minutes

The results from columns 2 and of Table 1.4 illustrate the difference between working-from-home fathers and fathers who work outside the home. Working from home decreases the harmful association between paternal employment and the time fathers spend on physical care from 12.3 minutes to 1 minute, or 92.2 percent; grocery shopping from 4.1 minutes to 3.4 minutes, or 17.6 percent; cooking from 11.2 minutes to 7.4 minutes, or 33.4 percent; playing

with children from 15.1 minutes to 12 minutes, or 20.6 percent; helping with homework from 2.5 minutes to 1.9 minutes, or 25.7 percent; supervising children from 2.6 minutes to 2.2 minutes, or 15.4 percent; and travel time for children from 5.4 minutes to 2.2 minutes, or 58.4 percent.

As for secondary activities, the results show that paternal employment is associated with an increase of 6.9 minutes per day in secondary childcare while working. On the other hand, fathers working outside the home have a 20.1-minute reduction in the time they spend simultaneously eating and drinking and performing childcare. Working from home increases this secondary-item decrease to 11.8 minutes. Because working from home is not strongly associated with an increase in fathers simultaneous participation in social activities or household activities and performing childcare, working from home does not eliminate the harmful effect associated with maternal

Working from home is also associated with a decrease in harmful effects between paternal employment and total primary-child-care time from 40.3 minutes to 20.9 minutes, or 48.3 percent; total secondary-child-care time from 194.8 minutes to 86.9 minutes, or 55.4 percent; and total time for primary and secondary childcare from 242.3 minutes to 110.3 minutes, or 54.5 percent.

1.5   Using Selection on Observed Variables to Address Selection on Unobserved Variables

Introduction

Researchers often lack knowledge about the degree of exogeneity of the variable of interest. One informal way to discuss exogeneity is by examining whether the estimate is sensitive to additional control variables. Nonetheless, some potentially omitted variables might affect the estimate. For example, one potentially omitted variable is the availability of nearby childcare to parents workplaces.

Researchers have developed and adopted an estimation strategy to estimate the amount of potential bias when inferring the amount of selection of unobservables (Altonji et al., 2005). This new estimation method uses the amount of selection on the observed explanatory variables as a guide for the amount of selection on the unobservables. Under certain assumptions, the condition of selection of the unobservables is the same as that of the selection of the observables. Roughly speaking, this statement means that the relationship between the unobservables and the variable of interest is the same as that of the relationship between the observables and the variable of interest. This condition is useful in estimating the amount of bias that is required to overturn the results. The first part of this section discusses the theoretical foundation, and the second part examines the robustness of the working-from-home results.

Theoretical Foundation

Consider the following model:

$$
\begin{aligned}
Minutes_i =& \alpha_{WFH}WFH_i + W_i'\theta \\
=& \alpha_{WFH}WFH_i + X_i'\theta_X + \mathcal{E} \qquad (1.3) \\
=& \alpha_{WFH}WFH_i + X_i'\gamma_X + \epsilon.
\end{aligned}
$$

where α_{WFH} represents the estimate of the indicator of working from home and W is a vector of the full set of variables that determine child-care minutes.[8] These variables include observed and unobserved variables. The second line divides the observed and unobserved components into X_i and $\mathcal{E}$ respectively. θ_X represents the subvector of θ, and the elements are the parameters for X_i. The third line adjusts θ_X so that $Cov(\epsilon, X) = 0$. Then consider the linear projection of the latent variable WFH_i^* onto $X_i'\theta_X$ and ϵ:

---

[8]Notation and the equations used in section 1.5 are from Altonji et al. (2005)

$$Proj(WFH_i^*|X_i'\theta_X, \epsilon) = \phi_0 + \phi X_i'\gamma_X + \phi_\epsilon \epsilon. \tag{1.4}$$

Using this definition, we can now develop a formal definition of selection of the unobservables, which is the same as selection of the observables under the following conditions:[9]

Condition 1.

$$\phi = \phi_\epsilon. \tag{1.5}$$

If there is no selection on the unobservables, then we have the following condition:

Condition 2.

$$\phi_\epsilon = 0. \tag{1.6}$$

Condition 1 says that the observables and the unobservables have the same relationship regarding working-from-home minutes. Condition 2 says that the unobservables have no relationship with working-from-home minutes. Three assumptions suffice to reach the above conditions, and Altonji et al. (2005) includes the formal model. According to Altonji et al. (2005), the assumptions are:

Assumption 1. The elements of X_i are selected randomly from the vector of the full set of variables W_i in the first line of equation 1.3;

Assumption 2. X_i and W_i contain a large number of elements and none of them dominates the distribution of childcare minutes or working from home indicator; and

Assumption 3. The regression of WFH on $Minutes - \alpha WFH$ is equal to the regression of the part of WFH that is orthogonal to X on the corresponding part of $Minutes - \alpha WFH$.

This paper includes a broad set of controls that determines child-care minutes. For example, controls include demographic controls, employment-related controls, family controls, and controls related to spousal information. They have an adequate amount of explanatory

---

[9]Condition 1,2, 3 and 4 are adapted from Altonji et al. (2005)

17

power, and a large number of controls play a role. For instance, the adjusted R squared for total time for primary or secondary childcare in tables 1.5 and 1.6 is approximately 0.3 to 0.4. This finding implies that the controls might have large explanatory power, although the subitems in primary and secondary childcare might have less explanatory power. Therefore, Assumption 2 might hold, and the observables might potentially provide a useful guide to the amount of unobservables. However, Assumption 1 generally does not hold (Altonji et al., 2000). In fact, researchers usually select the variables that determine outcomes to reduce the bias in the coefficient on the variable of interest. Nevertheless, this finding is helpful because the relationship between the unobservables and the variable of interest is likely to be weaker. Condition 3 illustrates the situation of the weaker relationship between the unobservables and the variable of interest:

Condition 3.

$$0 \leq \phi_\epsilon \leq \phi \: if \: \phi \geq 0. \tag{1.7}$$

$$0 \geq \phi_\epsilon \geq \phi \: if \: \phi < 0. \tag{1.8}$$

Finding an informal way to test the amount of unobservables to overturn the estimates of the observables requires one more condition: Condition 4.

$$\frac{E(\epsilon_i|WFH_i = 1) - E(\epsilon_i|WFH_i = 0)}{Var(\epsilon)} = \frac{E(X_i'\gamma_X|WFH_i = 1) - E(X_i'\gamma_X|WFH_i = 0)}{Var(X_i'\gamma_X)}. \tag{1.9}$$

This condition indicates that the relationship between WFH_i and ϵ is the same as the relationship between WFH and $X_i'\gamma_X$ after adjusting their variance. Condition 4 is mathematically equivalent to Condition 1. Therefore, the intuition from Condition 3 applies to Condition 4, and the standardized difference of the left-hand side of Condition 4 is likely to be smaller than that on the right-hand side. Consequently, using the standardized difference of the mean of the observables, we can estimate an upper bound for the standardized

difference of the mean of the unobservables. This determination will help in estimating the amount of selection on unobservables that are necessary to overturn the results.

To estimate the amount of selection on unobservables, I first define two equations, which will be useful later:

$$WFH_i = X_i'\beta_X + e_i \tag{1.10}$$

and

$$Minutes_i = \alpha_{WFH}WFH_i + X_i'\gamma_X + \epsilon_i. \tag{1.11}$$

where $X_i'\beta_X$ and e_i are the predicted value and residuals of the regression, respectively, of the regression of WFH_i on X_i. Line 1.11 of the above equation is just the original OLS equation for estimating the working-from-home effect indicated by α_{WFH}. X_i in this equation is a vector of controls with a vector of parameters γ_X. ϵ_i represents the error term. Substituting Equation 1.10 in Equation 1.11 yields

$$Minutes_i = X_i'[\gamma_X + \alpha_{WFH}\beta_X] + \alpha_{WFH}e_i + \epsilon_i. \tag{1.12}$$

Now I can find the amount of bias in α_{WFH} by using the familiar formula of the omitted variable bias equation:

$$\begin{aligned} plim\ \hat{\alpha}_{WFH} \simeq & \alpha_{WFH} + \frac{cov(e_i, \epsilon_i)}{var(e_i)} \\ = & \alpha_{WFH} + \frac{var(WFH_i)}{var(e_i)}[E(\epsilon_i|WFH_i = 1) - E(\epsilon_i|WFH_i = 0)] \end{aligned} \tag{1.13}$$

Using Condition 4, I can estimate $E(\epsilon_i|WFH_i = 1) - E(\epsilon_i|WFH_i = 0)$ by $E(X_i'\gamma|WFH_i = 1) - E(X_i'\gamma|WFH_i = 0)$.

Results

Tables 1.5 and 1.6 show the results of the estimation of the amount of selection on the unobservables. Column 1 shows the result of the right-hand side of Condition 4. Columns 2 and 3 show the denominator and the numerator of Column 1. Column 4 refers to the second term of line 2 of Equation 1.13, which is the bias of the estimate of working from home. The fifth column shows the result of the working-from-home estimate using Equation 1.11. Columns 6 and 7 are simply a division and a difference of columns 5 and 4, respectively. The last column lists the adjusted R squared for the reference of explanatory power.

The results indicate that the standardized differences of the means (Column 1) are generally negative in tables 1.5 and 1.6. This result implies that people working from home generally spend less time on child-care items. This result is a bit contradictory to the OLS results because the predicted mean of child-care minutes is larger for unemployed people, which includes the group of those working outside the home. Column 4 shows the biases of the working-from-home estimates if Condition 4 holds. Many of the working-from-home biases are negative, which implies that the working-from-home estimates are underestimated for both mothers and fathers. If the bias is positive, then it imply an overestimation of the OLS model. Column 6 shows the implied ratio, which is simply a comparison of the magnitudes of biases and working-from-home estimates. Many of the biases are negative because Column 1 is negative. Column 7 shows the potential real working-from-home estimates. The adjusted R-squared column shows that the subitems of primary-child-care activities are mostly lower than 0.1. It might imply that the assumptions required for the identification of bias might not hold for these items.

Nonetheless, the adjusted R squared for physical care, secondary-child-care activities and the total primary, secondary and total child-care time are reasonably large for both working-from-home estimates, and therefore it might be more reliable to examine these

estimates. For physical care, the implied ratios of working from home are approximately 4.1 for fathers, meaning that the selection on the unobservables would have to be 4.1 times as strong as the selection on the observables to explain away the entire working-from-home effect. But for mothers, the bias is negative, so there is a potential for an underestimation of the working-from-home effect. For the secondary childcare that occurs while the parents are working, both mothers and fathers show a high implied ratio. Thus, it is unlikely that unobservables can eliminate the working-from-home estimates. For the secondary childcare that parents perform while eating and drinking, the result for fathers shows a high implied ratio, whereas the result for mothers shows a negative ratio. The result for fathers implies that it is difficult for the unobservables to eliminate the working-from-home effect. The result for mothers shows a possibility of underestimating mothers working-from-home effect.

As for the secondary childcare that parents perform while conducting social and household activities, the results of biases for both fathers and mothers are mostly negative, which is an indication of underestimation. The total time for primary childcare, secondary childcare, and overall time for childcare has negative biases for mothers. Thus, it is likely that the analysis underestimates working-from-home effects for these items. For fathers, the analysis underestimates only the total time for secondary childcare. The total time for primary and overall time for childcare are positive, which implies a potential overestimation. However, the implied ratios are high, meaning that it is unlikely that unobservables can explain away the effects.

1.6   Conclusions

This paper investigates the association between working from home and child-care time. It also examines and compares the associations of maternal and paternal outside employment with the associations of working from home. The results show that both mothers and fathers

who work from home spend statistically more time on child-care activities such as physical care, cooking, grocery shopping, purchasing prepared food, playing with children, reading to children, and traveling for children. In all, working from home is significantly associated with an increase of 176.4 minutes per day of total primary- and secondary-child-care time for mothers and 132 minutes per day for fathers.

Overall, working from home offsets approximately 36.2 percent and 48.3 percent of the loss of total primary-child-care minutes associated with employment for mothers and fathers, respectively. It offsets approximately 62.6 percent and 54.5 percent of the loss of total primary- and secondary-child-care minutes for mothers and fathers, respectively.

The associations from secondary-child-care activities provide another set of results. Working from home is associated with increases in secondary-child-care minutes of 152.9 and 107.8 minutes for mothers and fathers, respectively. More than 80 percent of the increase of the total child-care minutes of both parents comes from secondary childcare. The increase in parents secondary-child-care time primarily occurs during working, eating, and drinking. Mothers also use time for social and household activities while performing secondary-child-care activities. Moreover, mothers shift more child-care activities to secondary care when working from home, but fathers do not.

I assess the potential for bias in the working-from-home estimate using selection on the observables as a guide for selection on unobservables. Robust results support the association of working from home with physical care; some secondary childcare; and overall primary-, secondary-, and total child-care-minutes for fathers and mothers. For example, the results show that OLS potentially underestimates the effects on total primary- and secondary-child-care time for mothers. Therefore, it is likely that working from home does actually cause an increase in childcare time.

Traditional literature suggests that maternal employment can reduce parental caregiving (Cawley and Liu, 2012; Fertig et al., 2009), which might contribute to obesity (Anderson

et al., 2003; Ruhm, 2008; Courtemanche, 2009) and reduced cognitive development (Ruhm, 2004, 2008) among children. Nonetheless, it is not easy to have policy solutions to address these problems since it is not possible to discourage women to leave the labor force.

This paper suggests a potentially viable option for the adverse effects of maternal employment: working from home. Some evidence suggests that working from home might not affect productivity in a company, although the effect could vary across companies or industries (Bloom et al., 2015). Some industries might suffer fewer productivity losses from employees working from home, and the government could encourage those companies to institute work-from-home policies. President Barack Obama has signed a Presidential Memorandum promoting flexible workplace policies in federal agencies (Romer, 2011). San Francisco and Vermont passed state and local right-to-request flexible-work-arrangement laws in 2014 (Romer, 2011). According to the law, employers cannot retaliate if workers request flexible work arrangements. Nonetheless, employers can take further action to promote working from home or flexible work arrangements. Federal or state governments could consider expanding the right-to-request law. More employees using flexible-work arrangements might potentially increase childcare time without reducing working hours.

A major limitation to this paper is the potentially endogenous nature of working from home. Although the regression model includes many controls, it is difficult to make causal claims without a randomized or quasi-experimental design. Since ATUS is not a panel data and includes only a small sample of people working from home, the use of empirical strategies such as fixed effects and instrumental variables estimation is not possible. Therefore, the results should be regarded as correlational instead of causal, though the analysis of selection on observables provides some evidence in favor of causality.

Another limitation is the lack of information about the option to work from home. No information indicates whether the respondents are voluntarily working from home or whether their employers are forcing them to work from home. Self-employed respondents are more

likely to work from home because they do not have an on-site office. Thus, the conclusion here is a weighted average across both groups. It is difficult to make a policy recommendation on whether forcing employees to work from home or having an option to work from home is better. However, the daily childcare behavior would be similar across both groups during weekdays, even though the weekly childcare activities would be more frequent among employees who must work from home than among those who choose to do so.

Table 1.1: Summary Statistics for Dependent Variables

Variable group	Description	Full	Women	Men
		Mean(SD)		
Primary Child care activities	Physical care	32.7(61.4)	45.6(70.6)	16.8(42.7)
	Grocery shopping	6.25(19.3)	8.58(22.2)	3.39(14.4)
	Cooking	31.3(43)	44.6(47.9)	15.1(28.7)
	Purchasing prepared food	1.29(4.35)	1.43(4.65)	1.11(3.93)
	Playing with children	17.4(51.7)	19.7(54.6)	14.6(47.8)
	Reading to children	2.68(10.7)	3.51(12.4)	1.66(8.15)
	Talking and listening to children	3.76(16.2)	5.13(19)	2.07(11.6)
	Helping with homework	7.38(23.5)	9.36(26)	4.94(19.8)
	Supervising children	4.49(25.6)	5.5(25.6)	3.24(25.5)
	Picking or dropping off children	4.57(9.78)	6.13(11.2)	2.66(7.14)
	Travel time for helping children	14.5(26.8)	18.8(30)	9.09(21.1)
Secondary child care	Second. child care - work	12.1(63.2)	13.6(67.4)	10.4(57.6)
	Second. child care - social act.	95(117)	105(120)	82.9(113)
	Second. child care - household act.	68.3(98.8)	97.6(110)	32.1(66.1)
	Second. child care - eating and drinking	33.3(35.3)	37.6(37)	27.9(32.2)
Total time for child care	Total time for primary child care	83.6(110)	109(121)	51.8(84.5)
	Total time for secondary child care*	276(229)	339(234)	199(198)
	Total time for primary and secondary child care*	374(270)	466(269)	260(224)
	Proportion of secondary child care	0.707(0.272)	0.699(0.243)	0.718(0.308)
Potential saved time from wfh	Travel time to and from work	27.1(41.3)	17.5(30.1)	38.9(49.4)
	Total grooming time	39.1(31.9)	43(33.7)	34.3(28.8)
	Total other time use	1260(120)	1220(125)	1300(100)

Note: Sampling weights are applied. Units of time are in minutes. *These dependent variables only use data with children under 13 years old.

