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The Connection between Maternal Employment and Childhood Obesity: Inspecting the Mechanisms

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Abstract: This paper investigates the channels through which maternal employment affects childhood obesity. We use time diaries and interview responses from the Child Development Supplement of the Panel Study of Income Dynamics which combine information on children's time allocation and mother's labor force participation. Our empirical strategy involves estimating the effect of children's activities and meal routines on children's body mass index (BMI), estimating the effect of maternal employment on these activities and routines and then combining these two estimates. We find that the effect of activities on BMI and the effect of maternal employment on activities vary greatly by the mother's educational status. In particular, when mothers are highly educated, mother's employment significantly increases time spent watching TV, which in turn, significantly increases a child's BMI. In contrast, when mothers have little education, mother's employment significantly increases time spent in school, which in turn, significantly decreases a child's BMI. However, for both groups, higher levels of employment reduce the number of meals consumed per day by children, which increases their BMI.

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I. Introduction

Over the past several decades, obesity has swept across the US and other industrialized countries, affecting all age groups. The fraction of overweight children between the ages of six and eleven increased from 4 percent in the 1960s to 13 percent by 1999. The problem of childhood obesity has already triggered a federal policy response – a new law (Public Law 108 - 265) requires schools to have a local wellness program by the beginning of school year 2006-2007, which must address both nutritional and physical activity goals. The immediate cause of the increase in obesity is clear: calories taken in persistently exceed calories burned. The more fundamental reasons are less clear: why would so many people in these particular years choose to systematically take in more calories than they expend? According to Cutler, Glaeser, and Shapiro (2003) and Philipson and Posner (1999), technological progress is responsible for cheaper fattening foods and a more sedentary lifestyle, while Chou, Grossman and Saffer (2002) claim that a decrease in smoking and an increase in the availability of restaurants, especially fast food restaurants, is responsible.

Any potential explanation for the phenomenal increase in *childhood* obesity must also involve changes in parental behavior, lifestyle, or attitudes (Patrick and Nicklas 2005, Golan and Crow 2004, and Ebbeling et al. 2002). One important change over this period that has touched family life in many ways is the increase in employment among mothers. Recently a few papers have documented a positive relationship between maternal employment and the bodyweight of her children (Anderson, Butcher and Levine 2003, Ruhm 2004, Lamerz et al. 2005, and Liu et al. 2005). Interestingly, this connection seems to be especially pronounced for highly educated, rich, white families. Taking the connection between mothers' employment and childhood obesity as given, this paper aims to identify the mechanisms by which mothers' labor supply affects children's weight, and why the effect of maternal employment is more pronounced for children from higher socioeconomic backgrounds.

The overarching theoretical principle guiding the empirical investigation is the concept of a health production function for children, where child's health (measured by obesity) is the output and mother's time at home with the child is the input. Given a low level of maternal education, the child's health production function is depicted by locus L in Figure 1. Each additional hour of mother's time increases the child's health but there are diminishing returns to mother's time. The production function for a mother with a high level of education would lie above L because mothers with more schooling have superior information which allows the same input level to produce a better health outcome. However, it is not clear from economic theory whether the slope of the production function is affected by maternal education. Thus, the production function for a highly educated mother could look like H1, with the same shape as L, or could look like H2, where the slope is steeper at every input level. The steeper slope implies that children benefit more in terms of health from an additional hour of their mother's time if she is highly educated than if she is not at every input level.

Thus, we might expect the effect of mothers' employment on children's health, represented by the slope of the production function, to be different by mother's education for two reasons. First, mother's education may be related to the average input level. If highly educated mothers work more hours on average, then even if the production functions have the same shape – as depicted by L and H1 in Figure 1, highly educated mothers are going to be on a steeper portion of the curve (point B) than the average less educated mother (point A). Second, mother's education may increase the slope of the production function, as depicted by H2, such that given the same input level, highly educated mothers are on a steeper slope (point C) than less educated mothers (point A). In either case, we would observe that an additional hour worked by a highly educated mother will have a more detrimental effect on her child's health than an additional hour worked by a less educated mother.

Economic theory suggests that there are various channels through which maternal employment can influence childhood bodyweight. First, a working mother has less time available for the family. That means the mother has less time to cook and prepare meals. Working mothers may decide to cook fewer meals at home, opting instead for more restaurant meals, skipping some meals like breakfast, or preparing more ready to eat meals such as take out or delivered meals. Restaurant meals, especially from fast food restaurants, and ready to eat meals are more densely packed with calories that meals prepared at home. There is also evidence (Stauton and Keast (1989) and Morgan et al. (1986)) that skipping breakfast is associated with overall higher calorie consumption. Moreover, a low meal frequency may lead to higher concentration of 24 hour insulin, which, in turn, can lead to increased fat deposition and higher body weight (see Ma et al. 2003). This channel suggests that higher maternal employment results in higher children's bodyweight.

Similarly, working mothers have less time and energy available to supervise and participate in their children's activities. This may mean that children are more autonomous in choosing their own activities or that the children spend more time in the care of others – either in school or in child care. Since parents presumably care more about the future health of their children than do other caretakers or children themselves, this may result in more time in front of the television, less time in outside activities, and a greater quantity of unhealthy snacks. Anderson and Butcher (2004) argue that schools "have given students greater access to 'junk' foods and soda pop," and find that access to junk food in schools increases students' weight. On the other hand, other caretakers may be able to offer a more structured routine involving physical activities with other children and healthier snacks than parents might provide. Thus, it is not clear which effect a greater amount of time spent in school or in child care will have on a child's weight status.

Third, increased hours worked by the mother results in higher household income. There is a large empirical literature which finds a negative relationship between obesity and socioeconomic status (e.g. Gordon-Larsen et al. 2003, Zhang and Wang 2004a, 2004b). The reasons for this linkage are debatable. Higher disposable income may allow households to provide better quality food or enroll children in organized activities which would reduce children's weight. However, the linkage might be entirely due to selection; people with low discount rates invest in education, which brings them higher earnings, and invest in their health, which keeps their weight in the normal range. While income in general is believed to have a negative effect on obesity, higher household income results in more restaurant meals, if restaurant meals are normal goods, and hence higher bodyweight for reasons elaborated above. Thus, economic theory does not unambiguously predict whether this channel results in higher or lower bodyweight for children.

Finally, we expect that currently working mothers returned to work sooner after birth and thus were less able to breastfeed or stopped breastfeeding at earlier ages. There is evidence that bottle fed infants are more likely to be overweight as children and adults than breastfed infants (Lucas et al. 1980, 1981). Thus, it may be that a mother's average work hours are correlated with her child's BMI because they are a good indicator of the probability that her child was bottle fed.

To quantify the importance of the various channels through which maternal employment may affect children's body weight, we use the Child Development Supplement (CDS) of the Panel Study of Income Dynamics (PSID). The CDS is well suited for this analysis because it includes the height and weight of the child, time diaries of the child's activities during one weekday and one weekend day, and a great deal of information about the child's household through the linkage with the main PSID survey.

