

## **Maternal Employment And Scholastic Achievement: Evidence From North Carolina**

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Women's labor force participation rates have been on the rise in recent years. Included in this group are working mothers with young children at home. In a recent news article (Census Bureau News, 2000), the Census Bureau reported that a record number of women with children under the age of one are returning to the work force. In addition, 36 percent of these women are working in full-time positions. The first year of a child's life is one of the most critical in psychological and intellectual development. The absence of a mother for a significant part of the day may contribute to problems in children's development.

Maternal employment can have various effects, both positive and negative, on the cognitive development of children. Recent studies by Ruhm (2000) and Baydar and Gunn (1991) find that maternal employment has a negative effect on children's cognitive development in the early years. Factors that may contribute to these negative effects are income effects, education levels of the parents, minority rates and other demographic variables such as divorce and living arrangements. The way in which these factors interact with maternal employment may be what is affecting cognitive development in children. In addition, the economic status of a family also seems to have an affect on child development. Studies conducted by Blau (1999) and Harvey (1999) focus on the various income effects on young children. These studies indicate that, by itself, income has positive affects on cognitive development in children. However, when interacting with maternal employment, there seem to be different outcomes. That is, maternal

employment may have negative effects on children from high-income families, but positive effects children from low-income families.

The focus of the present study is the relationship between maternal employment and the cognitive development of children. It has been speculated that children of employed mothers will be negatively affected by being away from their mother for a significant portion of the day. However, there may also be a neutral effect, in that the child will develop equally as well whether their mother is employed or not. This study will focus on demographics in North Carolina. The data used to represent cognitive development is end of grade test scores at the county level for third and eighth grade students in both reading and math. Women's labor force participation rates, as obtained from Census data for the counties of North Carolina, will also be incorporated. In addition, demographic variables such as divorce rates, education levels of adults in the county, and income variables will also be accounted for. These demographics will also be obtained from information provided by Census data. It is predicted that holding all variables constant, maternal employment will have either no effect or negative effects on children's cognitive development with respect to end of grade test scores.

## **I. Literature Review**

This paper draws on a number of different studies involving the relationship between maternal employment and children's cognitive development. Maternal employment is an economic factor that can influence a variety of environmental conditions, thus affecting the cognitive development of children. Therefore, while it can be speculated that economic conditions seem to be the initial factor affecting child development, psychological aspects also need to be taken into account. More

specifically, some components affecting child outcome may include maternal employment, socioeconomic standing, the education levels of parents, and other demographic variables.

Maternal employment is thought to have negative effects on the cognitive development of children. Possible resulting problems can include deficits in reading ability, slowed language development, and impaired mathematical abilities. Ruhm (2000) used data from the National Longitudinal Survey of Youth and various cognitive tests <sup>1</sup> in order to assess the effects of maternal employment on child development. This study also added the component of paternal employment. Ruhm (2000) found that maternal employment during the first year of the child's life had a detrimental effect on language development in 3 and 4 year olds and on the mathematical abilities of 5 and 6 year olds. The first year of a child's life may be one of the most developmentally important. Lack of stimulation, interaction, or bonding with the mother at this stage in life many times leads to cognitive difficulties in the child. Maternal employment separates mother and child, thus providing a possible venue for cognitive problems. When considering paternal employment, however, the opposite was found. The more time fathers spent at home and unemployed, the more negatively affected were the children's cognitive and behavioral development. It was inferred that this occurred because the fathers were not spending time with their children out of choice, as they were when they were employed full time.

There is further evidence that supports Ruhm's (2000) findings regarding the time in a child's life in which the mother returns to work. Baydar and Gunn (1991)

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<sup>1</sup> Tests used in Ruhm's (2000) study to assess cognitive ability include the Peabody Picture Vocabulary Test and the Peabody Individual Achievement Test Reading Recognition Subtest and Mathematics Subtest.

specifically investigated the relationship between the time mothers returned to work and the cognitive development of children. The second and third quarters of infancy seem to be significant periods for the formation of secure attachments between mother and child, and interruptions in this process can lead to detrimental effects on the child's development. This study focused on the cognitive outcomes of 3 and 4 year olds, as measured by various tests and surveys. Baydar and Gunn (1991) found significant negative effects on cognitive developments of 3 and 4 year olds when the mother returned to work during these quarters of their child's first year, as indicated by their low scores on the Peabody Picture Vocabulary Test-Revised.