Table 1.2: Summary Statistics for Variable of Interest and Control Variables

Variable group	Description	Mean(SD) Full	Women	Men
Work location	1 if work from home	0.0448(0.207)	0.0437(0.205)	0.0462(0.21)
	1 if work at office or other locations	0.955(0.207)	0.956(0.205)	0.954(0.21)
Age	Age	38.1(8.9)	36.7(8.65)	39.8(8.92)
Race	1 if non-Hispanic White	0.63(0.483)	0.611(0.488)	0.654(0.476)
	1 if non-Hispanic black	0.107(0.309)	0.125(0.331)	0.085(0.279)
	1 if Hispanic	0.201(0.401)	0.203(0.402)	0.199(0.4)
	1 if non-Hispanic Asian	0.0439(0.205)	0.0431(0.203)	0.045(0.207)
	1 if others	0.0175(0.131)	0.0183(0.134)	0.0166(0.128)
Gender	1 if male	0.448(0.497)	0(0)	1(1.11e-16)
	1 if female	0.552(0.497)	1(0)	0(0)
Marital status	1 if married	0.792(0.406)	0.719(0.449)	0.882(0.323)
	1 if divorced, separated or widowed	0.0922(0.289)	0.122(0.328)	0.0551(0.228)
	1 if never married	0.116(0.32)	0.158(0.365)	0.0629(0.243)
Education	1 if Less than HS	0.126(0.332)	0.122(0.328)	0.13(0.336)
	1 if HS	0.286(0.452)	0.278(0.448)	0.296(0.457)
	1 if some college/Associate Degree	0.259(0.438)	0.277(0.448)	0.237(0.425)
	1 if college or above	0.329(0.47)	0.323(0.468)	0.337(0.473)
Self-employ. status	1 if not self-employed	0.916(0.277)	0.939(0.239)	0.888(0.315)
	1 if self-employed	0.0837(0.277)	0.0607(0.239)	0.112(0.315)
Average work hours per week*	Weekly work hours	31.1(20.5)	23.6(19.5)	40.4(17.5)
Occupations	1 if business and financial operations	0.0382(0.192)	0.0371(0.189)	0.0395(0.195)
	1 if computer and mathematical science	0.0236(0.152)	0.00929(0.096)	0.0413(0.199)
	1 if architecture and engineering	0.018(0.133)	0.00422(0.0648)	0.035(0.184)
	1 if life, physical, and social science	0.00775(0.0877)	0.00662(0.0811)	0.00914(0.0952)
	1 if community and social service	0.0129(0.113)	0.0142(0.118)	0.0114(0.106)
	1 if legal	0.00975(0.0982)	0.00839(0.0912)	0.0114(0.106)
	1 if education, training, and library	0.0533(0.225)	0.0759(0.265)	0.0256(0.158)
	1 if arts, design, entertainment, sports, and media	0.0123(0.11)	0.0104(0.102)	0.0146(0.12)
	1 if healthcare practitioner and technical	0.0475(0.213)	0.0638(0.244)	0.0275(0.164)
	1 if healthcare support	0.0187(0.136)	0.032(0.176)	0.00237(0.0486)
	1 if protective service	0.0181(0.133)	0.00544(0.0735)	0.0336(0.18)
	1 if food preparation and serving related	0.0278(0.164)	0.0327(0.178)	0.0218(0.146)
	1 if building and grounds cleaning and maintenance	0.028(0.165)	0.0224(0.148)	0.0349(0.184)
	1 if personal care and service	0.0233(0.151)	0.0364(0.187)	0.00708(0.0839)
	1 if sales and related	0.0699(0.255)	0.0634(0.244)	0.0779(0.268)
	1 if office and administrative support	0.092(0.289)	0.132(0.338)	0.0433(0.203)
	1 if farming, fishing, and forestry	0.00714(0.0842)	0.00365(0.0603)	0.0114(0.106)
	1 if construction and extraction	0.0461(0.21)	0.00224(0.0473)	0.1(0.3)
	1 if installation, maintenance, and repair	0.0301(0.171)	0.00192(0.0438)	0.0647(0.246)
	1 if production	0.0522(0.223)	0.0266(0.161)	0.0837(0.277)
	1 if transportation and material moving	0.0396(0.195)	0.0135(0.115)	0.0717(0.258)

Variable group	Description	Mean(SD)		
		Full	Women	Men
Daily minutes on the main job	Daily work hours-main job	308(261)	228(244)	406(247)
Daily minutes on other job	Daily work hours-other jobs	5.37(41.5)	3.61(33.2)	7.54(49.9)
Average work hours last week	Work hours last week	28.9(20.5)	21.4(19.4)	38.1(17.9)
Household own business/farm	1 if someone in household own business/farm: yes	0.16(0.367)	0.146(0.353)	0.177(0.382)
	1 if someone in household own business/farm: no	0.84(0.367)	0.854(0.353)	0.823(0.382)
Unpaid work in family business/farm	1 if do unpaid work in family business/farm: yes	0.00996(0.0993)	0.0135(0.115)	0.00563(0.0748)
	1 if do unpaid work in family business/farm: no	0.99(0.0993)	0.987(0.115)	0.994(0.0748)
Number of children	Number of children	1.95(1.01)	1.95(1.03)	1.96(0.98)
Number of family members	Number of family members	4.16(1.29)	4.11(1.35)	4.21(1.21)
Age of youngest child	Age of youngest child	6.71(5.26)	6.68(5.24)	6.75(5.29)
Dairy day	1 if Monday	0.193(0.395)	0.188(0.391)	0.2(0.4)
	1 if Tuesday	0.203(0.403)	0.203(0.402)	0.204(0.403)
	1 if Wednesday	0.2(0.4)	0.203(0.402)	0.196(0.397)
	1 if Thursday	0.202(0.401)	0.202(0.402)	0.201(0.401)
	1 if Friday	0.202(0.401)	0.204(0.403)	0.199(0.399)
Spouse/partner present	1 if spouse/partner present	0.84(0.367)	0.762(0.426)	0.935(0.247)
	1 if spouse/partner not present	0.16(0.367)	0.238(0.426)	0.065(0.247)
Spouse/partner work status	1 if employed	0.646(0.478)	0.682(0.466)	0.602(0.49)
	1 if not employed	0.194(0.395)	0.0803(0.272)	0.333(0.471)
	1 if no spouse/partner present	0.16(0.367)	0.238(0.426)	0.065(0.247)
Spouse/partner work hours	Spouse/partner weekly work hours	25.5(22.3)	29.1(23.3)	21(20.2)
Spouse/partner employ. status	1 if full time	0.521(0.5)	0.615(0.487)	0.406(0.491)
	1 if part time	0.0992(0.299)	0.0359(0.186)	0.177(0.382)
	1 if hours vary	0.0257(0.158)	0.0312(0.174)	0.0189(0.136)
	1 if no spouse/partner present or not employed	0.354(0.478)	0.318(0.466)	0.398(0.49)
Family income*	1 if less than $5,000	0.0214(0.145)	0.0295(0.169)	0.0115(0.107)
	1 if $5,000 to $7,499	0.0143(0.119)	0.018(0.133)	0.00975(0.0983)
	1 if $7,500 to $9,999	0.0151(0.122)	0.0196(0.138)	0.00961(0.0976)
	1 if $10,000 to $12,499	0.0218(0.146)	0.0268(0.162)	0.0157(0.124)
	1 if $12,500 to $14,999	0.0212(0.144)	0.0232(0.151)	0.0188(0.136)
	1 if $15,000 to $19,999	0.0369(0.188)	0.0425(0.202)	0.03(0.171)
	1 if $20,000 to $24,999	0.0429(0.203)	0.0466(0.211)	0.0384(0.192)
	1 if $25,000 to $29,999	0.0481(0.214)	0.0512(0.22)	0.0444(0.206)
	1 if $30,000 to $34,999	0.0525(0.223)	0.053(0.224)	0.0519(0.222)
	1 if $35,000 to $39,999	0.0492(0.216)	0.048(0.214)	0.0508(0.22)
	1 if $40,000 to $49,999	0.0793(0.27)	0.0796(0.271)	0.0789(0.27)
	1 if $50,000 to $59,999	0.0816(0.274)	0.075(0.263)	0.0898(0.286)
	1 if $60,000 to $74,999	0.109(0.312)	0.104(0.305)	0.116(0.32)
	1 if $75,000 to $99,999	0.147(0.355)	0.138(0.345)	0.159(0.366)
	1 if $100,000 to $149,999	0.111(0.314)	0.103(0.304)	0.121(0.326)
	1 if $150,000 and over	0.0779(0.268)	0.0702(0.256)	0.0874(0.282)
Weekly earnings*	Weekly earnings	693(695)	450(543)	992(743)
Indicator of children's health	1 if sick	0.965(0.185)	0.947(0.224)	0.986(0.118)
	1 if not sick	0.0355(0.185)	0.0528(0.224)	0.0142(0.118)

Note: Sampling weights are applied. "*" indicates that missing values are imputed. Missing indicators are applied in the regression models.

Table 1.3: OLS Results of Working from Home and Marginal Effect of Maternal Employment

Dependent Variables	Coefficients estimates		Total associations at 480 work minutes
	Work from home (units of 480 minutes)	Work hours (units of 480 minutes)	Total association
Primary child care activities:			
Physical care	7.559**(2.972)	-23.177***(2.279)	-15.618***(2.870)
Grocery shopping	1.628*(0.956)	-7.213***(0.605)	-5.586***(1.038)
Cooking	9.438***(1.836)	-18.457***(1.196)	-9.019***(2.032)
Purchasing prepared food	-0.441**(0.185)	-0.502**(0.146)	-0.944***(0.223)
Playing with children	5.509**(2.178)	-13.576***(1.379)	-8.066***(2.415)
Reading to children	1.015**(0.470)	-1.183***(0.273)	-0.168(0.567)
Talking and listening to children	-0.108(0.776)	-1.845***(0.487)	-1.952**(0.900)
Helping with homework	1.436(1.114)	-1.801***(0.546)	-0.365(1.218)
Supervising children	2.089(1.473)	-3.541***(0.567)	-1.451(1.204)
Picking or dropping off children	-0.819*(0.475)	0.552**(0.271)	-0.267(0.526)
Travel time for helping children	1.003(1.523)	-1.762**(0.706)	-0.759(1.390)
Secondary child care:			
Second. child care - work*	119.627***(7.376)	23.581***(2.285)	143.209***(3.104)
Second. child care - social act.*	8.176*(4.403)	-81.801***(3.612)	-73.625***(5.696)
Second. child care - household act.*	15.569***(4.262)	-67.154***(2.898)	-51.586***(5.129)
Second. child care - eating and drinking*	8.256***(1.672)	-22.094***(1.924)	-13.839***(1.811)
Total time for child care:			
Total time for primary child care	19.065***(4.451)	-52.621***(2.949)	-33.556***(4.652)
Total time for secondary child care*	152.916***(12.384)	-218.947***(7.082)	-66.031***(10.901)
Total time for primary and secondary child care*	176.397***(12.240)	-281.904***(7.327)	-105.507***(10.954)
Proportion of secondary child care*	0.052**(0.012)	-0.051***(0.008)	0.001(0.013)
Potential saved time from working from home:			
Travel time to and from work	-22.335***(1.102)	27.610***(0.623)	5.274***(1.171)
Total grooming time	-13.645***(1.406)	12.610***(0.902)	-1.034(1.495)
Total other time use	9.492**(4.628)	29.972**(3.300)	39.464**(5.222)

Note: *p<0.1; **p<0.05; ***p<0.01. Sampling weights are applied and robust standard errors are used. The first and second columns are the coefficient estimates for the indicator of working from home estimates and work hours. Time dummies and geographic dummies are included in the regression model. The third column is the total associations adding working from home estimates and work hours estimates. The number of observations is 16915. For "*" items, data are restricted to the mothers who have at least one 13 years old child and the number of the observations is reduced to 14033. The controls are listed in the summary statistics table. Missing values of the controls, which are starred in Table 1.2, are imputed and the missing indicators are applied in the regression models.

Table 1.4: OLS Results of Working from Home and Marginal Effect of Paternal Employment

Dependent Variables	Coefficients estimates		Total associations at 480 work minutes
	Work from home (units of 480 minutes)	Work hours (units of 480 minutes)	Total association
Primary child care activities:			
Physical care	11.353**(4.202)	-12.316***(1.442)	-0.963(2.164)
Grocery shopping	0.720(0.545)	-4.096***(0.518)	-3.375***(0.780)
Cooking	3.727***(1.291)	-11.169***(1.140)	-7.442***(1.502)
Purchasing prepared food	-0.338*(0.201)	-0.490***(0.121)	-0.828***(0.216)
Playing with children	3.118(2.196)	-15.112***(2.161)	-11.993***(2.494)
Reading to children	0.861*(0.495)	-0.662***(0.226)	0.198(0.438)
Talking and listening to children	0.015(0.473)	-0.795**(0.320)	-0.780(0.636)
Helping with homework	0.642(0.816)	-2.492***(0.504)	-1.850*(1.038)
Supervising children	0.402(1.214)	-2.613***(0.619)	-2.211(1.362)
Picking or dropping off children	0.552(0.363)	-1.649***(0.214)	-1.097***(0.387)
Travel time for helping children	3.139***(1.098)	-5.372***(0.598)	-2.233*(1.117)
Secondary child care:			
Second. child care - work*	94.287*(8.521)	6.875***(1.314)	101.162***(3.229)
Second. child care - social act.*	0.719(4.537)	-78.189***(3.814)	-77.471***(6.249)
Second. child care - household act.*	-2.865(2.670)	-46.906***(2.934)	-49.770***(3.817)
Second. child care - eating and drinking*	8.224***(2.137)	-20.051***(1.098)	-11.827***(1.853)
Total time for child care:			
Total time for primary child care	19.457***(5.019)	-40.308***(2.805)	-20.851***(4.128)
Total time for secondary child care*	107.834***(14.201)	-194.760***(6.978)	-86.926***(10.999)
Total time for primary and secondary child care*	132.060***(14.825)	-242.333***(7.619)	-110.274***(11.599)
Proportion of secondary child care*	0.004(0.020)	-0.038***(0.010)	-0.034*(0.020)
Potential saved time from working from home:			
Travel time to and from work	-30.617***(2.399)	20.935***(1.485)	-9.682***(2.515)
Total grooming time	-11.824***(1.448)	7.349***(0.896)	-4.475***(1.519)
Total other time use	20.837*(5.489)	24.759***(3.598)	45.595***(5.166)

Note: *p<0.1; **p<0.05; ***p<0.01. Sampling weights are applied and robust standard errors are used. The first and second columns are the coefficient estimates for the indicator of working from home and work hours. Time dummies and geographic dummies are included in the regression model. The third column is the total associations adding working from home estimates and work hours estimates. The number of observations is 11582. For "*" items, data are restricted to the mothers who have at least one 13 years old child and the number of the observations is reduced to 9585. The controls are listed in the summary statistics table. Missing values of the controls, which are starred in Table 1.2, are imputed and the missing indicators are applied in the regression models.

28

Table 1.5: The Amount of Selection on Unobservables Relative to Selection on Observables Required to Attribute the Entire Working from Home Effect to Selection Bias - Mothers

Outcome	$\frac{\hat{E}(X\hat{\gamma}\|WFH_i=1)-\hat{E}(X\hat{\gamma}\|WFH_i=0)}{Var(X\hat{\gamma})}$	$\widehat{Var}(\hat{\epsilon})$	$\frac{E(\epsilon_i\|WFH_i=1)-E(\epsilon_i\|WFH_i=0)}{E(\epsilon_i\|WFH_i=0)}$ if Cond. 4 Holds	$\frac{Cov(\epsilon_i,\widehat{WFH_i})}{Var(\widehat{WFH_i})}$	$\hat{\alpha}$	Implied Ratio	Difference	Adj. R squared
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Primary child care activities:								
Physical care	-0.006	3300.996	-8.159	-9.397	7.559	-0.804	16.956	0.268
Grocery shopping	-0.070	440.140	-1.724	-1.985	1.628	-0.820	3.613	0.041
Cooking	-0.018	1665.452	-8.022	-9.239	9.438	-1.022	18.677	0.200
Purchasing prepared food	0.313	22.213	0.174	0.201	-0.441	-2.196	-0.642	0.018
Playing with children	-0.014	2361.290	-6.572	-7.569	5.509	-0.728	13.078	0.156
Reading to children	0.025	152.393	0.251	0.289	1.015	3.516	0.726	0.061
Talking and listening to children	0.046	360.556	0.626	0.721	-0.108	-0.149	-0.829	0.031
Helping with homework	-0.015	669.412	-0.581	-0.669	1.436	-2.147	2.105	0.052
Supervising children	-0.067	612.845	-1.646	-1.896	2.089	-1.102	3.985	0.030
Picking or dropping off children	0.053	123.735	0.359	0.414	-0.819	-1.979	-1.233	0.050
Travel time for helping children	0.013	850.344	0.856	0.986	1.003	1.018	0.017	0.067
Secondary child care:								
Second. child care - work*	0.055	4358.960	39.330	45.717	119.312	2.610	73.595	0.254
Second. child care - social act.*	-0.015	10580.673	-38.865	-45.176	9.915	-0.219	55.091	0.178
Second. child care - household act.*	-0.008	8755.811	-22.061	-25.643	15.235	-0.594	40.878	0.223
Second. child care - eating and drinking*	-0.015	1070.058	-3.298	-3.834	7.654	-1.997	11.488	0.146
Total time for child care:								
Total time for primary child care	-0.003	9154.297	-14.792	-17.036	19.065	-1.119	36.101	0.346
Total time for secondary child care*	-0.002	36699.858	-39.183	-45.546	152.916	-3.357	198.462	0.316
Total time for primary and secondary child care*	-0.002	37193.524	-55.112	-64.061	176.397	-2.754	240.458	0.476
Proportion of secondary child care*	-2.347	0.052	-0.013	-0.015	0.052	-3.481	0.067	0.084
Potential saved time from working from home:								
Travel time to and from work	0.027	655.483	7.610	8.764	-22.335	-2.548	-31.099	0.330
Total grooming time	0.016	946.451	1.785	2.055	-13.645	-6.639	-15.700	0.102
Total other time use	0.004	11359.203	15.539	17.897	9.492	0.530	-8.405	0.234

Note: For "*" items, data are restricted to the mothers who have at least one 13 years old child. Data in 2003 are dropped since some variables are missing in 2003, which causes problems in estimating predicted values. For column (1), the γ used in the formula is estimated under the null hypothesis that $\alpha = 0$.

