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Mother or Market? Effects of Maternal Employment on the Intellectual Ability of 4-Year-Old Children

Sonalde Desai
Rand Corporation, 1700 Main Street, Santa Monica, California 90406
P. Lindsay Chase-Lansdale
Center for Family Research, George Washington University Medical Center, 2300 I Street, N.W., Washington, D.C. 20037
Robert T. Michael
University of Chicago and NORC, 1155 E. 60th Street, Chicago, Illinois 60637

This article uses the 1986 Children of the National Longitudinal Survey of Youth data set to investigate the impact of maternal employment on children's intellectual ability, as measured at the age of 4 by using the Peabody Picture Vocabulary Test (PPVT). Results from multivariate regression analysis show a statistically significant adverse effect of mother's employment on children's intellectual ability, but only for boys in higher income families. Furthermore, the negative impact was related to the timing of maternal employment: employment during the boys' infancy had a statistically significant negative effect on PPVT scores at the age of 4. This pattern was not found for girls, for children in low-income families, or for families in which mothers resumed their employment after the child's first year of life. The impact of other demographic trends in recent years—declining fertility and rising marital instability—are also investigated. The results show an adverse effect of the presence of other siblings on children's PPVT scores; but holding family income constant, the effect of the parents' marital status on children's intellectual ability is not statistically significant. In addition, several family background factors are highly correlated with children's test scores.

Three significant and interrelated demographic trends have dominated the social landscape in the United States for the past quarter-century: a dramatic rise in the labor force participation of mothers with young children, a pervasive decline in fertility rates (especially marital fertility rates), and a more than doubling of divorce rates and growing rates of transitory nonmarital cohabitation.

1. In 1960 the labor force participation rate of married women with children under 6 years old was 18.6 percent, by 1970 it was 30.3 percent, by 1980 it was 45.1 percent, and by 1987 it was 56.8 percent (U.S. Bureau of the Census, 1988:374, table 624). Furthermore, mothers are more likely than ever before to return to work when their children are in their infancy. In 1985 52 percent of mothers whose youngest child was 1 year old or younger were in the labor force, up from 43 percent in 1982 and 32 percent in 1977. Of mothers with first-born infants under 1 year old, 57 percent were employed in 1985 (U.S. Bureau of the Census, 1986). Recent projections indicate that by 1995 more than 65 percent of young children will have an employed mother (Hofferth and Phillips, 1987).

2. The decline in the fertility rate has been equally dramatic. In the mid-1950s the total fertility rate (as expressed per woman) was 3.7 children (3.5 for whites; 4.7 for blacks), whereas 15 years later the comparable number was 2.5 children overall (2.4 for whites; 3.1 for blacks) and by 1985 the rate had further declined to 1.8 (1.8 for whites; 2.3 for blacks) (U.S. Bureau of the Census, 1988:59, table 82). Because higher order parities show disproportionate declines, the average child today has substantially fewer siblings than in the past. Moreover, the spacing between children has also widened (Eggebeen, 1988).

3. The divorce rate in 1960 was 9.2 (annually, per 1,000 marriages), by 1970 it was 14.9, and by 1984 it was 21.5 (U.S. Bureau of the Census, 1988:83, table 126). Correspondingly, the number of children affected by their parents' divorce has been well in excess of 1 million annually (it exceeds 1 million even in the subset of about 30 states in the Divorce Registration Area). In addition, the percentage of births to unmarried women has risen from 5.3 percent of all births in 1960 (2.3 percent for whites; not available for blacks), to 22 percent in 1985 (14.5 percent for whites; 60.1 percent for blacks) (U.S. Bureau of the Census, 1988:62, table 87).

These demographic changes imply that the experience of a young child today is quite different than in years past. Young children are less likely to live their whole youth with two married biological parents, more likely to live in smaller families, and more likely to have a mother in the labor force. The broad issue that motivates our research agenda is how these demographic trends have affected the well-being of children. In this article, we address a portion of that issue, asking more specifically: What is the influence of the early resumption of maternal employment on the intellectual abilities of 4-year-olds?

In the following section we discuss theoretical issues relevant to this question. Then we describe the data set and the variables used. The subsequent section presents empirical results from an aggregative perspective and provides one answer to the question posed—an essentially negative answer, that there appears to be very little influence. This is followed by a less aggregative look offering evidence that the first answer masks important effects that are specific to subgroups of the population. The final section is a summary.

Theoretical Paradigm

We view the household as a productive entity in which parents make decisions about expending resources on their children and in which one of the many desirable products of the parents' investment is the child's cognitive development. In broad terms, the more resources available to the parents, the more will be devoted to the child, in terms of both money and time. Similarly, the more competing demands there are for the household's resources, the less will be devoted to the child (Becker, 1981; Lazear and Michael, 1988; Rosenzweig and Schultz, 1983).

Each of the three demographic trends just described affects the resources available to the household of the child and may affect the incentives of noncustodial parents to expend resources on the child as well (on the latter point, see Weiss and Willis, 1988). No one of these trends has a single, simple influence on the resources devoted to the child, and taken together the impact of the three may be very complex. Moreover, there is no well-articulated conceptualization in demography of the mechanisms through which resources devoted to the child have their influence on the child's cognitive, social, emotional, and physical development, although developmental psychology provides many insights about these mechanisms, which we will discuss.

