DISCUSSION PAPER SERIES

IZA DP No. 1673

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Christopher J. Ruhm

July 2005

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

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Christopher J. Ruhm
University of North Carolina at Greensboro,
NBER and IZA Bonn

Discussion Paper No. 1673
July 2005

IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
Email: iza@iza.org

IZA Discussion Paper No. 1673
July 2005

ABSTRACT

Maternal Employment and Adolescent Development*

This study investigates how maternal employment is related to the outcomes of 10 and 11 year olds, controlling for a wide variety of child, mother and family characteristics. The results suggest that limited amounts of work by mothers benefit youths who are relatively "disadvantaged" and even long hours, which occur relatively rarely, are unlikely to leave them much worse off. By contrast, maternal labor supply is estimated to have much more harmful effects on "advantaged" adolescents. Particularly striking are the reductions in cognitive test scores and increases in excess body weight predicted by even moderate amounts of employment. The negative cognitive effects occur partly because maternal labor supply reduces the time these children spend in enriching home environments. Some of the growth in obesity may be related to determinants of excess weight that are common to the child and mother. Work hours are also associated with relatively large (in percentage terms) increases in early substance use and small decreases in behavior problems; however, neither are statistically significant.

JEL Classification: I20, J13, J18, J22

Keywords: maternal employment, adolescent development, child obesity, socioeconomic status

Corresponding author:

Christopher J. Ruhm
Department of Economics
University of North Carolina at Greensboro
P.O. Box 26165
Greensboro
NC 27402-6165
USA
Email: c_ruhm@uncg.edu

* I thank Reagan Baughman, Ariel Kalil, Michelle Sylvester and seminar participants at Georgia State University, the University of Canterbury, University of Chicago, University of New Hampshire and Southern Economic Association Meetings for helpful comments. Financial support from the National Institute of Child Health and Human Development (HD38521-01A1), National Science Foundation (SES-9876511) and Russell Sage Foundation is gratefully acknowledged. All opinions, findings, conclusions or recommendations are those of the author and do not necessarily reflect the views of the funding agencies.

Between 1975 and 2001, the labor force participation rate of mothers with non-adult children increased 54 percent, from 47.4 to 73.1 percent (U.S. Department of Labor, Bureau of Labor Statistics, 1988; U.S. Bureau of the Census, 2002). The growth was an even larger 66 percent (from 31.0 to 55.2 percent) for those with children younger than six and 78 percent, (from 31.0 to 55.2 percent between 1976 and 2000) for women with infants (Downs, 2003). Combined with increases in single-parent households, these changes suggest that parents have less time to invest in their offspring, with potentially deleterious effects.[1] However, increased market work may also yield benefits, most obviously by providing extra income.

This paper analyzes how maternal employment affects the development of 10 and 11 year olds using data from multiple years of the National Longitudinal Survey of Youth (NLSY). The dependent variables include three high quality assessments of cognitive skill, two indicators of socioemotional development and two measures of excess body weight. The results suggest sharply disparate impacts across categories of youths.

Moderate amounts of work by mothers have no effect or benefit children who are "disadvantaged" based on race/ethnicity, low maternal education, absence of a male adult in the household at birth, or using a multivariate index of low socioeconomic status (SES) described below. Even long hours, which occur relatively rarely, are unlikely to leave them much worse off than if their mothers did not engage in market work. By contrast, harmful consequences are predicted for "advantaged" adolescents, with negative effects extending to even limited employment. Particularly striking are the reductions in cognitive test scores and increases in excess body weight anticipated for high SES youths whose mothers work. One reason for the negative cognitive effects appears to be that these children have especially enriching home environments and so may lose when placed in nonparental care. The higher obesity rates may

[1] Moreover, the proportion of children in two-parent households declined from 80.3 percent in 1975 to 69.1 percent in 2001 (U.S. Bureau of the Census, 2004). Increased female employment has not been offset by substantial reductions in male work hours but fertility rates and time spent in housework have declined since the 1960s (Juster and Stafford, 1991; Mayer, 1997). The time parents have available for children fell by 22 hours per week (14 percent) between 1969 and 1999 (Council of Economic Advisers, 1999) but Sandberg and Hofferth (2001) argue that, since the early 1980s, behavioral changes have prevented any decrease in the time actually devoted to children.

partially be explained by determinants of excess weight that are common to both the child and mother, like changes in family eating habits. There is also evidence of relatively large (in percentage terms) increases in early substance use and small reductions in behavior problems; however, these are never statistically significant.

A. Previous Research

The relationship between maternal employment and cognitive development or behavior problems in early childhood (typically 3 to 6 years of age) has been widely studied. A few investigations find positive effects (Vandell and Ramanan, 1992; Parcel and Menaghan, 1994; Moore and Driscoll, 1997), others negative impacts (Leibowitz, 1977; Stafford, 1987; Mott 1991; Belsky and Eggebeen, 1991) and many obtain results that differ depending on the timing of work or the specific group or outcome analyzed (e.g. Desai et al., 1989; Baydar and Brooks-Gunn, 1991; Blau and Grossberg, 1992; Parcel and Menaghan, 1994; Greenstein, 1995; Barglow, et al., 1998).[2] The most recent and carefully conducted analyses generally indicate a deleterious impact of labor supply during the child's first year (Neidell, 2000; Han et al., 2001; Brooks-Gunn et al., 2002; Waldfogel et al., 2002; Baum, 2003; Ruhm, 2004; James-Burdumy, 2005; Verropoulou and Joshi, 2005; Hill et al., forthcoming) but with less consistent effects for subsequent work. However, it is not clear whether these last into adolescence or "fade out" over time. Harvey (1999) finds that the negative consequences of first year employment are temporary, whereas Neidell (2000), Han et al. (2001) and Waldfogel et al. (2002) indicate greater persistence. The patterns may vary across outcomes and with child or household characteristics in ways that are poorly understood.

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[2] The limited study of paternal employment obtains inconclusive results (Parcel and Menaghan, 1994; Harvey, 1999; Ermisch and Francesconi, 2001; Waldfogel et al., 2002; Ruhm, 2004). Substantial related research investigates the effects of early child care. Studies of infant-mother attachments (e.g. Belsky and Rovine, 1988; Clarke-Stewart, 1989; Lamb and Sternberg, 1990; NICHD Early Child Care Research Network, 1997) suggest that maternal employment, by increasing the use of day care, could reduce attachment security in some situations. Child care may also increase behavioral problems and stress levels (NICHD Early Child Care Research Network, 2003; Watamura et al., 2003; Magnuson et al., 2004a). Conversely, high quality care is linked to increased school readiness and improved cognitive development (NICHD Early Child Care Research Network, 2002; Magnuson et al., 2004b).

Studies of adolescents are also voluminous. Many researchers (Hillman and Sawilowsky, 1991; Gottfried and Gottfried, 1994; Paulson, 1994; Vander Ven et al., 2001) conclude that maternal employment does not affect outcomes such as academic achievement, delinquency, or substance abuse. However, both positive impacts (Richards and Duckett, 1994; Muller, 1995) and negative consequences (Bogenschneider and Steinberg, 1994) have been obtained, and there is a tendency to find the greatest gains or lowest costs from part-time (rather than full-time) work, and for girls, blacks or children with less educated parents (Richards and Duckett, 1991; Bogenschneider and Steinberg, 1994; Wolfer and Moen, 1996).

These inferences should be viewed as tentative because the studies generally lack the methodological sophistication found in recent investigations of younger children. The samples are usually small and unrepresentative, and large but imprecisely estimated coefficients are often interpreted as indicating no effect, without adequate consideration of statistical power.[3] Most importantly, mothers working long hours may differ from those who do not in ways that are inadequately accounted for. For example, women with characteristics associated with high ability tend to have elevated employment rates (Vandell and Ramanan, 1992; Waldfogel et al., 2002; Ruhm, 2004; Hill et al., forthcoming). If these advantages extend to productivity in home activities, maternal employment will be positively associated with child outcomes even absent a causal impact.[4] Reverse causation also presents problems if the mother's work hours are influenced by child outcomes in previous periods, since most prior studies control only for contemporaneous employment.[5]

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[3] This is particularly problematic given the small sample sizes. For example, analyses by Hillman and Sawilowsky (1991), Gottfried and Gottfried (1994), Paulson (1994), and Richards and Duckett (1994) contain 51, 106, 240 and 295 individuals, with results also often presented for subgroups.

[4] The bias could be in the opposite direction if working women have less interest or ability in home production. There are similar difficulties with the literature on day care (e.g. Clarke-Stewart, 1991; Field, 1991; Caughy et al., 1994). A few studies use quasi-experimental designs to control for omitted variables (e.g., Currie and Thomas, 1995). Karoly et al. (1998) provide an in-depth review of research on early intervention programs.

[5] Anderson et al.’s (2003) investigation of adolescent obesity overcomes many of these problems by using a large sample, reasonably comprehensive controls and sometimes estimating fixed-effect or instrumental variable models. Menaghan et al. (2000) find that maternal employment correlates with antisocial behaviors using a large sample and an apparently sound methodology. However, their control variables are not detailed, nor are the effects of work completely disentangled from those of family circumstances.

Three approaches are used below to reduce these sources of potential bias. First, an unusually comprehensive set of explanatory variables is included, with attention paid to changes in the parameter estimates when sequentially accounting for an increasing portion of the heterogeneity. The addition of more complete controls generally raises the predicted costs of maternal employment, suggesting that many previous investigations present overly optimistic assessments. Second, employment in a period *after* child assessment is controlled for in most models. Since labor supply is unlikely to have causal effects on outcomes measured at an earlier date, large or statistically significant parameter estimates for this variable suggest model misspecification. Third, results of the basic OLS and probit models are compared to those obtained when including maternal fixed-effects or to average treatment effects estimated using propensity score techniques.

B. Conceptual Framework and Econometric Methods

In economic models, parents allocate resources to maximize an objective function that includes child outcomes as one argument.[6] Maternal employment may benefit children by increasing incomes or hurt them because of decreases in child-related investments in time or energy.[7] The psychological and sociological literatures provide complementary mechanisms through which market work may affect children including: the disruption of mother-child attachments (Belsky, 1988); reductions in the quantity and quality of interactions (Hoffman, 1980); a weakening of social capital (Coleman, 1988); and "role model" effects (Haveman and Wolfe, 1995). These may vary with household characteristics and age of the child. For example, employment could be more harmful in rich than poor families if well-off parents provide higher *quality* time. Conversely, wealthy families can afford better day care and educated women spend a relatively large proportion of their nonmarket time in child-related activities (Leibowitz, 1974).

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[6] This section draws heavily on a detailed discussion in Ruhm (2004).

[7] There is wide agreement that children benefit from higher household incomes but debate over the strength and cause of these effects (Duncan and Brooks-Gunn, 1997; Mayer, 1997). Time-diary data confirm that working reduces the time mothers spend with children (Bryant and Zick, 1996; Zick and Bryant, 1996; Bianchi, 2000; Gershuny, 2000; Hofferth, 2001; Sandberg and Hofferth, 2001; Ichino and Sanz de Galdeano, 2002), although there is uncertainty about the extent to which productive time is protected by cutting back least on activities directly engaging children. Long hours might also cause parents to be tired or stressed (Bianchi, 2000), reducing the quality of the time with children.