Table 1.6: The Amount of Selection on Unobservables Relative to Selection on Observables Required to Attribute the Entire Working from Home Effect to Selection Bias - Fathers

Outcome	$\frac{E(X_i^2|WFH_i=1)-E(X_i^2|WFH_i=0)}{Var(X_i^2)}$	$\widehat{Var}(\hat{\epsilon})$	$E(\epsilon_i|WFH_i=1)-E(\epsilon_i|WFH_i=0)$ if Cond. 4 Holds	$\frac{Cov(\epsilon_i,\widehat{WFH_i})}{Var(\widehat{WFH_i})}$	$\hat{\alpha}$	Implied Ratio	Difference	Adj. R squared
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Primary child care activities:								
Physical care	0.009	1336.874	2.450	2.758	11.353	4.117	8.595	0.145
Grocery shopping	-0.090	180.033	-0.922	-1.038	0.720	-0.694	1.758	0.039
Cooking	-0.014	708.600	-1.301	-1.464	3.727	-2.546	5.191	0.099
Purchasing prepared food	0.422	15.862	0.167	0.188	-0.338	-1.802	-0.526	0.014
Playing with children	-0.009	1971.726	-2.120	-2.386	3.118	-1.307	5.504	0.094
Reading to children	0.175	72.259	0.570	0.642	0.861	1.341	0.219	0.039
Talking and listening to children	0.129	158.806	0.390	0.439	0.015	0.034	-0.424	0.010
Helping with homework	-0.016	378.615	-0.291	-0.328	0.642	-1.958	0.970	0.038
Supervising children	-0.040	537.074	-0.932	-1.049	0.402	-0.383	1.451	0.027
Picking or dropping off children	0.072	50.977	0.208	0.234	0.552	2.360	0.318	0.046
Travel time for helping children	0.028	436.105	1.008	1.134	3.139	2.767	2.005	0.070
Secondary child care:								
Second. child care - work*	0.082	3387.486	20.736	23.464	97.737	4.165	74.273	0.173
Second. child care - social act.*	-0.009	9157.812	-24.111	-27.282	1.248	-0.046	28.530	0.197
Second. child care - household act.*	-0.004	3691.866	-2.197	-2.486	-3.895	1.567	-1.409	0.129
Second. child care - eating and drinking*	0.027	895.558	3.640	4.119	8.540	2.074	4.421	0.123
Total time for child care:								
Total time for primary child care	0.001	5458.427	1.825	2.054	19.457	9.473	17.403	0.210
Total time for secondary child care*	-0.000	27460.844	-4.338	-4.909	107.834	-21.967	112.743	0.276
Total time for primary and secondary child care*	0.000	30824.257	1.386	1.568	132.060	84.216	130.492	0.368
Proportion of secondary child care*	-4.840	0.084	-0.042	-0.048	0.004	-0.088	0.052	0.074
Potential saved time from working from home:								
Travel time to and from work	0.007	2258.195	2.475	2.786	-30.617	-10.988	-33.403	0.143
Total grooming time	-0.025	715.189	-1.530	-1.722	-11.824	6.866	-10.102	0.072
Total other time use	0.001	8527.170	0.627	0.706	20.837	29.509	20.131	0.117

Table 1.7: Variable examples

Dependent Variables	Examples	ATUS code
Physical care	Bathing household child, dressing household child, feeding household child, waking household child	030101
Grocery shopping	Buying groceries, ordering groceries	070101
Cooking	Cooking dinner, baking, boiling water, heating food up	020201
Purchasing prepared food	Buying fast food, paying check for a meal/drink/snack	070103
Playing with children	Entertaining household child, playing games with household child	030103
Reading to children	Helping household child read, listening to a household child read	030102
Talking and listening to children	Hearing about household child's day, lecturing household child	030106
Helping with homework	Checking household child's homework for completion, helping household child with a school project	030201
Supervising children	Checking on household child, monitoring household child	030109
Picking or dropping off children	Dropping off household child at babysitter's, picking up household child from day care or school	030112
Total grooming time	Bathing, Blow-drying hair, brushing hair, getting dressed	010200+010299

Table 1.8: ATUS 2003-2014 Activity coding lexicon

ATUS 2-digit activity code	Category
01	Personal Care Activities
02	Household Activities
03	Caring For & Helping Household (HH) Members
04	Caring for & Helping Nonhousehold (NonHH) Members
05	Work & Work-Related Activities
06	Education
07	Consumer Purchases
08	Professional & Personal Care Services
09	Household Services
10	Government Services & Civic Obligations
11	Eating and Drinking
12	Socializing, Relaxing, and Leisure
13	Sports, Exercise, & Recreation
14	Religious and Spiritual Activities
15	Volunteer Activities
16	Telephone Calls
18	Traveling

*Source: The American Time Use Survey
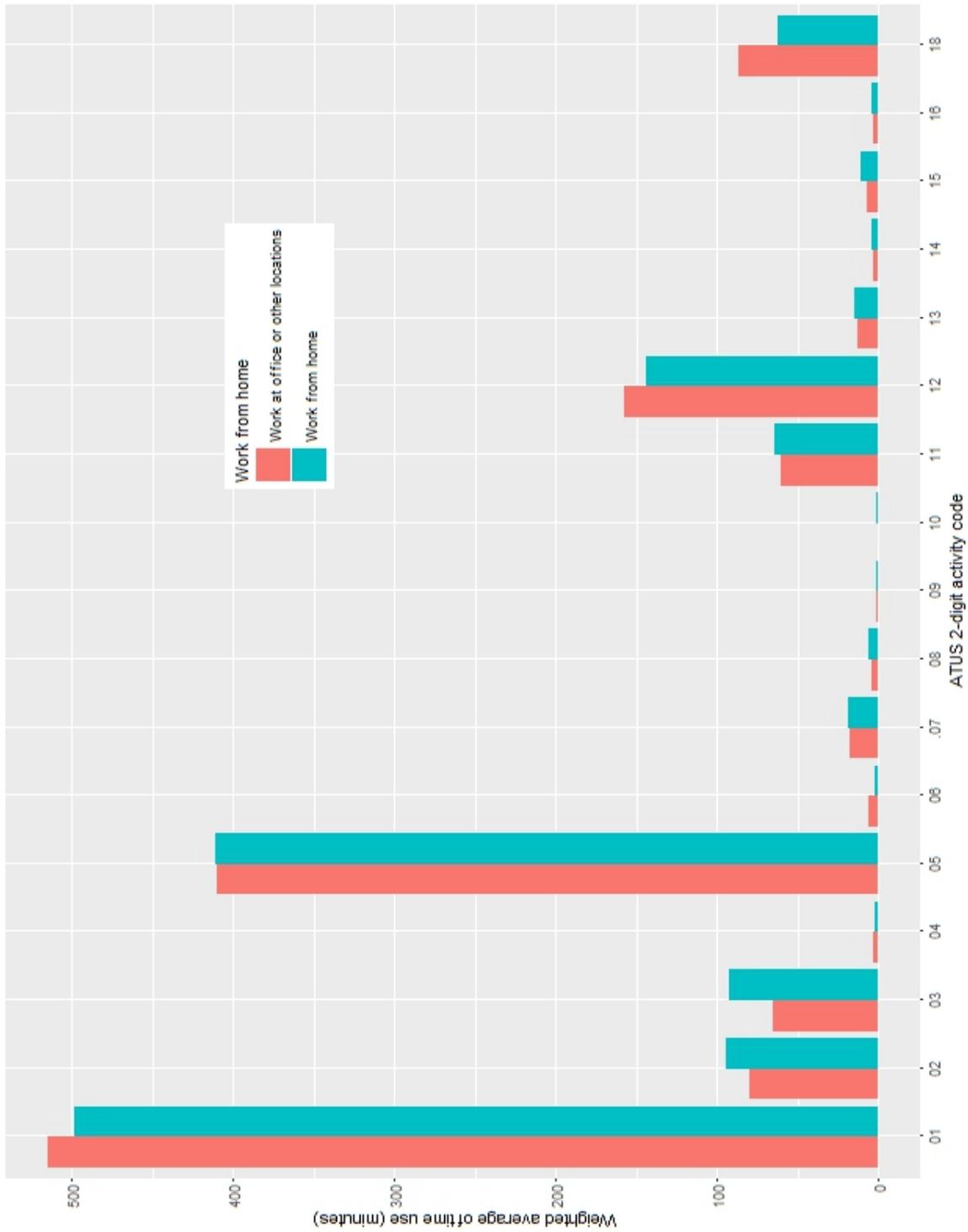
Figure 1.1: Time use on different activities: work from home vs. work at office or other locations

Chapter 2

THE EFFECTS OF MATERNAL EMPLOYMENT ON ADOLESCENT RISKY HEALTH BEHAVIORS: DOES PERSONALITY MATTER?

2.1 Introduction

Alcohol and tobacco are considered gateway drugs. Undoubtedly, being addicted to either of them is detrimental to an individuals health. Smoking is related to lung cancer and cardiovascular disease. Alcohol is associated with liver disease, lung cancer, and cardiovascular disease. Despite the obvious danger of binge drinking and smoking, adolescents, who are often actively seeking new adventures, may engage in these activities. According to Bobo and Husten (2000), individuals usually start using alcohol and tobacco between ages 14 and 18. They may not be mature enough to make decisions on how much to drink or smoke. Early prevention of unhealthy and risky behaviors may be more cost effective for society.

The growth of the female labor force may also fuel the risky behaviors of adolescents. From 1950 to 2015, female participation in the labor force increased from 33 percent to 56 percent.[1] This has led to more and more children with both parents working full time. The percentage of children living in households in which both parents work full time increased from 24.6 percent in 1968 to 48.3 percent in 2008 (Romer, 2011). These trends may be detrimental to children with regard to health, cognition, education, and other outcomes.

---

[1]Source: https://research.stlouisfed.org/fred2/series/LNS11300002

Effects of maternal employment may not be the same for all adolescents. In the economics literature, maternal employment's effects on various outcomes have been widely discussed. Cawley and Liu (2012) and Fertig et al. (2009) suggest that working mothers have less time to supervise children. Lerner and Noh (2000) argue that maternal employment can lead to more time alone for children, and thus greater responsibilities. Under such conditions, personality traits may play a significant role in predicting adolescent activities. For instance, a less conscientious adolescent may be more vulnerable to the temptation of binge drinking and smoking, while a more conscientious adolescent is more resistant to these activities. As for neuroticism, much research shows that it is strongly linked to the smoking and drinking activities (Littlefield and Sher, 2010; Terracciano and Costa, 2004). One potential explanation is that individuals use cigarettes and alcohol to reduce anxiety and alleviate negative emotional states (Littlefield and Sher, 2010; Terracciano and Costa, 2004). In fact, Borghans et al. (2008) and Almlund et al. (2011) have conducted a review of the psychology and economics literature and suggest that conscientiousness and neuroticism are the most important predictive factors with regard to health. This indicates the need to examine the interaction effect of maternal employment and these personality traits. Nevertheless, one should not overlook the effect of other personality traits on risky health behaviors. For instance, extraversion is also an influential personality trait. Extroverted persons are defined as those who tend to seek external stimuli. Terracciano and Costa (2004) suggest that extroverted individuals might smoke in search of stimulation. Fairbairn et al. (2015) suggest that extroverted individuals receive higher mood-enhancing effects from drinking. Also, in a social setting, alcohol might enhance the mood of extroverted individuals. Therefore, it is possible that when mothers work outside, extroverted individuals might seek stimulation by smoking and drinking with friends because of the lack of supervision. As a result, this paper will focus on three personality traits: conscientiousness, neuroticism and extraversion.

Prior researchers have studied the effects of maternal employment on adolescent well-being. Studies have looked at the effects of maternal employment on cognitive outcomes, school outcomes, BMI, weight and obesity, health, caregiving activities, and child activities. Theoretically speaking, maternal employment affects a child via two main channels. First, maternal employment may contribute to negative child outcomes because of lack of supervision. Second, maternal employment may improve child outcomes through an increased income. Empirically, the results are mixed and inconclusive. Generally speaking, with regard to risky health behaviors and outcomes, much research shows maternal employment leading to increased child obesity (Anderson et al., 2003; Courtemanche, 2009; Fertig et al., 2009; Bishop, 2011; Morrissey et al., 2011; Courtemanche et al., 2017). However, research related to smoking and drinking is particularly lacking. Some research shows no effects on risky behaviors. For example, Hillman and Sawilowsky (1991) and Hillman et al. (1993) show that maternal employment is not associated with more smoking and alcohol consumption. Aughinbaugh and Gittleman (2004) come to the same conclusion. They illustrate that maternal employment does not affect risky behaviors in adolescents, such as smoking, drinking alcohol, and using marijuana. Mendolia (2016) investigates the relationship using United Kingdom data and also finds no increased propensity to smoke.

Economics literature examining the role of personality is limited, although the number of studies is growing. The work by James Heckman raises the importance of the role of personality. For example, Heckman et al. (2006) suggest that the role of personality in various outcomes should be as important as that of cognitive skills. This has led to studies of how noncognitive factors, such as personality, affect various outcomes. Almlund et al. (2011) have summarized the economics literature about the relationship between personality and economic outcomes. Many papers focus on how personality traits affect labor and education outcomes. There are also a couple of papers that investigate the links between personality and health outcomes. For example, Conti et al. (2011) show that personality traits

explain more than half of health differences. Savelyev (2014) finds a strong effect of conscientiousness on the longevity of males but not of females. Although there is no economics literature investigating the effect of personality on risky health behaviors, a large amount of psychology literature has shown positive associations between the two. As mentioned previously, Borghans et al. (2008) and Almlund et al. (2011) suggest that conscientiousness and neuroticism are most important in determining life outcomes.

The purpose of this paper is to estimate the effects of the interaction between adolescent personality and maternal employment. I am investigating the heterogeneous effects (in terms of adolescents' personalities) of maternal employment on adolescents risky health behaviors. The personality traits considered in this context are conscientiousness, neuroticism, and extraversion. The restricted version of the National Longitudinal Study of Adolescent to Adult Health (Add Health) is used for this study. OLS estimates show that maternal employment has more adverse effects on less conscientious adolescents and extroverted adolescents in terms of smoking days. Less conscientious and extroverted individuals smoke for a greater number of days if their mothers work full time. Neurotic and non-neurotic children respond similarly. Individual fixed-effects models eliminate the statistical significance, but the magnitudes of the estimates remain large. Maternal employment effects are the same for conscientious and non-conscientious, neurotic and non-neurotic, extroverted and non-extroverted children with respect to weight-related outcomes, eating and exercise behaviors, alcohol-related behaviors, and drug-related behaviors.

This paper contributes to the literature on maternal employment by, to the best of my knowledge, being the first to investigate the heterogeneous effects of maternal employment on children with different personalities. It is widely established that maternal employment may have detrimental effects on child behaviors. However, the literature about the interaction effects of adolescents' personalities and maternal employment is particularly limited.

The results of this study suggest that another policy focus may help mitigate the negative effects of maternal employment. For example, one potential path is helping less conscientious children. Heckman (2007) argues that personalities are not fixed over the span of a persons life and that early childhood intervention for personality adjustment would be a cost-effective tool. Consequently, intervention programs such as the Perry Preschool Program may be a cost-effective way to alleviate the problems of risky health behaviors related to maternal employment.

Also, when mothers consider working full time outside, this paper suggests that less conscientious and extroverted adolescents will have a higher number of smoking days. But they will not misbehave regarding drinking, eating, exercise, or drug-related behaviors. Mothers can weigh the costs and benefits of working outside and make a decision with the help of information from this paper. For example, if their children are not conscientious and/or are extroverted, mothers might consider reducing their working hours in order to mitigate their children's smoking behaviors.

2.2   Data

Data used for this paper are from the National Longitudinal Study of Adolescent to Adult Health (Add Health). It is a longitudinal study of a nationally representative sample of adolescents, with minorities over-sampled. The study contained four waves: wave I in 1994 and 1995, wave II in 1996, wave III in 2001 and 2002, and wave IV in 2008 and 2009. The focus of this paper will be mainly on wave I and wave II. In both waves, respondents were in grades 7 to 12 and therefore generally lived with their mothers. A total of 20,745 adolescents were interviewed at home and at school. One parent of each adolescent was interviewed at home in wave I. Most of these respondents were resident mothers, but some of them were resident fathers.

Independent Variables of Interest

The mother's working hours is one of the main variables of interest. Adolescents were asked about the employment status, occupation, and work hours of their parents. If their mothers did not work, then the working hours were missing in the data. I filled in those missing values by entering 0 hours.

Other variables of interest relate to the measures of three child personality traits: conscientiousness, neuroticism, and extraversion. These measures were constructed using the questionnaires in Add Health.[2] To measure personality traits, construction followed the paper by Young and Beaujean (2011). Scores on specific questions about personality were added to construct the conscientiousness, neuroticism, and extraversion variables. They were standardized to a mean equal to 0 and a standard deviation of 1. High scores in conscientiousness, neuroticism, and extraversion indicated that the respondent was conscientious, neurotic, or extroverted, respectively.

Dependent Variables

Add Health provides rich information about weight outcomes and behaviors related to eating, exercise, smoking, and drinking alcohol. For obesity-related variables, I examined the BMI z-score and whether the adolescent attempted to lose weight. The BMI z-score is a standardized measure of BMI adjusted for height, age, and sex, with respect to a US reference distribution. This measure makes the comparison between age and sex possible, and thus it is used instead of the BMI score. If an adolescent's BMI is above the 85th percentile of the BMI distribution, then he is regarded as overweight. If his BMI is above the 95th percentile, he is regarded as obese. Obese and overweight are dichotomous variables, with 1 indicating obese (overweight). To examine the eating and exercise behaviors that lead to obesity, I also

---

[2]Details can be found in Appendix A.

investigate diet behavior, exercise, and vegetable and fruit. In each wave, Add Health asks the respondents to provide the methods used to reduce or gain weight. If they used diet or exercise to reduce or gain weight, then the outcome variables of "diet" and "exercise" coded as 1, and 0 otherwise. In addition, Add Health provides information about the consumption of vegetables and fruits.[3] If adolescents have consumed any fruits or vegetables the day before interview day, then the outcome variable of "vegetables and fruits consumption" will be coded as 1, and 0 otherwise.

In this study, I examined three dependent variables for smoking: number of days the subject smoked in the past 30 days, number of cigarettes smoked every time they smoked in the past 30 days, and the total amount of cigarettes smoked in the past 30 days. These were labeled "number of smoking days," "number of cigarettes each time," and "total number of cigarettes in a month" in the tables, respectively. The first two variables were provided in Add Health. All variables were continuous variables. "Total number of cigarettes" was the number of days smoked multiplied by number of cigarettes smoked each time.