The data and sample are described in section 2. There we also replicate the empirical finding that maternal employment has a positive and significant effect on children's BMI which is stronger for highly educated mothers using the PSID. In section 3, we detail our empirical strategy, which involves estimating two sets of equations; first, we estimate the effect of children's activities and meal routines on children's body max index (BMI); second, we estimate the effect of maternal employment on these activities and routines. Third, we combine these two estimates. We present our results in section 4. We find that the effect of activities on BMI and the effect of maternal employment on activities vary greatly by the mother's educational status. In particular, among highly educated mother families, mother's employment significantly increases time spent watching TV, which in turn, significantly increases a child's BMI. On the other hand, if the mother has no more than a high school diploma, mother's employment significantly increases the amount of time a child spends in school, which in turn, significantly *decreases* a child's BMI. However, for both education groups maternal employment decreases the number of meals consumed by children which in turn increases their weight. Finally, we offer a summary and conclusion in section 5.

II. The Data

The data used in this study come from the Child Development Supplement (CDS) of the Panel Study of Income Dynamics (PSID). The PSID has followed approximately 5,000 families since 1968. This original sample includes an equal probability, nationally representative sample of about 3,000 households called the Survey Research Center (SRC) sample, and a sample of about 2,000 low-income families called the Survey of Economic Opportunity (SEO) sample. Over time, the study has added the 'split-off' households of children and other members of the original PSID households after they leave and start their own families, such that in 1996 there were over 8,700 families involved in the survey.

Currently, the CDS consists of two waves. The first wave involves a sample of approximately 3,500 children under the age of thirteen who are members of PSID families in 1997. Because the sample of children is drawn from both the SRC and the SEO samples, the children's sample has unequal selection probabilities. The second wave involves re-interviewing about 2,900 children in 2002, when they were between the ages of 5 and 17. In this analysis, we use approximately 3,400 observations of 2,500 children from 1,100 PSID families. We have two observations on many children and there are some siblings as the CDS included at most two children from a family. Of the approximately 3,000 observations (3,500 + 2,900 – 3,400 = 3,000) that we omit, 700 are of children under the age of 3 at the first interview; the remainder are omitted because of missing information on height, weight, or mother's work hours, or there was no complete time diary for the child in a given wave.

Table 1 presents some descriptive statistics by mother's education. The primary variables of interest in this analysis are whether the child is overweight. The conventional basis for determining whether a child is overweight is the child's body mass index. BMI is calculated as weight in kilograms divided by height in meters squared (kg/m^2). The Centers for Disease Control (CDC) has produced a chart of percentiles describing the BMI distribution by the age (in months) and sex of children based on early waves (from the 1960s, 70s, and 80s) of the nationally representative National Health and Nutrition Examination Survey (NHANES).

Following the CDC and others (Anderson, Butcher, and Levine 2003), we define children to be overweight if the child's BMI is above the 95th percentile for their age and sex. Because of the growing numbers of overweight children, more than 5 percent of children are classified as overweight in our sample measured in 1997 and 2002: the percentage of children overweight is 22.5 among less educated mothers and 19.6 among highly educated mothers. Correspondingly, the average BMI of the children is 0.63 higher (= 20.34 – 19.71) in households with less educated mothers compared to highly educated mothers. In addition, we compute in what percentile of BMI distribution each child is located using 2000 CDC growth charts, which are computed for age and gender cells.

The other key variables in this study are the hours per week worked by the mother. On average, less educated mothers worked 15 hours per week over the child's life while highly educated mothers worked over 19 hours per week on average. Consistent with this, the fraction of mothers who have never worked during this child's life is twice as high for less educated mothers (12.1% vs. 6.3%).

The remainder of Table 1 describes the sample with a list of our main demographic controls. On average, children were just under 10 years old. Because the CDS draws from both the SRC and the SEO samples, there are a large proportion of black families – over 44 percent of children with less educated mothers are black and over 30 percent of children with highly educated mothers are black. On the other hand, the Hispanic sample is disproportionately small because of the design of the PSID. The Latino sample added to the PSID in 1990 was dropped in 1995 and a new immigrant sample was added in 1997. The CDS includes about 250 immigrant children from this new sample, some of which are Hispanic.

Of particular importance to this analysis, we can calculate the mother's BMI from the main household interview which asks the height and weight of the head of the household and the wife. These questions are only available in the 1986, 1999, 2001, and 2003 interviews. We use the mother's BMI in 1999 for the 1997 CDS wave and her BMI in 2001 for the 2002 CDS wave. The definition for obesity among adults accepted by the CDC is a BMI above 30. In our sample, nearly 29 percent of less educated mothers are obese while almost 19 percent of highly educated mothers are obese. The difference in father's BMI between the two groups is less pronounced.

A. Replication

Before describing the time diaries which allow us to investigate the mechanisms by which mother's employment can affect a child's BMI, we want to confirm that the empirical relationship between mother's employment and child's BMI exists in the PSID. The previous studies by Anderson, Butcher, and Levine (2003), Ruhm (2004), and Liu, Hsia, and Chou (2005) used the NLSY, while Lamerz et al. (2005) used German data. We replicate the previous analysis using PSID data in Table 2. For comparison, we construct control variables similar to those used by Anderson, Butcher, and Levine (2003). We find that, in the full sample, mother's work hours are positively correlated with the probability that the child is overweight. In addition, consistent with Anderson, Butcher, and Levine (2003), Ruhm (2004), and Lamerz et al. (2005), the effect of maternal employment is greater for more advantaged children (those with a highly educated mother). Thus, this relationship appears to exist across several data sources.

B. Time Diaries

The time diaries are a unique feature of this data. The primary caregiver or the child was asked to write down what the child was doing at every point in time over two days – one weekday and one weekend day. We have taken this information and categorized the child's time into six types of activities: sleeping, eating, attending school, being baby-sat, and participating in activities: TV watching, playing indoor games, socializing, shopping, traveling, playing on the computer or with video games, doing homework, and other miscellaneous passive activities, e.g. reading and interacting with others, playing sports, doing chores around the house, taking lessons (in dance, golf, etc.), and working at a part-time job.

Since a child can be engaged in multiple activities simultaneously, the time diary permits two activities to be assigned to any given time – a primary and a secondary activity. For example, a child could be watching television while being in daycare. Either one of these could be listed as the primary or secondary activities. We use all of the available information and, as a result the total number of hours accounted for over the two days is greater than 48 hours.

Table 3 provides the number of hours that a child spends on these activities by the child's age and mother's education status during the two time diary days. By far, sleeping takes the most amount of time. Children spend similar amounts of time in school and watching TV, the two most time consuming activities aside from miscellaneous passive activities, an aggregate category comprised of time spent watching others do activities, listening, personal care, hobbies like photography, singing, reading, and having conversations..

One potential problem for our analysis is the possibility that the data quality of the time diary entries may be worse for mothers who work. That is, mothers who work may know less about their child's activities and thus report those activities with more measurement error. It is true that children are more likely to fill out the diary themselves if their mother works more hours. However, on average, the children of mothers who work long hours are older and age of the child is the strongest predictor of how involved the child was in filling out the diary. This measurement error argument assumes that the mother is a more accurate reporter of their children's activities than the children themselves. However, mothers are more likely to be influenced by social norms in their responses than children, so one could make the argument that measurement error is smaller when children report their own activities. In any case, we argue that any bias from this type of measurement error is negligible because when we control for whether the mother filled out the diary without the child's help, the results presented in this paper are unchanged.

Finally, this data also provide a few diet-related aspects of the household. These are shown in Table 4. We know from the time diary whether meals take place in a restaurant or at home. However, we cannot distinguish whether the meal eaten at home is from a restaurant (like take-out or delivery pizza). On average, fewer than 6 meals were eaten over the two days, and less than one was eaten in a restaurant. We are also interested in breastfeeding and allowances which can be affected by maternal employment and may impact a child's nutritional intake. These variables are available from the CDS parent interview. Highly educated mothers are almost twice as likely to have breastfed but are a little less likely to give an allowance to their child.