The potential tradeoffs between the benefits of income and direct parental time investments can be illustrated in a model where child outcomes at age t (C_t) depend on status in the previous period (C_{t-1}), the non-market "leisure" time of parents (L), purchased inputs like food or medical care (F), and exogenous determinants or production shocks (V) according to:

(1) $$C_t = C(C_{t-1},L_t,F_t,V_t).$$ [8]

In (1), parental leisure benefits children by increasing time available and possibly by reducing stress, raising energy levels and so forth. Higher incomes similarly enhance the ability to purchase productive inputs and influence time allocation decisions. Child outcomes also depend on prior status and therefore on endowments and the past choices of parents.

Assume that parental time is divided between employment (H) and leisure (L), while purchases of child inputs and other consumption are limited to the sum of earned and nonearned income.[9] Incorporating the time constraint and recursively substituting in for lags of C, equation (1) can be rewritten as:

(2) $$C_t = C(\mathbf{H},\mathbf{F},\mathbf{V}),$$

where **H**, **F** and **V** are vectors of current and lagged values (e.g. $\mathbf{H}=\{H_t, H_{t-1}, \ldots H_{t-n}\}$, for t-n the first period where parental inputs affect children. Maximizing C subject to the income constraint yields the reduced-form demand function:

(3) $$C_t = C(\mathbf{P},\mathbf{V}),$$

where **P** is a vector of current and lagged prices and wages.[10]

Data restrictions preclude estimation of the child production or reduced-form demand functions specified by (2) and (3), since information is lacking on the full vector of relevant prices and many individual-specific production shocks. Instead, this analysis focuses on "hybrid" equations (Rosenzweig and Schultz, 1983) of:

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[8] This model follows Becker (1981) in emphasizing the role of non-market time in household production and Grossman (1972) in treating health as an outcome produced by investment activities.

[9] Total time available to spend with a given child varies with the number of parents and children in the household. The econometric analysis deals with this by directly controlling for family structure. The model can easily be extended to allow for borrowing or lending across periods.

[10] Formally, parents solve a dynamic programming problem where utility depends on child outcomes, parental consumption and non-market time. Blau et al. (1996) detail such a model.

(4) $$C_t = C(\mathbf{H},\mathbf{X},\varepsilon),$$

where **H** measures work hours, **X** is a vector of individual or family background characteristics and ε is a disturbance term capturing production shifters or shocks not otherwise controlled for.

The coefficient estimates from such hybrid equations generally embody the technological properties of the production function and characteristics of unobserved household preferences or production shifters. For example, child outcomes depend on the *quality* as well as the *quantity* of parental time inputs and the "technologies" in place when decisions are made. The employment coefficients therefore indicate the "effects" of working given average differences in other factors, such as the price-adjusted quality of day care, accompanying the variation in labor supply. A causal interpretation can only be applied if the variables in **X** capture the effects of all other structural determinants of child outcomes.

The model can be operationalized by allowing outcomes for child i at age t (C_{it}) to be an additive separable function of maternal work hours at child ages t-n through t ($\mathbf{H}_{it}=\{H_{it}, H_{it-1},\ldots H_{it-n}\}$) and other production shifters (V_{it}), according to:

(5) $$C_{it} = \alpha + \mathbf{H}_{it}\boldsymbol{\beta}_{\mathbf{t}} + V_{it} + \varepsilon_{it},$$

for ε_{it} an i.i.d. disturbance. Implicit in (5) is the assumption that parental job-holding prior to t-n or after t has no impact on child outcomes at age t.

Ruhm (2004) highlights several important econometric issues when using this approach. First, the parameters of primary interest, $\hat{\beta}$, will be biased if the uncontrolled portion of V is correlated with **H** (e.g. if employed women have high home productivity or their children have favorable endowments). The primary strategy below is to use the detailed information in the NLSY in an attempt to include a sufficiently rich set of covariates that the error term in the estimating equation is orthogonal to $\mathbf{H}_{it}$.[11] Second, most previous research focuses on only a specific period of interest (e.g. at assessment) and does not account for labor supply at other times. When this is done, the impact of working during the years of interest is likely to be combined with that of labor supply in other periods. Consider the case where $\mathbf{H}_{it}=\{H_{it},H_{it-j}\}$, for

[11] However, it is important to exclude variables that *result* from parental job-holding, since these may capture a portion of the labor supply effect.

t the assessment year and t-j an earlier period. If H_{it} is controlled for but H_{it-j} is not and employment is positively correlated over time, β_t will generally be biased in the direction of $\hat{\beta}_{t-j}$.[12] A key feature of this analysis is therefore to control for maternal employment during the youth's entire life (through the birthday prior to assessment), rather than for just a portion of it.

Even an extensive set of explanatory variables may not fully account for all important sources of heterogeneity. One strategy for dealing with this is to control for maternal employment characteristics prior to birth, in the hope that these absorb the effects of remaining omitted variables without causally affecting the adolescent outcomes. Employment in the calendar year *after* assessment is also incorporated as an additional control and to indicate possible reverse causation. For example, a positive coefficient might be expected if child health or developmental problems lead mothers to cut back work hours in future periods. Sibling fixed-effect and propensity score models, detailed in section D.5, additionally test the robustness of the results to alternative methods of accounting for heterogeneity.[13]

C. Data and Descriptive Results

Data are from the National Longitudinal Survey of Youth (NLSY), a sample of U.S. residents born between January 1, 1957 and December 31, 1964, and surveyed since 1979.[14] Children born to and living with female NLSY respondents have been interviewed at two year intervals beginning in 1986, with information used here through 2000. The NLSY provides a unique source of longitudinal information on a large sample of children, including great detail on maternal, child and household characteristics.

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[12] For example, the correlation between average hours in years 1 through 3 and years 4 through 10 or 11 is 0.635 for the nationally representative portion of the NLSY sample.

[13] Some researchers (e.g. Baum, 2003; Anderson et al., 2003; James-Burdumy, 2005) use IV strategies, most commonly with local economic conditions as instruments. For the methods in this study, however, it is difficult to devise instruments with power to predict differences in employment during the various periods controlled for (before pregnancy, during the first 10 or 11 years and post-assessment).

[14] The NLSY originally included a representative sample of 6,111 youths, an oversample of 5,295 blacks, Hispanics and economically disadvantaged whites, and a supplemental sample of 1,280 persons in the military. Interviews with the military subsample were suspended after 1984 and for economically disadvantaged non-Hispanic whites after 1990. This data set is now sometimes referred to as the NLSY79, to distinguish it from the new NLSY97 survey covering a later cohort. See Center for Human Resource Research (2001) for additional information.

The NLSY (through 2000) includes children whose mothers were 35 to 42 years old at the end of 1999. It covers approximately 90 percent of childbearing for this cohort but does not represent all fertility, since it excludes some births to older women (who tend to have high incomes and education). The sample analyzed contains children born between 1979 and 1988 and who were 10 or 11 years old at one of the biennial assessment dates between 1986 and 1998.

C.1 Outcomes

Cognitive development is proxied by scores on the Peabody Picture Vocabulary Test (PPVT) and Peabody Individual Achievement Test Mathematics (PIAT-M) and Reading Recognition (PIAT-R) subtests. These widely used assessments have high test-retest reliability and concurrent validity (Baker et al., 1993).[15] The PPVT measures receptive vocabulary for Standard American English and provides a quick estimate of verbal ability and scholastic aptitude. The PIAT-M assesses attainment in mathematics beginning with early skills, such as recognizing numerals and progressing to advanced concepts in geometry and trigonometry. The PIAT-R indicates word recognition and pronunciation ability by examining skills such as matching letters, naming names and reading single words aloud.

The analysis focuses on "standard" scores which have been commonly used by previous researchers (e.g. Baydar and Brooks-Gunn, 1991; Blau and Grossberg, 1992; Parcel and Menaghan, 1994; Ruhm, 2004) and represent age-specific transformations of the raw scores designed (during the 1970s) to have a normal distribution with a mean of 100 and a standard deviation of 15. For ease of interpretation, the scores have been transformed to have a mean of zero and a standard deviation of one for the nationally representative NLSY subsample, so that the regression coefficients show the standard deviation change in test scores predicted by a one unit change in the explanatory variable. These are sometimes referred to as "effect sizes" below.

Socioemotional problems are proxied by Behavior Problems Index (BPI) scores and a dichotomous measure of whether the child has smoked a cigarette or drunk more than a sip or two of alcoholic beverages. The overall BPI score, used here and in substantial previous

[15] Further information on the outcomes and many explanatory variables is contained in Center for Human Resource Research (2002).

research (e.g. Baydar and Brooks-Gunn, 1991; Moore and Driscoll, 1997; Harvey, 1999; Han et al., 2001), indicates problems related to antisocial behavior, anxiousness/depression, headstrongness, hyperactivity, immaturity, dependency and peer conflict/social withdrawal. Age-specific "standard" scores are used, normalized to a mean of zero and standard deviation of one. Higher scores imply more problems.[16] Early drinking or drug use are among the most pervasive adolescent problem behaviors and have been associated with increased mortality and morbidity (Kennedy and Prothrow-Stith, 1997). However, relatively few (13 percent) 10 or 11 year old NLSY children have engaged in these activities, limiting statistical power.

The final two dependent variables identify adolescents who are obese or at risk of overweight. Childhood obesity, which is rapidly increasing, reduces physical functioning, impairs psycho-social health and raises the short-term risks of orthopedic, neurological, pulmonary and endocrine conditions, type-2 diabetes, and the prediabetic state of glucose intolerance and insulin resistance (Must and Strauss, 1999; Ebbeling et al., 2002; Schwimmer et al., 2003). The excess weight significantly raises the chances of adult obesity (Whitaker et al., 1997; Guo et al., 2002) resulting in serious medical complications and higher rates of future mortality and medical costs (National Heart, Lung and Blood Institute, 1998; Johnson et al., 2003; Engeland et al., 2004).

Youths are classified as "obese" if their body mass index (BMI) – weight in kilograms divided by height in meters squared – is at or above the 95^{th} percentile for gender and age-specific growth charts compiled by the CDC's National Center for Health Statistics; they are "at risk of overweight" if BMI reaches or exceeds the 85^{th} percentile (Kuczmarski et al., 2000).[17] Since these thresholds were benchmarked for reference populations from the 1960s through

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[16] The BPI is a 32-item parent-reported scale with high internal consistency and test-retest reliability; it has been widely used and tested across diverse populations to predict future problems (Love, 1997).

[17] See www.cdc.gov/nccdphp/dnpa/bmi/bmi-for-age.htm for further information. The CDC terms youths above the 95^{th} percentile as "overweight". Following Johnson et al. (2003), I call them "obese" to avoid confusion with the distinct categories of "overweight" and "obese" used for adults. The "at risk of overweight" group includes children above the 95^{th} percentile here, who are often excluded from this category in government statistics. Adults are usually classified as obese if their BMI exceeds 30. A more complicated criterion is used for children because their BMI varies systematically with age.

1980s, secular increases in body weight imply that far more than 5 (15 percent) of the NLSY sample are obese (at risk of overweight).