Harvey (1999) both supports and disputes the findings of Baydar and Gunn (1991). Significant results were obtained; however, they differed for high income versus low-income families. Harvey (1999) also examined the effects of maternal employment on cognitive development using many of the same testing apparatuses as the previous studies mentioned. Harvey (1999) found that maternal employment is beneficial to children in low-income families. Perhaps these children receive more stimulation or education in their day care system than they would if they were at home. It can also be inferred that mothers of low-income families are also less educated, thus having poorer parenting skills. The children of low-income families with employed mothers scored higher on the cognitive tests and had less behavioral problems than children of low-income families where the mother was not employed. However, it was also determined that children in traditional, high-income families suffered as a result of maternal employment. Perhaps the standard of care received at the day care being provided paled in comparison to the child's home life. It can be inferred from these findings, that

positive effects on child development are felt if maternal employment is a significant necessity to the family. If maternal employment is not a necessity for maintaining a certain level of socioeconomic status then the children seem to be at a greater risk for developmental problems if the mother works outside of the home.

Measuring the direct effects of income on child development is important in determining a possible relationship between maternal employment and child development. David Blau (1999) conducted a study that focusing on income effects. Blau (1999) also determined that income was not as important a variable with respect to cognitive development in children as other familial aspects are. It was found that permanent income, that is income from a permanent career oriented position, is slightly significant. However, changing the families' income level has no significant effect. Children in different economic classes do seem to be on different cognitive levels. However, this does not seem to be caused by income, but rather by familial variables. These variables include the mother's race, her education level, and the marital status of the parents. These factors are interrelated in various ways. The mother's race may effect her education level, which then effects parenting skills.

The education level of the parents has been a speculated cause of cognitive problems in children throughout this paper. This variable was directly examined by Loury (1988) who looked at the effects of the education level of the mother with respect to child development. There were a number of significant findings involved with this study. Loury focused on the amount of time spent in school by children as related to the amount of time spent in school by the mother and the mother's amount of home time. Specifically, it was predicted that if the mother was highly educated and spent a

significant amount of time at home, the children would be more likely to further their education beyond high school. It is commonly thought that the more time the mother spends at home with the children the more benefits are felt by the child. However, Loury (1988) determined that this is only the case if the mother spends 12 or more years in school. In addition, the benefits of the child spending more time with the mother only increase if the opportunity costs of the mother staying at home do not exceed these benefits. This study also found other significant variables affecting the amount of school completed by children. These variables include the number of years each parent spent in school, income, father's occupation, and the expectations the parents have for their child's schooling. A positive relationship exists between the amount of time spent in school by the child and their adjustment.

The majority of this past theoretical work shows consistent findings regarding the variables that effect cognitive development in children. Maternal employment does seem to be a causal factor; however, there are also many other factors that play a role in this relationship.

## **II. Empirical Analysis**

### *Model*

This study uses North Carolina end of grade exams (1999) as a proxy for cognitive development. These tests are administered at the end of each year beginning at the third grade level and continuing through eighth grade. Data are reported at both the county and city level. This study used the county data in order to obtain consistency between the dependent and independent variables. In addition, end of grade scores are

represented as the percent of students at or above grade level in the county and not as a mean score.