Let us consider each of the three demographic trends in turn, beginning with the one of special interest to this article. The impact of maternal employment on the child's development, seen from this perspective, depends on how it affects the quality and quantity of resources available to the child. On the one hand, the mother's employment may reduce

the amount of time she spends with the child; thus it represents a reduction in the availability of one important resource that may enhance the child's development, the mother's time and responsiveness (Hill and Stafford, 1974, 1985; Leibowitz, 1974). On the other hand, the mother's employment immediately contributes income to the household and may, thereby, provide a better level of goods and services for the child's nurturance and development. In the longer run, her employment may result in the child's having fewer siblings as well as more distance in age from other siblings. It may also result in the mother's being more satisfied with her own life and thus being a stronger positive influence on the child.

The psychological literature, using other terms to describe the mother's resources allocated to the child, suggests three major mechanisms in explaining why maternal employment may be associated with certain negative outcomes: (1) The separation of mother and child may be particularly damaging in the first year of life and may start a trajectory that leads to long-term negative outcomes. The mother's physical absence may cause disturbances in the mother–child attachment relationship (Belsky, 1988) and may deprive the child of the stimulation necessary for cognitive development. (2) The stress and task overload on the mother associated with maternal employment may yield fewer and lower quality interactions with her children, affecting their emotional and cognitive development (Hoffman, 1980). (3) The quality of alternative child care and the stability of child care arrangements may affect the child. Higher quality care has been linked to more competent language development (McCartney, 1984), social adjustment (Phillips, McCartney, and Scarr, 1987), and play with peers, adults, and toys (Howes and Stewart, 1987). Recent studies have shown that instability in child care arrangements is related to poorer child outcomes (Howes and Stewart, 1987; Suwalsky et al., 1986).

The impact of the mother's employment on the child will depend on the quality of the alternative care given as compared with the mother's care, the mother's contribution to the household's income, and the effects of her employment on her own well-being and subsequent fertility. In all of these instances, the impact may be different depending on the characteristics of the mother, the family structure, the family income, and the age and gender of the child (Hoffman, 1980; Kamerman and Hayes, 1982; Milne et al., 1986).

In particular, we think it is more likely that the effect of maternal employment on the child will be adverse for high socioeconomic status (SES) families than for low SES families. A more highly educated mother probably provides a more stimulating environment for the child than does the typical alternative day care provider, and the added family income of the highly educated, married mother probably does not represent an equally proportionate increase in the material resources for the child. There is evidence that at low levels of income, a larger proportion of any additional family income is spent on children than at higher levels of income (see Lazear and Michael, 1988). A less educated mother, on the other hand, may be able to provide her child with a more, or at least equally, educated care giver through the marketplace. In addition, the added earnings of the less educated mother may make the difference in escaping poverty. We expect, therefore, that there may be a stronger negative net effect of maternal employment on the child in high SES families. This is an example of the interaction that we expect to find among the several sets of variables we will investigate as determinants of the child's development.

Most of the psychological research on maternal employment during the child's infancy has been conducted primarily on white middle-class samples. The few studies in that literature that have examined the impact of the early resumption of maternal employment indicate possible short- and long-term negative outcomes for children in both cognitive and social development. Several recent studies suggest that when mothers begin employment before their child's first birthday, problems in social development may arise. These problems are manifested in insecure attachment to parents at the age of 1 (Barglow, Vaughn, and Molitor, 1987; Schwartz, 1983), especially among boys (Belsky and Rovine, 1988; Chase-

Lansdale and Owen, 1987), many of whom showed higher rates of avoidant behavior. There is disagreement about how maladaptive this behavior is and whether it leads to long-term problems in social development (Clarke-Stewart and Fein, 1983). Some long-term negative effects are suggested by studies finding heightened aggression toward adults and peers and noncompliant behavior in preschoolers (Rubenstein, Howes, and Boyle, 1981; Schwarz, Strickland, and Krolick, 1974) and poor peer relations and lower self-esteem in third graders (Vandell and Corasaniti, 1988). The negative outcomes seem related to full-time but not part-time maternal employment (Bronfenbrenner and Crouter, 1982).

Regarding early maternal employment effects on cognitive development, the evidence is less substantial and contradictory. One study reported no differences between infants of employed and nonemployed mothers in cognitive development in the first year of life (Hock, 1980), whereas two other small studies reported lower cognitive performance in toddlers whose mothers resumed employment in infancy (Cohen, 1978; Schachter, 1981). The only study to examine long-term effects of early maternal employment on cognitive development (Vandell and Corasaniti, 1988) found poorer work habits and lower grades among 8-year-old children whose mothers returned to work full-time during infancy, compared with children whose mothers returned later, or part time, or not at all. For girls, but not for boys, early maternal employment was related to poor performance on standardized tests of intellectual ability at 8 years old. A separate subset of studies, however, indicates that children from very disadvantaged families may benefit from maternal employment if this includes their enrollment in high-quality enrichment programs (e.g., Ramey and Campbell, 1984).

There is no comparable literature in demography, since the child's development has not been a focus of study. It certainly is a consequence of demographic behavior, however; so we contend that it is a proper focus of demographic inquiry. Notice that the psychological literature looks for effects in what a demographer would consider a highly interactive model, holding many factors constant by the selection of a small group of socioeconomically similar children. In our inquiry we begin at the other end of the spectrum, by estimating the effect of maternal employment on the development of the child in a highly diverse sample. We then gradually move from that global estimate toward more highly interactive effects, by race, family income, and mother's ability.