C.2 Maternal Employment

Maternal employment is measured on an annual basis. The first year of the child's life (denoted as year 1) covers the four quarters immediately following birth, year 2 includes the fifth through eight quarters and so on, through the eleventh year.[18] The models control for average weekly work hours in all jobs divided by 20; thus, a one unit change corresponds to 20 additional hours of labor supply per week. Most models control for average weekly work hours during period from the child's birth through the week of their birthday preceding assessment – when they turned 10 or 11. For purposes of brevity, this is often referred to using terms like "all years" or the child's "entire life". Some estimates allow nonlinear impacts; others separate employment during the first three and later years. As with most prior research, paternal employment is ignored, a significant limitation dictated by severe constraints on the data available for fathers.[19]

C.3 Other Explanatory Variables

The analysis exploits the extensive child, maternal, household and geographic information in the NLSY. A vector of "basic" background variables, so labeled because they have frequently been used in prior research, contains continuous measures of birth order, mother's age (in years), a quadratic for child age in months, as well as dummy variables for race/ethnicity (2 variables), sex of the child, the mother's Armed Forces Qualifications Test (AFQT) score in 1980, her education at child birth (4 variables) and if a spouse/partner was in the household during the child's birth year. Unless noted, all regressors are measured at the child assessment date. Table A.1 further describes these and the other variables used in this study.

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[18] The NLSY Child/Young Adult File indicates work hours for the first 16 quarters after birth. These were used to construct the hours variables in the child's first through forth years of life. Average hours in other years were calculated using the NLSY Work History File containing weekly employment information from January 1, 1978 through the end of 1999. In cases where work hours were missing for specific weeks, the average was calculated over the weeks for which data were reported. Hours are calculated only for the main job in the few cases where data on secondary jobs were missing.

[19] Limited information is available only for fathers residing with interviewed mothers. Most jobless weeks do *not* reflect choices by fathers to spend time with young children (Ruhm, 2004), making it especially difficult to avoid omitted variables bias when considering paternal labor supply.

Most models include supplemental characteristics not usually controlled for that provide information on time or financial resources, child health endowments at birth and the quality of maternal inputs.[20] Early child health problems are incorporated through dichotomous indicators of low and very low birth weight (2 variables), long hospital stay at birth, hospitalization during infancy and physician visits for illness during the first three months of life (3 variables). Total family income in the year prior to birth is included, as are relative ages of the youth's siblings (4 variables) and a dummy variable for whether the mother attended a private secondary school.

A third set of regressors, labeled "maternal employment characteristics", control for occupation of the mother in the quarter prior to pregnancy (5 variables), the number of weeks before giving birth that she stopped working (4 variables) and her average weekly work hours in the year prior to pregnancy.[21] These supply information on tastes for employment and opportunity costs of not working that may be correlated with unobserved influences on child development. Weekly work hours in the calendar year after assessment (e.g. 1999 for children who were 10 and 11 in 1998) are included to further control for confounding factors and indicate possible reverse causation – from child outcomes to maternal labor supply.

I tested whether the results were sensitive to including a still more detailed "auxiliary" set of family and location characteristics such as: presence of the father in the household at the survey date, the mother's number of siblings (3 variables), her geographic location at age 14 (3 variables), whether magazines, newspapers, or library cards were in her home at 14 (3 variables), place of birth and education of her parents (4 variables), whether her mother worked when she was 14, her family structure at age 14 (2 variables), if she had smoked a cigarette before age 14 or tried marijuana or hashish before 21 (2 variables), residence in a central city or SMSA/MSA (2 variables) and location-specific measures of crime, birth, marriage and divorce rates and the number of physicians (5 variables).[22] These potentially account for attitudes, experiences,

[20] Ruhm (2004) included many of these same explanatory variables.
[21] The pre-pregnancy period includes the 40th through 91st weeks prior to birth. Since the NLSY employment history began in 1978, data for the entire year was not available for mothers giving birth in the first three quarters of 1979; their hours were averaged for weeks during 1978 prior to pregnancy.
[22] Most location data are from the restricted-use NLSY Geocode File and refer to the county of residence.

capabilities and geographic factors correlated with investments in children. They were excluded from the "preferred" econometric models, however, because their impact is likely to be indirect or of limited importance and may be accounted for by the "basic" or "supplemental" regressors. Also some of them (e.g. presence of the father) could be endogenous.

To avoid excluding persons lacking data on one or more background characteristics, the relevant regressors were sometimes set to zero and dummy variables created denoting the presence of missing values. For example, mothers not reporting an AFQT score were given a zero value and the "missing AFQT" variable was set to one.[23] Alternatively, some dummy variables were valued at one when the specified condition was met and zero when it was not *or* when the relevant data were absent.[24]

C.4 Socioeconomic Status

One goal of this investigation is to determine whether maternal employment affects "advantaged" and "disadvantaged" youths differently. In part, this is evaluated using univariate measures of race/ethnicity, maternal education or presence of a spouse/partner in the household at birth.[25] However, most of the analysis focuses on a multivariate index of socioeconomic status (SES) constructed by regressing total family income in the calendar year prior to assessment on mother's age (at child birth), AFQT score and education, the child's race/ethnicity, and whether a spouse/partner was in the household during the birth year. Youths were then ordered by predicted family incomes and classified as high (low) SES if they were in the upper (lower) half of the predicted income distribution.[26]

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[23] This was also done for pre-pregnancy income, father's presence in the household and local area characteristics.

[24] This strategy was used for hospitalizations and doctor visits in the first year, race/ethnicity and the two low birth weight regressors. Forty-eight observations were deleted because of missing data on one or more years of maternal employment.

[25] Researchers considering SES differences typically stratify their samples using single variables such as education, income or occupational attainment (e.g. Anderson et al., 2003; Zhang and Wang, 2004) or composites, like the Hollingsworth index, representing relatively simple combinations of two or more factors (e.g. Gordon-Larsen et al., 2003).

[26] Rosenbaum and Ruhm (2004) use a similar procedure. The econometric estimates are generally as expected. Income is positively related to the mother's AFQT score, education and age. Incomes are relatively low for children who are black or born into single-parent households. Being Hispanic has statistically insignificant positive predicted effect. Sample weights were accounted for when calculating

This SES index simultaneously accounts for a large number of determinants, rather than relying on multiple stratifications with highly correlated indicators. It also removes some sources of endogeneity. For example, current income varies with the mother's employment but this is less of an issue for predicted incomes that rely on group rather than individual characteristics.[27] Since the ranking procedure does not capture components of SES unrelated to predicted incomes, it is complementary to rather than a substitute for the univariate measures.[28]

C.5 Home Environment

Differences in home environments are proxied by total standard scores on the Home Observation Measurement of the Environment – Short Form, hereafter referred to as "HOME" scores.[29] The HOME inventory contains a mix of observational and parent-reported items assessing the emotional support and cognitive stimulation received by children through their home environment, planned events and family surroundings.[30] HOME scores are averaged values for the assessment year and two and four years earlier, and transformed to have a mean of zero and standard deviation of one for the nationally representative NLSY subsample. The HOME inventory has high validity and reliability and has been extensively used in analyses of the NLSY (Mott, 2004).

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the income percentiles, with the result that the full NLSY sample (because it oversamples minorities) contains more low than high SES youths. Persons with missing values for family incomes are excluded from the prediction equation but are placed into SES categories based on the resulting predicted incomes (which require information on the regression covariates but not on family income itself).

[27] Some endogeneity may remain. For example, nonwhites have relatively low average incomes and high obesity prevalence but both could result from third factors.

[28] For example, Smith (forthcoming) presents evidence that education is more important than income in determining the health of middle-aged adults and seniors, although he emphasizes the importance of economic circumstances during childhood for determining adult health outcomes.

[29] The standard HOME scores are normed to have an age-specific mean (standard deviation) of 100 (15).

[30] The total score reflects a summation of between 20 and 40 individual items, with the number and specific items varying by age of the child. An example of a question on cognitive stimulation is "How often do you read stories to your child" (asked in various wordings for children 9 and under); an example relating to emotional support is "How often is child expected to clean his/her room" (for ages 6 and older). Interviewer observations cover topics such as cleanliness of the household and the mother's interactions with the child.

C.6 Patterns of Maternal Employment

Figure 1 provides kernel density estimates for weekly maternal employment hours during the first, third and tenth year of the child's life, as well as averages over all years.[31] There are spikes at 0 and 40 hours for each individual year, fairly constant probabilities for intermediate hours and low rates of labor supply beyond 40 hours. The fraction of mothers with no annual work experience declines and the spike at 40 hours per week becomes much more pronounced as the child ages. The distribution for hours averaged over the child's life is considerably more uniform. Over 93 percent of mothers work at some point during the period, averaging 19.0 hours per week; the 10^{th}, 25^{th}, 50^{th}, 75^{th} and 90^{th} percentiles are 0.8, 6.6, 18.0, 30.2 and 38.1 hours.

Mothers work much less in their first child's year than prior to pregnancy (11.8 vs. 19.0 hours) but labor supply rises substantially by the second year (to 15.1 hours) and increases steadily thereafter due to growth at both the intensive and extensive margins (see the top panel of Table 1). Just 57 percent engage in market employment during the child's infancy, compared to 64 percent in year 2 and 76 percent in year 10. The probability of working more than 40 hours per week is 7, 14 and 30 percent in the first, second and tenth years.

Labor supply also increases with socioeconomic status. High SES mothers average 21 hours per week over the child's life, versus 17 hours for the low SES group (see the lower panel of table 1). They are 1.3 times as likely to work 20 or more hours weekly (51 vs. 40 percent) and average at least 40 hours over twice as often (7.9 vs. 3.7 percent). However, almost all (93 percent) of low SES mothers engage in some market employment.

C.7 Descriptive Relationships

Maternal employment is associated with favorable child outcomes. The top panel of Table 2 shows that children whose mothers averaged at least 30 hours per week had mean scores .16 to .17 standard deviations higher on the three cognitive assessments than those with mothers working fewer than 15 hours weekly. They also had substantially fewer behavioral problems

[31] Results in this section and the next refer to the nationally representative subsample of the NLSY. Similar findings are obtained using weighted data for the full sample.

and lower rates of substance use but higher probabilities of obesity or risk of overweight. Youths with mothers employed 15-29 hours per week generally had intermediate outcomes.[32]

These disparities need *not* reflect causal effects. The remainder of the table demonstrates that children whose mothers supply large amounts of labor tend to come from advantaged families and possess favorable characteristics. Women averaging 30 or more hours per week were older at child birth (23.5 vs. 22.7 years) and more likely to have attended college (43.8 vs. 25.5 percent) than those working 14 or fewer hours. They more often lived with a spouse/partner during the birth year (80.4 vs. 69.6 percent), had higher AFQT scores (44.4 vs. 33.5), greater income in the calendar year preceding assessment ($54,106 vs. $36,891) and their children less frequently had low birth weight (4.8 vs. 6.8 percent).

There are sharp SES gradients for all outcomes. Average differences between the top and lower half of the SES distribution are .78, .62, .59 and -.24 standard deviations for PPVT, PIAT-M, PIAT-R and BPI scores and -5.1, -5.8 and -3.6 percentage points for substance use, obesity and risk of overweight (see Table A.2). These disparities once again mainly reflect factors other than maternal employment. For instance, high SES youths rarely had low birthweight (5.8 vs. 8.9 percent), were much more likely to be born into two-parent households (92.5 vs. 46.0 percent) and to have college-educated mothers (56.0 vs. 16.2 percent).