As for alcohol consumption, there were three variables: the number of days drinking alcohol over the past year, the number of drinks on each day drinking alcohol, and the total number of drinks over the past year. The first two variables were provided in Add Health.[4] "Total number of drinks in a year" equaled the number of days drinking alcohol multiplied by the number of drinks each time.

To examine the behavior of illegal drug use, two variables were used in this study: had the subject smoked marijuana in the past 30 days, and had other drugs been used in the past

---

[3]The questions about vegetables and fruits consumption were asked differently in wave I and wave II. In wave I, adolescents were asked only two general questions about the consumption of vegetables and fruits. In wave II, Add Health provides detailed nutritional information.

[4]Some of the variables, such as number of days drinking alcohol over the past year, were categorical variables in Add Health. For instance, the answer chosen by the interviewer could be "everyday," "3 to 5 days a week," or "1 to 2 days a week." I transformed the answers to the number of days, such as 365 days, 4 days x 52 weeks = 208 days, 1.5 days x 52 weeks = 78 days. They were called "number of days drinking, "number of drinks each time," and "total number of drinks in a year," respectively. All three variables were continuous variables.

30 days. These were "smoked marijuana" and "used other drugs." Both were dichotomous variables, with 1 indicating that the respondent had smoked marijuana or used other drugs at least once in the last 30 days, and 0 indicating otherwise.

Descriptive Statistics

Tables 2.1 and 2.2 report the sample size, mean, standard deviation, and minimum and maximum for the dependent variables in two waves. Both tables show that there are certain missing values for the dependent, independent, and control variables. This is because some respondents refused to answer some questions or did not know the answers. Also, the variables are presented following imputation. The missing control values were imputed either by filling in 0 or using the mean of the available sample. For instance, annual family income was imputed using the mean value of the sample.

As for the key variables, one should note that the percentages of people who smoked marijuana, or used other illegal drugs were low. Only 15 percent had smoked marijuana, and 5.6 percent had used other illegal drugs. According to the Monitoring the Future Survey by the National Institute on Drug Abuse, the percentage of grade 12 students who had smoked marijuana in the past month was approximately 12.5 percent in 1993.[5] The percentage of grade 8, 10, and 12 students who had smoked illicit drugs other than marijuana in the past 30 days was 7.1 percent in 1994.[6] The percentages of people smoking marijuana and other drugs from the Monitoring the Future Survey are similar to the values in Table 1.1.

In Table 2.2, the average number of mother working hours is 26.8, and average father working hours are 29.8. They are both lower than the national averages, which were 35.8 hours for women and 42.1 for men in 1995.[7] This is possibly because families who did not have a father or mother, or fathers and mothers who did not work were imputed as 0 weekly

---

[5]Source: https://www.drugabuse.gov/sites/default/files/pdf/mtfhighlights10.pdf
[6]Source: http://www.monitoringthefuture.org/data/15data/15drtbl16.pdf
[7]Source: http://www.bls.gov/mlr/1997/04/art1full.pdf

hours. In addition, as mentioned previously, measures of conscientiousness, neuroticism, and extraversion are standardized; means were approximately 0 and standard deviations are approximately 1.

2.3 Econometric Methods

subsection*OLS/LPM: Interaction of Mother Working Hours and Conscientiousness I begin the empirical analysis by showing the baseline model used to estimate the interaction of adolescent personality and the mother's working hours:

$$
\begin{aligned}
RB_i = & \alpha_0 + \beta_1 MWH_i + \beta_2 CONSCIENT_i + \beta_3 (MWH_i \; x \; CONSCIENT_i) \\
& + \beta_4 NEUROTICISM_i + \beta_5 (MWH_i \; x \; NEUROTICISM_i) \\
& + \beta_6 EXTRAVERSION_i + \beta_7 (MWH_i \; x \; EXTRAVERSION_i) \\
& + \beta_8 \textbf{DEMO}_i + \beta_9 \textbf{MOM.OCCUP}_i + \beta_{10} \textbf{MOM.EDUC}_i + \beta_{11} \textbf{DAD.BG}_i \\
& + \beta_{12} FAM.INC_i + \tau_m + \epsilon_i
\end{aligned} \tag{2.1}
$$

Where i is an index for individual i and t indicates wave t with t = 1 or 2. RB_i represents different risky health behaviors related to obesity, eating and exercise, smoking, drinking, and drugs. They are either continuous or dichotomous variables. $CONSCIENT_i$, $NEUROTICISM_i$, and $EXTRAVERSION_i$ are continuous variables measuring the following personality traits: conscientiousness, neuroticism, and extraversion. MWH_i refers to mother working hours and is a continuous variable. $\textbf{DEMO}_i$ is a vector of demographic variables including gender, age, race, number of siblings, a proxy for cognitive ability, mother and father's age and their presence. $\textbf{MOM.OCCUP}_i$ and $\textbf{MOM.EDUC}_i$ include two vectors of variables indicating the mother's occupation and educational background. $\textbf{DAD.BG}_i$

is a vector of variables indicating the father's working hours, occupation, and educational background. $FAM.INC_i$ indicates the family income. τ_m is a set of month dummies.

Individual Fixed Effects: Interaction of Mother Working Hours and Conscientiousness

OLS estimates might generate inconsistent estimates if there is an endogeneity problem. In order to control for all common individual attributes, an individual fixed-effects model is employed:

$$
\begin{aligned}
RB_{it} =& \alpha_0 + \beta_1 MWH_{it} + \beta_2 (MWH_{it} \; x \; CONSCIENT_i) \\
& + \beta_3 (MWH_{it} \; x \; NEUROTICISM_i) \\
& + \beta_4 (MWH_{it} \; x \; EXTRAVERSION_i) \\
& + \beta_5 \mathbf{DEMO}_{it} + \beta_6 \mathbf{MOM.OCCUP}_{it} + \beta_7 \mathbf{MOM.EDUC}_{it} + \beta_8 \mathbf{DAD.BG}_{it} \\
& + \tau_m + \lambda_i + \epsilon_{it}
\end{aligned}
\tag{2.2}
$$

Where the controls are the same as before with the addition of unobserved time-invariant individual effect (λ_i). The variables that do not change over time will drop out. Some variables inside the vector of demographic variables such as gender, race, and cognitive ability do not change over time and will drop out as well.

Individual fixed effects have the advantages of controlling the unobserved individual characteristics, such as parents personalities, parents ability, and each individual's ability. However, individual fixed effects do not address the problems of reverse causality and measurement error. Therefore I do not claim the estimates as causal. Instead, it is just an empirical method that moves one step toward causality.

2.4   Results

OLS Estimation Results: Interaction of Maternal Employment and Child's Conscientiousness

Columns 1 and 2 of Tables 2.3 through 2.7 present the results of the OLS interaction estimates between adolescents' conscientiousness and their mothers' working hours. Column 1 shows the results without any control. Column 2 includes all controls specified in equation 2.1. Generally speaking, the interaction estimates in terms of weight-related outcomes, eating and exercise behaviors, alcohol-related behaviors, and drug-related behaviors are insignificant. This indicates that more conscientious and less conscientious adolescents behave similarly when their mothers work outside.

As for smoking behaviors, the results show a significant difference between more conscientious children and less conscientious children for the cases of "Number of smoking days."[8] The significance and the signs of the point estimates are robust throughout all OLS specifications in columns 1 to 2. According to column 2, if mothers work full time (40 hours per week), their less conscientious adolescents have a higher number of smoking days by 1.77 days. As for the more conscientious adolescents (measure of conscientiousness equals 1), when their mothers work full time, the number of smoking days increases by 0.53 days. Comparing more conscientious adolescents with those less conscientious, it is obvious that the more conscientious ones are more well-behaved. The results do not show any significant effects on the number of cigarettes smoked and the total number of cigarettes.

---

[8]Here I define a child as more conscientious if his or her measure of conscientiousness equals 1. If the measure is -1, then he or she is defined as less conscientious.

OLS Estimation Results: Interaction of Maternal Employment and Child's Neuroticism

Columns 1 and 2 of Tables 2.3 through 2.7 present the results of the OLS interaction estimates between adolescents' neuroticism and their mothers' working hours. All of the interaction estimates are insignificant. The signs of the estimates are contradictory as well. For example, the signs for the outcome of the number of cigarettes are negative whereas those for the number of smoking days are positive. This means neurotic children smoked fewer cigarettes but smoked more days when mothers worked outside, which is quite contradictory. In general, it is difficult to conclude anything from these interaction estimates. Perhaps the interaction effects for the neurotic children are too small to detect.

OLS Estimation Results: Interaction of Maternal Employment and Child's Extraversion

Lastly, Tables 2.3 through 2.7 present the results of the OLS interaction estimates between adolescents' extraversion and their mothers' working hours. The interaction estimates in terms of weight-related outcomes, eating and exercise behaviors, alcohol-related behaviors, and drug-related behaviors are insignificant. This indicates that more extroverted and introverted adolescents behave similarly when their mothers work outside. However, for smoking behaviors, I find a significant difference between these two type of adolescents for the categories of "number of smoking days". The significance and the signs of the point estimates are robust throughout all OLS specifications, although it is only significant at 10 percent level. According to column 2, if mothers work full time (40 hours per week), their extroverted adolescents have a higher number of smoking days by 1.59 days.[9] As for the introverted adolescents, when their mothers work full time, the number of smoking days increases by only 0.71 days. The results do not show any significant effects on the number of cigarettes smoked or the total number of cigarettes.

---

[9]Here I define a child as an extroverted individual if his or her measure of extraversion equals 1. If the measure is -1, then he or she is defined as introvert.

Individual Fixed-Effects Estimation Results: Interaction of Maternal Employment and Child's Conscientiousness

Column 3 of Tables 2.3 through 2.7 presents the results of individual fixed effects. As we can see in the tables, individual fixed effects change the magnitudes of some OLS coefficient estimates. This implies that some unobserved individual heterogeneity is correlated with the interaction estimates. Also, all of the interaction coefficients remain insignificant after including fixed-effects models for weight-related outcomes, eating and exercise behaviors, alcohol-related behaviors, and drug-related behaviors. Therefore, for these outcomes, there is no evidence that more conscientious and less conscientious adolescents behave differently when their mothers work outside.

When it comes to smoking behaviors, we can see that the interaction estimates of conscientiousness and mother work hours are insignificant from the results of individual fixed effects. However, for the outcomes of "Number of smoking days," the magnitudes of the estimates remain large. If mothers work full time, their less conscientious adolescents have a higher number of smoking days by 2.31 days. As for the more conscientious adolescents, the number of smoking days increases by 0.60 days. In this situation, I suspect that individual fixed effects do not greatly reduce the magnitudes of the OLS estimates. The insignificant results might be caused by insufficient statistical power. To examine the decrease in coefficient magnitudes caused by individual fixed effects, I compared the interaction estimates from fixed effects and OLS by running a Hausman test.[10] Table 2.8 summarizes the results and shows that the differences between fixed effects and OLS estimates are small and statistically insignificant. This test suggests that perhaps the statistical power is too small to make the coefficients statistically significant.

---

[10]I used Bootstrap Hausman test to examine the coefficient differences.

Individual Fixed-Effects Estimation Results: Interaction of Maternal Employment and Child's Neuroticism

Row 6 of column 3 shows the results of the interaction of maternal employment and child neuroticism using individual fixed-effects models. Again, all of the interaction estimates are insignificant. Similar to the OLS estimates, the signs are contradictory. Moreover, individual fixed effects change the magnitudes of some OLS coefficient estimates. This again implies that some unobserved individual heterogeneity are correlated with the interaction estimates. All in all, there is no evidence that neurotic and less neurotic adolescents behave differently when their mothers work outside.

Individual Fixed-Effects Estimation Results: Interaction of Maternal Employment and Child's Extraversion

Lastly, row 7 of column 3 illustrates the results of the interaction of maternal employment and child extraversion using individual fixed-effects models. Similar to the interaction estimates of conscientiousness, all of the interaction coefficients are insignificant after including fixed-effects models for weight-related outcomes, eating and exercise behaviors, alcohol-related behaviors, and drug-related behaviors. The interaction estimates of extraversion and mother work hours from the results of individual fixed effects are also insignificant. However, for the outcomes of "number of smoking days," the magnitudes of the estimates remain large. If mothers work full time, their extroverted adolescents have a higher number of smoking days by 1.83 days. As for the introverted adolescents, the number of smoking days increases by 1.07 days. To examine the decrease of the coefficient magnitudes caused by individual fixed effects, I again compare the interaction estimates from fixed effects and OLS by running a Hausman test. Table 2.8 once again shows that the differences between fixed-effects and OLS estimates are small and statistically insignificant.

Multiple Hypothesis Issue

Tables 2.5 shows that OLS interaction estimates of maternal employment and child conscientiousness/extraversion are statistically significant. However, it is the only significant result and it is possible that this result is just simply an example of multiple hypothesis problem.[11] In order to provide more evidence about the possibility of multiple hypothesis testing problem, I use the Bonferroni correction to adjust the significance level. Table 2.9 shows the adjusted significance level with the number of hypotheses defined as the number of outcomes.[12] Since the P-value for the interaction estimates of maternal employment and child conscientiousness is 0.007 in Table 2.5 column 2 under the outcome of the number of smoking days, it is significant at the 10 percent level after the adjustment of the Bonferroni correction. But it is not significant at the 5 percent or 1 percent level of significance. As for the interaction estimates of maternal employment and child extraversion, since Table 2.5 column 2 show that it is significant at 10 percent level and the P-value is 0.06, it is not significant at any significance level after the adjustment of the Bonferroni correction. To conclude, it seems that the interaction estimate of maternal employment and child conscientiousness is more robust.

2.5   Simulations

Figures 2.1 and 2.2 show how the marginal effect of mother work hours on the number of smoking days varies across the conscientiousness and extraversion distributions. I use the specification in column 3 of the middle panel of Table 2.5 to calculate the average marginal

---

[11]Multiple hypothesis problem describes a situation when I test lots of hypotheses. Suppose I test 20 hypotheses simultaneously, and I set the significance level at five percent. The probability of observing at least one significant result just because of chance is around 64 percent. If I test more hypotheses, the chance for me to see a significant result goes up. However, this significant result is just a false positive.

[12]The formula for the Bonferroni correction is the significance level divided by the number of hypotheses. There is no consensus on how to define the number of hypotheses. Since my target is to check whether the interaction coefficients with respect to all 14 outcomes are equal to zero, I set my number of hypotheses equals the number of outcomes.

effect. The graph shows that a one-hour increase in mother work hours increases the number of smoking days of the least conscientious adolescent by 0.10 days and the most extroverted adolescent by 0.067 days. If a mother works 40 hours a week, the increase of the number of smoking days will be around 4 days for the least conscientious, which is 76 percent of the sample mean, and 2.68 days for the most extroverted, or 51 percent of the sample mean. The effect gradually weakens with additional conscientiousness. As for the extraversion distribution, the effect gradually strengthens with additional extraversion. For Figure 2.1, although the signs become negative after the measure of conscientiousness equals 1.5, the average marginal effects do not become negative and significant at the 5 percent level.

2.6 Conclusions

The purpose of this paper is to examine the interaction of maternal employment and adolescent personality traits and the resulting effects on risky health behaviors. OLS estimates show that maternal employment has more adverse effects on less conscientious and extroverted adolescents in terms of the number of smoking days. The P-values after the adjustment of Bonferroni correction show that only the interaction estimate of maternal employment and conscientiousness is significant at 10 percent level. Employment effects are the same for more neurotic adolescents as for less neurotic adolescents.

Individual fixed-effects models show that the interaction estimates of conscientiousness or extraversion and maternal employment are no longer statistically significant. However, the effects are still noticeable since the magnitudes of the interaction estimates remain large. Using the Hausman test, I illustrate that the differences between OLS and fixed-effects estimates are statistically insignificant. Therefore, I suspect that individual fixed effects only took away the statistical power and that the magnitudes of the interaction coefficients are in fact the same. I use Bootstrap Hausman test to compare the interaction coefficients of OLS

49

and individual fixed-effects models and the results support my statement. As for neuroticism, the interaction estimates of maternal employment and neuroticism remain statistically insignificant.

In terms of policy implications, this study suggests that policy makers should not overlook the role of adolescent personality traits when considering the adverse effects of maternal employment. The results suggest that designing policies to improve personality skills is a potential method for addressing this problem. As mentioned previously, childhood education programs that focus on character development, such as the Perry Preschool Program, may reduce the likelihood of risky health behaviors. For example, a Tool of the Mind program is implemented to promote self-control, which is an important skill directly related to conscientiousness.

A major limitation to this paper is the potentially endogenous nature of maternal employment. It is widely known that maternal employment is endogenous. Although many controls are included and an individual fixed-effects model is used, it is still difficult to make causal claims without a randomized or quasi-experimental design. For example, the problems of individual unobserved heterogeneities and measurement errors are not addressed. In particular, mother work hours are reported by adolescents, which may be inaccurate. Therefore, the results should be treated as correlational rather than causal.