The literature previously outlined regarding maternal employment and cognitive development suggests the following baseline model:

$$(1) \quad \text{Exam pass rate} = B_0 + B_1 (\% \text{ Minorities}) + B_2 (\text{Maternal Employment}) + B_3 (\text{Median family income})$$

This model indicates that children's cognitive abilities are predicted to be dependent on three factors. The percentage of minorities and the maternal employment rates in the county are predicted to have negative effects on cognitive development, while the median family income should have positive effects on children. These assumptions are consistent with the findings of Ruhm (2000), Harvey (1999), and Blau (1999). Literature derived from Ruhm (2000) and Harvey (1999) suggested that as the children increased in age, the effects of maternal employment and other variables would decrease in significance. In addition, Baydar and Gunn (1991) also suggested gender differences as pertaining to the effects of maternal employment and other variables on development. The education level of the parents also has an effect on cognitive development in children according to Loury (1988). However, it was determined that income and education are highly correlated ( $p = .66$ ). Therefore, to avoid the problem of multicollinearity during analysis income was the variable included in the model.

Information from the Census (Geolytics 1999) was used to obtain the independent variables included in this study. These data were obtained for each county in the state of

North Carolina as it correlated with the end-of-grade exam data. The independent variables include the percentage of women in the work force with children under the age of six, percent of minorities within the county, median family income, and many other demographic variables that were determined to be insignificant <sup>2</sup>.

### **III. Results**

Data were analyzed using ordinary least squares multiple regression analysis. End-of-grade pass rates were used as the dependent variables and were broken down into twelve separate dependent variables. These included:

- Reading at the 3<sup>rd</sup> grade level: all students, males only and females only;
- Reading at the 8<sup>th</sup> grade level: all students, males only and females only;
- Math at the 3<sup>rd</sup> grade level: all students, males only and females only;
- Math at the 8<sup>th</sup> grade level: all students, males only and females only.

Pass rates were tested for third grade students and eighth grade students in order to determine which independent variables, if any became less important as the child progressed in age.

A baseline regression model was obtained for reading scores for all students at the third grade level. This model is represented in the first equation as written in the above section. All eight dependent variables, as described previously, were then analyzed using this baseline model (equation 1).

Reading scores for all students at the third grade level yielded significant results consistent with the theories. Regressions indicated that maternal employment, minority rates, and economic status all have significant effects on the reading abilities of third

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<sup>2</sup> Divorce rates, poverty rates, type of job (white vs. blue collar), and unemployment rates were all tested against the dependent variables and were determined insignificant. Thus, these will not be mentioned further.



grade students (see Table 1). Maternal employment and minority rates both indicate a negative effect on reading scores. Therefore, a high level of working mothers and/or having a high rate of minorities in a county hinders reading abilities at this level. Median family income had a positive effect on the dependent variable. This indicates that the higher the income of a family, the more beneficial it is to the development of reading in third graders. These findings are consistent with the literature provided by Blau (1999), Harvey (1999), and Ruhm (2000).

An interaction effect between median family income and maternal employment was also incorporated into analysis. This regression was run for all dependent variables, however, there were significant results for 3<sup>rd</sup> grade reading pass rates only (see Table 1). The examples below represent how this interaction works.

$$(2) \quad \textit{Exam pass rate} = B_0 + B_1(\% \textit{ Minorities}) + B_2(\textit{ Maternal Employment}) + B_3 \\ (\textit{ Median family incom}) + B_4(\textit{ Income*Maternal Employment})$$