III. The Empirical Strategy

The goal of this paper is to investigate the channels through which maternal employment affects children's BMI. We assume that maternal employment affects the number and composition of meals and the nature of her children's activities, which influence calorie intake and expenditure, thereby affecting the child's BMI. Thus, our empirical strategy consists of estimating two equations. First, we estimate the direct effects of number and type of meals (calorie intake) and activities (calorie expenditure) on BMI. Then, we estimate the effects of maternal employment on these direct determinants of body weight.

Let the BMI of child *i* be a linear function of the direct determinants of body weight. For simplicity, we will use two examples of these direct determinants in this discussion: the number of meals in an average day (*NM*) and the number of hours watching TV in an average day (*TV*). Let *X* represent characteristics of the child and family related to both maternal employment and the child's body weight which confound the relationship of interest. For example, we control for the child's age because BMI changes with age and mothers of older children are more likely to work. We control for race because black and Hispanic children are more likely to be overweight and black and Hispanic mothers may be less likely to work because they face a tougher job market than white mothers. We then estimate a series of equations of the following form:

$$ln\ BMI_i = \alpha_0 + \alpha_{NM} NM_i + \alpha_3 X_i + \varepsilon_i\,, \tag{1}$$

$$ln\ BMI_i = \beta_0 + \beta_{TV} TV_i + \beta_3 X_i + \mu_i\,, \tag{2}$$

where ε_i and μ_i are idiosyncratic error terms with mean zero. We estimate each of these equations separately, instead of running one regression with all of the time allocations and routines, to avoid multi-collinearity. The time allocations do not add up to 48 hours because of double counting, but they necessarily range between 100 and 200 percent of the child's time.

Both the number of meals and the duration of TV watching depend on the number of hours the mother works (*MWH*) as follows:

$$NM_i = \gamma_0 + \gamma_{NM} ln\ MWH_i + \gamma_2 X_i + u_i \tag{3}$$

$$TV_i = \delta_0 + \delta_{TV} ln\ MWH_i + \delta_2 X_i + v_i, \tag{4}$$

where u_i and v_i are idiosyncratic error terms with mean zero. Based on the model above the full effect of maternal employment on a child's BMI is equal to:

$$\frac{\partial \ln BMI}{\partial \ln MWH} = \frac{\partial \ln BMI}{\partial NM}\frac{\partial NM}{\partial \ln MWH} + \frac{\partial \ln BMI}{\partial TV}\frac{\partial TV}{\partial \ln MWH} = \alpha_{NM}\gamma_{NM} + \beta_{TV}\delta_{TV}.$$

Of particular interest to this study, we can separate the effect of maternal employment on a child's BMI by channel to assess the relative importance of the various channels proposed. Thus $\alpha_{NM}\gamma_{NM}$ is the part of the effect attributable to a change in the number of meals and $\beta_{TV}\delta_{TV}$ is the part of the effect attributable to a change in the amount of TV watching that results when mothers work more.

We estimate equations (1), (2), and (4) using ordinary least squares (OLS). Because NM_i is a non-negative count variable, we estimate equation (3) using a Poisson maximum likelihood regression. We use this technique instead of the more common ordered logit or probit because we need a marginal effect in order to combine coefficients to get the effect of maternal employment on a child's BMI. For dichotomous dependent variables, we compute marginal effects from a probit regression.

The goal is to estimate a set of elasticities of a child's BMI with respect to mother's work hours, one for each channel. These elasticities are computed by multiplying the appropriate coefficients from two regressions—equations (1) and (3), for example. Computing the standard error on this elasticity is not trivial because there is covariance between the estimators from equations (1) and (3). To deal with this issue, we "stack" our two equations and estimate them using seemingly unrelated estimation. That is, we stack the data needed for equation (1) on top of the data needed for equation (3) such that the dependent variable for the first half of the data is $\ln BMI_i$ and is NM_i in the second half of the data. Then, we can compute a standard error on a non-linear combination of coefficients from this one regression on stacked data, and it fully accounts for the correlation between the error terms across the two equations.

IV. Results

A. The effect of calorie intake and expenditure on a child's BMI

Table 5 presents the results of regressing the child's log BMI on variables that capture the child's calorie intake and expenditure, as expressed in equation (1) above. We also estimate the effect of activities on BMI percentiles, as well as the probability of being overweight, using the 95th percentile on the CDC's distribution of children's BMI before the 1990s.

The variables of interest in this regression are the number of meals, the fraction of meals in a restaurant, whether the child was breastfed, whether the child receives an allowance, and the time allocations of the child. Each cell in the table provides a coefficient from a separate regression. We report our results for the full sample and also for the cases when the sample is broken down by mother's education. In all the regressions we control for child's age, gender, race, number of children in the family, whether the child is first born, birth weight, mother's age at the child's birth, education, marital status, obesity status, family income, father's work hours since the child's birth, geographic location and the year of the interview.

Our results on the correlation of the time allocations with BMI and the probability of being overweight reveal some interesting patterns. While the number of meals eaten over the two observed days and having been breastfed are significantly and negatively related to BMI, as predicted, the fraction of meals in a restaurant and whether the child received an allowance are not. We expected that restaurant meals, which we assume to be more calorie-dense, would increase the probability of being overweight. However, we cannot distinguish between fast food and conventional restaurants in our data, thus it may be that families that go to restaurants often go to healthy restaurants. We predicted that allowances, with which the child could buy junk food, would also increase a child's BMI.

More time spent sleeping and eating are negatively related to children's weight. The sleep effect is consistent with the literature (Gangwisch et al., 2005) which finds that sleep deprivation is associated with the risk of obesity. The effect of time spent eating is related to the effect of the number of meals on BMI and could possibly be the effect of fast food consumption, which both takes little time and is dense in fat and calories. We had argued that time spent in the care of others might be positively or negatively related to children's weight and we find here that both time in school and child care are both negatively related to BMI and the probability of being overweight.

In the full sample, the time spent watching TV is positively and significantly associated with all three measures of BMI. This result is consistent with Proctor et al. (2003) and Hancox et al. (2004). Other passive activities like shopping are also positively and significantly correlated with BMI, although with much smaller levels of significance. We were surprised to find that several activities which we had classified as passive were negatively related to the child's weight – miscellaneous passive activities, playing indoors, and doing homework. Time spent on miscellaneous passive activities, and doing homework may be indicators of a child's involvement in school and social activities. Thus, there may be some reverse causality at work – that is, this result may be capturing the possibility that children who are normal weight are more active socially and in school. The negative effect of playing indoors may have a different explanation. The effect is confined to less educated mother families and to children over the age 10. It is also the case that these older children who spend a lot of time playing indoors are more likely to live in urban areas where playing outdoors might be hazardous due to traffic or other safety concerns. Playing indoors comes at the expense of other passive activities but not sports. Thus, we interpret this finding to reflect parents finding a way for children to be active indoors.