D. Econometric Estimates

Table 3 summarizes results of four econometric specifications where the outcomes are cognitive test performance. Table 4 provides corresponding results for BPI scores, substance use, and excess body weight. Maternal employment refers to average weekly work hours (divided by 20) during child's first 10 or 11 years. Estimation is by ordinary least squares for the cognitive and BPI scores, with effect sizes of a 20 hour per week increase in the mother's labor supply displayed. Binary probit models are used for the dichotomous outcomes (substance use, obesity and overweight risk) and the tables indicate the predicted effect of an extra 20 hours of

[32] The patterns differ somewhat for employment during the first three years, where the highest cognitive scores were obtained by youths whose mothers averaged 15-29 hours per week. However, the penalties associated with longer hours were not statistically significant and the latter group were least likely to have behavioral problems or to have used tobacco or alcohol.

work with other explanatory variables evaluated at the sample means. All models include assessment year dummy variables. Additional regressors are detailed at the bottom of the table: B, S and E refer to the vectors of basic, supplemental and maternal employment characteristics described previously and detailed in appendix Table A.1. One empirical strategy is to examine how the addition of more extensive controls alters the parameter estimates on maternal labor supply. Additional specifications, summarized in Table A.3, include vectors of auxiliary characteristics or state fixed-effects.

D.1 Cognitive Development

Column (a) of Table 3, which controls only for work hours and the assessment year, provides further evidence that 10 and 11 year olds with employed mothers have relatively high cognitive scores – 20 hours of labor supply per week is associated with a .19 to .26 standard deviation rise in test performance. However, this largely results from omitted variables bias rather than a causal effect. Inclusion of the basic set of covariates (specification b) cuts the parameter estimates by at least 70 percent; adding the supplemental regressors (column c) further reduces the predicted gains, and accounting for maternal employment characteristics (model d) yields small and insignificant negative point estimates – the increased employment is correlated .03, .03 and .05 standard deviation reductions in verbal, mathematics and reading scores, corresponding to changes from the median to the 49th, 49th and 48th percentile. Inclusion of auxiliary characteristics or state fixed-effects do not substantially alter these estimates (see Table A.3) but, if anything, suggest more deleterious impacts than in model (d), the "preferred" specification focused upon below.

The coefficients on post-assessment employment imply a fairly strong positive relationship between test scores and the mother's *future* labor supply. Since employment is unlikely to substantially affect outcomes in earlier periods, these results suggest reverse causation, whereby good cognitive performance is positively correlated with subsequent work hours. Assuming a similar pattern occurs at younger child ages, the estimates in Table 3 are therefore likely to understate the negative effects of work. However, even accounting for this, there is little evidence that the employment strongly affects cognitive development for the average child.

D.2 Socioemotional Development and Excess Body Weight

Absent regressors other than the survey year, there is a negative association between maternal work hours and behavior problems or early substance use but a positive correlation with excess body weight (see column a of Table 4). The inclusion of additional controls (specifications b through d) attenuates but does not eliminate the reduction predicted for BPI scores – the effect size declines from -.11 to -.04 – and the small positive coefficient on post-assessment employment suggests that the favorable impact of maternal job-holding on problem behaviors may be slightly understated in specification (d). However, these effects are again small for the average youth – corresponding to movement from the median to the 48th percentile—and statistically insignificant. Conversely, labor supply predicts increases in smoking or tobacco use that are large in percentage terms but imprecisely estimated.[33]

The addition of covariates only minimally affects the employment coefficients for obesity and overweight risk – 20 additional hours of work per week are anticipated to raise these probabilities by 1.6 and 3.0 percentage points in column (a), compared to 1.6 and 2.3 points in specification (d). These magnitudes are substantial but the confidence intervals are large.[34] Moreover, while the findings are consistent with Anderson et al.'s (2003) evidence that maternal labor supply increases youth obesity, large parameter estimates for future employment raise doubts that these represent causal effects rather than a spurious positive relationship.[35]

D.3 Socioeconomic Status

Small average effects of maternal employment mask sharp disparities across "advantaged" and "disadvantaged" adolescents. This is shown in Table 5 which displays results

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[33] With other explanatory variables at their sample means, the predicted probability of substance use is .1110, so that an increase of .0112 corresponds to a rise of 10 percent. The small coefficient on future employment (.001 with a standard error of .007) provides no indication of reverse causation.

[34] At the sample means, 13.4 (30.5) percent of children are predicted to be obese (at risk of overweight); therefore the estimates in model (d) imply that 20 extra work hours raise the probability by 12 (8) percent.

[35] The parameter estimates on labor supply are only minimally affected, for all of these outcomes, by controlling for auxiliary characteristics or state fixed effects (see Table A.3).

for subsamples stratified by race/ethnicity, maternal education, presence of a spouse/partner in the household at child birth, and the previously discussed multivariate SES index. Here and below, all specifications control for the survey year, basic, supplemental and maternal employment characteristics (equivalent to model d of Tables 3 and 4).

Substantial negative impacts are predicted for advantaged youths, compared to neutral or favorable consequences for the less advantaged. Effect sizes for the three cognitive scores range between -.03 and .06 for disadvantaged children (see the top panel of the table), compared to .03 to .21 standard deviation reductions for advantaged adolescents (see the lower panel). The magnitudes vary with the method of stratifying the sample but the adverse consequences of the mother's labor supply are estimated to be larger for advantaged than disadvantaged youths using any of the criteria. Particularly noteworthy are the large reductions in cognitive performance associated with the employment of highly educated mothers.

The patterns are similar for excess body weight. Twenty hours of weekly employment predicts –0.8 to 1.3 (0.2 to 2.0) percentage point increases in obesity (risk of overweight) among disadvantaged youths, compared to a 1.4 to 3.2 (1.8 to 5.0) point higher prevalence for the advantaged.[36] There is also some indication of less favorable or more detrimental effects for advantaged adolescents when considering behavior problems or early substance use, although these results are more sensitive to the sample stratification criteria.

Evidence that high SES children are particularly disadvantaged by maternal employment has been obtained in a number of recent studies (e.g. Brooks-Gunn et al., 2002; Ruhm, 2004; Lopoo, forthcoming) as well as some earlier research (Greenstein, 1995). With the exception of Anderson et al. (2003), however, this issue has received only peripheral attention. To remedy this, the remainder of the analysis focuses on the role of SES, emphasizing results for the multivariate measure based upon predicted family incomes.

[36] The positive relationship between the maternal work hours and obesity among high SES children does not reflect reverse causation – the coefficient (standard error) on future employment is .004 (.010). However, this remains a concern for overweight risk, where the coefficient (standard error) is .037 (.016).

D.4 Nonlinearities

The impact of maternal employment could vary with its intensity. For example, several studies (Parcel and Menaghan, 1994; Richards and Duckett, 1994; Muller, 1995; Ruhm, 2004) suggest benefits of limited employment but decreasing returns or costs for longer work hours. Specification (b) of Table 6 allows such nonlinearities by including a quadratic in labor supply, with results displayed for cognitive performance and excess body weight.[37] The first three rows of each panel indicate predicted changes associated with averaging 20, 30 or 40 hours of work per week over the child's life, compared to no employment. Model (a) shows corresponding estimates from models that exclude the quadratic term. The fourth row presents the p-value for the null hypothesis that the coefficient on hours squared is zero. The fifth shows p-values for the null hypothesis that the employment coefficients in the model are *all* equal to zero – testing whether maternal labor supply has a statistically significant impact.

The results again differ sharply by SES. Allowing for nonlinearities (specification b), moderate amounts of employment have strongly *positive* anticipated impacts on the cognitive outcomes of disadvantaged youths. The p-values are below .03 for verbal and reading achievement, with substantial but less precisely estimated effects for math performance. The scores are predicted to reach a maximum when the mother averages 18 to 22 hours of work weekly, with negative effects obtained only for very long hours. Compared to not working, 20 hours per week of employment predicts PPVT, PIAT-M and PIAT-R score gains of .19, .09 and .11 standard deviations. These findings contrast with the small and statistically insignificant results obtained using linear models (see specification a). Neither the linear nor quadratic specifications indicate any employment effect on obesity or risk of overweight.

By contrast, maternal labor supply predicts strong deleterious impacts for high SES adolescents which, except for PIAT-M scores, accumulate in an approximately linear fashion. The coefficient on hours squared only approaches statistical significance for mathematics performance; in all other cases, the results suggest that the linear model (specification a) is

[37] BPI scores and substance use are not shown since mixed and generally insignificant findings were obtained for them above and using these specifications.

preferable. However, the employment effects are large in either specification. Compared to not working, 40 hours per week of maternal employment is estimated to reduce PPVT, PIAT-M and PIAT-R scores by .20, .18 and .18 standard deviations and raise obesity and overweight risk by 6.6 and 9.6 percentage points in model (a), versus changes of -.17, -.13 and -.18 standard deviations and 5.6 and 8.9 points in specification (b); although there are sometimes larger disparities at shorter hours.

D.5 Alternative Specifications and Tests of Robustness

The first years of life are believed to be especially important for children because of early influences on brain development, learning skills, self-esteem and emotional security (Carnegie Task Force on Meeting the Needs of Young Children, 1994; Shore, 1997; Heckman, 2000).[38] I examined this issue by allowing maternal employment during the first three years to have different effects from that in later periods. The results do not provide uniform support for a special role during earliest childhood. More adverse impacts are obtained for work in the first three years for some outcomes (e.g. PPVT and PIAT-M scores) but not others (e.g. PIAT-R performance). When considering obesity among high SES children, the negative consequences are largely restricted to maternal labor supply occurring *after* the first three years.

Boys are often thought to be particularly affected by early environmental conditions.[39] Although estimates for subsamples of males and females were usually not precise enough to reject the null hypothesis of no gender difference, the point estimates consistently suggested stronger negative effects of maternal labor supply on cognitive development and excess body weight for boys than girls. Working an extra 20 hours per week was predicted to reduce male PPVT, PIAT-M and PIAT-R scores by .04, .08 and .09 standard deviations, compared to .03, -.02 and -.00 standard deviations for females; obesity and overweight risk were anticipated to rise 2.8 and 3.2 percentage points for boys versus -0.0 and 1.2 points for girls. The data indicate the

[38] However, the mechanisms are poorly understood and the relationship between early brain development and future outcomes remains controversial (Bruer, 1999).

