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# Maternal investments and child cognitive achievement

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## Abstract

In this paper, we examine the effects of maternal investment decisions on child development, as measured by the Peabody Picture Vocabulary Test. Using the NLSY79, we model the life-cycle marriage, fertility, schooling, employment, and child care outcomes of mothers jointly with the achievement outcomes of their children. By treating these maternal outcomes as endogenous, we can avoid the potential bias of unobserved mother or child factors that influence both maternal investment and child achievement outcomes. Our results show positive effects of mother's human capital and work experience and negative effects of birth order and family size. We also find negative effects of informal child care use in the first year of a child's life.

This research was conducted with restricted access to Bureau of Labor Statistics (BLS) data. The views expressed here do not necessarily reflect the views of the BLS. We appreciate the useful comments of seminar participants at the University of North Carolina at Chapel Hill, Wheaton College, and the Southern Economic Association Annual Conference.
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# 1. Introduction

The importance of childhood and adolescent human capital accumulation in determining later-life outcomes is well known throughout the economics literature (Cunha et al., 2010; Chetty et al., 2011). It is estimated that nearly fifty percent of the inequality in lifetime earnings can be explained by characteristics established by the late teenage years (Cuhna et al., 2005; Huggett et al., 2011). Subsequently, there exists a growing literature on the determinants of human capital production at early ages (Almond and Currie, 2010).

Within this broader literature exists research on the effects of maternal inputs on child outcomes. When choosing the type and level of investment, the mother faces several tradeoffs among the pecuniary and non-pecuniary benefits of these inputs. For example, time spent in the labor market or acquiring human capital brings greater financial resources that could be spent on the child, but necessarily reduces the amount of time the mother spends with the child. Similarly, there are tradeoffs in family size as additional children reduce both time and monetary resources available for each child.

Economics researchers have largely come to a consensus on the direction of individual effects of some of these decisions - notably parents' education levels, income, and marital status - while others, such as fertility, employment and child-care use, are still in debate. Hanushek (1992) and Conley and Glauber (2006) find that greater numbers of children in the household have negative effects on child outcomes, while Angrist, Lavy, and Schlosser (2006) and Caceres-Delpiano (2006) find inconclusive or negligible effects. Recent studies find that having a higher birth order negatively affects outcomes, and once controlling for birth order, family size effects are weak or insignificant (Black et al., 2005; Conley et al., 2007; Booth and Kee, 2009). Many studies have found child care use to have detrimental effects on child outcomes in the first year, but varying effects of child care use in subsequent years (Waldfogel et al., 2002; Ruhm, 2004, James-Burdumy, 2005).

However, even with inputs where the literature has reached agreement, researchers face a variety of issues in estimating the impact of parental inputs on a child's cognitive achievement and growth. Most notably, researchers face challenges in accounting for differences in types of parents that are unobserved by the researcher. For example, a mother who works full-time and utilizes child care may have different unobserved characteristics (e.g. fecundity and preferences for family size) from a mother who does not work during her child's infant years. These unobserved differences may also include labor market opportunities. Women with lower potential wages necessarily have lower pecuniary opportunity costs of having a newborn and using maternal care for her child. Hence, these women may be more likely to have children. Furthermore, unobservable child characteristics can be related to both maternal labor market decisions and child cognitive outcomes. Failing to account for unobservable mother or child characteristics that influence maternal inputs and child outcomes can lead to biased estimates of the effectiveness of maternal inputs.

Recently, researchers have used fully specified structural models to account for the effects of unobserved heterogeneity on the dynamics of a mothers' decisions and child outcomes. Bernal (2008) examines the use of child care by married mothers with one child using the National Longitudinal Study of Youth. She finds negative effects of child care on cognitive

ability. Likewise, Del Boca, Flinn, and Wiswall (2014) examine the employment and time allocation decisions of married mothers with one or two children using the Panel Study of Income Dynamics. Although they do not explicitly model child-care decisions, they find parental time inputs to have positive effects on child cognitive outcomes that are larger than the effects of monetary inputs. Bernal and Keane (2010) extend Bernal (2008) to that of single mothers, finding similarly deleterious, however larger, effects of child care. In their 2011 study, Bernal and Keane again examine the outcomes of single mothers, where they differentiate between formal and informal child-care arrangements, finding no difference between maternal and formal care.