Playing sports, which we expected to have a negative effect on BMI, is indeed negative correlated with BMI, but mostly for mothers with 12 years of schooling or less. Because the time playing sports is outside of school time, this result is not inconsistent with Cawley, Meyerhoefer, and Newhouse (2005) who find that an increase in mandated time for physical activity in school does not have a significant impact on children's BMI. We were surprised to see that doing chores appears to significantly increase the probability of being overweight, given that these could be more physical activities like mowing the lawn and walking the dog. The strong positive effect of doing chores on both log BMI and the probability of being overweight is significant only among children with less educated mothers. We find that children who do a lot of chores spend less time socializing, playing sports, and working. Thus, it may be the case that reverse causality plays a role in this case also. That is, it could be the case that overweight children have less of a social life and, hence, spend more time at home helping adults. Alternatively, parents of overweight children may assign them more chores as a way of forcing them to perform more physical activities.

Finally, it is interesting to note the striking difference between the results by mother's education. The effects of breastfeeding, time in school, playing indoor games, shopping, sports, and doing chores are only significant for less educated mothers. On the other hand, the effects of the number of meals, sleeping, eating, being in child care, watching TV, and doing homework are only significant for highly educated mothers.

B. Estimating the effect of maternal employment on calorie intake and expenditure

The second part of our empirical strategy is to estimate the effect of maternal employment on the variables we have chosen to capture calorie intake and expenditure. Table 6 presents the results of running regressions of the form expressed by equations (3) and (4) above.

Each cell in the table contains the marginal effect from a separate regression of our independent variable of interest – the log of the average number of hours worked per week by the mother since the birth of the child – on the calorie intake or expenditure variable listed in the left-most column of the table. That is, the coefficient in the top left-hand cell, -0.028, indicates that, for the full sample of mothers, the marginal effect of mother's work on the number of meals for the full sample is negative and significant. We report our results for the full sample and for sub-samples by mother's education. Probit regressions were used to estimate the effect of maternal employment on breastfeeding and receiving allowance, and Poisson regression for the number of meals; the rest were estimated using OLS. We control for the same set of variables list above.

We find that mother's employment has a wide variety of effects in the full sample (first column). However, just as in the previous section, the effects vary substantially by the mother's education. In particular, of the ten left-hand side variables that have a significant coefficient in any column, only three are significant for both less educated and highly educated mothers – the negative effect on the number of meals, the positive effect on the time spent in child care and the negative effect on miscellaneous passive activities.

The other effects differ by mother's education. Children with less educated mothers who work more hours spend more time in school, traveling/commuting, and doing chores, and less time playing indoor games. On the other hand, children of highly educated mothers who work more consume more restaurant meals and watch more TV.

Given the time and energy constraints of all working mothers, most of these effects are expected and reasonable. The only effect that may need interpreting is the effect on children's work. We suggest that mother's who work more value work and may want their children to acquire that value by earning their own money while young. Naturally, this effect only kicks in for older children.

C. How does maternal employment affect childhood obesity?

Finally, we can put the coefficients from Tables 5 and 6 together to determine the relative importance of the various mechanisms we have considered in this analysis. We present these combined coefficients in Table 7. The first and second columns of each sample are taken from Tables 5 and 6. The coefficients in the third column of each sample are computed by multiplying the coefficients in the two previous columns; the standard error on this term is estimated by seemingly unrelated regression as described in a section above. The coefficients in the forth column are computed using a similar procedure with BMI percentile being the dependent variable in the first stage.

We find that the number of meals is the most persistent mechanism through which maternal employment affects child's BMI – although the elasticity is small, it is significant for both education groups (the p-value for the less educated mothers is 15%) as well as the full sample.

The most pronounced effect of maternal employment on BMI for less educated mothers is through the increased time their children spend in school. For more educated mothers, the largest effect is through the time their children spend watching TV – the more mothers work, the longer their children spend in front of the TV, which, in turn, increases their BMI. In addition, children of more educated mothers who work more spend more time in child care, which reduces their BMI – this effect is more pronounced for BMI percentiles (the p-value for log BMI is 15%).

However, the effects in all cases are very small. If a less educated mother doubles her work hours from 15 hours per week – the average for the sample – to 30 hours per week, her child’s BMI would fall by less than 1 percent because of increased time in school. Likewise, if a highly educated mother doubles her work hours from the average of almost 20 to 40 hours per week, her child’s BMI would increase by less than 1 percent because of increased time in front of the TV.

Our findings suggest that maternal employment affects a child’s BMI in two ways: 1) there is a nutritional effect – children of mothers who work longer hours have fewer meals, and either eat bigger portions or substitute snacks in between meals (this effect is similar for both education groups); and 2) there is a supervision effect – with less maternal supervision, children of highly educated mothers watch more TV which might be accompanied by the consumption of foods high in calories, while children of less educated mothers stay longer at school taking part in activities which reduce their BMI.

In Tables 6 and 7 we used average mother's working hours over the child's life. In Table 8 we replicate our analysis using mother's working hours over the last two years instead. The results are quiet similar with the only difference being that the effect of TV time becomes insignificant. A possible explanation is that a habit formation of TV watching and its effect on BMI take longer time to develop.

V. Conclusions

In this paper, we have replicated the empirical connection found in the NLSY between mother’s employment and childhood BMI/obesity for the PSID. We then inspect the mechanisms which connect hours worked by the mother to BMI/obesity of the child. In the first stage of our analysis, we find that the usual suspects, like being bottle fed, a small number of meals, and much time in front of the TV are positively correlated with bodyweight and that playing sports in negatively correlated with bodyweight (at least for less educated mothers). At the second stage, we find that the number of meals is negatively correlated with mother's work, while TV watching, for example, is positively correlated with mother's work. The results from these two steps taken separately provide some evidence that mother's employment has influenced childhood body weight. Combining these results, as we do in table 7, reveals that this effect is not of great significance economically.

Two important limitations of this study are the small sample size and the lack of detail available about meals. A larger sample would allow us to disaggregate by child's age which would sharpen the analysis since the activities of 3 year-olds are quite different from the activities of teenagers and the effects of maternal employment on childhood obesity are likely age specific. Despite the small sample sizes, we did find some evidence that maternal work hours only affect the time spent sleeping when the child is very young and only affect TV watching which the child is over age 9.

We believe that a possible reason that we do not get stronger results on restaurant meals, as opposed to meals at home, for example, is that we do not have information on take out meals. The pizza delivered from the hut to the home and eaten at home is as fattening as the pizza eaten in the hut. In our data set we can also not distinguish between a meal at a fast food restaurant and a salad in a conventional restaurant. We suspect that families who frequently eat greasy pizzas and fatty burgers in restaurants also use more fatty and calorie rich foods in meals that are cooked at home. Answering the question of how mother's employment affects childhood obesity via the channel of the number and variety of meals cooked probably requires a much more detailed data set.

Because of these limitations, we believe it would be premature to conclude that the majority of the mechanisms evaluated in this analysis are not relevant based on the results of this single study. Prior to making this conclusion, it is necessary to replicate these findings with other data and research strategies.