[39] Previous research obtains mixed evidence for maternal employment however. Desai, et al., 1989; Richards and Duckett, 1991; Brooks-Gunn, et al., 2002) obtain stronger negative effects for boys than girls but Han et al. (2001) do not uncover gender differences, Waldfogel et al. (2002) find larger negative effects for girls, and the relative magnitudes obtained by Ruhm (2004) vary across outcomes.

same pattern of gender differences for high SES youths, although with smaller discrepancies than for the full sample.[40]

Some researchers (Neidell, 2000; Ermisch and Francesconi, 2001; Waldfogel et al., 2002; Anderson, et al., 2003; James-Burdumy, 2005) have use fixed-effect (FE) models to exploit variations among children with the same mother. These automatically control for time-invariant maternal factors but are not a panacea because child-specific attributes (uncorrelated with the maternal fixed-effect) are not held constant. The resulting bias may be *larger* than in corresponding OLS estimates if unobserved differences across children are a key determinant of sibling variations in maternal labor supply. There is considerable evidence that mothers work less when their children have health or developmental problems (e.g. Behrman, et al., 1982; Corman et al., 2003; Powers, 2003), implying that the FE models are likely to underestimate any costs of work by mothers. Even so, for high SES siblings the fixed-effect estimates usually revealed *more* deleterious effects on cognitive development than analogous OLS specifications.[41]

A similar pattern was obtained when I calculated average treatment effects from propensity score (PS) models (Rosenbaum and Rubin, 1983; Heckman et al., 1998) where the treatment (control) group included youths whose mothers averaged at least 30 (10 or fewer) hours of weekly work.[42] Maternal employment was once again usually estimated to have small

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[40] A 20-hour per week increase in maternal employment is predicted to reduce the PPVT, PIAT-M and PIAT-R scores of high SES boys by .10, .15 and .09 standard deviations, compared to decreases of .10, -.02 and .07 standard deviations for high SES girls. Obesity and overweight risk are anticipated to rise by 4.3 and 5.4 percentage points for males, versus 2.3 and 5.2 points for females.

[41] Fairly large (but statistically insignificant) positive (negative) FE coefficients were obtained for the PPVT and PIAT-M (PIAT-R) scores of low SES youths, while the OLS coefficients were close to zero. Reliable FE estimates could not be obtained for the body weight measures because the conditional logit procedures rely on the small sample of siblings with different values for these dichotomous outcomes.

[42] Youths whose mothers averaged more than 10 and less than 30 hours of labor supply were excluded. The PS estimates used kernel-matching with a Gaussian kernel. Computation of the average treatment effects was restricted to the region of common support and bootstrapped standard errors were obtained using 250 repetitions.

and insignificant effects for low SES adolescents.[43] By contrast, the PS specifications yielded larger deleterious effects for high SES youths than corresponding OLS models.[44]

The observed SES differences are also not an artifact of the classification thresholds. This is shown in the top panel of Table 7, which divides the sample into thirds (rather than halves) of the predicted income distribution. The estimated effects again become uniformly more negative as SES increases. For example, a 20 hour per week increase in maternal labor supply is anticipated to raise the PPVT scores of children in the lowest third of distribution by .05 standard deviations, compared to reductions of .07 and .16 standard deviations for those in the middle and top tertiles. Similarly, predicted changes in obesity are -1.7, 0.7 and 6.3 percentage points for children in the lowest, middle and highest SES groups.

As an alternative stratification criteria, the lower panel of Table 7 categorizes SES using family income in the year prior to pregnancy. The rational for doing so is that pre-pregnancy incomes will unaffected by employment decisions made by the mother during the child's life. The pattern of results obtained are similar to those just discussed – with more negative maternal employment effects for high than low SES children – although the gradient is weaker for excess body weight than when basing SES on predicted incomes.

D.6 Sources of SES Disparities

I tested, but found no support, for the possibility that maternal labor supply has particularly deleterious consequences for advantaged adolescents because the benefits of earnings provided by the mother's employment are muted at high SES levels.[45] When controls for family incomes or maternal earnings (averaged over several years) were added to the basic

[43] The one exception was that both the PS and OLS models suggested that low SES children in the treatment group had significantly fewer behavior problems than those in the control group.

[44] Effect sizes from the PS models were -.11, -.05, -.14, and .07 for PPVT, PIAT-M, PIAT-R and BPI scores, compared to -.05, .02, -.09 and .02 in corresponding OLS specifications. The PS (OLS) models predicted 1.8, 6.6 and 14.5 (0.9, 4.4 and 11.2) percentage point increases in substance use, obesity and overweight risk.

[45] This might occur because of diminishing marginal benefits of income or because a greater proportion of income is devoted to children in poor than wealthy families (Lazear and Michael, 1988).

regression model, there was little indication that either mattered; moreover, the employment coefficients were scarcely affected by their inclusion.[46]

Another potential explanation is that advantaged adolescents have particularly enriching home environments, implying relatively high costs of being placed in nonparental care.[47] Such effects may vary across outcomes. The most negative consequences for academic test scores above were to children with highly educated mothers (see Table 5), suggesting that time inputs by educated parents may be a key input for cognitive development. By contrast, family structure (as proxied by presence of an adult male in the birth year) was of equal or greater importance when considering obesity, possibly reflecting differences in eating habits and recreational activities.

The data confirm that home environments vary systematically with socioeconomic status. Average HOME scores of high SES children are .71 standard deviations above those of their low SES counterparts and the environments of advantaged youths are superior across a variety of other measurable dimensions.[48] Favorable home environments also predict better cognitive scores, as shown in specification (a) of Table 8 which adds the HOME standard score to the regression specifications estimated previously. A one standard deviation increase in this score is associated with a .15 to .20 standard deviation rise in verbal, mathematics and reading test scores for the full sample, with effect sizes ranging between .12 and .20 (.18 and .29) for low (high) SES youths. However, HOME scores are not consistently related to excess body weight.

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[46] Family incomes (for the prior calendar year) were measured at the assessment date and 2, 4, 5, 6, 7, 8 and 9 survey years earlier. Maternal earnings were averaged for the year before assessment and 2, 4, 6, 8 and 10 years prior to that. The choice of periods was largely dictated by data availability. These results are consistent with other recent research (e.g. Blau, 1999; Shea, 2000; Aughinbaugh and Gittleman, 2003) indicating that income has no effect or a very small positive impact on child outcomes.

[47] Bianchi et al. (2004) provide evidence that highly educated mothers spend relatively large amounts of time with their children and devote more of it to activities likely to be particularly beneficial (e.g. reading to their children rather than watching television with them). These education differentials appear to have risen over time, despite faster growth in the employment of highly educated mothers.

[48] They are more likely to have visited a museum in the previous year (84.4 vs. 72.3 percent), to have been read to by their mother three or more times per week at ages 6 or 7 (55.1 vs. 37.1 percent) and they watch 1.1 fewer hours of television per day (3.8 vs. 4.9 hours).

Specification (b) of Table 8 augments the models by interacting HOME scores and maternal work hours. If the mother's employment is particularly harmful to children raised in enriching environments, we expect the interaction coefficient to be negative. This is what occurs for the three cognitive outcomes, although the parameter estimate is not always statistically significant. Given the absence of any main effect of HOME scores on obesity or overweight risk, the small and insignificant interaction effects for these outcomes are not surprising.

Table 9 shows how much of the SES disparity in the effects of maternal employment can be attributed to differences in the environmental factors captured by HOME scores. The top rows of the upper and middle panels, labeled "At Actual HOME Score", indicate predicted labor supply effects without adjusting for these differences. These are obtained from regressions identical to specification (d) of Tables 3 and 4, for the subsample of children with reported HOME scores.[49] The second row of the top two panels, labeled "At Average HOME Score", shows the expected impact of maternal employment obtained from specification (b) of Table 8 but with the HOME score (and so also its interaction with work hours) set to zero – the average value for the nationally representative NLSY subsample. The bottom panel shows the total SES disparity (the difference between the first rows of the middle and upper panels), the predicted gap for children living in an average home environment (the difference between the second rows of the middle and top panel) and the fraction of the disparity explained by differences in average HOME scores (one minus the second row of the lower panel divided by the first row, expressed as a percentage).

The findings confirm that heterogeneity in home environments explains, at least in a statistical sense, a large portion of the SES disparity in the effects of maternal employment on cognitive development. For instance, 20 hours of additional weekly labor supply are predicted to reduce the PPVT scores of high SES youths by .100 standard deviations while having virtually no effect low SES adolescents (raising them.004 standard deviations), for a total disparity of -.104 standard deviations. However, the anticipated decreases are .033 and .077 standard deviations, for low and high SES adolescents with average HOME scores, leaving a gap of -.044

[49] A maximum of 0.4% of observations are lost due to missing HOME scores.

standard deviations and implying that 58 percent of the original disparity has been accounted for. Differences in HOME scores similarly explain 35 and 62 percent of the SES gap in PIAT-M and PIAT-R performance, while playing no role for excess body weight. Since the HOME inventory is an imperfect proxy of the home environment, these results may provide a lower-bound on the extent to which the latter explains the observed SES disparities.

The NLSY contains no information on physical activity or food intake, which determine (in a mechanical sense) adolescent obesity. However, there is indirect evidence that maternal employment changes factors such as eating habits (e.g. the frequency of calorie-rich meals in restaurants) that have common effects across family members. Higher maternal BMI predicts greater risk of excess body weight among adolescents.[50] Such correlations are not decisive, because they may partially reflect other factors (like genetics), but it is noteworthy that *changes* in maternal BMI, from before pregnancy to the assessment date, are also positively related to adolescent obesity and risk of overweight.[51] Moreover, controlling for the change in BMI changes reduces the SES disparity in maternal employment "effects" by 11 (17) percent for adolescent obesity (risk of overweight), again suggesting a role for common family factors.[52]

Further support is obtained from models where *maternal* BMI (at the assessment date) is the outcome. The striking result is that higher labor supply predicts reductions in body weight for low SES mothers but increases for their advantaged counterparts. These relationships are attenuated but not eliminated when also controlling for BMI prior to pregnancy or using changes in BMI between the two periods as the dependent variable (see Table A.4).[53] The differences are not always statistically significant and need not represent causal relationships, if selection into employment by body weight is not adequately accounted for, but they are consistent with the effects of work hours on adolescent body weight documented above and so with a role for

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[50] When mother's BMI at the assessment date is added to the models estimated above, each BMI "point" (kg/m^2) raises the probability of obesity (overweight risk) by 0.9 (2.2) percentage points for high SES youths and 1.0 (1.6) points for low SES adolescents.

[51] A one kg/m^2 change in the maternal BMI is predicted to raise obesity by 0.5 (0.9) percentage points for low (high) SES youths and elevate the risk of overweight by 0.8 (2.0) points.

[52] The gaps decrease considerably more – by 39 and 67 percent – when maternal BMI before pregnancy and at the assessment date are separately controlled for.

[53] The coefficient on BMI before pregnancy exceeds one, suggesting that early disparities grow over time.

common family factors.[54] That said, future research needs to further examine sources of SES disparities.[55]

E. Discussion

Recent studies indicate that maternal employment during the child's early years has negative effects on cognitive and socioemotional development measured around the time of school entry. This analysis shows that few of these deleterious consequences persist through the beginning of adolescence for the average youth. More striking are the sharp variations in predicted effects by socioeconomic status. For low SES youths, the most favorable outcomes occur when the mother is employed approximately half-time, with negative impacts largely restricted to long work hours. Maternal employment averaging 20 hours per week is anticipated to raise their verbal, mathematics and reading test scores by 0.19, 0.09 and 0.11 standard deviations, compared to no work, while having little effect on excess body weight. Averaging 40 hours of work per week, which is rare, eliminates many of the cognitive benefits but still generally leaves the youths no worse off than if the mother did not hold a job.