In this paper, we estimate a model of a woman's life-cycle choices and the effect of these outcomes on a child's cognitive outcomes. Our main structural equation models the child's education production function, measured by a picture vocabulary cognitive test, as a function of maternal inputs: marital status, employment status, educational attainment, family size, and child-care arrangements. We treat these maternal inputs as endogenous by jointly estimating demand equations for these inputs with an equation for child achievement equation.

Our analysis extends the aforementioned literature in several notable ways. Firstly, we estimate a model that includes the life-cycle outcomes of both single and married women. By doing so, we can include the effect of marital status on the child outcomes while controlling for the unobserved differences that influence marriage outcomes as well as other maternal and child outcomes. Secondly, we include households with multiple children by explicitly modeling the fertility outcomes of the mother. Mothers with three or more children may be different in unobserved ways, whether by opportunities or preferences, from mothers with fewer children. By modeling the fertility outcomes we can account for a mother's unobserved preferences for family size that may affect both maternal inputs and child outcomes. Including households with multiple children also allows us to account for the effects of the child's birth order. Furthermore, we examine different types of child care.[1] Explicitly, we distinguish between maternal care, informal child care by a relative or friend, and child care at a formal center, allowing the effects of child care on child achievement to vary by arrangement.

By addressing the endogeneity of these inputs, we can avoid the bias that may arise from unobserved differences among women driving both maternal inputs and child development. To mitigate the effect of spurious unobserved influences, we use a discrete factor random effects approach that allows for both individual- and time-varying unobserved heterogeneity among mothers. Our findings, consistent with the literature, show positive effects of marriage, maternal human capital stock and work experience on child outcomes. We find negative effects of birth order and increasingly negative effects of having additional siblings. We also find small negative effects of informal child-care use during the first year of a child's life. However, we find no significant difference between maternal care and formal child care.

[1] In this regard, our paper is most similar to Bernal and Keane (2011).

## 2. Data

To perform this analysis, we utilize the 1979 National Longitudinal Study of Youth (NLSY) and its accompanying child supplement. These data provide rich information as to the pathways through which parental decisions can affect their children across a variety of measures. Beginning with youths ranging from ages 14-22, the NLSY data allow for the construction of a female's complete fertility, employment, schooling, and marital history from the initial survey to the current period. From these data we create indicators and stock variables for the per-period outcomes of the mother's decision about marriage, schooling, work, fertility, and child-care arrangement. The NLSY provides information on the child-care arrangement during each of the first three years of life for each child. Conditional upon having a child, we distinguish between three types of primary child-care arrangements. If the child is primarily cared for by the mother, we classify the arrangement as maternal care. If the child is primarily cared for informally by a relative or acquaintance, we classify the arrangement as informal child care.[2] Finally, if the child is primarily cared for by an official child-care provider, we classify the arrangement as formal child care. We create these mutually exclusive indicators for each child for each of the child's first three years. We also are able to control for the income accumulated by the mother and family during the child's life.

The NLSY Child Supplement, begun in 1986 and completed biennially since, contains detailed information on the children of women in the original sample. From these data, we use the results of the Peabody Picture Vocabulary Test (PPVT) as a representation of the child's cognitive achievement. The PPVT is an advantageous assessment instrument for our study because it is the Peabody test administered at the earliest age, hence the nearest test to the observed child-care choices. The PPVT measures a child's receptive vocabulary for Standard American English.[3] Designed to measure verbal ability and scholastic aptitude at an early age, it consists of 175 vocabulary terms. Children listen to the the word spoken by the interviewer and then points to one of four pictures that best describes the word. The standard scores have a normalized mean of 100 points.[4]

We append these data with county-level characteristics to include a wide array of possible exclusion restrictions. We use the American Community Survey and the County and City Data Book from the U.S. Bureau of the Census to create county-level variables regarding poverty, educational attainment levels, manufacturing employment, males per females, birth rates, and unemployment rates. We create a panel data set consisting of 3,947 women over 21 years, resulting in 3,964 children and 6,662 observed PPVT scores.[5]

[2]Because only 3.1% to 3.4% of children are primarily cared for by the spouse at a given age, we include spousal care in our category of informal care.