Table 2.1: Summary Statistics for Dependent Variables

	count	mean	sd	min	max
BMI Z-score	31740	0.411	1.048	-4.869	3.483
Overweight	32494	0.299	0.458	0	1
Obese	32494	0.148	0.355	0	1
Diet	32462	0.156	0.363	0	1
Exercise	32462	0.518	0.500	0	1
Veg. and fruit consumption	32452	0.886	0.318	0	1
Num. of cigarettes each time	32063	2.248	5.861	0	95
Num. of smoking days	32031	5.253	10.43	0	30
Total num. of cigarettes in a month	31989	56.27	164.0	0	2850
Num. of drinks each time	31826	2.698	5.928	0	95
Num. of days drinking	32142	18.58	52.51	0	365
Total num. of drinks in a year	31826	155.4	763.7	0	31755
Smoked marijuana	31798	0.154	0.361	0	1
Used other drugs	32104	0.0556	0.229	0	1

Table 2.2: Summary Statistics for Variables of Interest and Controls

	count	mean	sd	min	max
Mom work hours	31890	26.77	19.80	0	168
Child's conscientiousness	32024	-0.0562	1.015	-4.486	1.896
Child's neuroticism	32313	-0.0188	0.993	-1.500	5.194
Child's extraversion	21705	0.0353	0.999	-2.882	1.530
Age	32479	15.69	1.770	11	21
Male	32492	0.506	0.500	0	1
Female	32492	0.494	0.500	0	1
Hispanic	32378	0.122	0.328	0	1
Black or African American	32378	0.159	0.366	0	1
Asian	32378	0.0385	0.192	0	1
Native American	32378	0.0200	0.140	0	1
Other, Non-Hispanic	32378	0.0103	0.101	0	1
White	32378	0.650	0.477	0	1
Num. of siblings	32434	1.375	1.209	0	12
Add Health Picture Vocabulary Test (AHPVT) score	30975	100.7	15.00	13	146
Absence of Mom at home	32493	0.0642	0.245	0	1
Absence of Dad at home	32492	0.280	0.449	0	1
Mom's age	31047	38.22	11.63	0	74
Dad's age	31205	31.13	20.75	0	94
Mom's occupation: blue collar	32352	0.0714	0.257	0	1
Mom's occupation: white collar or technical	32352	0.413	0.492	0	1
Mom's occupation: service	32352	0.148	0.355	0	1
Mom's occupation: other	32352	0.161	0.367	0	1
Mom's occupation: unknown	32352	0.142	0.349	0	1
Mom's education: GED, high school, or below	32124	0.480	0.500	0	1
Mom's education: college but not graduate	32124	0.115	0.319	0	1
Mom's education: college	32124	0.166	0.372	0	1
Mom's education: trade or vocational school	32124	0.0685	0.253	0	1

Table 2.2: Summary Statistics for Variables of Interest and Controls

	count	mean	sd	min	max
Mom's education: above college	32124	0.0634	0.244	0	1
Mom's education: unknown	32124	0.0324	0.177	0	1
Dad's occupation: blue collar	32347	0.282	0.450	0	1
Dad's occupation: white collar or technical	32347	0.214	0.410	0	1
Dad's occupation: service	32347	0.0457	0.209	0	1
Dad's occupation: other	32347	0.140	0.347	0	1
Dad's occupation: unknown	32347	0.0364	0.187	0	1
Dad's education: GED, high school, or below	32285	0.336	0.472	0	1
Dad's education: college but not graduate	32285	0.0797	0.271	0	1
Dad's education: college	32285	0.143	0.350	0	1
Dad's education: trade or vocational school	32285	0.0476	0.213	0	1
Dad's education: above college	32285	0.0688	0.253	0	1
Dad's education: unknown	32285	0.0274	0.163	0	1
Dad work hours	31901	29.83	23.47	0	168
Annual family income ($1000s)	32494	45.17	41.29	0	999

Table 2.3: Results for Mom Work Hours X Child's Personalities: Weight-Related Outcomes

Category: Weight-related outcomes	Outcome: BMI Z-score			Outcome: Overweight			Outcome: Obese		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	LPM:	LPM:	Individual FE:	LPM:	LPM:	Individual FE:	LPM:	LPM:	Individual FE:
Included controls	No control	Add All	Add All	No control	Add All	Add All	No control	Add All	Add All
Mom work hours (MWH)	0.00193*	0.00249**	0.00107	0.000400	0.000647	-0.000148	0.000291	0.000116	2.33e-05
	(0.00108)	(0.00116)	(0.00136)	(0.000417)	(0.000459)	(0.000892)	(0.000303)	(0.000342)	(0.000824)
Child's conscient.	-0.0178	-0.0173		-0.00568	-0.00849		-0.00488	-0.00925	
	(0.0224)	(0.0223)		(0.0110)	(0.0108)		(0.00762)	(0.00737)	
Child's neuroticism	0.0389	0.0621**		0.00591	0.0153		0.00720	0.0132	
	(0.0238)	(0.0267)		(0.0106)	(0.0117)		(0.00871)	(0.00913)	
Child's extraversion	-0.00197	0.0102		-0.0232**	-0.0198*		-0.0120*	-0.00982	
	(0.0242)	(0.0243)		(0.00939)	(0.0102)		(0.00700)	(0.00723)	
MWH X child's conscient.	0.000913	0.000845	-0.000609	0.000189	0.000234	-0.000371	0.000175	0.000202	0.000133
	(0.000761)	(0.000787)	(0.000938)	(0.000333)	(0.000348)	(0.000709)	(0.000239)	(0.000246)	(0.000473)
MWH X child's neuroticism	0.000147	0.000355	5.71e-05	0.000249	0.000290	-6.74e-05	2.61e-05	4.40e-05	0.000265
	(0.000674)	(0.000714)	(0.000883)	(0.000293)	(0.000308)	(0.000618)	(0.000258)	(0.000258)	(0.000520)
MWH X child's extraversion	-0.000192	-9.38e-05	-0.000813	0.000259	0.000309	-0.000790	-0.000162	-5.83e-05	-6.63e-05
	(0.000659)	(0.000693)	(0.000956)	(0.000274)	(0.000278)	(0.000622)	(0.000200)	(0.000199)	(0.000420)
Observations	30,844	27,542	27,351	21,107	18,617	18,617	21,107	18,617	18,617

*p<0.1; **p<0.05; ***p<0.01. Robust standard errors in parentheses. All OLS/FE estimations are clustered at school level. Sampling weights are applied. The controls that are used here are listed in the summary statistics table. All specifications include a set of month dummies. Missing values of the controls such as family income and mother working hours are imputed either using the mean value of the sample or filled with 0. Missing indicators are applied in the regression models. Everything mentioned in this note applies from Tables 2.3 through 2.7.

Table 2.4: Results for Mom Work Hours X Child's Personalities: Eating and Exercise Behaviors

Category: Eating and exercise-related outcomes	Outcome: Diet			Outcome: Exercise			Outcome: Vegetable and fruit consumption		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	LPM:	LPM:	Individual FE:	LPM:	LPM:	Individual FE:	LPM:	LPM:	Individual FE:
Included controls	No control	Add All	Add All	No control	Add All	Add All	No control	Add All	Add All
Mom work hours (MWH)	-0.000400	-0.000200	-0.000341	0.000974*	0.00138**	0.000907	-0.000320	-0.000130	0.000293
	(0.000318)	(0.000350)	(0.00106)	(0.000579)	(0.000619)	(0.00143)	(0.000309)	(0.000322)	(0.000915)
Child's conscient.	0.0210***	0.0224***		0.0385***	0.0445***		0.0200***	0.0175**	
	(0.00681)	(0.00688)		(0.00907)	(0.0104)		(0.00695)	(0.00707)	
Child's neuroticism	0.0480***	0.0446***		0.0108	0.00903		-0.0107*	-0.0137**	
	(0.00693)	(0.00702)		(0.00994)	(0.0119)		(0.00614)	(0.00611)	
Child's extraversion	-0.00122	-0.00747		0.0248**	0.0164		0.0129*	0.00412	
	(0.00683)	(0.00726)		(0.00987)	(0.0108)		(0.00688)	(0.00693)	
MWH X child's conscient.	-7.71e-05	-0.000209	-8.08e-05	-8.95e-07	-0.000145	0.00126	-0.000323	-0.000183	0.000122
	(0.000191)	(0.000205)	(0.000765)	(0.000301)	(0.000328)	(0.000793)	(0.000203)	(0.000204)	(0.000752)
MWH X child's neuroticism	8.20e-05	-4.72e-05	-0.000107	0.000391	0.000339	0.000959	-8.35e-05	2.84e-05	-0.000153
	(0.000192)	(0.000194)	(0.000961)	(0.000309)	(0.000346)	(0.000936)	(0.000180)	(0.000184)	(0.000726)
MWH X child's extraversion	-4.12e-05	0.000183	0.000398	0.000112	0.000144	-4.71e-05	6.21e-05	0.000108	0.000247
	(0.000202)	(0.000208)	(0.000883)	(0.000295)	(0.000312)	(0.00105)	(0.000200)	(0.000215)	(0.000758)
Observations	21,103	18,615	18,615	21,103	18,615	18,615	21,107	18,617	18,617

Table 2.5: Results for Mom Work Hours X Child's Personalities: Smoking-Related Behaviors

Category: Smoking-related outcomes	Outcome: Num. of cigarettes each time			Outcome: Num. of smoking days			Outcome: Total num. of cigarettes in a month		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	LPM:	LPM:	Individual FE:	LPM:	LPM:	Individual FE:	LPM:	LPM:	Individual FE:
Included controls	No control	Add All	Add All	No control	Add All	Add All	No control	Add All	Add All
Mom work hours (MWH)	0.0155**	0.0109*	0.0246	0.0343***	0.0287***	0.0363*	0.446**	0.362**	0.809
	(0.00605)	(0.00578)	(0.0220)	(0.00984)	(0.00988)	(0.0190)	(0.171)	(0.167)	(0.648)
Child's conscient.	-0.141	-0.173		0.0585	0.0733		-3.397	-4.166	
	(0.139)	(0.137)		(0.208)	(0.223)		(3.941)	(3.924)	
Child's neuroticism	0.363**	0.296**		1.010***	0.749**		9.334**	7.494*	
	(0.152)	(0.148)		(0.262)	(0.288)		(4.410)	(4.239)	
Child's extraversion	-0.468***	-0.301***		-1.034***	-0.862***		-14.60***	-9.984***	
	(0.123)	(0.0997)		(0.211)	(0.196)		(3.583)	(2.947)	
MWH X child's conscient.	-0.00144	-0.000464	-0.000842	-0.0149***	-0.0155***	-0.0214	-0.0450	-0.0225	-0.229
	(0.00367)	(0.00344)	(0.00996)	(0.00543)	(0.00568)	(0.0132)	(0.103)	(0.0964)	(0.290)
MWH X child's neuroticism	-0.00234	-0.00179	-0.00725	0.000622	0.00350	-0.0135	-0.0459	-0.0316	-0.347
	(0.00437)	(0.00409)	(0.0128)	(0.00733)	(0.00749)	(0.0163)	(0.121)	(0.113)	(0.365)
MWH X child's extraversion	0.00239	0.000339	0.00734	0.0109*	0.0110*	0.00955	0.100	0.0580	0.106
	(0.00323)	(0.00272)	(0.00889)	(0.00605)	(0.00581)	(0.0151)	(0.0890)	(0.0769)	(0.248)
Observations	20,957	18,493	18,493	20,931	18,473	18,473	20,910	18,454	18,454

Table 2.6: Results for Mom Work Hours X Child's Personalities: Alcohol-Related Behaviors

Category: Alcohol-related outcomes	Outcome: Number of drinks each time			Outcome: Number of days drinking			Outcome: Total number of drinks in a year		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	LPM:	LPM:	Individual FE:	LPM:	LPM:	Individual FE:	LPM:	LPM:	Individual FE:
Included controls	No control	Add All	Add All	No control	Add All	Add All	No control	Add All	Add All
Mom work hours (MWH)	0.0104*	0.00449	-0.0104	0.0428	0.0130	-0.0311	0.773**	0.230	0.0166
	(0.00534)	(0.00568)	(0.0203)	(0.0383)	(0.0427)	(0.105)	(0.377)	(0.395)	(1.405)
Child's conscient.	-0.169	-0.195*		-0.219	-1.309		-6.072	-11.42	
	(0.106)	(0.104)		(0.972)	(1.000)		(9.986)	(11.77)	
Child's neuroticism	0.234**	0.180		2.280*	2.625*		13.44	10.47	
	(0.118)	(0.133)		(1.292)	(1.391)		(13.39)	(14.58)	
Child's extraversion	-0.0714	0.0591		-1.704	-0.423		-9.173	-0.661	
	(0.118)	(0.123)		(1.258)	(1.292)		(14.56)	(14.88)	
MWH X child's conscient.	-0.00187	-0.00128	-0.000343	-0.0156	-0.00752	-0.0103	0.0129	-0.00476	-0.0388
	(0.00288)	(0.00297)	(0.00988)	(0.0296)	(0.0293)	(0.0812)	(0.273)	(0.320)	(1.064)
MWH X child's neuroticism	0.00193	0.00344	0.00864	-0.00590	-0.0101	0.00425	0.0950	0.286	0.288
	(0.00346)	(0.00385)	(0.0145)	(0.0341)	(0.0380)	(0.0890)	(0.400)	(0.455)	(1.050)
MWH X child's extraversion	-0.00117	-0.00195	0.00296	0.0472	0.0373	-0.0125	0.444	0.433	-0.256
	(0.00298)	(0.00352)	(0.0100)	(0.0306)	(0.0308)	(0.0922)	(0.336)	(0.367)	(1.051)
Observations	20,815	18,372	18,372	21,000	18,528	18,528	20,815	18,372	18,372

Table 2.7: Results for Mom Work Hours X Child's Personalities: Drug-Related Behaviors

Category: Drugs-related outcomes	Outcome: Smoked marijuana				Outcome: Used other drugs			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	LPM:	LPM:	LPM:	Individual FE	LPM:	LPM:	LPM:	Individual FE
Included controls	No control	Add Demographic	Add All	Add All	No control	Add Demographic	Add All	Add All
Mom work hours (MWH)	0.000954***	0.000691**	0.000782**	0.000287	0.000118	-1.61e-05	-5.63e-05	-0.000389
	(0.000342)	(0.000341)	(0.000369)	(0.000759)	(0.000233)	(0.000238)	(0.000263)	(0.000515)
Child's conscient.	-0.00850	-0.0130*	-0.0139**		-0.00853**	-0.00967**	-0.0110**	
	(0.00631)	(0.00698)	(0.00698)		(0.00398)	(0.00421)	(0.00434)	
Child's neuroticism	0.0271***	0.0290***	0.0269***		0.0135***	0.0141***	0.0127***	
	(0.00789)	(0.00769)	(0.00757)		(0.00461)	(0.00486)	(0.00480)	
Child's extraversion	-0.0170**	-0.00645	-0.00858		-0.0101***	-0.0102***	-0.0109***	
	(0.00815)	(0.00798)	(0.00786)		(0.00336)	(0.00346)	(0.00359)	
MWH X child's conscient.	-0.000317*	-0.000211	-0.000188	-0.000232	-0.000118	-8.61e-06	4.00e-05	0.000190
	(0.000177)	(0.000190)	(0.000187)	(0.000635)	(0.000103)	(0.000102)	(0.000106)	(0.000411)
MWH X child's neuroticism	2.89e-05	5.94e-05	0.000107	-0.000729	2.72e-06	3.87e-05	8.32e-05	-0.000157
	(0.000207)	(0.000200)	(0.000208)	(0.000704)	(0.000130)	(0.000133)	(0.000136)	(0.000457)
MWH X child's extraversion	0.000103	3.08e-05	7.00e-05	1.23e-05	-8.66e-05	-2.30e-05	-5.45e-06	0.000163
	(0.000208)	(0.000220)	(0.000216)	(0.000584)	(0.000123)	(0.000125)	(0.000125)	(0.000444)
Observations	20,804	18,760	18,362	18,362	20,976	18,908	18,506	18,506

58

Table 2.8: Test of the Differences Between OLS and Individual FE Coefficients. Chi-sq(1) P values are reported.

Outcome Variable	Variable of Interest	Coefficient Differences	P-value
Number of smoking days	MWH X child's conscient.	0.00584	0.604
Number of smoking days	MWH X child's extraversion	0.00147	0.910

Table 2.9: The Bonferroni correction

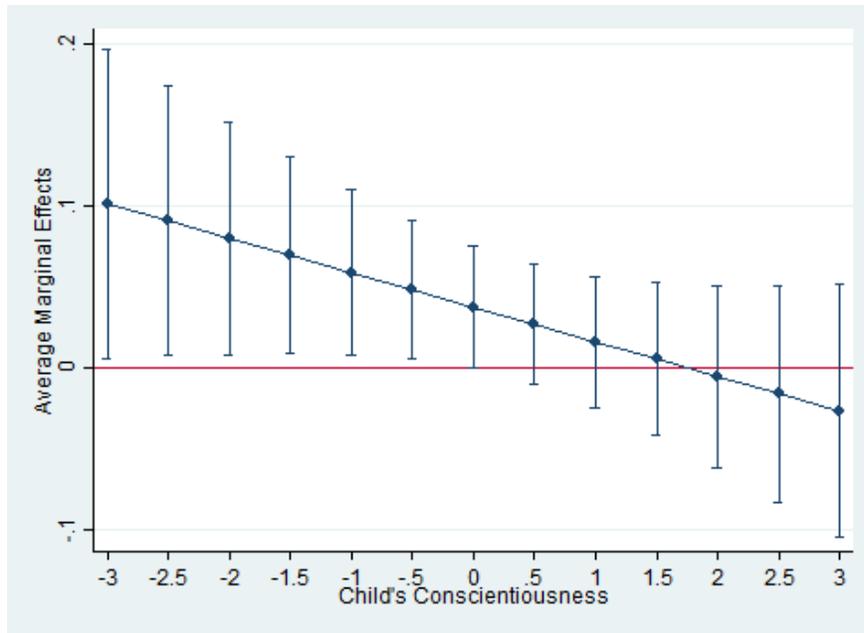| Significance level	Number of outcomes tested	P-value after the Bonferroni correction
0.1	14	0.00714
0.05	14	0.00357
0.01	14	0.000714

Figure 2.1: Marginal Effect of Mother Working Hours on the Number of Smoking Days Across Conscientiousness Distribution
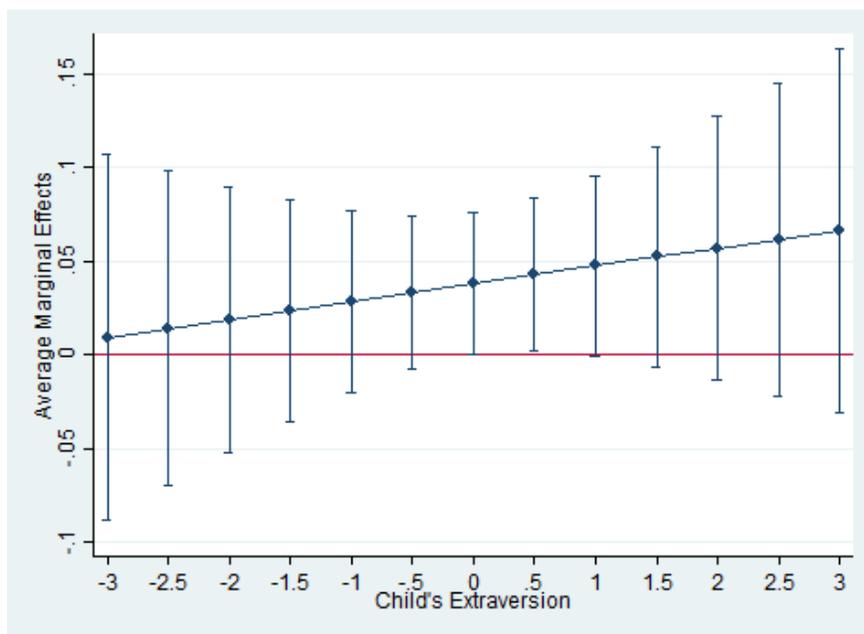

Figure 2.2: Marginal Effect of Mother Working Hours on the Number of Smoking Days Across Extraversion Distribution

Chapter 3

THE EFFECTS OF PARENTAL EMPLOYMENT ON ACADEMIC OUTCOMES: DOES CONSCIENTIOUSNESS MATTER?