Thus our focus on the resources available to the child leads us to emphasize three complexities in studying the effects of maternal employment on the child: (1) There are direct and indirect effects, some detrimental and others beneficial. Thus depending on what we control in the multivariate analyses, we expect to see different estimated effects. (2) There are important interaction effects, and the impact of maternal employment is not likely to be uniform across all income levels, family structures, or mothers' abilities. (3) The timing of the mother's entry into employment following the birth has an influence on its impact on the child.

Our focus on the resources for the child has implications as well for how the other two demographic trends, smaller family size and rising divorce rates, directly affect the child and how they interact with the mother's employment in influencing the child's development. Lower fertility implies that each child has fewer siblings and, holding the resource level of the household constant, receives more of the available resources (Becker and Tomes, 1976; Espenshade, 1984; Lazear and Michael, 1988; Willis, 1973). Thus we expect the decline in fertility to accompany an increase in resources available per child; or in a cross-sectional analysis, we expect to find that the number of siblings is negatively related to the child's development. Children whose parents wait a longer period before having another child are also more likely to have greater parental attention and monetary resources (Stafford, 1987).

This perspective is in accordance with a large number of empirical studies that have demonstrated a negative relationship between family size and children's intellectual abilities (for a thorough review of the literature, see Heer, 1985). The research suggests that a number

of different aspects of family size are negatively related to children's intellectual abilities: number of siblings (Belmont and Marolla, 1973; Black, 1981), birth spacing (Lindert, 1977; Zajonc, 1976; Zajonc and Marcus, 1975), and sibling order with greater negative effect from the presence of younger siblings than older siblings (Mercy and Steelman, 1982).

Families that experience marital disruption typically have less parental time as well as less monetary resources to devote to the child. These families also have a relatively high probability that the mother is employed. Both the lower level of monetary resources and the lower availability of the parent (as well as the lack of stability in living arrangements and routines and the reduction in the quality of parent–child interactions) may be expected to affect the child's development adversely.

There are many other family resources that may vary and may affect the child's development. We use measures of the mother's verbal ability, her schooling, her age at the birth of the child, the family's income, and the mother's earnings. In each case we expect that the availability of greater resources in the family will be associated with a greater level of intellectual ability in the child.

Data and Methodology

In our empirical analysis we use a subset of the newly released data file Children of the National Longitudinal Survey of Youth (referred to as the children of the NLS/Y; for details see Baker and Mott, 1989). The parent survey, conducted by the Center for Human Resource Research at Ohio State University since 1979, has annually surveyed a national probability sample of 12,686 men and women aged 14–21 on January 1, 1979, with oversampling of blacks, Hispanics, and low-income whites. The children of the NLS/Y is a data set from a 1986 survey of the nearly 5,000 biological children of the women in the NLS/Y data. The data on the children are integrated with the 8 years of data collected about their mothers.

We have chosen to study the 4-year-old children, of whom there are 585, with 503 having complete data for our analysis. There are 250 girls and 253 boys in the sample. We investigate their intellectual ability, measured by the Peabody Picture Vocabulary Test (PPVT).

We do not include older children in our sample and focus on 4-year-olds to eliminate the complexity of analyzing the impact of school enrollment and its influence on the relationship between maternal employment and children's intellectual ability. In addition, we conduct our analyses separately for boys and girls, since an extensive literature suggests that certain subgroups of boys may be more negatively affected by maternal employment than girls (Bronfenbrenner and Crouter, 1982; Hoffman, 1984; Zaslow, 1987; Zaslow and Hayes, 1986).

Our statistical procedure is multiple regression, estimated using ordinary least squares and weighted by mother's sample weight to correct for the oversampling of blacks, Hispanics, and low-income whites. We regress the child's PPVT score on a set of demographic and socioeconomic family background variables, together with alternative sets of variables describing the mother's employment behavior over the child's lifetime. We examine the impact of the timing and extent of maternal employment on PPVT scores, controlling in the multiple regression for other variables known to relate to development or maternal employment.

Table 1 provides the summary statistics of the variables used in our study, reported separately for boys and for girls. In the next few paragraphs, we briefly discuss these variables. Exact definitions are provided in the Appendix.

Our sample of children is not a random sample of all 4-year-olds. Rather, it represents children born in 1981 and 1982 to the women in the NLS/Y sample. This implies that these children were born to mothers aged 16–25 at this birth. Since these children were

Table 1. Means and Standard Deviations (S.D.'s) for the Variables Used in the Analyses and Correlation With Child's PPVT Score, by Gender