[3]After 1986, children had the option to have the test administered in Spanish, however the number of children needing this option is relatively small. In 1986, of 354 children assigned to bilingual interviews less than one third received assessments in Spanish. By 1990, only 52 children were assigned bilingual interviewers with 17 receiving assessment in Spanish.

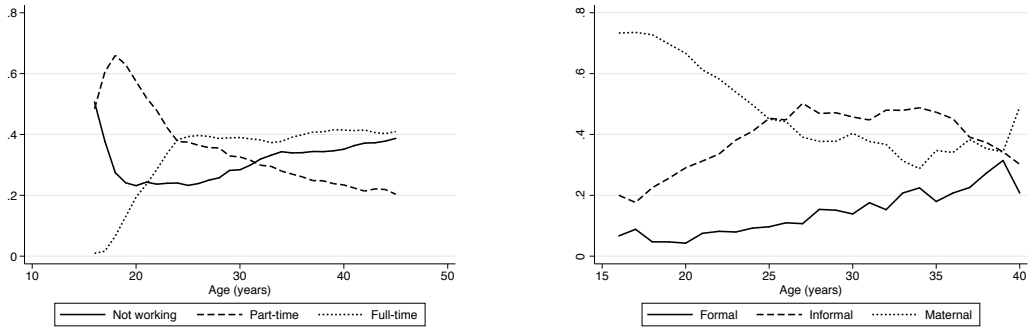
[4]For scaling purposes in estimation, we divide the standard test score by ten, resulting in a sample mean of 9.25 and standard deviation of 1.86.

[5]Table A1 of the appendix provides simple summary statistics of these data.

Figures 1 through 3 summarize the differences in maternal outcomes across the woman's lifecycle in these data. Both informal and formal child-care arrangements tend to increase across mother's age. On average, women without a degree have more children in the household than women with either a high school or college degree (Figure 2a). Women with more intensive participation have fewer children (Figure 2b). As shown in Figures 3a and 3b, the timing of fertility also varies by educational attainment and labor force participation. Women with more education and more involvement in the labor market typically have fertility outcomes at a later age than women with lower education and labor market involvement.

Figures 4 and 5 show the distribution of child achievement, as measured by PPVT scores, conditional upon educational attainment, work status, and child-care arrangement. As shown in Figure 4a, higher educational attainment by the mother is associated with higher test scores. Children of working mothers have moderately larger test scores, especially when comparing the lower tails of the distributions (Figure 4b). When conditioning solely on the type of child care, the general trend across achievement outcomes is that children with formal and informal child-care arrangements perform slightly better, in a distributional sense, than children with maternal care (Figure 5).

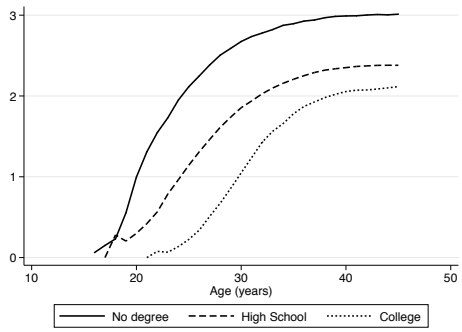
Figure 1: Work Status and Child-Care Arrangement