By contrast, there appear to be negative consequences of even limited amounts of labor supply for advantaged adolescents, where maternal employment averaging 40 hours per week decreases predicted cognitive test performance by .13 to .20 standard deviations, while raising obesity (risk of overweight) by 6.6 (9.6) percentage points. Losses of this size are substantial. Compared to not working, full-time employment is anticipated to decrease PPVT, PIAT-M and PIAT-R scores from the 60th, 57th and 61st to the 53rd, 52nd and 54th percentiles, to almost double the rate of obesity (from 7.6 to 14.2 percent) and raise overweight risk by over 40 percent (from 23.5 to 33.5 percent). Currie and Thomas (2001) indicate that early test performance is strongly

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[54] I briefly examined whether the SES disparities might be related to variations in television viewing. The estimates suggested that television hours were positively associated with adolescent obesity but, since maternal employment was more strongly correlated with TV watching for low than high SES youths, this seems unlikely to explain the differences in excess body weight.

[55] Crepinsek et al. (2004) provide intriguing evidence that children whose mothers work full-time have less healthy diets than those with nonworking mothers, with larger differences 5-12 than 2-4 year olds. They do not analyze SES disparities but show that participation in the federal Child and Adult Care Food Program (which provides subsidized nutritious meals and snacks to children in day care) is associated with larger improvements in diet for children in low than high income families.

related to future educational and labor market outcomes, suggesting that the cognitive effects may have lasting economic costs. The negative health consequences of excess weight during early adolescence are well known.

We do not fully understand why maternal job-holding is particularly deleterious for high SES youths. A tentative but fairly strong conclusion is that much of the negative effect on cognitive development occurs because these children are pulled out of home environments conducive to learning, presumably to be placed in less enriching nonparental care. This does not explain the findings for obesity, where preliminary evidence suggests the importance of determinants weight that are common to both the child and mother (e.g. the frequency of consuming home-cooked meals).

These findings demonstrate that the pathways to desirable child outcomes may vary with the specific attributes considered and highlight the need to examine other potential sources of SES disparities. For example, disadvantaged children with working mothers are often cared for by grandparents or other relatives (Anderson and Levine, 2000; Smith, 2002; Rosenbaum and Ruhm, 2004), which might reduce any negative effects if relatives provide time investments of similar quality to those from the mother. Alternatively, employment by high SES women might relatively frequently be motivated by divorce or other adverse family events that negatively affect children.[56] Also, experimental evidence indicates that the work requirements associated with welfare reform adversely affected the school performance of adolescent children (Gennetian et al., 2002), suggesting that the consequences for low SES youths may vary depending on whether the maternal employment is voluntary or mandated.

Several limitations of the analysis deserve mention. The NLSY is not entirely representative, since it excludes some offspring of older mothers and is restricted to children born between 1979 and 1988. The consequences of employment may depend on the

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[56] High SES mothers more frequently work long hours but there is no evidence that this is the main reason for the disparities in employment effects. Instead, the combination of adverse consequences for even limited amounts of labor supply and for work after the child's first three years of life is consistent with this group having particularly favorable home environments (e.g. whereby time investments by highly educated mothers during the early school years are particularly valuable for the development of good study habits and the mastery of difficult material).

technologies or institutional arrangements in place, and so could differ across locations or for more recent cohorts (e.g. if workplaces have become more "family-friendly" or there have been changes in the quality of nonparental child care). Better understanding the mechanisms by which parental investments promote child development might facilitate designing less costly methods of achieving the same benefits. The role of paternal employment also needs to be examined, which is difficult given shortcomings of existing data sources.

The models rely upon the explanatory variables to account for the selection into market work, rather than exploiting exogenous sources of variation. Identifying natural experiments or instrumental variable approaches represents a useful goal for future research. That said, the negative consequences of maternal employment for advantaged youths are probably not an artifact of the estimation technique. The predicted labor supply effects typically become less favorable with the addition of more complete controls for heterogeneity and women tend to work less if their offspring had low test scores in *previous* years, which is likely to induce a positive correlation between employment and cognitive development. Maternal fixed-effect and propensity score models also yield similar or more negative estimated consequences for high SES adolescents than corresponding OLS specifications.

Over 90 percent of mother's work during their child's first 10 or 11 years but most not so intensively – less than half average 20 or more hours per week and fewer than 6 percent at least 40 hours. These results suggest that low SES families are generally making employment decisions consistent with the most favorable child outcomes. Conversely, even limited amounts of employment are predicted to have negative effects for high SES adolescents and their mothers supply more labor.

Advantaged youths, however, do relatively well even when their mothers work. Table 10 shows predicted cognitive scores and prevalence of excess weight at 0, 20 and 40 hours of maternal employment.[57] A high SES adolescent whose mother averaged 40 hours per week is

[57] These predictions are obtained using a quadratic in work hours for low SES youths and a linear model for their high SES counterparts, except for PIAT-M scores where a quadratic specification is used for both groups. For the dichotomous outcomes, the expected outcomes are averaged over all children, with covariates other than maternal employment evaluated at the values of each individual.

expected to have considerably worse cognitive performance than if her mother did not hold a job – scoring at the 52nd through 54th percentile on the three tests, versus the 57th through 61st percentiles. Nevertheless, these are well above the 33rd through 39th percentiles predicted for a low SES child whose mother worked 20 hours per week (approximately where test performance is maximized). Expected rates of overweight risk and obesity are also relatively low for advantaged 10 and 11 year olds, except when their mothers are employed full-time. The welfare implications of these findings are unclear since child outcomes are just one argument in the parents' utility function. High SES families may willingly forgo some gains to their children to obtain other benefits.[58] Alternatively, they might not be aware of the negative labor supply effects, implying suboptimal outcomes.

[58] For example, time off work might reduce advancement in the labor market and lower future incomes.

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Table 1:
Maternal Employment at Specified Child Ages

Time Period/Group	Average Weekly Work Hours	Prob (Hours>0)	Prob (Hours $\geq$ 20)	Prob (Hours $\geq$ 40)
Before Pregnancy	19.0	.747	.475	.165
Year 1	11.8	.569	.272	.070
Year 2	15.1	.636	.363	.140
Year 3	16.3	.638	.398	.155
Year 4	17.3	.652	.421	.179
Year 5	18.3	.679	.448	.201
Year 6	19.3	.689	.468	.215
Year 7	20.3	.710	.491	.236
Year 8	21.6	.733	.523	.259
Year 9	22.8	.750	.555	.269
Year 10	23.5	.762	.564	.298
Year 11	24.3	.782	.588	.307
Post-Assessment	24.8	.771	.596	.333
All Years	18.9	.934	.453	.057
Years 1 – 3	14.4	.763	.339	.054
After Year 3	20.7	.911	.508	.111
Low SES	17.0	.927	.402	.037
High SES	20.9	.940	.509	.079

Note: Table displays results for the nationally representative subsample of the NLSY. The sample size is 2,201. Year 1 refers to the first four quarters of the child's life, year 2 to the fifth through eighth quarter, and so forth. The period before pregnancy refers to the 40th through 91st weeks prior to pregnancy; that after assessment to the calendar year following the survey date at which the child is 10 or 11 years old. "All years" refers to the period from the child's birth until the birthday preceding the assessment date. "After year 3" refers to the same period, with the exclusion of the first three years. SES is determined by ranking children according to predicted total family income in the year prior to assessment. Predicted income is estimated by regressing income on maternal age, education and AFQT scores, race/ethnicity and presence of a spouse/partner in the household in the birth year. High (low) SES children are those whose families are in the top (bottom) half of the predicted income distribution. The results in the lower panel of the table refer to employment in all years.

Table 2:
Sample Means of Selected Variables By Average Weekly Work Hours of Mother

Variable	Full Sample	Average Weekly Work Hours		
		0-14	15-29	≥ 30
Outcome				
PPVT	0.00	-0.10	0.08	0.06
	(0.02)	(0.04)	(0.04)	(0.04)
PIAT-Mathematics	0.00	-0.09	0.05	0.08
	(0.02)	(0.04)	(0.04)	(0.04)
PIAT-Reading Recognition	0.00	-0.09	0.05	0.08
	(0.02)	(0.04)	(0.04)	(0.04)
Behavior Problems Index	0.00	0.04	0.00	-0.07
	(0.02)	(0.03)	(0.04)	(0.04)
Substance Use (%)	13.1	13.4	15.7	9.3
	(0.8)	(1.2)	(1.5)	(1.4)
Obese (%)	12.7	11.9	12.5	14.1
	(0.7)	(1.1)	(1.3)	(1.5)
Overweight Risk (%)	29.2	29.0	27.8	31.5
	(1.0)	(1.5)	(1.7)	(2.0)
Family Background				
Mother's Age (years)	22.9	22.7	22.7	23.5
	(0.1)	(0.1)	(0.1)	(0.1)
Mother Has Attended College (%)	32.4	25.5	32.7	43.8
	(1.0)	(1.4)	(1.8)	(2.1)
Mother's AFQT Score	38.3	33.5	40.1	44.4
	(0.6)	(0.9)	(1.0)	(1.1)
Spouse/Partner Present (%)	74.5	69.6	76.5	80.4
	(0.9)	(1.3)	(1.6)	(1.6)
Total Family Income in Previous Year ($)	43,848	36,891	45,170	54,106
	(1,696)	(2,265)	(3,317)	(3,570)
Child Characteristics				
Low Birth Weight (%)	6.2	6.8	6.6	4.8
	(0.5)	(0.8)	(0.9)	(0.9)
Very Low Birth Weight (%)	0.8	1.0	0.6	0.5
	(0.2)	(0.3)	(0.3)	(0.3)

Note: See note on Table 1. Table displays averages for the nationally representative subsample of the NLSY. Standard errors are in parentheses. Work hours are averaged over all years. PPVT, PIAT and BPI scores are normalized to have a mean (standard deviation) of 0 (1) for the nationally representative NLSY subsample. Mother's age or education and presence of a spouse/partner refer to year in which the child was born. Total family income is for the calendar year before the assessment date. Low (very low) birth weight indicates that the child weighed less than 2500 (1500) grams at birth.

Table 3:
Regression Estimates of the Effect of Maternal Employment on Cognitive Outcomes

Time Period	**(a)**	**(b)**	**(c)**	**(d)**
		PPVT Score		
Before Assessment	.262 (.026)	.048 (.023)	.023 (.024)	-.033 (.031)
Post-Assessment				.032 (.019)
		PIAT-Mathematics Score		
Before Assessment	.195 (.025)	.055 (.024)	.044 (.024)	-.031 (.032)
Post-Assessment				.036 (.019)
		PIAT-Reading Recognition Score		
Before Assessment	.190 (.025)	.020 (.024)	-.001 (.024)	-.050 (.032)
Post-Assessment				.035 (.019)
Other Regressors	None	B	B,S	B,S,E

Note: Table shows predicted effect of a 20 hour increase in average weekly maternal work hours during the period from the child's birth through the birthday prior to assessment and, in specification (d), also for the calendar year after assessment. Outcomes are for children 120-143 months of age. The cognitive assessments are normalized to have a standard deviation of one and estimation is by ordinary least squares. All models control for the assessment year. The categories of additional regressors are "Basic" child, maternal and household characteristics (B); Supplementary child health, family background and location specific characteristics (S), and pre-pregnancy maternal employment characteristics (E). See Table A.1 for full descriptions. Sample sizes are 3,521, 3,556 and 3,547 for PPVT, PIAT-M and PIAT-R scores.