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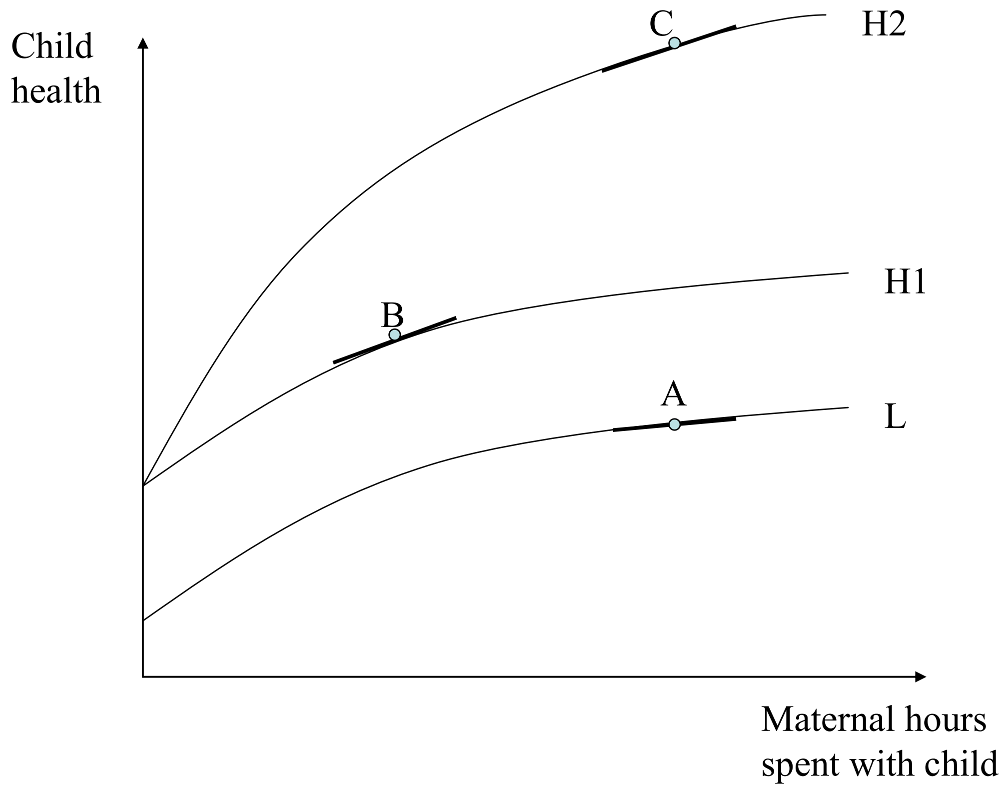

Figure 1. Maternal Education and Child's Health Production

Table 1: Descriptive Statistics by Mother's Education

	Mother's Ed ≤ 12 years		Mother's Ed > 12 years	
	Mean	N	Mean	N
Overweight (BMI>95th percentile for age & sex)	22.5%	1798	19.6%	1583
BMI of children	20.34	1798	19.71	1583
BMI Percentile of children*	64.5	1798	63.0	1583
Hours per week worked by mother over child's life	15.21	1798	19.34	1583
Mother never worked during child's life	12.1%	1798	6.3%	1583
Age of child	9.76	1798	9.51	1583
Black	44.5%	1796	31.4%	1578
Hispanic	10.7%	1796	2.4%	1578
Female	51.2%	1798	47.5%	1583
First born child	43.2%	1798	58.7%	1583
Birth weight (pounds)	7.18	1778	7.47	1569
Number of children in household	2.40	1798	2.23	1583
Age of mother at child's birth	25.52	1684	28.70	1570
Education of mother in 1997 (years)	10.54	1798	14.79	1583
Mother is obese (BMI>30)	27.5%	1755	19.5%	1561
Father is obese (BMI>30)	23.4%	1444	18.4%	1419
Parents always married over child's life	46.7%	1798	69.5%	1583
Annual labor income over child's life	$26	1442	$51	1404
Northeast	10.3%	1798	18.4%	1580
North Central	22.3%	1798	24.1%	1580
South	46.1%	1798	39.8%	1580
West	21.4%	1798	17.8%	1580
Urban	52.3%	1616	58.8%	1482

*Percentiles based on 2000 CDC Growth Charts by gender and child's age in months.

Table 2: Replication of result that mother's employment affects probability of being overweight
Dependent Variable: Overweight

Sample:	Full Sample	Mother's Ed ≤ 12	Mother's Ed > 12
Log hours/week worked by mother over child's life	0.016**	0.007	0.021*
	(0.006)	(0.009)	(0.010)
Child's Age	-0.016+	-0.013	-0.018
	(0.008)	(0.012)	(0.012)
Child's Age Squared	0.000	0.000	0.000
	(0.000)	(0.001)	(0.001)
Black	0.061**	0.046+	0.081*
	(0.020)	(0.028)	(0.032)
Hispanic	0.148**	0.176**	0.157*
	(0.038)	(0.051)	(0.064)
Female	-0.047**	-0.038*	-0.047*
	(0.013)	(0.019)	(0.019)
First born child	0.016	0.012	0.016
	(0.015)	(0.021)	(0.022)
Birth weight (pounds)	0.017**	0.017*	0.020**
	(0.005)	(0.008)	(0.008)
Number of children in household	-0.011	-0.011	-0.006
	(0.007)	(0.010)	(0.012)
Age of mother at birth	0.002	0.002	0.003
	(0.001)	(0.002)	(0.002)
Education of mother in 1997 (years)	-0.004	-0.000	-0.021*
	(0.003)	(0.005)	(0.009)
Mother is obese (BMI>30)	0.144**	0.112**	0.175**
	(0.019)	(0.026)	(0.031)
Breastfed	-0.041*	-0.049*	-0.025
	(0.016)	(0.022)	(0.024)
Fraction of child's life parents married	-0.031	-0.000	-0.093*
	(0.025)	(0.033)	(0.040)
Log labor income/1000 over child's life	-0.008	-0.002	0.006
	(0.010)	(0.014)	(0.015)
Log hours/week worked by father over child's life	-0.008	-0.012	-0.010
	(0.010)	(0.014)	(0.017)
Northeast	-0.026	-0.024	-0.017
	(0.022)	(0.034)	(0.029)
North Central	-0.013	-0.031	0.000
	(0.019)	(0.026)	(0.028)
West	-0.031	-0.034	-0.030
	(0.021)	(0.030)	(0.030)
Urban	-0.023	-0.047*	0.003
	(0.016)	(0.022)	(0.021)
2002 interview	0.065**	0.065**	0.069**
	(0.015)	(0.021)	(0.022)
Observations	4419	2267	1954

Robust standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%

Table 3: Average Time Use Over 2 Days by mother's education and child's age (in hours)

	Mother's Ed ≤ 12 years		Mother's Ed > 12 years	
	Child's Age<10	Child's Age≥10	Child's Age<10	Child's Age≥10
Sleeping	22.1	20.4	21.7	19.8
Misc. passive activities*	9.8	11.1	10.3	11.2
TV watching	5.3	5.8	4.5	5.3
Attending school	5.3	5.5	5.1	5.9
Eating	3.1	2.9	3.1	2.9
Playing indoor games	2.9	0.8	3.1	0.8
Sports	2.7	2.1	2.5	1.9
Socializing	1.6	1.8	1.8	2.0
Traveling	1.3	1.5	1.5	1.8
Shopping	1.0	1.1	1.2	1.0
Chores	0.8	1.2	0.9	1.1
Computer/Video games	0.8	1.7	0.8	1.8
In child care	0.8	0.1	0.9	0.1
Homework	0.5	0.9	0.5	1.4
Lessons	0.0	0.0	0.1	0.0
Work	0.0	0.6	0.0	0.6
Total**	58.1	57.3	58.0	57.6
Observations	865	933	810	773

*Misc passive activities include a large variety of activities including watching others do activities, listening, personal care, hobbies like photography, singing, reading, and having conversations.