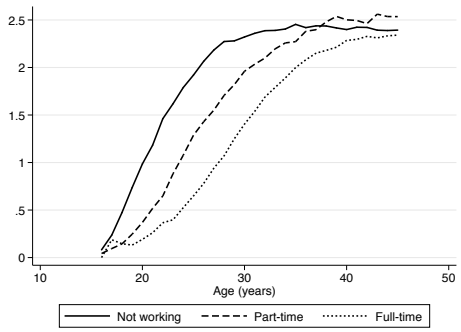

(a) Work Status

(b) Child-Care Arrangement

Figure 2: Average Children by Education and Work Status




(a) Educational Attainment



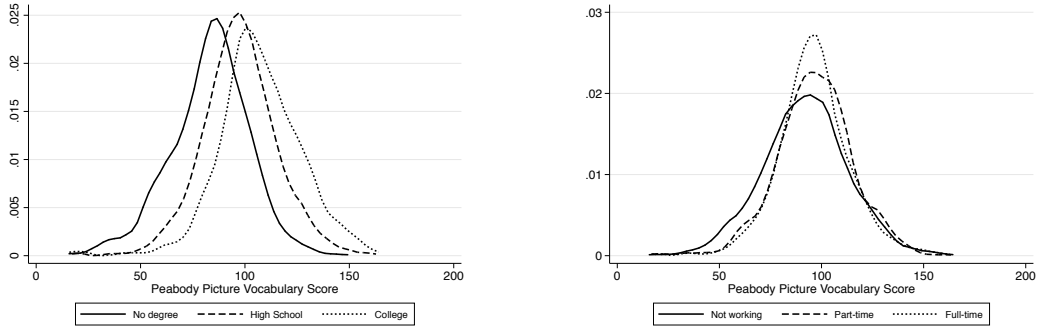

(b) Work Status

Figure 3: Average Fertility by Education and Work Status


(a) Educational Attainment


(b) Work Status

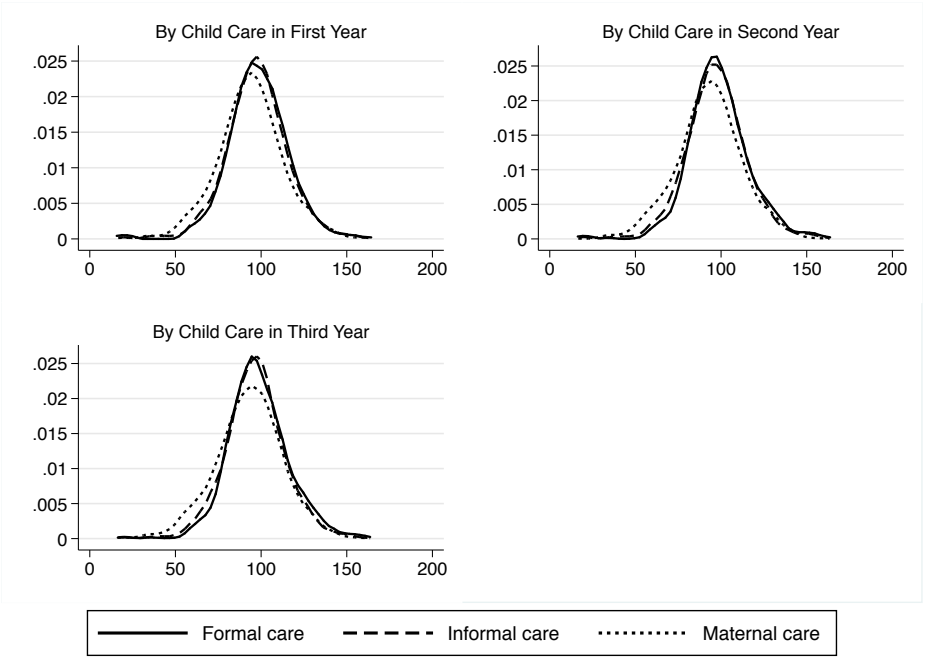
Figure 4: Peabody Picture Vocabulary Score by Education and Work Status




(a) Educational Attainment

(b) Work Status

Figure 5: Peadbody Picture Vocabulary Score by Child-Care Type in Child's First Three Years



## 3. Empirical Model

Our analysis aims to explain the variation in cognitive achievement, as shown through PPVT score, that is attributable to different types of maternal investments. We use a value-added specification where achievement of child $j$ of mother $i$ in period $t$ ($A_{ijt}$) is a function of achievement in the previous period ($A_{ijt-1}$), mother's education stock ($S_{it}$), marital status ($M_{it}$), employment stock ($E_{it}$), number of children in household ($N_{it}$), child-care arrangements during the first three years of child $j$'s life ($C_{ijt}$), and a vector of demographic variables ($X_{it}$).

$$A_{ijt} = \beta' A(A_{ijt-1}, S_{it}, M_{it}, E_{it}, N_{it}, C_{ijt}, X_{it}) + \mu_i^A + \nu_{it}^A + \epsilon_{it}^A \tag{1}$$

In addition to being determined by observable characteristics, child achievement is also influenced by a variety of factors that are unobserved to the econometrician, typically absorbed by the error term. We decompose the error term into a mother-specific permanent component ($\mu_{it}^A$), a time-varying component ($\nu_{it}^A$), and an i.i.d. serially-uncorrelated component ($\epsilon_{it}^A$).