Table 4:
Regression Estimates of the Effect of Maternal Employment on Non-Cognitive Outcomes

Time Period	(a)	(b)	(c)	(d)
		Behavior Problems Index		
Before Assessment	-.114 (.024)	-.049 (.025)	-.041 (.026)	-.038 (.034)
Post-Assessment				.016 (.021)
		Substance Use		
Before Assessment	-.009 (.009)	.002 (.009)	.003 (.009)	.012 (.012)
Post-Assessment				.001 (.007)
		Obesity		
Before Assessment	.016 (.008)	.029 (.009)	.022 (.009)	.016 (.012)
Post-Assessment				.013 (.012)
		Overweight Risk		
Before Assessment	.030 (.011)	.040 (.012)	.032 (.012)	.023 (.016)
Post-Assessment				.027 (.010)
Other Regressors	None	B	B,S	B,S,E

Note: See note on Table 3. BPI scores are normalized to have a standard deviation of one. Estimation is by OLS for BPI and as binary probit models for substance use and excess body weight. For the probit estimates, the table shows predicted effects with the other explanatory variables evaluated at the sample means. Sample sizes are 3,651, 3,245, 3,775 and 3,775 for BPI, Substance Use, Obesity and Overweight Risk.

Table 5:
Effects of Maternal Employment for Advantaged and Disadvantaged Children

Group	PPVT	PIAT-M	PIAT-R	BPI	Substance Use	Obesity	Overweight Risk
	Disadvantaged Children						
Hispanic or Black	.018 (.045)	.004 (.045)	-.012 (.045)	-.124 (.047)	.001 (.016)	.002 (.017)	.020 (.022)
Mother Has Not Attended College	.060 (.038)	.033 (.039)	-.017 (.039)	-.009 (.042)	.019 (.015)	.013 (.015)	.012 (.020)
No Spouse/Partner Present in Birth Year	.027 (.052)	-.018 (.055)	.030 (.055)	-.076 (.060)	.007 (.022)	-.008 (.022)	.009 (.028)
Low SES (bottom 50%)	.004 (.040)	.014 (.042)	-.025 (.043)	-.049 (.047)	.002 (.017)	-.002 (.017)	.002 (.022)
	Advantaged Children						
Not Hispanic or Black	-.126 (.042)	-.083 (.047)	-.092 (.047)	.054 (.051)	.019 (.018)	.022 (.015)	.018 (.023)
Mother Has Attended College	-.214 (.054)	-.155 (.056)	-.133 (.055)	-.102 (.058)	.000 (.016)	.014 (.018)	.039 (.027)
Spouse/Partner Present in Birth Year	-.063 (.039)	-.030 (.040)	-.089 (.040)	-.027 (.042)	.012 (.014)	.028 (.013)	.037 (.020)
High SES (top 50%)	-.100 (.050)	-.091 (.051)	-.090 (.050)	-.063 (.051)	.016 (.015)	.032 (.015)	.050 (.024)

Note: See note on Tables 3 and 4. The specification estimated is the same as model (d) of those tables, with the sample limited to the specified group. Maternal education refers to status in the year the child was born. SES is determined by ranking children according to predicted total family income in the year prior to assessment. Predicted income is estimated by regressing total family income on maternal age, education and AFQT scores, race/ethnicity and presence of a spouse/partner in the household in the birth year. High (low) SES children are those whose families are in the top (bottom) half of the SES distribution. Samples sizes range between 1,845-2,165 for Hispanics or blacks, 1,400-1,600 for non-Hispanic non-Blacks, 2,225-2,569 for no college, 1,015-1,198 for attended college, 1,171-1,357 for no spouse/partner present in birth year, 2,001-2,298 for spouse/partner present in birth year, 2052-2373 for low SES and 1,239-1,477 for high SES children.

Table 6:
Linear and Quadratic Estimates of Effect of Maternal Employment on the Cognitive Development and Body Weight by SES

	PPVT		PIAT-M		PIAT-R		Obesity		Overweight Risk	
	(a)	**(b)**	**(a)**	**(b)**	**(a)**	**(b)**	**(a)**	**(b)**	**(a)**	**(b)**
	Low SES Children									
Effects of Working										
20 Hours	.004	.185	.014	.094	-.024	.105	-.002	.006	.002	-.009
30 Hours	.006	.143	.021	.082	-.037	.061	-.002	.035	.003	-.005
40 Hours	.008	.010	.028	.028	-.050	-.049	-.003	-.003	.004	.004
P-Value										
Hours Squared		<.001		.094		.008		.696		.641
Joint Test	.918	<.001	.742	.232	.559	.024	.925	.923	.921	.892
	High SES Children									
Effects of Working										
20 Hours	-.100	-.025	-.091	.039	-.090	-.091	.029	.004	.046	.027
30 Hours	-.150	-.083	-.137	-.020	-.135	-.136	.047	.023	.071	.054
40 Hours	-.200	-.171	-.182	-.133	-.180	-.181	.066	.056	.096	.089
P-Value										
Hours Squared		.286		.067		.986		.209		.558
Joint Test	.047	.078	.073	.038	.069	.192	.032	.044	.039	.100
Hours Squared	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Note: See notes on Tables 3 through 5. SES is determined by ranking children according to predicted total family income in the year prior to assessment. High (low) SES children are those whose families are in the top (bottom) half of the SES distribution. Specification (b) includes a quadratic for maternal work hours whereas model (a) does not. “Effects of working” refer estimated differentials relative to no employment by the mother during the child's life. For the binary probit estimates, these are calculated as differences in predicted values averaged across all sample members. The P-Value for “joint test” refers to the hypothesis that the linear and quadratic term (if any) on work hours are jointly equal to zero; that on hours squared refers to the p-value for only the quadratic term.

Table 7:
Effects of Maternal Employment Using Alternative SES Groupings

SES Group	PPVT	PIAT-M	PIAT-R	Obesity	Overweight Risk
SES Based on Predicted Family Income in Year Before Assessment					
Lower Third	.045	.035	.007	-.017	-.005
	(.046)	(.049)	(.050)	(.020)	(.025)
Middle Third	-.065	-.040	-.053	.007	.008
	(.059)	(.061)	(.060)	(.019)	(.029)
Top Third	-.164	-.107	-.161	.063	.091
	(.063)	(.063)	(.060)	(.019)	(.030)
SES Based on Actual Family Income in Year Before Child's Birth					
Lower Third	.003	.023	.015	-.005	-.002
	(.057)	(.059)	(.058)	(.022)	(.029)
Middle Third	-.075	-.026	-.087	.033	.019
	(.057)	(.063)	(.062)	(.022)	(.031)
Top Third	-.133	-.198	-.165	.028	.037
	(.073)	(.073)	(.073)	(.022)	(.037)

Notes: See notes on Tables 3 through 5. In the top panel, SES is determined by ranking children according to predicted total family income in the year prior to assessment. In the lower panel, SES categorizes children based upon actual family income in the calendar year prior to the child's birth.

Table 8:
Estimated Effects of Home Environment on Cognitive Development and Body Weight by SES

Regressor	PPVT		PIAT-M		PIAT-R		Obesity		Overweight Risk	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
	All Children									
HOME	.204	.248	.152	.185	.159	.191	-.000	-.004	.002	.006
	(.017)	(.024)	(.018)	(.025)	(.018)	(.024)	(.006)	(.009)	(.009)	(.012)
HOME * Work Hours		-.054		-.039		-.040		.005		-.004
		(.020)		(.021)		(.021)		(.008)		(.010)
	Low SES Children									
HOME	.167	.196	.122	.143	.144	.173	.002	.002	.014	.017
	(.020)	(.028)	(.021)	(.030)	(.021)	(.030)	(.009)	(.012)	(.011)	(.015)
HOME * Work Hours		-.038		-.028		-.039		.001		-.005
		(.026)		(.028)		(.028)		(.012)		(.015)
	High SES Children									
HOME	.285	.418	.212	.265	.175	.203	-.001	-.014	-.018	-.011
	(.032)	(.050)	(.033)	(.052)	(.032)	(.051)	(.010)	(.016)	(.015)	(.025)
HOME * Work Hours		-.125		-.050		-.027		.011		-.006
		(.037)		(.039)		(.037)		(.010)		(.018)

Notes: See notes on Tables 3 through 6. SES is determined by ranking children according to predicted total family income in the year prior to assessment. Specification (a) includes a control for the total standard score on the Home Observation Measurement of the Environment (HOME), averaged over measurements at the assessment year and two and four years earlier, and normalized to have a mean of zero and a standard deviation of one for the nationally representative NLSY subsample. Model (b) also includes an interaction of the HOME score with maternal work hours.

Table 9:
Effects of Work Hours on Cognitive Development and Body Weight At Actual and Average Home Environment

Predicted Employment Effect	PPVT	PIAT-M	PIAT-R	Obesity	Over-weight Risk
Low SES Children					
At Actual HOME Score	.004 (.040)	.014 (.042)	-.025 (.043)	-.001 (.017)	.004 (.022)
At Average HOME Score	-.033 (.042)	-.014 (.044)	-.060 (.045)	-.001 (.018)	.000 (.023)
High SES Children					
At Actual HOME Score	-.100 (.050)	-.092 (.051)	-.092 (.050)	.033 (.015)	.051 (.024)
At Average HOME Score	-.077 (.049)	-.082 (.051)	-.085 (.049)	.033 (.015)	.051 (.024)
SES Disparity Due to Difference in Home Environment					
Total SES Disparity	-.104	-.106	-.067	.034	.047
Disparity Remaining After Controlling for HOME Score	-.044	-.068	-.025	.034	.051
% of SES Disparity Explained	58.1	35.4	61.8	0.9	-8.3

Note: The predictions at "Actual HOME Score" are obtained for specifications corresponding to model (d) of Tables 3 and 4, with SES based on predicted income and the sample restricted to observations with valid HOME score data. Those at "Average HOME Score" are obtained from the coefficients on work hours in model (b) of Table 8, which are the expected effects of maternal employment when HOME scores are equal to zero (the average value for the nationally representative NLSY subsample).

Table 10:
Predicted Test Scores and Obesity/Overweight Prevalence by Maternal Employment and SES

Average Weekly Work Hours	**PPVT** (percentile)	**PIAT-M** (percentile)	**PIAT-R** (percentile)	**Obesity** (%)	**Overweight Risk** (%)
	Low SES Children				
0	**27.1**	**32.2**	**34.4**	**16.8**	**32.8**
20	**32.7**	**35.4**	**38.7**	**17.4**	**31.9**
40	**27.4**	**33.1**	**32.8**	**16.5**	**33.2**
	High SES Children				
0	**60.2**	**57.2**	**61.0**	**7.6**	**23.5**
20	**56.7**	**58.6**	**57.8**	**10.5**	**28.2**
40	**53.2**	**52.3**	**54.4**	**14.2**	**33.2**

Note: See notes on Tables 3 through 7. SES is determined by ranking children according to predicted total family income in the year prior to assessment. High (low) SES children are those whose families are in the top (bottom) half of the SES distribution. The table shows the predicted test score percentile or percent predicted to be obese or at risk of overweight for specified number of maternal work hours during the child's life. Predictions are based on quadratic work hours specification for low SES children. They are based on a linear specification for the high SES group, except for PIAT-M scores, where the quadratic model is used. Test percentiles are calculated for each individual, with maternal work hours set to the specified value, and then averaged across all children in the group.