Variable	Boys			Girls		
	Mean	S.D.	Corr.	Mean	S.D.	Corr.
PPVT standard score	88.490	18.805	1.000	91.626	20.749	1.000
Mother's race/ethnicity						
White	0.735		0.515	0.727		0.529
Black	0.162		−0.449	0.177		−0.420
Hispanic	0.103		−0.204	0.097		−0.255
Maternal characteristics						
Verbal ability	−0.318	0.983	0.435	−0.172	0.902	0.494
Education	11.512	1.676	0.172	11.668	1.835	0.330
Age at birth	21.432	2.145	0.124	21.408	2.147	0.160
Family income (in $1,000s)						
Family income	14.150	10.767	0.225	15.842	26.615	0.180
Mother's maximum earnings	6.167	6.770	0.142	6.062	7.373	0.037
Mother's marital history						
Continually married	0.583		0.172	0.615		0.216
Divorced	0.138		0.002	0.172		0.077
Married after birth	0.079		−0.049	0.098		−0.167
Never married	0.185		−0.191	0.111		−0.271
Siblings						
Birth order	1.558	0.785	−0.226	1.550	0.796	−0.257
Sibling ≤3 yrs. younger	0.326		−0.146	0.380		−0.008
Sibling >3 yrs. younger	0.125		0.152	0.112		0.046
Maternal employment history						
Continuously employed	0.394		0.116	0.430		0.064
Intermittently employed	0.402		−0.036	0.411		−0.001
Never employed	0.204		−0.097	0.158		−0.085
Worked in first year	0.495		0.058	0.582		0.039
Stopped work after 3 mos.	0.039		0.079	0.044		0.035
Began work in second yr.	0.140		0.027	0.106		0.138
Continued work in second yr.	0.447		0.084	0.513		0.096
Sample size		253			250	

born to women who are relatively early childbearers and previous studies have shown that early childbearing is associated with lower education of the mother and low income (Hofferth and Moore, 1979; Marini, 1984), this sample is drawn from children born into more disadvantaged circumstances than a representative national sample of 4-year-olds.

Intellectual Ability. The dependent variable in our analysis is the revised PPVT (Dunn and Dunn, 1981). This test assesses vocabulary knowledge in children aged 3 years and older and gives an indication of mental age and intelligence quotient. The PPVT was standardized nationally on a sample of 4,200 children and adolescents. The revised test reworked the content for better racial, ethnic, and gender balance. The PPVT correlates significantly with other measures of verbal intelligence and with measures of reading and math achievement (Dunn and Dunn, 1981). As a measure of IQ, it taps the child's ability as influenced by both genetic and environmental factors (Rutter, 1985). The test yields a standard score, with 100 as the average and a standard deviation of 16. Given the nature of our sample, it is not surprising that the mean score on the standardized PPVT scale is about 90 in our sample, with a standard deviation of 20. About 12 percent of the sample did not complete this test and hence was excluded from the analyses.[1]

Maternal Employment. Several variables shown in Table 1 pertain to the mother's full-time employment: continuously worked (all 4 years of the child's life), intermittently worked (during the 4-year period), worked in the first year, stopped work after the first 3 months, began work in the second year, and continued work in the second year. All are dummy variables defined in the Appendix. Prior research (Heyns and Catsambis, 1986; Milne et al., 1986) suggests that estimates of the effect of maternal employment on children's achievement are extremely sensitive to the definition of mother's employment, so we use a variety of measures. Two are global measures of maternal employment in the first 4 years; others reflect the timing of the mother's return to work.

Family Structure and Family Size. In addition to maternal employment, we focus on the effects of two other demographic phenomena on the child's cognitive development: family structure, and family size and birth spacing. These variables are defined in the Appendix. Family structure variables were developed to take into account the experience of the child over his or her lifetime.

Family Background Characteristics. We control for the following family background variables: race/ethnicity, mother's education and scholastic aptitude, mother's age at the child's birth, and family income. Based on the mother's self-identification, we divide race/ethnicity into white (including Asian Americans and other groups), black, and Hispanic.

Mother's education is a continuous variable, showing the highest grade completed at the 1982 interview (about the time of the child's birth). The mother's scholastic aptitude was measured in 1980, well before the child was conceived, using the Armed Services Vocational Aptitude Battery (ASVAB), a test with several components (see Bock and Moore, 1986, for an assessment of this test as administered to this sample). We use the verbal aptitude component, measured by the Word Knowledge subscale. The tests were standardized to have a mean of 0 and a standard deviation of 1.0 in a cross-sectional, nationally representative sample.

We also include the age of the mother at the child's birth. The majority of the mothers (84 percent) were at least 19 years old at the time of the birth, and the mean age of the mothers at birth in this sample was 21.4 years. This age range covers some of the prime childbearing ages in the United States, but it does not allow us to examine the effect of the age of the mother at the child's birth between the two extremes, very young and relatively old mothers.

We use several different measures of the family's income level, including the total income in the family, excluding any earnings by the mother, and, separately, a measure of the mother's annual earnings during the same 4 years. Since many mothers were employed in some years and not in others, or part time some years and full time others, we used the maximum reported annual earnings by the mother in the 4 years.

Child Care Arrangements. At the time of the 1986 interview, mothers were asked to list the number and types of child care arrangements used in the first 3 years after the birth of each child. We use the variable *number of child care arrangements*, reflecting an aspect of the stability of child care. Although the quality of child care is an important factor in child outcomes in employed-mother families (Phillips, 1987), this is not the focus of our effort here. Although the data set may be used to study child care in depth, the reliability of this retrospective history of the child care arrangements has yet to be determined.

Empirical Results and Discussion

Results from ordinary least squares regressions, weighted by mother's sample weight and estimated separately for boys and girls, are presented in Table 2.