3.1 Introduction

The female labor force participation rate has increased in the last fifty years all over the world. In the US, from 1950 to 2017, the participation rate increased from 33 percent to 57 percent.[1] The male labor force has shown the opposite trend. The male labor force participation rate decreased from 86 percent in 1950 to 69 percent in 2017.[2] The change in labor structure can have enormous effects on adolescents behaviors and outcomes, especially academic achievement.

High school academic outcomes are important in determining education attainment and labor market outcomes. A high school student with a low GPA will likely have difficulty getting admitted to a university, which may lead to undesirable labor market outcomes such as low salary and unemployment. Therefore, it is important to examine how parental employment affects the adolescent academic outcomes.

The effects of parental employment on academic achievement may not be the same for all adolescents. Parental employment affects children in different ways. One is the income effect. When two parents work, family income may increase. It becomes more financially

---

[1]Source: https://research.stlouisfed.org/fred2/series/LNS11300002
[2]Source: https://fred.stlouisfed.org/series/LNS11300001

possible to buy books, have extra lessons after school, and pay tuition for a high-quality high school. Another possible effect is reduced parental time with children. When parents work, they have less time with their children, which may lead to less child supervision (Cawley and Liu, 2012; Fertig et al., 2009).

With respect to both of these effects, conscientious children may be better off than less conscientious children. When family income increases, adolescents have more resources (such as better books or a high-quality school) available to them. Conscientious children may be able to utilize these resources better than less conscientious children since they are hardworking and more self-disciplined. Also, when parents spend less time with adolescents, conscientious adolescents are more well-behaved and less affected by lack of supervision. In contrast, it might be better to reduce parental work hours and spend more time supervising less conscientious adolescents. Therefore, I expect that when parental employment increases, conscientious adolescents may have better academic outcomes.

Much research has examined the relationship between parental employment and academic outcomes. Generally speaking, the results are mixed, with some research showing a positive relationship and other studies showing negative or insignificant results. The results are sensitive to the data sets, identification strategies, and the timing of parental employment. Some research looks at the effect of parental employment during adolescence. For instance, Rokicka (2016) shows that parental employment has a significant negative effect on adolescent academic outcomes. Much research focuses on the parental employment effect on children of younger ages. For instance, Ermisch and Francesconi (2013) show that if a mother is employed full time when a child is age 0 to 5, the child has a lower educational attainment. Schildberg-Hoerisch (2011) studies the effect of parental employment on children aged 0 to 3 in Germany. He finds that parental employment does not affect childrens educational attainment. Dustmann and Schönberg (2012) use the exogenous variation of maternity leave

legislation to examine the effect of maternal employment. They find that the delay of return to work created by the legislation does not improve childrens educational attainment.

Limited economic research has investigated how personality traits affect different outcomes. However, in recent years, Heckman and his collaborators have emphasized the importance of personality and noncognitive skills. For instance, Heckman et al. (2006) suggest that the role of noncognitive skills is as important as that of cognitive skills in various outcomes. They find that the effects of cognitive skills on wages are similar to the effects of noncognitive skills. Therefore, more and more economic research has started to examine how personality affects various outcomes. For example, Savelyev (2014) studies how noncognitive skills are related to health outcomes. He finds that conscientiousness has a strong effect on the longevity of males. Fletcher (2013) examines the effects of personality traits on labor market outcomes and finds that extraversion has the largest effect. Lundberg (2013) examines the effects of personality on educational attainment and finds that the return on each personality trait depends on family education background.

The purpose of this paper is to examine the heterogeneous effects (in terms of adolescent conscientiousness) of maternal, paternal, and total parental employment on academic outcomes. The personality trait that is considered here is conscientiousness. This study uses the restricted version of the National Longitudinal Study of Adolescent to Adult Health (Add Health). Generally speaking, I do not find different effects of maternal, paternal, and total parental work hours on adolescents with different degrees of conscientiousness. All the interaction effects on overall GPA, math GPA, English GPA, Science GPA, and all other languages GPA are small and statistically insignificant. As a result, I think that conscientious and less conscientious adolescents achieve similar GPAs in response to maternal, paternal, and total parental employment.

To the best of my knowledge, this paper is the first to study the effects of parental employment on childrens academic achievements with regard to their personalities. Most

of the literature considers the effect of maternal employment on academic outcomes. None of the research examines whether effects are potentially different among adolescents with different personalities. This paper contributes to the literature by looking at heterogeneous effects.

High school GPAs and SAT results can determine whether adolescents receive a college education. Therefore, it is very important to determine whether it is worthwhile for mothers to reduce work hours and invest more time supervising their children. For example, if they know that conscientious children study well without any guidance or supervision, they can choose to work more and provide better monetary support. However, the results of this study suggest that conscientious and less conscientious children should receive equal attention. Academic outcomes caused by changes in parental work hours are the same for both types of adolescents.

3.2 Data

Data in this paper are from the National Longitudinal Study of Adolescent to Adult Health (Add Health). They include a representative sample of adolescents in grades seven to twelve, therefore most of them live with their parents. It contains four waves: wave I in 1994 and 1995, wave II in 1996, wave III in 2001 and 2002, and the last wave in 2008. The focus of this paper is on waves I and II. There are about 20,000 observations in wave I and 15,000 observations in wave II. In wave III, Add Health located wave I respondents and asked them to sign a Transcript Release Form in order to obtain official transcripts from the high schools. Approximately 12,000 respondents consented to releasing transcript information. The grade point average data in this paper are obtained from the transcripts. However, not everyone studied in high school during waves I and II. Some adolescents were

in middle school. I dropped these adolescents since I do not have their parents work hours information. Therefore, the observations dropped from 12,000 to approximately 8,000.

Independent Variables of Interest

The variables of interest include mother and father work hours and personality traits. Mother and father work hours are filled in as 0 hours if they did not work or they were not present at home.

Conscientiousness is the main focus of personality in this study. This measure is constructed using the personality measure in wave I.[3] The construction of the measure follows the suggestions in Young and Beaujean (2011). Additionally, the measure is standardized to a mean of 0 and a standard deviation of 1. A high-magnitude conscientiousness measure indicates a conscientious adolescent. For example, an adolescent with a conscientiousness measure of 1 is more conscientious than the one with a magnitude of 0.

Dependent Variables

The dependent variables include high school GPAs for different subjects during wave I and wave II. These subjects include mathematics, English, science, and all other languages. Overall GPA is also included in this study. These GPAs are all continuous variables with a minimum score of 0 and a maximum score of 4. All information is from the transcript data; therefore, there is no measurement error.

Descriptive Statistics

Tables 3.1 and 3.2 report the summary statistics of the dependent variables and independent variables respectively. Tables 3.1 shows that there are some missing GPA values for

---

[3]Details can be found in Appendix A1 of the "The Effects of Maternal Employment on Adolescent Risky Health Behaviors: Does Personality Matter?".

various subjects. For example, the GPA for all other languages has only 6160 observations. This is because not everyone took other language courses during wave I and wave II. These missing values are dropped during the regression estimation. The mean GPA for all five GPAs is around 2.5 and the standard deviation is approximately 1.

In Table 3.2, I show the summary statistics only if the observation contains the overall GPA data. Mother and father weekly work hours are around 28 and 32 hours, respectively. They are lower than the national average, which were 35.8 hours for women and 42.1 for men in 1995.[4] This is because the adolescent who did not have a father or mother were imputed 0 weekly work hours. If fathers or mothers did not work, then the observation is also imputed as 0 work hours.

3.3   Econometric Methods

OLS: Interaction of Mother and Father Working Hours and Adolescents' Personality Traits

The baseline OLS model that is used to examine the interaction effects of mother work hours and adolescent personality traits is the following:

---

[4]Source: http://www.bls.gov/mlr/1997/04/art1full.pdf

$$
\begin{aligned}
GPA_i =\,& \alpha_0 + \beta_1 MWH_i + \beta_2 FWH_i \\
& + \beta_3 CONSCIENT_i + \beta_4(MWH_i \; x \; CONSCIENT_i) \\
& + \beta_5 NEUROTICISM_i + \beta_6(MWH_i \; x \; NEUROTICISM_i) \\
& + \beta_7 EXTRAVERSION_i + \beta_8(MWH_i \; x \; EXTRAVERSION_i) \\
& + \beta_9 CONSCIENT_i + \beta_{10}(FWH_i \; x \; CONSCIENT_i) \\
& + \beta_{11} NEUROTICISM_i + \beta_{12}(FWH_i \; x \; NEUROTICISM_i) \\
& + \beta_{13} EXTRAVERSION_i + \beta_{14}(FWH_i \; x \; EXTRAVERSION_i) \\
& + \beta_{15}\mathbf{DEMO}_i + \beta_{16}\mathbf{MOM.OCCUP}_i + \beta_{17}\mathbf{MOM.EDUC}_i + \beta_{18}\mathbf{DAD.BG}_i \\
& + \beta_{19} FAM.INC_i + \tau_m + \epsilon_i.
\end{aligned}
$$

$$(3.1)$$

The i is an index for individual i. The dependent variable is GPA_i which indicates the GPA for different subjects. MWH_i and FWH_i indicate mother work hours and father work hours. $CONSCIENT_i$, $NEUROTICISM_i$ and $EXTRAVERSION_i$ are the variables for personality traits. $DEMO$ is a vector of demographic controls indicating adolescents' gender, age, race, number of siblings, whether they have father or mother, and a proxy for cognitive ability. $MOM.OCCUP$ and $MOM.EDUC$ are two vectors of controls indicating mother's occupation and mother's educational background. $DAD.BG$ is a vector of controls indicating father's occupation and educational background. $FAM.INC$ is a control indicating family income. τ_m is a set of month dummies.

OLS: Interaction of Parent Working Hours and Adolescents' Personality Traits

Since it is possible that the total parent work hours instead of individual work hours affect the GPA results, I examine the following OLS equation:

67

$$GPA_i = \alpha_0 + \beta_1 PARENT_i$$

$$+ \beta_3 CONSCIENT_i + \beta_4 (PARENT_i \, x \, CONSCIENT_i)$$

$$+ \beta_5 NEUROTICISM_i + \beta_6 (PARENT_i \, x \, NEUROTICISM_i)$$

$$+ \beta_7 EXTRAVERSION_i + \beta_8 (PARENT_i \, x \, EXTRAVERSION_i)$$

$$+ \beta_9 \mathbf{DEMO}_i + \beta_{10} \mathbf{MOM.OCCUP}_i + \beta_{11} \mathbf{MOM.EDUC}_i + \beta_{12} \mathbf{DAD.BG}_i$$

$$+ \beta_{13} FAM.INC_i + \tau_m + \epsilon_i.$$

$$(3.2)$$

Where $PARENT_i$ indicates the total parent work hours. The controls are the same as in equation 3.1.

Individual Fixed Effects: Interaction of Mother Working Hours and Conscientiousness

It is likely that OLS estimates give bias results if there is an endogeneity problem. In order to control for unobserved heterogeneity that is constant over time, I use an individual fixed-effects model for equations 3.1 and 3.2:

$$GPA_{it} = \alpha_0 + \beta_1 MWH_{it} + \beta_2 FWH_{it}$$
$$+ \beta_3 CONSCIENT_i + \beta_4(MWH_{it} \; x \; CONSCIENT_i)$$
$$+ \beta_5 NEUROTICISM_i + \beta_6(MWH_{it} \; x \; NEUROTICISM_i)$$
$$+ \beta_7 EXTRAVERSION_i + \beta_8(MWH_{it} \; x \; EXTRAVERSION_i)$$
$$+ \beta_9 CONSCIENT_i + \beta_{10}(FWH_{it} \; x \; CONSCIENT_i)$$
$$+ \beta_{11} NEUROTICISM_i + \beta_{12}(FWH_{it} \; x \; NEUROTICISM_i)$$
$$+ \beta_{13} EXTRAVERSION_i + \beta_{14}(FWH_{it} \; x \; EXTRAVERSION_i)$$
$$+ \beta_{15}\mathbf{DEMO}_{it} + \beta_{16}\mathbf{MOM.OCCUP}_{it} + \beta_{17}\mathbf{MOM.EDUC}_{it} + \beta_{18}\mathbf{DAD.BG}_{it}$$
$$+ \tau_m + \epsilon_i.$$

$$(3.3)$$

If the variables of interest change from father or mother work hours into total parent work hours, then the following equation is used:

$$GPA_{it} = \alpha_0 + \beta_1 PARENT_{it}$$
$$+ \beta_3 CONSCIENT_i + \beta_4(PARENT_{it} \; x \; CONSCIENT_i)$$
$$+ \beta_5 NEUROTICISM_i + \beta_6(PARENT_{it} \; x \; NEUROTICISM_i)$$
$$+ \beta_7 EXTRAVERSION_i + \beta_8(PARENT_{it} \; x \; EXTRAVERSION_i)$$
$$+ \beta_9\mathbf{DEMO}_{it} + \beta_{10}\mathbf{MOM.OCCUP}_{it} + \beta_{11}\mathbf{MOM.EDUC}_{it} + \beta_{12}\mathbf{DAD.BG}_{it}$$
$$+ \tau_m + \epsilon_i.$$

$$(3.4)$$

3.4 Results

OLS Estimation Results: Interaction of Maternal/Paternal Employment and Child's Con-scientiousness

Row 6 of Tables 3.3 through 3.7 shows the OLS results of the interaction effects of mother work hours and adolescent's conscientiousness. Row 9 shows the results for father work hours. Column 3 of all tables shows the OLS results with all controls included in the regression models.

Generally speaking, we cannot conclude anything about the interaction effects of mother work hours and adolescent's conscientiousness on the GPA.[5] The magnitude of the coefficient estimates are small as well. For instance, according to column 3 of Table 3.3, if mothers work full time (40 hours per week), their more conscientious adolescents will have a decrease of 0.14 in the overall GPA, which is 5.38 percent of the sample mean.[6] If the child is less conscientious, then the decrease in overall GPA is 0.092, which is 3.54 percent of the sample mean. The difference in overall GPA between more conscientious and less conscientious adolescents is only about 0.048. The same picture emerges with regard to father work hours. If fathers work full time, their more conscientious adolescents will have a decrease of 0.053 in overall GPA. As for the less conscientious adolescents, the decrease in overall GPA is about 0.052. Basically there is no difference between the two. The signs and magnitudes are stable for the second and the third column but not the first column.

Insignificant results and small-magnitude interaction effects are found for other GPAs, including math, English, science and all other languages.[7] According to Table 3.4, column

---

[5]In order to examine whether multicollinearity affects the null results, I have done some F tests of joint significance. The results show that the interaction coefficient estimates are all insignificant. Please see Table 3.13.

[6]Here I define a child as more conscientious if his or her measure of conscientiousness equals 1. If the measure is -1, then he or she is defined as less conscientious.

[7]Please see Table 3.13 for the results of F tests of joint significance.

3, if a mother works full time, more conscientious adolescents have a decrease in the math GPA of 0.26. For less conscientious adolescents, the decrease in the math GPA is 0.27. The difference is only 0.01. For the effects of paternal employment, the difference is only around 0.009. For the English GPA, Table 3.5 shows that the difference in GPAs between more conscientious and less conscientious children is around 0.0026 if mothers work full time and 0.019 if fathers work full time. For the science GPA, Table 3.6 shows that the difference of the changes in GPAs of more conscientious and less conscientious children is around 0.058 if mothers work full time and 0.042 if fathers work full time. Lastly, the difference in the all other languages GPAs is 0.058 if mothers work full time and 0.017 if fathers work full time. All the results are insignificant and the magnitudes are very small. All the results are stable over columns 2 and 3.

OLS Estimation Results: Interaction of Total Parental Work Hours and Child's Conscientiousness

Row 5 of Column 3 in Tables 3.8 through 3.12 shows the OLS results of the interaction effects of total parent work hours and adolescent's conscientiousness. Once again, the results are insignificant and the magnitudes are small.[8] If the child is more conscientious and the parents work 80 hours per week (both work full time), then the decrease in overall GPA is 0.15. If the child is less conscientious, then the decrease in overall GPA is 0.11. The difference between more conscientious and less conscientious adolescents is only 0.038, which is small and insignificant.

Insignificant results and small-magnitude interaction effects are also found for other GPAs.[9] In Table 3.9, column 3, the difference in the math GPAs of more conscientious and less conscientious children is around 0.085 if both parents work full time. As for the

---

[8]Please see Table 3.15 for the results of F tests of joint significance.
[9]Please see Table 3.15 for the results of F tests of joint significance.

English GPA, the science GPA, and the all other languages GPA, the differences are 0.016, 0.088, and 0.043, respectively. All the interaction estimates are small and insignificant. Again, the results are stable over columns 2 and 3 but different for the first column. This implies that having controls is important in reducing omitted variable bias.