**Table 1: Regression Results on Reading Pass Rates**

Variables	3 <sup>rd</sup> Grade Reading (all students)		8 <sup>th</sup> Grade Reading (all students)		3 <sup>rd</sup> Grade Reading (Males only)		8 <sup>th</sup> Grade Reading (Males only)	3 <sup>rd</sup> Grade Reading (Females only)		8 <sup>th</sup> Grade Reading (Females only)
<b>Constant</b>	82.129** (16.702)	30.554 (1.081)	89.598** (19.88)	70.769** (2.69)	78.042** (13.35)	17.23* (.513)	85.86** (14.78)	87.024** (18.24)	44.08 (1.6)	93.327** (23.134)
<b>Minorities (%)</b>	-28.3773** (-8.356)	-28.615** (-8.526)	-26.932** (-8.65)	-27.018** (-8.65)	-34.637** (-8.5795)	-34.17** (-8.749)	-27.22** (-6.786)	-23.152** (-7.028)	-23.35** (-7.138)	-27.52** (-9.877)
<b>Maternal Employment (%)</b>	-17.3099** (-2.1186)	66.839 (1.448)	-12.887* (-1.72)	17.834 (.415)	-11.36 (-1.229)	87.28 (1.591)	-15.442 (-1.599)	-23.57** (-2.974)	46.479 (1.033)	-9.85 (-1.47)
<b>Median Family Income</b>	0.00029** (2.197)	.00229** (2.106)	.00016 (1.335)	.00089 (.882)	.00024 (1.541)	.0026** (2.011)	.000215 (1.375)	.00034** (2.68)	.002* (1.896)	.00011 (.9797)
<b>Income*Maternal Employment</b>		-0.00323* (-1.852)		.0012 (-.73)		-.0038* (1.837)			-.0027 (-1.582)	
Sample size	100	100	100	100	100	100	100	100	100	100
Adjusted R <sup>2</sup>	.4586	.47199	.4557	.453	.45887	.4719	.343	.397	.407	.5155

**Notes:**

- \*\* = P<.05 \* = P<.10
- Interaction effects were only significant for R3, as seen by R8, therefore the results will not be used and are not shown for any other variables

**Independent Variable Definitions**

- Minorities (%)= the rate of people in the county who are not Caucasian
- Maternal Employment (%) = rate of women employed with children under the age of six in their care

Examples of Predicted Pass Rates from 3<sup>rd</sup> Grade Reading (all students):

$$\text{Predicted Pass Rate} = 30.55 - 28.61 * (\% \text{Minorities}) + 66.83 * (\% \text{Maternal Employment}) \\ + .0023 * (\text{Median family income}) - .0032 * (\text{Median family income} * \text{Maternal Employment})$$

Assume: %Minorities = 20%, Median family income for low-income households = 20,000, Median family income for high-income households =

Example 1: 40,000, Maternal Employment = 50%

- Predicted Pass Rate (high) = 86.243
- Predicted Pass Rate (low) = 72.243

Example 2: If maternal employment increases to .6:

- Predicted Pass Rate (high) = 80.126
- Predicted Pass Rate (low) = 72.526

Example 3: If maternal employment increases to .6 AND income increases 10,000:

- Predicted Pass Rate (high) = 83.926
- Predicted Pass Rate (low) = 76.326

Based on the above examples, children of high-income families pass their end-of-grade reading exams at a higher rate than those from low-income families. This finding is consistent with Blau (1999), who suggests that children in high-income families are on a higher cognitive level than those in low-income families. When maternal employment increases by 10% and income increases by \$10,000, there seems to be damaging effects to those children from wealthier families. However, increasing maternal employment and income by the same rates in low-income families has positive effects on the cognitive development of the children. This is consistent with the theory from Harvey (1999), which states that maternal employment can be beneficial to children from low-income families, but detrimental to children from high-income families.

Reading scores for all students at the eighth grade level were then analyzed using the baseline model (Equation 1). Regressions incorporating the interaction of income and maternal employment were also estimated.<sup>3</sup> This regression indicated that the percentage of minorities in a school district and the maternal employment rate were both significant. However, median family income was no longer significant at this age level (see Table 1). In addition, though maternal employment was still significant at the eighth grade level, it decreased in strength from the third grade level. These results indicate that the effects of income and maternal employment on children's cognitive development diminish with time. These findings are consistent with those of Ruhm (2000).

The data representing math scores were also analyzed using the baseline model given in Equation 1. The results for third grade math pass rates (all students) demonstrated significance with respect to minority rates only (see Table 2). Both maternal employment and median family income had insignificant effects on the math abilities of third grade students. However, when analyzing eighth grade math pass rates (all students), both minority rates and maternal employment were significant and have negative effects. Median family income remained insignificant.