Table 2. Effect of Maternal Characteristics, Family Structure, and Maternal Employment on the PPVT Scores of Children, by Gender

Variable	Boys		Girls	
	Parameter	*t*	Parameter	*t*
Constant	87.615	6.621	88.942	6.298
Mother's race/ethnicity				
Black	−20.106**	−5.978	−18.397**	−5.386
Hispanic	−14.211**	−4.173	−16.214**	−4.362
Maternal characteristics				
Verbal ability	4.583**	3.642	6.268**	3.971
Education	−0.033	−0.048	2.443**	2.832
Age at birth	0.604	1.044	−0.575	−0.841
Family income				
Family income	0.051	0.418	−0.003	−0.072
Mother's maximum earnings	0.241	1.366	−0.011	−0.065
Mother's marital history				
Divorced	−3.282	−1.032	−1.265	−0.424
Married after birth	1.725	0.431	−3.511	−0.874
Never married	0.715	0.213	−1.948	−0.482
Siblings				
Birth order	−2.833	−1.948	−2.990*	−1.999
Sibling ≤3 yrs. younger	−6.469**	−2.895	−2.864	−1.214
Sibling >3 yrs. younger	6.359*	2.033	−2.426	−0.679
Maternal employment				
Continuously employed	−4.602	−1.371	−3.840	−1.034
Intermittently employed	−0.024	−0.009	2.259	0.699
R^2	0.405		0.434	
Sample size	253		250	

* $p < 0.05$.
** $p < 0.01$.

Family Background

Consider, first, the family background variables in the multiple regression. Blacks and Hispanics have lower PPVT scores, and the differences are substantial and statistically significant. Other research indicates that black children perform more poorly on tests of cognitive ability than white children, and this is often attributed to more disadvantaged economic circumstances (Lee, Brooks-Gunn, and Schnur, 1988). Our regression holds several economic indicators constant, and we still find a strong negative effect for black children. Cultural bias in the test itself is a possible explanation. Findings for Hispanic children are less extensive. For our sample, the issue of cultural bias for Hispanics is complicated because the PPVT was not available in Spanish at the time of its administration, so it was given in English to all children. Hence the measured lower verbal ability among Hispanics should be treated with great caution.[2] As the test can be viewed as an assessment of one aspect of school readiness of 4-year-olds, these racial/ethnic factors are important.

The measure of mother's verbal ability is strongly related to the child's PPVT scores, as anticipated. The educational level of the mother appears to have a strong positive influence on the girls' test scores but not on the boys' scores.

We find that holding all of the other variables in this regression constant, the mother's age at the birth of the child has no effect on the child's test score. Thus there is no evidence in this regression of an adverse effect of being born to a young mother, net of these other controls. In these data, however, the range of ages is narrow, 16–25 years. There is a positive

simple correlation of the mother's age and the child's PPVT score; but the negative effects young motherhood has on the child seem to be related to the other variables in the regression, a finding consonant with other studies indicating that socioeconomic conditions associated with teen parenthood are the factors in poor child outcomes (Furstenberg, Brooks-Gunn, and Chase-Lansdale, 1989).

None of the income variables used in this regression have a big influence on the child's PPVT. Neither the measure of family income (excluding mother's earnings) nor the measure of the mother's annual earnings seems to affect the PPVT score when other variables are held constant, but they do have sizable simple correlations, as seen in Table 1. This finding persists when we use other measures of the family's income, including the use of a single income variable instead of two or three.[3]

Family Structure and Family Size

Family structure appears to have very little partial effect on child outcomes, holding resources and other factors constant. In analyses not reported here, we used several different definitions of family structure but did not find a significant effect of the mother's marital status on the child's PPVT scores in any of these formulations. This is in accordance with other studies (Hetherington, Camara, and Featherman, 1981) showing that the short-term effect of parental divorce on children's cognitive outcomes tends to operate through a decline in family resources. Hence family structure may not have an independent significant effect in our model because we control for family income.

The presence of other siblings has a negative effect on the child's PPVT scores, with birth order having a significant negative effect for girls and a short interval between the index child and the next youngest sibling having a significant negative effect for boys. Research on the effect of family size on children's achievement suggests that children from smaller families have higher achievement. To some extent this may be a function of selection mechanisms, whereby families with higher SES have fewer children. In addition, a larger family (income held constant) has lower money resources and less parental time for each child. Furthermore, maternal employment is highly correlated with the family's size (Cramer, 1980; Eggebeen, 1988; Stolzenberg and Waite, 1977). The result reported here is a partial effect, controlling for these other factors.

In sum, several of the family background variables are strongly correlated with the child's PPVT score and in directions that are consistent with other findings reported in the literature. These findings can be interpreted in terms of the perspective suggested before: fewer resources available to the child result in a lower PPVT score. That interpretation is consistent with the effect seen here for mother's ability, mother's education (for girls), and number of siblings or birth order. The differences for blacks and Hispanics are not easily interpreted but are consistent with other reported results.

Mother's Employment

We turn now to the evidence about the impact of the mother's employment on the child. There was little opportunity prior to the availability of these data to look at the overall effect of maternal employment on young children's intellectual abilities in a large heterogeneous sample, controlling for many other dimensions of the family. Public policy debates over whether to encourage or discourage mother's employment during the child's infancy hinge on evidence of this nature. The motivation for our inquiry—the rise in the labor force participation of mothers with very young children—focuses on this overall relationship. Hence we use two measures, continuous employment and intermittent employment, to reflect the extent of the mother's employment over the child's first 4 years, without distinguishing the timing or intensity of the employment.

As we see in Table 2, the employment variables do not have a statistically significant effect on the PPVT score for boys or girls. Similar results were obtained when we used a variable reflecting whether the mother had any employment at all during her child's first 4 years. In our preliminary work to date, we have also found no relationship between the PPVT score and either the total number of weeks or the total number of hours the mother was employed in those 4 years. There is no discernible influence, overall, of the mother's employment on the child's intellectual ability, as measured by PPVT at the age of 4. In neither the simple correlations (Table 1) nor these partial relationships (Table 2) does the mother's employment appear to be related to the child's PPVT score. We believe this is an important finding.