Appendix

Table A.1: Variables Used in Analysis

Variable	Description
	Outcomes
PPVT	Peabody Picture Vocabulary Test-Revised Total Standard Score
PIAT-M	Peabody Individual Achievement Test, Mathematics Total Standard Score
PIAT-R	Peabody Individual Achievement Test, Reading Recognition Total Std. Score
BPI	Behavior Problems Index Total Standard Score
Substance Use	Has Smoked Cigarettes or Used (more than a sip or two of) Alcohol
Obesity	Body Mass Index (BMI) at or above sex- and age-specific 95^{th} percentile cut point
Overweight Risk	BMI at or above sex- and age-specific 85^{th} percentile cut point
	Maternal Employment
Hours	Average Weekly Work Hours (divided by 20) during specified period
Post-Assessment	Average Weekly Work hours (divided by 20) in calendar year after assessment
	"Basic" Child, Maternal and Household Characteristics (B)
Age	Age of child (in months) at assessment date
Age Squared	Age Squared of child at assessment date
Race/Ethnicity	Child is Hispanic or a non-Hispanic Black (2 d.v.'s)
Female	Child is Female (d.v.)
Parity	Birth order of child
AFQT Score	Mother's score on the Armed Forces Qualification Test in 1980
Mother's Age	Age (in years) of mother at the time of child's birth
Education	Mother completed high school, attended college, college graduate in birth year (3 d.v.'s)
Spouse	Spouse/Partner present in birth year (d.v.)
	Supplemental Maternal, Family and Child Characteristics (S)
Birth weight	Low ($\leq$2500 grams) or Very Low ($\leq$1500 grams) Birth weight (2 d.v.'s)
Long Hospital Stay	Child stayed in hospital longer than mother following birth (d.v.)
M.D. Visit	M.D. visit in first, second/third month of life (2 d.v.'s)
Hospitalization	Child hospitalized during first year (d.v.)
Income	Family Income in Year Before Birth (2000 year dollars)
Siblings	Sibling born $\leq$18, 19-36 months before/after child's birth (4 d.v.'s)
Private	Mother's current or last secondary school attended in 1979 was private (d.v.)
	Pre-Pregnancy Employment Characteristics (E)
Weeks Before	Mother Stopped Working 0, 1-13,14-39, 40-155 weeks before birth (4 d.v.'s)
Hours Before	Average Weekly Work Hours (divided by 20) in Year Prior to Pregnancy
Occupation	Occupation of main job in 4^{th} quarter prior to birth was: professional/managerial, sales, clerical, crafts/operative, service/household (5 d.v.'s)
	Auxiliary Family and Location Characteristics (A)
Father Present	Father living in household at assessment date (d.v.)
Location	Mother lived outside U.S., in Southern U.S., or in rural area at age 14 (3 d.v.'s)
Grandmother Work	Mother's mother worked when mother was 14 (d.v.)
Learning Resources	Mother had magazines, newspaper, library card in home in age 14 (3 d.v.'s)
Foreign Born	Mother's mother/father foreign born (2 d.v.'s)
Grandparents Educ.	Mother's mother/father completed high school, attended college (4 d.v.'s)
Both Parents	Mother lived with both mother and father at age 14 (d.v.)

Table A.1 (Continued)	
Mother Only	Mother lived with mother and no adult male in household at age 14 (d.v.)
First Smoked	Mother smoked first cigarette before age 14 (d.v.)
Marijuana	Mother tried marijuana/hashish, before age 21 (d.v.)
Mother's Siblings	Mother had 0, 3-5, ≥ 6 siblings (3 d.v.'s)
Residence	Lives in central city, SMSA/MSA at assessment date (2 d.v.'s)
Crime	Local crime rate (in 1985)
Birth	Local birth rate (in 1984)
Marriage	Local marriage rate (in 1984)
Divorce	Local divorce rate (in 1985)
Physician	Local physicians per 100,000 people (in 1985)
	Home Environment
HOME	Home Observation and Measurement of the Environment – Short Form Total Standard Score, averaged over three assessments
	Maternal Body Mass Index
BMI Before	Maternal BMI based on weight immediately before pregnancy.
BMI as Assessment	Maternal BMI based on weight at child assessment date.

Note: All variables are obtained from the NLSY. See text for additional details.

Table A.2:
Sample Means of Demographic Characteristics and Outcomes By SES

Variable	Low SES	High SES
Outcomes		
PPVT	-0.59 (0.02)	0.19 (0.03)
PIAT-Mathematics	-0.44 (0.02)	0.18 (0.03)
PIAT-Reading Recognition	-0.38 (0.02)	0.21 (0.03)
Behavior Problems Index	0.12 (0.02)	-0.12 (0.03)
Substance Use (%)	14.7 (0.8)	9.6 (0.8)
Obesity (%)	16.8 (0.8)	11.0 (0.8)
Overweight Risk (%)	32.4 (1.0)	28.8 (1.2)
Family Background		
Mother's Age (years)	21.2 (0.1)	24.8 (0.1)
Mother Has Attended College (%)	16.2 (0.7)	56.0 (1.3)
Mother's AFQT Score	18.6 (0.3)	49.1 (0.7)
Spouse/Partner Present (%)	46.0 (1.0)	92.5 (0.7)
Total Family Income in Previous Year ($)	30,960 (1,382)	54,790 (2,497)
Child Characteristics		
Low Birth Weight (%)	8.9 (0.6)	5.8 (0.6)
Very Low Birth Weight (%)	1.3 (0.2)	0.4 (0.2)

Note: See note on Table 5. SES is determined by ranking children according to predicted total family income in the year prior to assessment. High (low) SES children are those whose families are in the top (bottom) half of the SES distribution. Standard errors are in parentheses.

Table A.3:
Additional Estimates of Effect of Maternal Employment

Outcome	(a)	(b)	(c)
PPVT	-.033	-.035	-.035
	(.031)	(.031)	(.031)
PIAT-Mathematics	-.031	-.036	-.031
	(.032)	(.033)	(.033)
PIAT-Reading Recognition	-.050	-.054	-.053
	(.032)	(.032)	(.032)
Behavior Problems Index	-.038	-.056	-.034
	(.034)	(.035)	(.035)
Substance Use	.012	.013	.017
	(.012)	(.012)	(.012)
Obesity	.016	.016	.017
	(.012)	(.012)	(.012)
Overweight Risk	.023	.023	.024
	(.016)	(.017)	(.016)
Additional Regressors	B,S,E	B,S,E,A	B,S,E,F

Note: See notes on Tables 3 and 4. Specification (a) is the same as model (d) of those tables. Columns (b) and (c), respectively, add controls for auxiliary characteristics (A) and state dummy variables (F).

Table A.4:
Effects of Work Hours on the BMI of Mothers With 10-11 Year Old Children

Regressor	**(a)**	**(b)**	**(c)**
Low SES			
Maternal Work Hours	-.890 (.292)	-.377 (.209)	-.412 (.209)
BMI Before Pregnancy		1.076 (.209)	
High SES			
Maternal Work Hours	.482 (.299)	.134 (.197)	.164 (.199)
BMI Before Pregnancy		1.135 (.197)	
Dependent Variable	BMI	BMI	Δ in BMI

Notes: See notes on Tables 3 through 5. SES is determined by ranking families according to predicted total family income in the year prior to assessment. The dependent variable is Body Mass Index (BMI) of the mother when the child is 10 or 11, except in column (c) when it is the change in BMI from immediately prior to pregnancy until this time. Sample sizes range from 2,083 to 2,247 (1,320 to 1,414) for low (high) SES mothers.

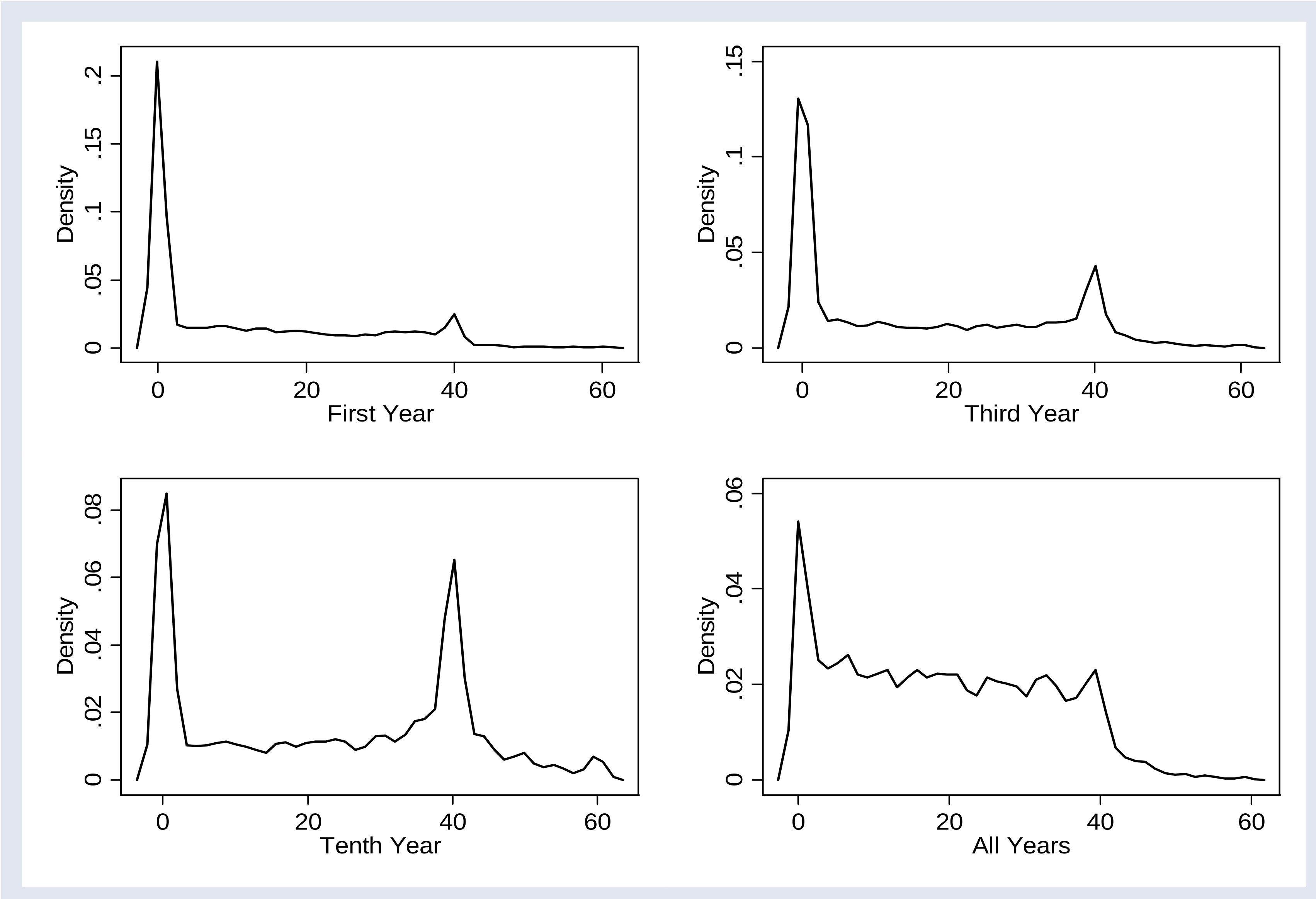

Fig 1: Average Weekly Work Hours of Mother at Specified Child Ages