Individual Fixed-Effects Estimation Results

Column 4 of all tables shows the individual fixed-effects estimation. For the interaction effects of mother work hours or father work hours and child's conscientiousness, individual fixed effects basically shrink the magnitude, or even switch the sign. But, generally speaking, all interaction estimates are small and statistically insignificant.[10] For the overall GPA in Table 3.3, the difference between more conscientious and less conscientious adolescents is 0.037 if mothers work full time and 0.016 if fathers work full time. For the math GPA, Table 3.4 shows that the difference is 0.086 if mothers work full time and 0.17 if fathers work full time. Interestingly, the sign switches from positive in column 3 to negative in column 4. This indicates that some unobserved individual heterogeneity is correlated with the interaction estimates. In Table 3.5, column 4, the difference in GPAs is 0.13 if mothers work full time and 0.05 if fathers work full time. Again, the interaction estimate of mother work hours changes from negative for the OLS model to positive for the individual fixed-effects model. Table 3.6, column 4, shows the interaction estimates for the science GPA. We can see that the difference in GPAs is 0.13 if mothers work full time and 0.24 if fathers work full time. The magnitude of the interaction estimate is larger if fathers work full time. However, it is still statistically insignificant, so it is hard to be conclusive about the effect. Lastly, Table 3.7, column 4, shows the interaction estimates for the all other languages GPA. The difference is 0.31 if mothers work full time and 0.15 if fathers work full time. The magnitudes are reasonably large but they are all statistically insignificant.

---

[10]Please see Table 3.14 for the results of F tests of joint significance.

As for the interaction effects of total parent work hours and child's conscientiousness, the results are also statistically insignificant.[11] But one should be aware that some interaction coefficient estimates are reasonably large. Table 3.8 shows that the difference between more conscientious and less conscientious adolescents is only 0.015 when both parents work outside, which is small and insignificant. Table 3.9 through Table 3.12, column 4, shows the results for the other GPAs. For the math GPA, the difference is 0.24 when both parents work. Nonetheless, the effect of total parent work hours is negative for more conscientious adolescents and positive for less conscientious adolescents, which is contrary to my expectation. The differences in GPAs of other subjects are also reasonably large, though they are all statistically insignificant. The differences are 0.2, 0.28, and 0.46 for the English GPA, science GPA, and all other languages GPA, respectively. Moreover, the increases and decreases in GPAs are mixed for different subjects. For the science GPA, more conscientious adolescents have a decrease in the GPA but less conscientious adolescents have an increase in the GPA. For all other languages, more conscientious adolescents have an increase in the GPA but less conscientious adolescents have a decrease in the GPA. Therefore, it is hard to be conclusive about how parental employment affects adolescents differently. The signs of the interaction coefficient estimates, except for the English GPA, are consistent for OLS estimates and individual fixed-effects estimates. However, all of the fixed-effects estimates have larger magnitudes. This implies that controlling for unobserved time-invariant heterogeneity is important.

3.5 Conclusions

The purpose of this paper is to examine the interaction effects of maternal, paternal, and parental employment and adolescent personality traits on academic outcomes. OLS and individual fixed-effects models show that all interaction estimates are statistically insignificant

---

[11]Please see Table 3.16 for the results of F tests of joint significance.

and that most have small magnitudes. Therefore, it is very likely that more conscientious and less conscientious adolescents have similar changes in GPAs if mothers, fathers, or both parents work long hours.

Kwok (2017) shows that maternal employment has heterogeneous effects on adolescent risky health behaviors. He shows that if mothers work full time, less conscientious and more extroverted adolescents have a larger increase in the number of smoking days. This paper shows that both father and mother work hours have similar effects on adolescents. It is possible that parental employment does not have heterogeneous effects on the GPA because the GPA is an accumulated stock of human capital. It is affected by family input, personal ability, and personal input. Variations in parent work hours might not affect GPA instantly and might only play a small role in the GPA. In fact, many research studies show that parental employment does not have large effects on educational attainment, verbal skills, or mathematics skills (Schildberg-Hoerisch, 2011). However, smoking behavior is a contemporaneous behavior, which is much more easily affected by maternal employment. This might explain the difference between results obtained in this study and those obtained in the study by Kwok (2017).

From the policy perspective, this paper suggests that making children more conscientious might not alleviate the potential negative effect of maternal employment. The supervision effect and income effect might be similar for both more conscientious and less conscientious children. Furthermore, this study implies that a more conscientious personality might not be a good reason for a parent to decide to reduce work hours in order to increase the child's academic performance.

A major limitation to this paper is the nature of parental employment. Parental employment is potentially endogenous. In addition, the measurement error is potentially large, as adolescents may not remember the work hours of their parents. Therefore, the results should be treated as correlational rather than causal.

Table 3.1: Summary Statistics for Dependent Variables

	count	mean	sd	min	max
Overall GPA	13637	2.603	0.914	0	4
Math GPA	11743	2.226	1.172	0	4
English GPA	13075	2.455	1.105	0	4
Science GPA	10742	2.366	1.167	0	4
All other languages GPA	6160	2.656	1.191	0	4

Table 3.2: Summary Statistics for Variables of Interest and Controls (if overall GPA data is available)

	count	mean	sd	min	max
Mom work hours	13443	28.10	19.44	0	168
Dad work hours	13439	31.83	22.81	0	168
Parents work hours	13314	60.05	30.08	0	240
Child's conscientiousness	13545	0.000368	0.992	-4.486	1.896
Child's neuroticism	13565	0.0336	0.989	-1.500	5.194
Child's extraversion	9900	-0.00454	0.989	-2.882	1.530
Age	13631	16.54	1.190	12	21
Male	13637	0.487	0.500	0	1
Female	13637	0.513	0.500	0	1
Hispanic	13608	0.105	0.306	0	1
Black or African American	13608	0.141	0.348	0	1
Asian	13608	0.0458	0.209	0	1
Native American	13608	0.0184	0.134	0	1
Other, Non-Hispanic	13608	0.00881	0.0935	0	1
White	13608	0.681	0.466	0	1
Num. of siblings	13618	1.339	1.168	0	10
Add Health Picture Vocabulary Test (AHPVT) score	13018	103.5	13.74	14	136
Absence of mom at home	13637	0.0572	0.232	0	1
Absence of dad at home	13637	0.237	0.425	0	1
Mom's age	13110	39.70	11.23	0	74

Table 3.2: Summary Statistics for Variables of Interest and Controls (if overall GPA data is available)

	count	mean	sd	min	max
Dad's age	13153	33.94	20.19	0	94
Mom's occupation: blue collar	13598	0.0640	0.245	0	1
Mom's occupation: white collar or technical	13598	0.460	0.498	0	1
Mom's occupation: service	13598	0.135	0.342	0	1
Mom's occupation: others	13598	0.163	0.369	0	1
Mom's occupation: unknown	13598	0.121	0.326	0	1
Mom's education: GED, high school or below	13540	0.449	0.497	0	1
Mom's education: college but not graduate	13540	0.123	0.328	0	1
Mom's education: college	13540	0.191	0.393	0	1
Mom's education: trade or vocational school	13540	0.0718	0.258	0	1
Mom's education: above college	13540	0.0772	0.267	0	1
Mom's education: unknown	13540	0.0256	0.158	0	1
Dad's occupation: blue collar	13595	0.276	0.447	0	1
Dad's occupation: white collar or technical	13595	0.255	0.436	0	1
Dad's occupation: service	13595	0.0471	0.212	0	1
Dad's occupation: others	13595	0.146	0.353	0	1
Dad's occupation: unknown	13595	0.0382	0.192	0	1
Dad's education: GED, high school or below	13577	0.334	0.472	0	1
Dad's education: college but not graduate	13577	0.0901	0.286	0	1
Dad's education: college	13577	0.160	0.366	0	1
Dad's education: trade or vocational school	13577	0.0573	0.232	0	1
Dad's education: above college	13577	0.0887	0.284	0	1
Dad's education: unknown	13577	0.0217	0.146	0	1
Dad work hours	13439	31.83	22.81	0	168
Annual family income ($1000s)	13637	49.09	43.15	0	999

Table 3.3: Results for Mom/Dad Work Hours X Child's Personalities: Overall GPA

	(1) OLS No control	(2) OLS Add demographic	(3) OLS Add all	(4) Individual FE Add all
Included controls				
VARIABLES	Dep Var: Overall GPA	Dep Var: Overall GPA	Dep Var: Overall GPA	Dep Var: Overall GPA
Dad work hours	0.000281	-0.000887	-0.00131	0.000639
	(0.00141)	(0.00110)	(0.00114)	(0.00200)
Mom work hours	-0.00338***	-0.00288***	-0.00291***	-0.000577
	(0.00104)	(0.000913)	(0.000985)	(0.00203)
Child's conscient.	0.0320	0.0675**	0.0644**	
	(0.0373)	(0.0295)	(0.0282)	
Child's neuroticism	-0.0453	-0.0515*	-0.0541*	
	(0.0348)	(0.0281)	(0.0292)	
Child's extraversion	0.0244	0.00769	0.0200	
	(0.0349)	(0.0299)	(0.0303)	
Mom work hours X child's conscient.	0.000164	-0.000717	-0.000607	-0.000457
	(0.000748)	(0.000697)	(0.000597)	(0.00157)
Mom work hours X child's neuroticism	0.000652	-0.000448	-0.000278	-0.00195
	(0.000804)	(0.000638)	(0.000717)	(0.00131)
Mom work hours X child's extraversion	0.000171	0.000403	-4.55e-06	-0.000884
	(0.000735)	(0.000687)	(0.000679)	(0.00133)
Dad work hours X child's conscient.	0.000185	-1.58e-05	-1.17e-05	0.000194
	(0.000752)	(0.000598)	(0.000622)	(0.00131)
Dad work hours X child's neuroticism	0.000162	0.000441	0.000232	0.00177
	(0.000725)	(0.000655)	(0.000676)	(0.00138)
Dad work hours X child's extraversion	0.00109	0.00126**	0.000957*	-0.000235
	(0.000695)	(0.000525)	(0.000564)	(0.00195)
Observations	9,622	8,716	8,647	8,647

*p<0.1; **p<0.05; ***p<0.01. Robust standard errors in parentheses. All OLS/FE estimations are clustered at school level. Sampling weights are applied. The controls that are used here are listed in the summary statistics table. All specifications include a set of month dummies. Missing values of the controls such as family income and mother working hours are imputed either using the mean value of the sample or filled with 0. Missing indicators are applied in the regression models. Everything mentioned in this note applies from Tables 3.3 through 3.12.

Table 3.4: Results for Mom/Dad Work Hours X Child's Personalities: Math GPA

VARIABLES	(1) OLS No control Dep Var: Math GPA	(2) OLS Add demographic Dep Var: Math GPA	(3) OLS Add all Dep Var: Math GPA	(4) Individual FE Add all Dep Var: Math GPA
Included controls	No control	Add demographic	Add all	Add all
Dad work hours	0.00256	0.00128	0.00107	0.00249
	(0.00221)	(0.00199)	(0.00205)	(0.00486)
Mom work hours	-0.00642***	-0.00686***	-0.00664***	-0.00193
	(0.00187)	(0.00190)	(0.00181)	(0.00408)
Child's conscient.	-0.00417	0.0473	0.0472	
	(0.0502)	(0.0411)	(0.0414)	
Child's neuroticism	-0.0897*	-0.0723*	-0.0824*	
	(0.0512)	(0.0420)	(0.0425)	
Child's extraversion	0.0256	-0.0123	0.0118	
	(0.0519)	(0.0505)	(0.0479)	
Mom work hours X child's conscient.	0.00139	0.000112	0.000121	-0.00108
	(0.000908)	(0.000829)	(0.000810)	(0.00273)
Mom work hours X child's neuroticism	0.00112	-0.000532	-0.000273	-0.000507
	(0.00119)	(0.00107)	(0.00109)	(0.00304)
Mom work hours X child's extraversion	0.000630	0.000979	0.000644	-0.00118
	(0.00122)	(0.00111)	(0.00108)	(0.00310)
Dad work hours X child's conscient.	-0.000941	-0.00109	-0.00108	-0.00217
	(0.000904)	(0.000809)	(0.000802)	(0.00314)
Dad work hours X child's neuroticism	0.000879	0.00109	0.00101	0.00316
	(0.00113)	(0.00107)	(0.00106)	(0.00314)
Dad work hours X child's extraversion	0.000297	0.000757	0.000304	0.00248
	(0.00108)	(0.000910)	(0.000925)	(0.00434)
Observations	8,399	7,635	7,575	7,575

Table 3.5: Results for Mom/Dad Work Hours X Child's Personalities: English GPA

VARIABLES	(1) OLS No control Dep Var: English GPA	(2) OLS Add demographic Dep Var: English GPA	(3) OLS Add all Dep Var: English GPA	(4) Individual FE Add all Dep Var: English GPA
Dad work hours	-6.18e-05 (0.00172)	-0.00196 (0.00143)	-0.00238 (0.00144)	-0.00163 (0.00359)
Mom work hours	-0.00472*** (0.00124)	-0.00452*** (0.00116)	-0.00459*** (0.00128)	-0.00264 (0.00346)
Child's conscient.	0.0244 (0.0402)	0.0536 (0.0356)	0.0575* (0.0344)	
Child's neuroticism	-0.0298 (0.0442)	-0.0398 (0.0384)	-0.0320 (0.0391)	
Child's extraversion	0.0428 (0.0410)	0.0220 (0.0377)	0.0307 (0.0386)	
Mom work hours X child's conscient.	0.000985 (0.000914)	-4.94e-05 (0.000913)	-3.22e-05 (0.000838)	0.00170 (0.00213)
Mom work hours X child's neuroticism	0.00133 (0.00109)	1.63e-05 (0.000972)	0.000144 (0.000976)	-0.00197 (0.00234)
Mom work hours X child's extraversion	8.67e-05 (0.000857)	0.000344 (0.000828)	-0.000108 (0.000821)	-0.000182 (0.00278)
Dad work hours X child's conscient.	-5.70e-05 (0.000783)	-0.000169 (0.000726)	-0.000242 (0.000742)	0.000635 (0.00192)
Dad work hours X child's neuroticism	-9.85e-05 (0.000766)	-9.58e-06 (0.000668)	-0.000415 (0.000681)	0.000617 (0.00192)
Dad work hours X child's extraversion	0.00101 (0.000809)	0.00112* (0.000651)	0.000728 (0.000676)	0.00184 (0.00260)
Observations	9,330	8,461	8,396	8,396

79

Table 3.6: Results for Mom/Dad Work Hours X Child's Personalities: Science GPA

	(1) OLS	(2) OLS	(3) OLS	(4) Individual FE
Included controls	No control	Add demographic	Add all	Add all
VARIABLES	Dep Var: Science GPA	Dep Var: Science GPA	Dep Var: Science GPA	Dep Var: Science GPA
Dad work hours	0.000530	-7.56e-05	-0.000569	0.00110
	(0.00197)	(0.00149)	(0.00159)	(0.00463)
Mom work hours	-0.00452**	-0.00331*	-0.00383*	-0.00223
	(0.00205)	(0.00196)	(0.00217)	(0.00461)
Child's conscient.	0.0901	0.125**	0.115**	
	(0.0623)	(0.0509)	(0.0496)	
Child's neuroticism	-0.0700	-0.0834	-0.0760	
	(0.0528)	(0.0512)	(0.0507)	
Child's extraversion	0.0428	0.0467	0.0484	
	(0.0490)	(0.0491)	(0.0473)	
Mom work hours X child's conscient.	-5.05e-05	-0.000773	-0.000720	-0.00157
	(0.00133)	(0.00113)	(0.00104)	(0.00249)
Mom work hours X child's neuroticism	0.00160	-1.16e-05	4.05e-05	-0.00257
	(0.00144)	(0.00144)	(0.00148)	(0.00232)
Mom work hours X child's extraversion	-0.000229	-0.000420	-0.000572	-0.00412
	(0.00107)	(0.00100)	(0.00102)	(0.00339)
Dad work hours X child's conscient.	-0.000357	-0.000721	-0.000525	-0.00302
	(0.000972)	(0.000933)	(0.00101)	(0.00400)
Dad work hours X child's neuroticism	1.89e-05	0.000845	0.000575	-0.00118
	(0.00123)	(0.00109)	(0.00110)	(0.00250)
Dad work hours X child's extraversion	0.00106	0.00110	0.000984	-0.00464
	(0.00108)	(0.00103)	(0.000944)	(0.00301)
Observations	7,721	6,988	6,936	6,936

Table 3.7: Results for Mom/Dad Work Hours X Child's Personalities: All other lang GPA

Included controls	(1) OLS No control	(2) OLS Add demographic	(3) OLS Add all	(4) Individual FE Add all
VARIABLES	Dep Var: All other lang GPA	Dep Var: All other lang GPA	Dep Var: All other lang GPA	Dep Var: All other lang GPA
Dad work hours	-0.00154 (0.00248)	-0.00152 (0.00212)	-0.00265 (0.00234)	0.000739 (0.00558)
Mom work hours	-0.00633** (0.00253)	-0.00408 (0.00257)	-0.00404 (0.00267)	0.00217 (0.00673)
Child's conscient.	0.00686 (0.0790)	0.0123 (0.0607)	0.0346 (0.0674)	
Child's neuroticism	-0.0501 (0.0661)	0.0182 (0.0615)	0.0120 (0.0598)	
Child's extraversion	0.0604 (0.0863)	0.0915 (0.0755)	0.0674 (0.0763)	
Mom work hours X child's conscient.	0.00171 (0.00164)	0.000943 (0.00144)	0.000731 (0.00157)	0.00389 (0.00555)
Mom work hours X child's neuroticism	0.000650 (0.00154)	-0.00172 (0.00119)	-0.00131 (0.00121)	-0.00446 (0.00388)
Mom work hours X child's extraversion	-0.00211 (0.00160)	-0.00278* (0.00153)	-0.00253 (0.00156)	0.00183 (0.00669)
Dad work hours X child's conscient.	-1.88e-05 (0.00141)	3.03e-05 (0.00111)	-0.000214 (0.00111)	0.00185 (0.00471)
Dad work hours X child's neuroticism	-0.000144 (0.00128)	-0.000774 (0.00116)	-0.00105 (0.00114)	0.00320 (0.00502)
Dad work hours X child's extraversion	0.00120 (0.00155)	0.00138 (0.00128)	0.00179 (0.00125)	-0.00239 (0.00462)
Observations	4,629	4,257	4,228	4,228