The results presented in Table 2 hold constant three factors related to maternal employment: mother's earnings, presence of other children, and birth spacing. Maternal employment clearly leads, however, to increased earnings and possibly to delayed or postponed subsequent births. To distinguish empirically between the *total* and *partial* effects of maternal employment, we reestimated the same regression excluding maternal earnings, presence of younger siblings, and narrow birth spacing from our model. The results are presented in Table 3. The parameters labeled "Partial" indicate the effect of maternal employment, holding earnings and subsequent fertility constant (as shown in Table 2). The parameters labeled "Total" are based on a model that does not control for income or fertility following the birth of this child.

Both income and fertility change with the mother's employment in the direction that tends to benefit the child. Hence it is not surprising that the partial effect of maternal employment, holding constant income and fertility, is more negative than the total effect.

There are several qualifications to interpretations of the finding that mother's employment has no influence on the child's cognitive test score. First, we stressed in discussing the theoretical paradigm that the effect of the mother's employment probably differs by other family circumstances. That is, the effect should be expected to interact with the family's income and the mother's ability, in particular. Second, we have not considered the timing, as distinct from the amount, of the mother's employment. The developmental psychology literature (reviewed earlier) suggests that *when* the mother returns to work is more important than the mother's employment per se. It is the early exodus from the home that seems to have adverse effects for the child, so some refinement in our measure of maternal employment seems warranted. Thus it is not surprising that overall, maternal employment, as estimated in the regressions in Table 2, has little or no effect. We investigate in the next section some of the timing and interaction effects. Nonetheless, it is interesting and useful for public policy purposes to know that the partial as well as total effects on the intellectual progress of these 4-year-old children overall are essentially nonexistent.

Table 3. Total and Partial Effects of Maternal Employment on Child's PPVT Score, by Gender

	Boys		Girls	
Employment	Partial	Total	Partial	Total
Continuous	−4.602	0.292	−3.840	−2.937
t	−1.371	0.103	−1.034	−0.875
Intermittent	−0.024	1.851	2.259	2.826
t	−0.009	0.683	0.699	0.894

Note: Values for the partial effect are coefficients from the model presented in Table 2. Values for the total effect are coefficients from the model estimated with all of the variables in Table 2 excluding mother's earnings and the presence of younger siblings.

Disaggregated Effects of Maternal Employment

Maternal Employment and Family Income

We now turn to the interactions between income and maternal employment. To distinguish between higher and lower income families, we created a dummy variable called high income, defined as 1 for children whose family income over the 4 years of the child's life, net of the mother's earnings, was above $13,204.[4] This variable was considered in interaction with various measures of maternal employment. These interactions permit us to estimate separately the effect of maternal employment for the upper third and the lower two-thirds of the sample in terms of family income, exclusive of the mother's earnings.

As Panel A of Table 4 indicates, the mother's continuous employment has a significant negative effect on boys from higher income families. The magnitude of this effect is large—9 points on the PPVT test score (standardized mean, 100; standard deviation, 16). The effect of intermittent employment is not significant at the 0.05 level, nor is either employment variable for boys in low-income families or for girls in any of these interactions.

This finding of an effect for higher income families but not for lower income families is consistent with the implications of our theoretical paradigm: specifically, that maternal employment may reduce the resources available to children in higher income families but have a neutral or positive effect on the resources for children in low-income families. It may be that the daily absence of the higher SES mother is not compensated for by the alternative care setting, that is, that the quality of responsiveness and verbal interactions is not comparable. In contrast, at poverty or near-poverty levels, the increased economic security due to the mother's employment may outweigh any negative effects (Bronfenbrenner, 1985), perhaps by reducing the stress associated with poverty and by enabling the child to

Table 4. Interactive Effect of Family Income and Maternal Employment on Child's PPVT Score, by Gender

Main effect/interaction	Boys		Girls	
	Parameter	*t*	Parameter	*t*
	Panel A			
High Income	7.679	1.416	2.975	0.517
High Income × Continuous Employment	−9.239*	−2.077	−2.371	−0.484
High Income × Intermittent Employment	−1.514	−0.392	6.800	1.429
Low Income × Continuous Employment	0.209	0.049	−4.156	−0.857
Low Income × Intermittent Employment	1.742	0.467	−0.936	−0.220
	Panel B			
High Income	5.754	1.416	8.701*	2.347
High Income × Employed in Year 1	−7.218*	−2.292	−4.150	−1.195
Low Income × Employed in Year 1	−0.868	−0.289	−1.476	−0.477
Stopped Work After First 3 Months	3.950	0.758	2.970	0.559
	Panel C			
High Income	5.944	1.373	6.090	1.557
High Income × Began Work in Year 2	−0.819	−0.164	12.850**	2.589
High Income × Continued Work in Year 2	−8.687*	−2.537	−0.945	−0.253
Low Income × Began Work in Year 2	2.960	0.729	2.511	0.459
Low Income × Continued Work in Year 2	−0.810	−0.233	1.342	0.412

Note: Panels A, B, and C also contained maternal characteristics, mother's marital history, family size, family income, and mother's earnings.

* $p < 0.05$.