Baydar et al. (1991) and Ruhm (2000) suggested that there are differences in development between males and females. Therefore, both reading and math abilities were analyzed for males and females in both third and eighth grade. Results for third grade reading pass rates (males) indicate that maternal employment does not have an effect on reading abilities as shown in Table 1. However, when income and employment are combined, significance is found. This indicates that the higher the family income and

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<sup>3</sup> Interaction effects between income and maternal employment were incorporated in a regression for each of the models. However, significance was found only for R3, therefore results of the other 7 models will

maternal employment are, reading scores for males at the third grade level will suffer. These findings are consistent with Harvey (1999) who states that maternal employment is beneficial to low-income families, but not families in high economic standing. In the eighth grade (male) regressions, however, minority rates were the only variable that proved to be significant for males.

Gender differences were also examined with regards to math abilities in both third and eighth grades. Males seem to be affected by maternal employment and minority status only at the eighth grade level (see Table 2). This indicates that high maternal employment has a delayed effect on males with respect to math abilities. At the third grade level, however, only the percent of minorities has a significant effect. Females at both the third and eighth grade levels are only significantly affected by minority status. Maternal employment and median family income do not seem to have a significant impact on females' math skills.

#### **IV. Discussion**

The data in this study seems to suggest that maternal employment has various effects on the cognitive development of children. There seems to be a consistent picture created by the independent variables for each of the twelve models with respect to end-of-grade pass rates. The most consistent variable was the rate of minorities in each county. This variable was significant in each of the regressions. In addition, the minority rate has a negative correlation with end of grade pass rates in both reading and math at all grade levels and for both genders. This indicates that the higher the minority rates within a county, the lower the end-of-grade pass rates are for the students at both the third and

**Table 2: Regression Results on Math Pass Rates**

<b>Variables</b>	<b>3<sup>rd</sup> Grade Math (all students)</b>	<b>8<sup>th</sup> Grade Math (all students)</b>	<b>3<sup>rd</sup> Grade Math (Males only)</b>	<b>8<sup>th</sup> Grade Math (Males only)</b>	<b>3<sup>rd</sup> Grade Math (Females only)</b>	<b>8<sup>th</sup> Grade Math (Females only)</b>
<b>Constant</b>	86.115** (15.318)	95.987** (19.63)	87.364** (15.374)	94.501** (17.691)	87.409** (15.37)	98.865** (19.593)
<b>Minorities (%)</b>	-35.9195** (-9.252)	-30.308** (-8.976)	-42.097** (-10.726)	-32.909** (-8.92)	-31.119** (-7.923)	-27.359** (-7.8509)
<b>Maternal Employment (%)</b>	-1.969 (-1.17)	-15.058* (-1.853)	-10.676 (-1.131)	-19.344** (-2.179)	-15/405 (-1.63)	-13.296 (-1.5858)
<b>Median Family Income</b>	-0.000012 (-.075)	-.000039 (-.295)	-.000042 (-.275)	.000044 (.7598)	.000016 (.1029)	.00012 (-.85)
<b>Sample Size</b>	100	100	100	100	100	100
<b>Adjusted R2</b>	.4667	.4494	.5412	.4538	.3903	.3777

**Notes:**

- \*\* = P<.05 \* = P<.10
- Interaction effects were only significant for R3, as seen by R8, therefore the results will not be used and are not shown for any other variables

**Independent Variable Definitions**

- Minorities (%)= the rate of people in the county who are not Caucasian
- Maternal Employment (%) = rate of women employed with children under the age of six in their care

eighth grade levels. This is consistent with Blau's (1999) finding that found that the race of the parents has significant influence on children's cognitive development. There are various speculations that could be made as to why this seems to be the case. Perhaps minority families are, on average, more likely to be of low economic standing, thus leading to poorer cognitive development among children.

Median family income is positively correlated with cognitive development in each of the twelve models. However, there is no significance in any of the regressions performed with respect to math abilities that indicates that income has any bearing on mathematical development in children. With regards to reading abilities, income does appear to play a role at the third grade level. A positive correlation indicates that the higher the income of a family, the more the children's reading abilities will thrive. However, by the time the individuals reach eighth grade, all significance with respect to income effects seems to be faded out.