**Total is greater than 48 hours because at any given time, two activities can be reported.

Table 4: Determinants of Diet by Mother's Education

	Mother's Ed ≤ 12 years		Mother's Ed > 12 years	
	Child's Age<10	Child's Age≥10	Child's Age<10	Child's Age≥10
Total number of meals	5.8	4.8	6.3	5.1
Percent of meals at home	90.2%	87.4%	87.9%	84.3%
Percent of meals in a restaurant	9.8%	12.0%	11.9%	14.8%
Child breastfed as infant	36.4%	34.5%	61.6%	56.0%
Percent with an allowance (age>5)	61.2%	59.8%	57.1%	51.7%
Observations	865	933	810	773

Table 5: What affects BMI and the probability of being overweight?

Sample:	Full Sample			Mother's Ed ≤ 12			Mother's Ed > 12		
Dependent Variable:	Ln BMI	BMI Ptile	Overwt	Ln BMI	BMI Ptile	Overwt	Ln BMI	BMI Ptile	Overwt
Number of meals	-0.006**	-0.816**	-0.005	-0.004	-0.471	0.001	-0.006*	-0.776+	-0.006
	(0.002)	(0.283)	(0.004)	(0.003)	(0.405)	(0.006)	(0.003)	(0.430)	(0.005)
% meals in restaurant	0.042	5.604+	0.049	0.039	2.497	0.034	0.025	7.731+	0.031
	(0.025)	(3.279)	(0.043)	(0.041)	(4.904)	(0.061)	(0.032)	(4.485)	(0.064)
Breastfed	-0.015	-2.083	-0.032+	-0.026+	-4.448*	-0.050+	-0.005	0.478	-0.012
	(0.010)	(1.470)	(0.019)	(0.016)	(2.110)	(0.027)	(0.015)	(2.192)	(0.026)
Receives allowance	-0.006	-0.200	-0.002	-0.004	-0.382	0.017	-0.008	-0.051	-0.018
	(0.010)	(1.296)	(0.017)	(0.016)	(1.937)	(0.027)	(0.012)	(1.794)	(0.023)
<u>Fraction of time spent</u>									
sleeping	-0.070	-4.019	-0.170	0.016	6.560	-0.070	-0.216+	-19.582	-0.384
	(0.075)	(10.239)	(0.133)	(0.104)	(13.718)	(0.181)	(0.121)	(16.530)	(0.234)
misc. passive activities	-0.074+	-10.221+	-0.145*	-0.071	-12.600	-0.164+	-0.055	-2.675	-0.087
	(0.039)	(5.452)	(0.069)	(0.060)	(7.867)	(0.098)	(0.054)	(8.076)	(0.101)
watching TV	0.134+	15.168+	0.199+	0.047	9.156	0.051	0.229*	16.449	0.339*
	(0.069)	(8.912)	(0.112)	(0.093)	(12.669)	(0.153)	(0.108)	(13.113)	(0.167)
attending school	-0.077	-5.430	-0.017	-0.216*	-25.385+	-0.085	0.046	9.056	0.014
	(0.070)	(10.025)	(0.130)	(0.106)	(14.314)	(0.194)	(0.093)	(14.631)	(0.175)
eating	-0.180+	-19.042	-0.230	-0.050	-3.710	-0.039	-0.357*	-41.640	-0.614+
	(0.107)	(15.443)	(0.207)	(0.158)	(21.371)	(0.284)	(0.162)	(25.985)	(0.318)
playing indoor games	-0.109	-9.828	-0.172	-0.243+	-18.086	-0.320	-0.037	-6.851	-0.166
	(0.095)	(12.940)	(0.167)	(0.135)	(17.110)	(0.236)	(0.135)	(20.412)	(0.240)
playing sports	-0.138+	-1.942	-0.011	-0.234*	-20.436	-0.161	-0.076	17.214	-0.007
	(0.083)	(11.868)	(0.161)	(0.117)	(16.231)	(0.220)	(0.118)	(17.677)	(0.247)
socializing	-0.104	-13.082	-0.089	-0.139	-22.012	0.019	-0.060	1.236	-0.196
	(0.082)	(12.727)	(0.146)	(0.132)	(20.146)	(0.214)	(0.095)	(14.436)	(0.208)
traveling	-0.143	-15.339	-0.377	-0.439	-61.984	-0.543	-0.043	4.479	-0.353
	(0.175)	(24.790)	(0.320)	(0.289)	(38.969)	(0.511)	(0.218)	(32.230)	(0.423)
shopping	0.236+	20.972	0.284	0.368+	25.159	0.556+	0.044	11.061	-0.119
	(0.130)	(17.204)	(0.212)	(0.204)	(24.699)	(0.301)	(0.161)	(22.567)	(0.303)
doing chores	0.317*	22.056	0.416	0.474*	35.634	0.679+	0.212	22.114	0.236
	(0.159)	(19.775)	(0.280)	(0.232)	(27.872)	(0.354)	(0.205)	(28.566)	(0.424)
computer/video games	-0.111	-4.476	-0.126	-0.008	10.423	-0.170	-0.116	-12.611	0.110
	(0.097)	(12.795)	(0.167)	(0.141)	(17.725)	(0.203)	(0.134)	(19.336)	(0.267)
in child care	0.122	-24.815	-0.153	0.512	13.490	0.161	-0.265	-57.946+	-0.643*
	(0.254)	(25.550)	(0.286)	(0.478)	(39.216)	(0.460)	(0.175)	(32.223)	(0.328)
doing homework	-0.289+	-42.901*	-0.143	-0.174	6.381	0.288	-0.346*	-66.438**	-0.334
	(0.160)	(20.716)	(0.277)	(0.333)	(37.427)	(0.491)	(0.176)	(25.494)	(0.361)
taking lessons	-0.056	5.366	-1.008	-0.330	-93.142	-1.121	0.356	188.704	-0.590
	(0.454)	(69.584)	(1.228)	(0.635)	(102.822)	(1.805)	(0.741)	(115.133)	(1.760)
working	0.155	4.505	0.291	0.102	18.342	0.014	0.193	-9.918	0.566+
	(0.151)	(15.948)	(0.230)	(0.227)	(21.373)	(0.363)	(0.212)	(24.461)	(0.311)
Observations		3252			1613			1489	

Each coefficient is from a separate regression. OLS when dependent variable is ln BMI or BMi Ptile; Probits when Overwt. Robust standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%. Missing indicators for controls included. Only the effects of breastfeeding, time in school, and time taking lessons are significantly different by education.

Table 6: What does mother's employment affect?
Coefficient: Marginal effect of log mother's work hours on dependent variable.