** $p < 0.01$.

have experiences that benefit his or her intellectual development [e.,g., books at home or a family outing (Bradley and Caldwell, 1980)] that he or she might otherwise not have.

Why are the negative effects of maternal employment limited to *boys*? Boys are perceived by parents to be tougher, more autonomous, and less in need of parental responsiveness than girls (Zaslow and Hayes, 1986). Under stressful circumstances associated with maternal employment—task overload, reduced time together, separation—parents may expect their sons to cope on their own and thus may not interact with them nearly as much as with daughters (Chase-Lansdale and Owen, 1987). The few available studies of parent–child interaction at home indicate that in middle-class families, the sons of employed mothers received less stimulation and responsiveness from parents than girls in such families or children of either sex in families in which the mother does not work for pay (Stuckey, McGhee, and Bell, 1982; Zaslow et al., 1985). A related possibility is that boys' more aggressive tendencies and lower ability to self-regulate are exacerbated in child care settings and are more exasperating to tired middle-class parents at the end of a work day, resulting in less favorable feelings and responses to them than to girls.

Timing of Maternal Employment

The timing of the mother's return to work has been found to be an important factor in the psychological literature. We investigate it in interaction with the family's income level. Panel B of Table 4 shows the coefficient from the interaction of family income and a dummy indicating that the mother worked in the first year of the child's life. Maternal employment in the first year of life has a statistically significant negative effect on the PPVT scores of boys in higher income families but not on any other children.

Panel C of Table 4 shows results from the regression of the interaction of maternal employment in year 2 and family income. To distinguish between maternal employment begun in year 2 and maternal employment begun in year 1 and continued in year 2, two sets of variables are used. Again, boys in higher income families are the only subgroup negatively affected by the mother's continued employment in the second year. Among boys from higher income families, the coefficient for mother's employment in the first year (from Panel B) is -7.2, and that for mother's employment in years 1 and 2 is -8.7. This suggests that most of the adverse effect on boys occurs if the mother resumes employment in the first year. In parallel regressions using variables reflecting maternal employment in years 3 and 4, there were no significant effects for any of the children. It may be that mother–child separation and stress and task overload due to employment in the first year lead to negative effects on interaction patterns, which starts a negative trajectory over the 4 years. An alternative explanation is that adequate quality child care is particularly hard to find during infancy and boys are more vulnerable than girls in these settings.

Panel C of Table 4 also suggests a significant effect for girls: for high-income families, girls whose mothers waited to return to employment in the second year of their daughter's life have higher PPVT scores than those with comparable mothers who never worked. Among low-income families, this effect is smaller and not statistically significant, but it is in the same direction. This effect is intriguing, since studies in the psychological literature indicate that maternal employment has a positive effect on older girls through such mechanisms as independence training and role modeling (Hoffman, 1980). Our result is quite weak, though, and somewhat puzzling because we did not see such an effect when the mother's employment was begun in the third or fourth year (data not shown).

This interaction effect may also be due to maternal education, verbal skills, or race, since income is highly correlated with all of these factors. In a slightly different formulation of this model, we looked at the interaction of mother's verbal aptitude and maternal employment and found some evidence suggesting that employment of more verbally skilled

mothers, but not less skilled mothers, has a negative effect on children. There is also some evidence that the negative effect for boys exists only for white children.

Studies (Bronfenbrenner and Crouter, 1982) indicate that the negative effects of maternal employment in the child's infancy are limited to the mothers who work full time. In our sample of 503 children, very few mothers were employed part time. Hence we are unable to test the effect of part-time work, and our conclusions refer to a sample of primarily full-time employed women.

Child Care Arrangements

In results not presented here, we briefly examined whether the negative effect of the mother's employment for boys in higher income families might be due to the instability of the child care arrangements experienced by the child. We used a single measure of child care—the total number of child care arrangements the child experienced in the first 3 years, reported retrospectively by the mother. We also distinguished between various types of child care arrangements, such as child care by family or relatives, day care centers, other day care arrangements, or no regular child care arrangement while the mother worked. We found that neither the number of child care arrangements nor the type of child care had any influence on the observed negative effect of maternal employment in infancy on the boys from high-income families. Including the total number of child care arrangements in the regression had little effect on our overall results, and the interaction of maternal employment in the first year with the type of child care arrangement used produced no effects of statistical significance.

Summary

In this article we have used the new children of the NLS/Y data to investigate the effect of maternal employment and family background on young children's cognitive development, as measured by the PPVT. Several background factors are highly correlated with the child's score, notably the measures of race/ethnicity, mother's verbal ability, and the presence and spacing of other siblings. Black and Hispanic children scored lower on the test, and the measures of the verbal ability of the mother and child are highly positively correlated.

We found no relationship between the child's PPVT score and the age of the mother at the child's birth, controlling for the other variables in the study. The mother's marital status during the child's life seems to have no impact on the child's intellectual development by the age of 4. Generalizing from these cross-sectional results to the effect of the changes in family structure and family size (fertility) over the past 30 years, we do not find a statistically significant short-term effect of increased marital instability on the PPVT scores of young children, whereas a decrease in the number of children in the family does seem to have a positive effect.

Regarding the central focus of our inquiry, the overall effect of maternal employment on the child's test score appears to be negligible. For the sample as a whole, there is no statistically significant effect on the PPVT score of whether or when the mother began her employment after the child's birth. As the theoretical considerations presented imply, however, there is reason to expect that the effect, if any, depends on (1) the family circumstances and the characteristics of the mother and (2) the extent to which the indirect effects through income level, child care, timing of employment, and subsequent fertility are held constant.