By estimating the vector of parameters ($\beta$) we can better understand the effects of different maternal decisions on the academic growth of the child. Accurately estimating the parameters using Ordinary Least Squares relies on the exogeneity of our regressors. Since the unobserved components represented by $\mu_i$ and $\nu_{it}$ could also influence the maternal investments made, it is plausible that these maternal outcomes are endogenous. By explicitly modeling the demand for these maternal investment outcomes and allowing these outcomes to be influenced by the same unobserved components as achievement, we can more accurately estimated the effects of these investments on child achievement.

While we do not observe the decision making mechanisms for each of these demand functions, we do observe the outcomes from these decisions. We model the probability of the observed jointly determined outcome by allowing the demand functions for schooling, marriage, employment, fertility, and child care to be correlated through the permanent family-specific unobserved component ($\mu_i$) and the time-varying family-specific unobserved component ($\nu_{it}$). Under the assumption that the serially-uncorrelated idiosyncratic component of the error term ($\epsilon_{it}$) has an Extreme Value distribution, we can express the probabilities of demand function outcomes using logit specifications.

Expressed in log odds, the probability of woman $i$ being enrolled in school ($s_{it} = 1$) in time $t$ relative to not being in enrolled ($s_{it} = 0$) is

$$\ln\left[\frac{Pr(s_{it}=1)}{Pr(s_{it}=0)}\right] = \alpha' S(S_{it}, M_{it}, E_{it}, N_{it}, X_{it}, P_{it}^Z) + \mu_i^S + \nu_{it}^S \quad . \tag{2}$$

The probability of woman $i$ being married ($m_{it} = 1$) in period $t$ relative to being single ($m_{it} = 0$) in time $t$ is

$$\ln\left[\frac{Pr(m_{it}=1)}{Pr(m_{it}=0)}\right] = \delta' M(S_{it}, M_{it}, E_{it}, N_{it}, X_{it}, P_{it}^Z) + \mu_i^M + \nu_{it}^M \quad . \tag{3}$$

The probability of woman $i$ being employed part-time ($e_{it} = 1$) or full-time ($e_{it} = 2$) relative to not working ($e_{it} = 0$) in time $t$ is

$$\ln\left[\frac{Pr(e_{it}=e)}{Pr(e_{it}=0)}\right] = \gamma_e' E(S_{it}, M_{it}, E_{it}, N_{it}, X_{it}, P_{it}^Z) + \mu_{ei}^E + \nu_{eit}^E \quad e = 1, 2 \; . \tag{4}$$

The fertility outcome for woman $i$ is represented by the probability of pregnancy ($f_{it} = 1$) relative to the probability of no pregnancy ($f_{it} = 0$) in time $t$ is

$$\ln\left[\frac{Pr(f_{it}=1)}{Pr(f_{it}=0)}\right] = \lambda' F(S_{it}, M_{it}, E_{it}, N_{it}, X_{it}, P_{it}^Z) + \mu_i^F + \nu_{it}^F \; . \tag{5}$$

The probability of informal child care ($c_{ijt} = 1$) or formal child care ($c_{ijt} = 2$) relative to maternal child care ($c_{ijt} = 0$) in time $t$ for child $j$ is

$$\ln\left[\frac{Pr(c_{ijt}=c)}{Pr(c_{ijt}=0)}\right] = \theta_c' C(S_{it}, M_{it}, E_{it}, N_{it}, X_{it}, P_{it}^Z) + \mu_{ci}^C + \nu_{cit}^C \quad c = 1, 2 \; . \tag{6}$$