Dependent Variable:	Sample:	Full Sample	Mother's Ed ≤ 12	Mother's Ed > 12
Number of meals		-0.028**	-0.019*	-0.033**
		(0.005)	(0.008)	(0.008)
%meals in restaurant		0.007*	0.006	0.006
		(0.003)	(0.004)	(0.004)
Breastfed		-0.013	-0.010	-0.008
		(0.012)	(0.015)	(0.018)
Receives allowance		0.007	0.021	0.008
		(0.011)	(0.015)	(0.016)
Fraction of time spent				
sleeping		-0.001	-0.003+	-0.002
		(0.001)	(0.001)	(0.001)
misc. passive activities		-0.005**	-0.005+	-0.005+
		(0.002)	(0.003)	(0.003)
watching TV		0.002+	-0.000	0.006**
		(0.001)	(0.002)	(0.002)
attending school		0.002*	0.004**	0.001
		(0.001)	(0.001)	(0.001)
eating		-0.001	-0.001	-0.000
		(0.001)	(0.001)	(0.001)
playing indoor games		-0.002*	-0.002*	-0.001
		(0.001)	(0.001)	(0.001)
playing sports		-0.002+	-0.001	-0.001
		(0.001)	(0.001)	(0.001)
socializing		0.000	0.002	-0.001
		(0.001)	(0.001)	(0.001)
traveling		0.001**	0.001*	0.001
		(0.000)	(0.000)	(0.001)
shopping		0.001	0.000	0.000
		(0.001)	(0.001)	(0.001)
doing chores		0.001*	0.001*	0.001
		(0.000)	(0.001)	(0.001)
computer/video games		-0.001	-0.001	-0.001
		(0.001)	(0.001)	(0.001)
in child care		0.002**	0.002**	0.002**
		(0.000)	(0.001)	(0.001)
doing homework		-0.000	0.000	-0.001
		(0.000)	(0.000)	(0.001)
taking lessons		-0.000	0.000	-0.000
		(0.000)	(0.000)	(0.000)
working		0.001+	0.001	0.000
		(0.000)	(0.001)	(0.001)
Observations		3252	1613	1489

Probit when dependent variable is Breastfed and Receives Allowance; Poisson when Number of Meals; OLS for all others. Marginal effects reported. Robust standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%. Missing indicators for controls included.

Table 7: The Implied Elasticities of Mother's Employment on BMI, by Channel

Sample:	Full Sample				Mother's Ed ≤ 12				Mother's Ed > 12			
Variable (V):	$\frac{\partial lnBMI}{\partial V}$	$\frac{\partial V}{\partial lnMWH}$	$\frac{\partial lnBMI}{\partial lnMWH}$	$\frac{\partial pBMI}{\partial lnMWH}$	$\frac{\partial lnBMI}{\partial V}$	$\frac{\partial V}{\partial lnMWH}$	$\frac{\partial lnBMI}{\partial lnMWH}$	$\frac{\partial pBMI}{\partial lnMWH}$	$\frac{\partial lnBMI}{\partial V}$	$\frac{\partial V}{\partial lnMWH}$	$\frac{\partial lnBMI}{\partial lnMWH}$	$\frac{\partial pBMI}{\partial lnMWH}$
Number of meals	-0.006**	-0.028**	0.0002**	0.0229**	-0.004	-0.019*	0.0001	0.0091	-0.006*	-0.033**	0.0002*	0.0252+
	(0.002)	(0.005)	(0.0001)	(0.0089)	(0.003)	(0.008)	(0.0001)	(0.0084)	(0.003)	(0.008)	(0.0001)	(0.0145)
% meals in restaurant	0.042	0.007*	0.0003	0.0371	0.039	0.006	0.0002	0.0142	0.025	0.006	0.0002	0.0481
	(0.025)	(0.003)	(0.0002)	(0.0263)	(0.041)	(0.004)	(0.0003)	(0.0285)	(0.032)	(0.004)	(0.0002)	(0.0442)
Breastfed	-0.015	-0.013	0.0002	0.0276	-0.026+	-0.010	0.0003	0.0457	-0.005	-0.008	0.0000	-0.0032
	(0.010)	(0.012)	(0.0002)	(0.0297)	(0.016)	(0.015)	(0.0004)	(0.0614)	(0.015)	(0.018)	(0.0001)	(0.0151)
Receives allowance	-0.006	0.007	0.0000	-0.0011	-0.004	0.021	-0.0001	-0.0061	-0.008	0.008	0.0000	-0.0003
	(0.010)	(0.011)	(0.0001)	(0.0071)	(0.016)	(0.015)	(0.0003)	(0.0307)	(0.012)	(0.016)	(0.0001)	(0.0100)
<u>Fraction of time spent</u>												
sleeping	-0.070	-0.001	0.0001	0.0057	0.016	-0.003+	0.0000	-0.0171	-0.216+	-0.002	0.0004	0.0324
	(0.075)	(0.001)	(0.0001)	(0.0152)	(0.104)	(0.001)	(0.0003)	(0.0355)	(0.121)	(0.001)	(0.0003)	(0.0390)
misc. passive activities	-0.074+	-0.005**	0.0004	0.0486	-0.071	-0.005+	0.0003	0.0591	-0.055	-0.005+	0.0003	0.0139
	(0.039)	(0.002)	(0.0002)	(0.0322)	(0.060)	(0.003)	(0.0003)	(0.0502)	(0.054)	(0.003)	(0.0003)	(0.0422)
watching TV	0.134+	0.002+	0.0003	0.0360	0.047	-0.000	0.0000	-0.0039	0.229*	0.006**	0.0014+	0.0972
	(0.069)	(0.001)	(0.0002)	(0.0282)	(0.093)	(0.002)	(0.0001)	(0.0168)	(0.108)	(0.002)	(0.0008)	(0.0841)
attending school	-0.077	0.002*	-0.0001	-0.0104	-0.216*	0.004**	-0.0008+	-0.0919	0.046	0.001	0.0000	0.0066
	(0.070)	(0.001)	(0.0001)	(0.0191)	(0.106)	(0.001)	(0.0004)	(0.0576)	(0.093)	(0.001)	(0.0001)	(0.0164)
eating	-0.180+	-0.001	0.0001	0.0146	-0.050	-0.001	0.0000	0.0030	-0.357*	-0.000	0.0001	0.0142
	(0.107)	(0.001)	(0.0001)	(0.0162)	(0.158)	(0.001)	(0.0001)	(0.0170)	(0.162)	(0.001)	(0.0003)	(0.0371)
playing indoor games	-0.109	-0.002*	0.0002	0.0163	-0.243+	-0.002*	0.0005	0.0408	-0.037	-0.001	0.0001	0.0101
	(0.095)	(0.001)	(0.0002)	(0.0230)	(0.135)	(0.001)	(0.0004)	(0.0442)	(0.135)	(0.001)	(0.0002)	(0.0304)
playing sports	-0.138+	-0.002+	0.0002	0.0030	-0.234*	-0.001	0.0003	0.0235	-0.076	-0.001	0.0001	-0.0194
	(0.083)	(0.001)	(0.0002)	(0.0187)	(0.117)	(0.001)	(0.0003)	(0.0330)	(0.118)	(0.001)	(0.0002)	(0.0264)
socializing	-0.104	0.000	0.0000	-0.0018	-0.139	0.002	-0.0002	-0.0374	-0.060	-0.001	0.0001	-0.0014
	(0.082)	(0.001)	(0.0001)	(0.0109)	(0.132)	(0.001)	(0.0003)	(0.0391)	(0.095)	(0.001)	(0.0001)	(0.0157)
traveling	-0.143	0.001**	-0.0001	-0.0156	-0.439	0.001*	-0.0005	-0.0710	-0.043	0.001	0.0000	0.0032
	(0.175)	(0.000)	(0.0002)	(0.0261)	(0.289)	(0.000)	(0.0004)	(0.0572)	(0.218)	(0.001)	(0.0002)	(0.0226)
shopping	0.236+	0.001	0.0002	0.0141	0.368+	0.000	0.0002	0.0111	0.044	0.000	0.0000	0.0043
	(0.130)	(0.001)	(0.0002)	(0.0156)	(0.204)	(0.001)	(0.0003)	(0.0227)	(0.161)	(0.001)	(0.0001)	(0.0120)
doing chores	0.317*	0.001*	0.0003	0.0235	0.474*	0.001*	0.0006	0.0485	0.212	0.001	0.0001	0.0143
	(0.159)	(0.000)	(0.0002)	(0.0238)	(0.232)	(0.001)	(0.0004)	(0.0442)	(0.205)	(0.001)	(0.0002)	(0.0251)
computer/video games	-0.111	-0.001	0.0001	0.0034	-0.008	-0.001	0.0000	-0.0073	-0.116	-0.001	0.0001	0.0107
	(0.097)	(0.001)	(0.0001)	(0.0106)	(0.141)	(0.001)	(0.0001)	(0.0149)	(0.134)	(0.001)	(0.0002)	(0.0209)
in child care	0.122	0.002**	0.0002	-0.0492	0.512	0.002**	0.0010	0.0263	-0.265	0.002**	-0.0006	-0.1293+
	(0.254)	(0.000)	(0.0005)	(0.0509)	(0.478)	(0.001)	(0.0010)	(0.0763)	(0.175)	(0.001)	(0.0004)	(0.0763)
doing homework	-0.289+	-0.000	0.0001	0.0210	-0.174	0.000	0.0000	0.0018	-0.346*	-0.001	0.0002	0.0447
	(0.160)	(0.000)	(0.0002)	(0.0221)	(0.333)	(0.000)	(0.0001)	(0.0110)	(0.176)	(0.001)	(0.0003)	(0.0538)
taking lessons	-0.056	-0.000	0.0000	-0.0002	-0.330	0.000	0.0000	-0.0054	0.356	-0.000	-0.0001	-0.0489
	(0.454)	(0.000)	(0.0000)	(0.0025)	(0.635)	(0.000)	(0.0000)	(0.0108)	(0.741)	(0.000)	(0.0002)	(0.0352)
working	0.155	0.001+	0.0001	0.0029	0.102	0.001	0.0001	0.0123	0.193	0.000	0.0000	-0.0016
	(0.151)	(0.000)	(0.0001)	(0.0103)	(0.227)	(0.001)	(0.0002)	(0.0174)	(0.212)	(0.001)	(0.0001)	(0.0076)