There is evidence among these 4-year-olds that when these interaction and indirect effects are considered, the overall finding of no significant effect is, indeed, modified. There is a statistically significant adverse effect of the mother's employment in the first year of the child's life, but only for *boys* and only for the children in *higher income families.*

Notes

[1] It is possible that the children who were unable to complete this test may be children with low verbal ability, and hence our sample may be biased. To examine the magnitude of this problem, we used a technique suggested by Heckman (1979). The coefficient for sample censoring was never significant under various assumptions regarding the functional form of the disturbance (bivariate normal, bivariate logistic, and uniform). Moreover the NLS/Y contains another test for the child's verbal ability, the McCarthy Verbal Memory Test. Comparing the mean score on the McCarthy test for children who completed the PPVT and those who did not, the latter group performed a little better on the McCarthy scale. We conclude that sample selection bias is not a major problem in these data. Perhaps the child's inability to complete the test is related to its being the last of a series of tests administered to 4-year-olds and some of the children perhaps became too tired to complete it.

[2] The data set has codes for children who had a language problem on each of the tests administered as well as for those who had difficulty understanding the test. Ten of the 585 children in our data file of 4-year-olds had a language problem and/or difficulty understanding the test. Only 1 of these actually completed the PPVT and had a score, and that child eventually was dropped from our study for several other pieces of missing data. Hence none of our 503 children was noted by the interviewer to have a problem with English or difficulty understanding the test. (Among our 4-year-old sample, the percentage of children dropped because of missing data on the PPVT test was 18 percent of Hispanics, 15 percent of blacks, and 8 percent of whites. Hence if language is a problem in the administration of the test, it manifests itself as sample censoring, not as measurement error. A correction for sample selection bias suggests, however, that this is not a major problem.)

[3] In addition to a single measure of family income, we examined two other aspects of family income: fluctuation in income, as measured by the coefficient of variation over 4 years, and being in the lower tail of the income distribution, as measured by the number of years the mother and child lived below the poverty line. None of these variables had a statistically significant effect.

[4] The mean family income for the low-income group is $6,570 and for the high-income group is $26,059. We use the whole sample average for the partitioning, so this is an absolute level of income applied similarly to whites, blacks, and Hispanics, to boys and girls, and so on. It is not an income level relative to each group's average income.

Appendix: Definition of the Variables Used in the Analysis

PPVT. Age-standardized score on the Peabody Picture Vocabulary Test.

Race/Ethnicity. Mother's primary or only self-identification: black, Hispanic, and white (including other minorities). In multivariate analyses, white is the omitted category.

Mother's Verbal Ability. Mother's standardized score on the Word Knowledge component of the Armed Services Vocational Aptitude Battery (ASVAB) administered in 1980.

Mother's Education. Highest grade of regular school completed by the mother at the time of the 1982 interview, about the time the child was born.

Mother's Age at Birth. Mother's age at the time of the birth of the child.

Family Income. Average of total family income in the calendar years 1982, 1983, 1984, and 1985 (in 1985 dollars), net of mother's salary and business income.

High Family Income. Dummy variable: Coded 1 if the average family income, net of mother's earnings, was greater than $13,204.

Continuously Married Mother. Mother was married at the birth of the child and was not divorced by the time of the 1986 interview. This category is omitted in the multivariate analyses.

Divorced Mother. Mother was married at the birth of the child but was divorced subsequently.

Mother Married After Birth. Mother was not married at the birth of the child but did marry subsequently.

Never Married Mother. Mother was not married at the birth of the child and did not marry between the birth and the 1986 interview.

Birth Order. Birth order of the child.

Sibling Age Gap ≤3 Years. Coded 1 if the younger sibling was born by the time the child was 3 years old, 0 otherwise. Coded 0 if there was no younger sibling.

Sibling Age Gap >3 Years. Coded 1 if the younger sibling was born after the child was 3 years old, 0 otherwise. Coded 0 if there was no younger sibling.

Mother's Earnings. Maximum of the salary or business income of the mother in the calendar years 1982, 1983, 1984, and 1985 (in 1985 dollars).

Continuously Employed Mother. Dummy variable: Coded 1 if the mother was employed in each of the 4 years after the birth of the child.

Intermittently Employed Mother. Dummy variable: Coded 1 if the mother was employed in some but not all of the 4 years after the birth of the child.

Employed in Year 1. Dummy variable: Coded 1 if the mother was employed in the first year of the child's life, 0 otherwise.

Stopped Work Within 3 Months After the Birth. Dummy variable: Coded 1 if the mother was employed in the first quarter after the birth of the child but not in the second, 0 otherwise.

Continued Work in Year 2. Dummy variable: Coded 1 if the mother was employed in years 1 and 2 after the birth of the child, 0 otherwise.

Began Work in Year 2. Dummy variable: Coded 1 if the mother was not employed in the first year after the birth of the child but was employed in the second year, 0 otherwise.

Total Number of Child Care Arrangements. Total number of child care arrangements experienced by the child in the first 3 years of life. Based on retrospective child care history provided by the mother at the 1986 interview.

Type of Child Care Arrangements. Based on the retrospective child care history, whether the child experienced any of the following arrangements in the first year of life: care by family members and relatives, care in a day care center, any other day care arrangement, and no regular source of child care while the mother worked.

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