Table 3.8: Results for Parents Work Hours X Child's Personalities: Overall GPA

	(1) OLS No control Dep Var: Overall GPA	(2) OLS Add demographic Dep Var: Overall GPA	(3) OLS Add all Dep Var: Overall GPA	(4) Individual FE Add all Dep Var: Overall GPA
Included controls				
VARIABLES				
Parents work hours	0.00141**	-0.00112*	-0.00167**	-8.06e-05
	(0.000701)	(0.000622)	(0.000638)	(0.00117)
Child's conscient.	0.0246	0.0629**	0.0607**	
	(0.0383)	(0.0297)	(0.0285)	
Child's neuroticism	-0.0460	-0.0580*	-0.0579*	
	(0.0363)	(0.0293)	(0.0294)	
Child's extraversion	0.0343	0.00585	0.0167	
	(0.0359)	(0.0299)	(0.0306)	
Parents work hours X child's conscient.	0.000280	-0.000279	-0.000239	-9.19e-05
	(0.000609)	(0.000483)	(0.000447)	(0.000965)
Parents work hours X child's neuroticism	0.000391	9.89e-05	3.34e-05	-3.48e-06
	(0.000554)	(0.000438)	(0.000453)	(0.000888)
Parents work hours X child's extraversion	0.000559	0.000882**	0.000554	-0.000559
	(0.000486)	(0.000401)	(0.000407)	(0.00118)
Observations	9,622	8,716	8,647	8,647

Table 3.9: Results for Parents Work Hours X Child's Personalities: Math GPA

VARIABLES	(1) OLS No control Dep Var: Math GPA	(2) OLS Add demographic Dep Var: Math GPA	(3) OLS Add all Dep Var: Math GPA	(4) Individual FE Add all Dep Var: Math GPA
Included controls				
Parents work hours	0.000794	-0.00232**	-0.00258**	0.00126
	(0.00106)	(0.00102)	(0.00111)	(0.00251)
Child's conscient.	-0.0103	0.0475	0.0480	
	(0.0521)	(0.0419)	(0.0421)	
Child's neuroticism	-0.0912*	-0.0807*	-0.0898**	
	(0.0521)	(0.0436)	(0.0435)	
Child's extraversion	0.0384	-0.0179	0.00574	
	(0.0519)	(0.0494)	(0.0465)	
Parents work hours X child's conscient.	0.000224	-0.000536	-0.000533	-0.00150
	(0.000696)	(0.000608)	(0.000605)	(0.00212)
Parents work hours X child's neuroticism	0.000980	0.000408	0.000471	0.00139
	(0.000726)	(0.000617)	(0.000623)	(0.00187)
Parents work hours X child's extraversion	0.000333	0.000939	0.000546	0.000807
	(0.000696)	(0.000648)	(0.000627)	(0.00277)
Observations	8,399	7,635	7,575	7,575

Table 3.10: Results for Parents Work Hours X Child's Personalities: English GPA

	(1) OLS No control Dep Var: English GPA	(2) OLS Add demographic Dep Var: English GPA	(3) OLS Add all Dep Var: English GPA	(4) Individual FE Add all Dep Var: English GPA
Included controls	No control	Add demographic	Add all	Add all
VARIABLES	Dep Var: English GPA	Dep Var: English GPA	Dep Var: English GPA	Dep Var: English GPA
Parents work hours	0.000526	-0.00263***	-0.00298***	-0.00163
	(0.000830)	(0.000801)	(0.000775)	(0.00235)
Child's conscient.	0.0180	0.0509	0.0542	
	(0.0411)	(0.0359)	(0.0347)	
Child's neuroticism	-0.0253	-0.0424	-0.0320	
	(0.0434)	(0.0368)	(0.0368)	
Child's extraversion	0.0541	0.0216	0.0290	
	(0.0426)	(0.0375)	(0.0386)	
Parents work hours X child's conscient.	0.000507	-7.99e-05	-0.000101	0.00126
	(0.000580)	(0.000532)	(0.000497)	(0.00141)
Parents work hours X child's neuroticism	0.000495	2.16e-05	-0.000159	-0.000619
	(0.000639)	(0.000531)	(0.000535)	(0.00172)
Parents work hours X child's extraversion	0.000471	0.000761	0.000366	0.000858
	(0.000608)	(0.000514)	(0.000504)	(0.00181)
Observations	9,330	8,461	8,396	8,396

Table 3.11: Results for Parents Work Hours X Child's Personalities: Science GPA

	(1) OLS No control Dep Var: Science GPA	(2) OLS Add demographic Dep Var: Science GPA	(3) OLS Add all Dep Var: Science GPA	(4) Individual FE Add all Dep Var: Science GPA
Included controls				
VARIABLES				
Parents work hours	0.00115	-0.000741	-0.00134	0.000276
	(0.00126)	(0.00112)	(0.00124)	(0.00283)
Child's conscient.	0.0754	0.121**	0.110**	
	(0.0615)	(0.0515)	(0.0506)	
Child's neuroticism	-0.0673	-0.0913*	-0.0825*	
	(0.0540)	(0.0499)	(0.0489)	
Child's extraversion	0.0540	0.0418	0.0422	
	(0.0497)	(0.0495)	(0.0477)	
Parents work hours X child's conscient.	-1.99e-05	-0.000691	-0.000552	-0.00174
	(0.000927)	(0.000789)	(0.000798)	(0.00247)
Parents work hours X child's neuroticism	0.000695	0.000532	0.000390	-0.00166
	(0.000796)	(0.000724)	(0.000718)	(0.00197)
Parents work hours X child's extraversion	0.000342	0.000462	0.000343	-0.00400*
	(0.000744)	(0.000743)	(0.000691)	(0.00208)
Observations	7,721	6,988	6,936	6,936

Table 3.12: Results for Parents Work Hours X Child's Personalities: All other lang GPA

	(1) OLS No control Dep Var: All other lang GPA	(2) OLS Add demographic Dep Var: All other lang GPA	(3) OLS Add all Dep Var: All other lang GPA	(4) Individual FE Add all Dep Var: All other lang GPA
Included controls				
VARIABLES				
Parents work hours	-0.00166	-0.00334**	-0.00441***	-0.000625
	(0.00150)	(0.00140)	(0.00146)	(0.00425)
Child's conscient.	-0.0295	0.00745	0.0300	
	(0.0824)	(0.0577)	(0.0651)	
Child's neuroticism	-0.0592	0.00703	0.00344	
	(0.0677)	(0.0604)	(0.0584)	
Child's extraversion	0.0682	0.0731	0.0503	
	(0.0864)	(0.0807)	(0.0820)	
Parents work hours X child's conscient.	0.00119	0.000496	0.000271	0.00290
	(0.00124)	(0.000925)	(0.000958)	(0.00308)
Parents work hours X child's neuroticism	0.000262	-0.00111	-0.00110	-0.000712
	(0.000934)	(0.000839)	(0.000839)	(0.00304)
Parents work hours X child's extraversion	-0.000409	-0.000272	5.71e-05	-0.00146
	(0.00123)	(0.00123)	(0.00122)	(0.00386)
Observations	4,629	4,257	4,228	4,228

Table 3.13: F tests of joint significance of the OLS interaction terms for mother and father work hours

Outcome Variable	P-value of joint significance of conscient. interactions	P-value of all interactions
Overall GPA	0.5982	0.5555
Math GPA	0.3891	0.5326
English GPA	0.9425	0.8976
Science GPA	0.7262	0.8259
All other lang. GPA	0.8670	0.1559

The second column indicates the join significance of mom work hours X child's conscientiousness and dad work hours X child's conscientiousness in column 3 of Table 3.3 through 3.7. The third column indicates the join significance of all the interaction terms of mom/dad work hours and all three personalities.

Table 3.14: F tests of joint significance of the individual FE interaction terms for mother and father work hours

Outcome Variable	P-value of joint significance of conscient. interactions	P-value of all interactions
Overall GPA	0.9526	0.6483
Math GPA	0.7394	0.8679
English GPA	0.6798	0.8627
Science GPA	0.6607	0.2140
All other lang. GPA	0.6871	0.7466

The second column indicates the join significance of mom work hours X child's conscientiousness and dad work hours X child's conscientiousness in column 4 of Table 3.3 through 3.7. The third column indicates the join significance of all the interaction terms of mom/dad work hours and all three personalities.

Table 3.15: F tests of joint significance of the OLS interaction terms for parents work hours

Outcome Variable	P-value of all interactions
Overall GPA	0.4294
Math GPA	0.4368
English GPA	0.8466
Science GPA	0.7743
All other lang. GPA	0.5237

The second column indicates the join significance of all the interaction terms of parents work hours and all three personalities in column 3 of Table 3.8 through 3.12.

Table 3.16: F tests of joint significance of the individual FE interaction terms for parents work hours

Outcome Variable	P-value of all interactions
Overall GPA	0.9639
Math GPA	0.7468
English GPA	0.6109
Science GPA	0.1786
All other lang. GPA	0.7917

The second column indicates the join significance of all the interaction terms of parents work hours and all three personalities in column 4 of Table 3.8 through 3.12.

APPENDIX A: MEASURES OF PERSONALITY TRAITS

Questions related to conscientiousness in Add Health wave I:

1. When you have a problem to solve, one of the first things you do is get as many facts about the problem as possible.

2. When you are attempting to find a solution to a problem, you usually try to think of as many different ways to approach the problem as possible.

3. When making decisions, you generally use a systematic method for judging and comparing alternatives.

4. After carrying out a solution to a problem, you usually try to analyze what went right and what went wrong.

Questions related to neuroticism in Add Health wave 1:

1. You have a lot of good qualities.

2. You have a lot to be proud of.

3. You like yourself just the way you are.

4. You feel like you are doing everything just about right.

5. You feel socially accepted.

6. You feel wanted and loved.

REFERENCES

Almlund, M., Duckworth, A. L., Heckman, J. J., and Kautz, T. D. (2011). Personality psychology and economics. Technical report, National Bureau of Economic Research.

Altonji, J. G., Elder, T. E., and Taber, C. R. (2000). Selection on observed and unobserved variables: Assessing the effectiveness of catholic schools. Technical report, National bureau of economic research.

Altonji, J. G., Elder, T. E., and Taber, C. R. (2005). Selection on observed and unobserved variables: Assessing the effectiveness of catholic schools. *Journal of Political Economy*, 113(1):151–184.

Anderson, P. M., Butcher, K. F., and Levine, P. B. (2003). Maternal employment and overweight children. *Journal of Health Economics*, 22(3):477–504.

Aughinbaugh, A. and Gittleman, M. (2004). Maternal employment and adolescent risky behavior. *Journal of Health Economics*, 23(4):815–838.

Baltes, B. B., Briggs, T. E., Huff, J. W., Wright, J. A., and Neuman, G. A. (1999). Flexible and compressed workweek schedules: A meta-analysis of their effects on work-related criteria. *Journal of Applied Psychology*, 84(4):496.

Bishop, J. (2011). The effect of maternal employment on youth overweight in australia. *Economic Record*, 87(s1):92–104.

Bloom, N., Liang, J., Roberts, J., and Ying, Z. J. (2015). Does working from home work? evidence from a chinese experiment. *The Quarterly Journal of Economics*, 130(1):165–218.

Bobo, J. K. and Husten, C. (2000). Sociocultural influences on smoking and drinking. *Alcohol Research and Health*, 24(4):225–232.

Borghans, L., Duckworth, A. L., Heckman, J. J., and Ter Weel, B. (2008). The economics and psychology of personality traits. *Journal of Human Resources*, 43(4):972–1059.

Cawley, J. and Liu, F. (2012). Maternal employment and childhood obesity: A search for mechanisms in time use data. *Economics & Human Biology*, 10(4):352–364.

Conti, G., Heckman, J. J., and Urzua, S. (2011). Early endowments, education, and health. *Unpublished manuscript, University of Chicago, Department of Economics.*

Courtemanche, C. (2009). Longer hours and larger waistlines? the relationship between work hours and obesity. In *Forum for Health Economics & Policy*, volume 12.

Courtemanche, C., Tchernis, R., and Zhou, X. (2017). Parental work hours and childhood obesity: Evidence using instrumental variables related to sibling school eligibility. Working Paper 23376, National Bureau of Economic Research.

Dustmann, C. and Schönberg, U. (2012). Expansions in maternity leave coverage and children's long-term outcomes. *American Economic Journal: Applied Economics*, 4(3):190–224.

Edwards, L. N. and Field-Hendrey, E. (2002). Home-based work and women?s labor force decisions. *Journal of Labor Economics*, 20(1):170–200.

Ermisch, J. and Francesconi, M. (2013). The effect of parental employment on child schooling. *Journal of Applied Econometrics*, 28(5):796–822.

Fairbairn, C. E., Sayette, M. A., Wright, A. G., Levine, J. M., Cohn, J. F., and Creswell, K. G. (2015). Extraversion and the rewarding effects of alcohol in a social context. *Journal of Abnormal Psychology*, 124(3):660.

Fertig, A., Glomm, G., and Tchernis, R. (2009). The connection between maternal employment and childhood obesity: Inspecting the mechanisms. *Review of Economics of the Household*, 7(3):227–255.

Fletcher, J. M. (2013). The effects of personality traits on adult labor market outcomes: Evidence from siblings. *Journal of Economic Behavior & Organization*, 89:122–135.

Gajendran, R. S. and Harrison, D. A. (2007). The good, the bad, and the unknown about telecommuting: meta-analysis of psychological mediators and individual consequences. *Journal of Applied Psychology*, 92(6):1524.

Golden, L. (2008). Limited access: Disparities in flexible work schedules and work-at-home. *Journal of Family and Economic Issues*, 29(1):86–109.

Heckman, J. J. (2007). The economics, technology, and neuroscience of human capability formation. *Proceedings of the National Academy of Sciences*, 104(33):13250–13255.

Heckman, J. J., Stixrud, J., and Urzua, S. (2006). The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior. *Journal of Labor economics*, 24(3):411–482.

Hillman, S. B. and Sawilowsky, S. S. (1991). Maternal employment and early adolescent substance use. *Adolescence*, 26(104):829.

Hillman, S. B., Sawilowsky, S. S., and Becker, M. J. (1993). Effects of maternal employment patterns on adolescents' substance use and other risk-taking behaviors. *Journal of Child and Family Studies*, 2(3):203–219.

Kwok, J. (2017). The effects of maternal employment on adolescent risky health behaviors: Does personality matter? *Unpublished manuscript, Georgia State University, Department of Economics.*

Lerner, J. V. and Noh, E. R. (2000). Maternal employment influences on early adolescent development: A contextual view. *Resilience across contexts: Family, work, culture, and community*, pages 121–145.

Littlefield, A. K. and Sher, K. J. (2010). The multiple, distinct ways that personality contributes to alcohol use disorders. *Social and Personality Psychology Compass*, 4(9):767–782.

Lundberg, S. (2013). The college type: Personality and educational inequality. *Journal of Labor Economics*, 31(3):421–441.

Madsen, S. R. (2003). The effects of home-based teleworking on work-family conflict. *Human Resource Development Quarterly*, 14(1):35–58.

Mateyka, P. J., Rapino, M., and Landivar, L. C. (2012). *Home-based workers in the United States: 2010*. US Department of Commerce, Economics and Statistics Administration, US Census Bureau.

Mendolia, S. (2016). Maternal working hours and the well-being of adolescent children: Evidence from british data. *Journal of Family and Economic Issues*, pages 1–15.

Morrissey, T. W., Dunifon, R. E., and Kalil, A. (2011). Maternal employment, work schedules, and childrens body mass index. *Child Development*, 82(1):66–81.

Oettinger, G. S. (2011). The incidence and wage consequences of home-based work in the united states, 1980–2000. *Journal of Human Resources*, 46(2):237–260.

Presser, H. B. and Bamberger, E. (1993). American women who work at home for pay: Distinctions and determinants. *Social Science Quarterly*, 74(4):815–837.

Rokicka, M. (2016). Do mothers and fathers work involvement matter for teenagers school outcomes? *British Educational Research Journal*, 42(1):117–134.

Romer, C. (2011). *Work-Life Balance and the Economics of Workplace Flexibility*. DIANE Publishing.

Ruhm, C. J. (2004). Parental employment and child cognitive development. *Journal of Human Resources*, 39(1):155–192.

Ruhm, C. J. (2008). Maternal employment and adolescent development. *Labour Economics*, 15(5):958–983.

Savelyev, P. A. (2014). Socioemotional skills, education, and longevity of high-ability individuals.

Schildberg-Hoerisch, H. (2011). Does parental employment affect children's educational attainment? *Economics of Education Review*, 30(6):1456–1467.

Terracciano, A. and Costa, P. T. (2004). Smoking and the five-factor model of personality. *Addiction*, 99(4):472–481.

Thomas, L. T. and Ganster, D. C. (1995). Impact of family-supportive work variables on work-family conflict and strain: a control perspective. *Journal of Applied Psychology*, 80(1):6.

Wight, V. R. and Raley, S. B. (2009). When home becomes work: Work and leisure patterns of home-based workers. *Social Indicators Research*, 93(1):197–202.

Young, J. K. and Beaujean, A. A. (2011). Measuring personality in wave i of the national longitudinal study of adolescent health. *Frontiers in Psychology*, 2.

VITA

Kwan Lun Julian Kwok was born in Hong Kong in 1985. He obtained a Bachelor of Science degree in Economics and Mathematics from the University of Wisconsin-Madison in 2008. In 2010, he obtained a Master of Arts degree in Economics from Boston University. He enrolled in the Ph.D. program at Georgia State University in 2011 and finished his Ph.D. degree in 2017.

Julian's main fields of interest are health economics and labor economics. He is also interested in behavioral economics. He worked as a graduate research assistant for Dr. Mary Beth Walker and was the sole instructor for the course of Principles of Microeconomics in Spring 2017. In Spring 2005, he also worked as an intern at ADP.

Julian has accepted a postdoctoral research associate position in the School of Public Health of Georgia State University.

PERMISSIONS NOTICE