The first and second columns of each sample are taken from Tables 5 and 6. The third and fourth columns of each sample are computed by multiplying the coefficients from a regression of ln BMI or percentile BMI on an activity and a regression of an activity on ln mother's work hours. The standard error on this combined term is estimated by seemingly unrelated regression on "stacked" data. Robust standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%. Only the effects of time in school, tv watching, and socializing are significantly different by education.

Table 8: The Implied Elasticities of Mother's Employment on BMI, by Channel, using only the last 2 years of mother's work

Sample:	Full Sample		Mother's Ed ≤ 12		Mother's Ed > 12	
Variable (V):	$\frac{\partial \ln BMI}{\partial \ln MWH}$	$\frac{\partial pBMI}{\partial \ln MWH}$	$\frac{\partial \ln BMI}{\partial \ln MWH}$	$\frac{\partial pBMI}{\partial \ln MWH}$	$\frac{\partial \ln BMI}{\partial \ln MWH}$	$\frac{\partial pBMI}{\partial \ln MWH}$
Number of meals	0.0002**	0.0211**	0.0001	0.0081	0.0002+	0.0248+
	(0.0001)	(0.0085)	(0.0001)	(0.0076)	(0.0001)	(0.0149)
% meals in restaurant	0.0003	0.0358	0.0002	0.0100	0.0002	0.0581
	(0.0002)	(0.0258)	(0.0002)	(0.0215)	(0.0003)	(0.0459)
Breastfed	0.0002	0.0235	0.0001	0.0245	0.0000	-0.0024
	(0.0002)	(0.0257)	(0.0003)	(0.0499)	(0.0001)	(0.0116)
Receives allowance	0.0000	-0.0010	-0.0001	-0.0074	0.0000	0.0001
	(0.0001)	(0.0064)	(0.0003)	(0.0370)	(0.0001)	(0.0052)
Fraction of time spent						
sleeping	0.0000	0.0029	0.0000	-0.0142	0.0000	0.0033
	(0.0001)	(0.0084)	(0.0002)	(0.0297)	(0.0002)	(0.0221)
misc. passive activities	0.0004	0.0492	0.0003	0.0524	0.0003	0.0137
	(0.0002)	(0.0328)	(0.0003)	(0.0470)	(0.0003)	(0.0420)
watching TV	0.0002	0.0246	0.0000	-0.0075	0.0010	0.0700
	(0.0002)	(0.0220)	(0.0001)	(0.0189)	(0.0006)	(0.0632)
attending school	-0.0002	-0.0139	-0.0007+	-0.0843	0.0001	0.0167
	(0.0002)	(0.0256)	(0.0004)	(0.0541)	(0.0002)	(0.0293)
eating	0.0002	0.0168	0.0001	0.0040	0.0001	0.0093
	(0.0001)	(0.0173)	(0.0002)	(0.0229)	(0.0003)	(0.0335)
playing indoor games	0.0002	0.0167	0.0004	0.0262	0.0001	0.0152
	(0.0002)	(0.0232)	(0.0003)	(0.0314)	(0.0003)	(0.0449)
playing sports	0.0001	0.0014	-0.0001	-0.0048	0.0001	-0.0142
	(0.0001)	(0.0087)	(0.0003)	(0.0224)	(0.0001)	(0.0219)
socializing	0.0001	0.0096	0.0000	-0.0016	0.0001	-0.0017
	(0.0001)	(0.0147)	(0.0002)	(0.0253)	(0.0001)	(0.0192)
traveling	-0.0001	-0.0095	-0.0003	-0.0365	0.0000	0.0024
	(0.0001)	(0.0162)	(0.0003)	(0.0372)	(0.0001)	(0.0172)
shopping	0.0001	0.0116	0.0003	0.0191	0.0000	0.0006
	(0.0001)	(0.0135)	(0.0003)	(0.0244)	(0.0000)	(0.0082)
doing chores	0.0003	0.0225	0.0007+	0.0525	0.0001	0.0136
	(0.0002)	(0.0227)	(0.0004)	(0.0451)	(0.0002)	(0.0238)
computer/video games	0.0001	0.0033	0.0000	-0.0068	0.0001	0.0130
	(0.0001)	(0.0104)	(0.0001)	(0.0136)	(0.0002)	(0.0243)
in child care	0.0002	-0.0477	0.0009	0.0235	-0.0006	-0.1395+
	(0.0005)	(0.0488)	(0.0010)	(0.0695)	(0.0004)	(0.0819)
doing homework	0.0002	0.0253	-0.0001	0.0029	0.0004	0.0754
	(0.0002)	(0.0231)	(0.0002)	(0.0169)	(0.0003)	(0.0610)
taking lessons	0.0000	-0.0004	0.0000	0.0047	-0.0001	-0.0398
	(0.0000)	(0.0053)	(0.0000)	(0.0098)	(0.0002)	(0.0329)
working	0.0001	0.0023	0.0000	0.0085	0.0000	-0.0011
	(0.0001)	(0.0086)	(0.0001)	(0.0130)	(0.0001)	(0.0063)

These coefficients are computed by multiplying the coefficients from a regression of ln BMI or percentile BMI on an activity and a regression of an activity on ln mother's work hours. The standard error on this combined term is estimated by seemingly unrelated regression on "stacked" data. Robust standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%.