Finally, the main focus of this study was the effects of maternal employment on the cognitive development of children. This variable seems to have different effects on the math and reading abilities of children. The end-of-grade pass rates for third grade females, males, and all students were significantly affected by maternal employment. This effect was negative, indicating that the more the mother's work, the more detrimental it is to children as a whole, and specifically to each gender's reading skills.

The math end-of-grade pass rates suggest a different relationship between maternal employment and mathematic abilities. When analyzing the data provided as the proxy for math skills, the effects of maternal employment seem to have a delayed onset. Third grade students were not affected by having their mothers in the work force and

away from the home. However, the math abilities of eighth grade students in general and males specifically were negatively affected by this variable. The data suggests that higher rates of maternal employment will eventually lead to poor performance in math related subjects. Once again, differences between genders were found regarding performance in math and maternal employment. Maternal employment seems to be more damaging to males, but not females, with respect to performance in math at a later age, while the effects of maternal employment is felt only at an early age and across the board with respect to reading abilities.

## **V. Conclusion**

Cognitive development in children is complex and affected by various elements that stem from a variety of places. One constant element, as suggested by this study, is maternal employment. This variable has been examined continuously and there have been many diverse findings. This research suggests that maternal employment can have a detrimental affect on cognitive development of children at both the early and adolescent stages of life, holding other variables constant. There were some similarities and discrepancies between the present study and literature used as the background findings. Ruhm (2000) and Harvey (1999) both suggest negative effects of maternal employment before six years of age. These studies also provided information attesting to the diminishing of these problems as the child progressed in age. The present research suggests this pattern regarding reading ability. However, the opposite seems to hold true when considering mathematic performance.



Maternal employment does not always produce negative effects on children. In certain situations, when income and maternal work are combined, positive effects for low-income families are found. This indicates that it can actually be beneficial to children from low-income families to have two working parents. Speculations as to why can include increasing income in order to provide for more education opportunities. As a whole, maternal employment and cognitive development in children seem to paint the predicted picture. Maternal employment does seem to have damaging effects on children's development and scholastic abilities in the areas of math and reading. However, with the exception of eighth grade math scores, these negative effects become less important as children progress in age.

## References

- Baydar, N, and Brooks-Gunn, J. "Effects of Maternal Employment and Child-care Arrangements on Preschooler's Cognitive and Behavioral Outcomes: Evidence from the Children of the National Longitudinal Survey of Youth." *Developmental Psychology*, 21 , 1991, pp. 932-945.
- Blau, D. "The Effect of Income on Child Development." *Review of Economics & Statistics*, 81 , 1999, pp. 261-277.
- Geolytics. *Census CD & Maps*. East Brunswick, NJ, 1999.
- Harvey, E. "Short-term and Long-term Effects of Early Parental Employment on Children of the National Longitudinal Survey of Youth." *Developmental Psychology*, 35, 1999, pp. 445-459.
- Datcher-Loury, L. "Effects of Mother's Home Time on Children's Schooling." *The Review of Economics and Statistics*, 52, 1988, pp. 367-373.
- MacEwn, K.E., & Barling, J. "Effects of Maternal Employment Experiences on Children's Behavior Via Mood, Cognitive Difficulties, and Parenting Behavior." *Journal of Marriage & Family*, 53, 1991, pp. 635-645.

North Carolina Public Schools. "A Report Card for the ABC's of Public Education, Vol 2." Available: [www.dpi.state.nc.us/account/reporting/99reportcard/index.html](http://www.dpi.state.nc.us/account/reporting/99reportcard/index.html), 1999.

Ruhm, C. "Parental Employment and Child Cognitive Development." *NBER Working Paper Series*, 2000.

United States Department of Commerce. *Record Share of New Mothers in Labor Force*.

Washington, DC: U.S. Census Bureau Reports, 2000.