The decisions determining the outcomes modeled above are also influenced by the woman's economic returns in the labor market. For example, both the woman's decision to enter the work and choice of child-care arrangement is most likely influenced by the wage she could receive in the labor market. As econometricians, we do not observe all real or potential wage offers. We only observe accepted wage offers, conditional upon being employed. Because of this pecuniary influence of wages on the other outcomes, we include an equation explaining the variation in observed wage across working mothers as determined by individual and community characteristics. The log of wages for woman $i$ in time $t$ conditional upon working in time $t$ is given by:

$$\ln(w_{it} \mid e_{it} = 1 \; or \; e_{it} = 2) = \phi' W(S_{it}, M_{it}, E_{it}, N_{it}, X_{it}, P_{it}^Z) + \mu_i^W + \nu_{it}^W + \epsilon_{it}^W \; . \tag{7}$$

Equations 2 through 7 help to determine the stock of maternal inputs that enter equation 1. We jointly estimate these seven equations using a flexible semi-parametric approach, based on Heckman and Singer (1984) that discretely approximates the distribution of the individual-level permanent ($\mu_i$) and time-varying ($\nu_{it}$) unobserved heterogeneity (UH) components. This discrete factor random effects method (DFRE) approximates the joint cumulative distribution of each UH component using a discrete step-wise function (Mroz and Guilkey, 1995; Mroz, 1999). The DFRE method has several advantages over common panel data approaches as it controls for both individual permanent and time-varying heterogeneity while retaining the ability to estimate the effects of time-invariant observed regressors. (Angeles et al., 1998).

We estimate the specified empirical model as a system of dynamic equations, with the endogenous maternal outcomes used as regressors explaining the child achievement outcomes.

The empirical model attains identification from theoretical exclusion restrictions and the nonlinear dynamic nature of the equations. Variables that are valid exclusion restrictions should influence the endogenous outcomes without affecting the end-of-period child achievement outcomes, conditional on the mother's currently obtained outcomes. We use a vector of county-level variables that exogenously describe the environment in which the woman's decisions are made. This vector includes information on economic factors such the unemployment rate, employment in manufacturing, poverty rate, and educational attainment, as well as other community characteristics such as birth rates and ratio of males to females.

In addition to these county-level descriptors, we use several state-level policy variables that influence child-care and labor market conditions. State regulations of child-care facilities include requirements for insurance coverage, the number of annual inspections, and the ratio of children to child-care worker. These regulations constrain the inputs for child-care services, hence influencing the cost and availability of child-care options. Because these regulations are at the state level, they are exogenous regarding differences across local market characteristics that could also influence family human capital inputs.[6]

To further characterize state-level labor market conditions we use temporal and state variation in state minimum wage, maximum welfare benefits for a family of three, and effective earned income tax rates for welfare program eligibility and benefits.[7] Maximum welfare benefits and effective tax rates approximate the benefits and costs of engaging the workforce, particularly for women lower in the earnings distribution.[8] State minimum wages directly affect women at the binding wage level but research has shown that minimum wages also affect the wage offers of workers earning a wage above the minimum wage (Neumark et al., 2004; Jardim et al., 2017). In a similar manner to the child-care regulations, these state welfare and labor market policies exogenously influence a woman's outcomes.

These factors influence the woman's human capital and labor market outcomes and vary across women and over time. Conditional on these outcomes, these factors do not influence the child achievement outcomes. Specifically, these exclusion restrictions are not statistically significant when added to the achievement equations.[9] In other words, these state and community factors primarily influence the child outcomes through their effect on the mother's outcomes.[10]

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[6]For more information about these child-care center regulations see Hotz and Xiao (2011).

[7]These data are from the University of Kentucky Center for Poverty Research National Welfare Data and Ziliak (2007).

[8]Bernal and Keane (2011) use similar welfare policy variables as exclusion restrictions for employment outcomes.

[9]These exclusion restrictions are summarized in Table A1 of the appendix. A Wald test for joint significance fails to reject the null hypothesis that the exclusion restrictions explain the PPVT achievement outcome with a p-value of 0.78.

[10]We also achieve identification of parameters through the dynamic nature and functional form of the model (Bhargava, 1991). Furthermore, non-linear dynamic models have been shown to possess a greater degree of identification (Mroz and Savage, 2006). In these models, the entire history of exogenous time-varying variables serve as instrumental variables for the endogenous variables in the current period (Cameron and Trivedi, 2005).

# 4. Results

Table 1 contains the estimation results of the child achievement equation specified in Section 3. The second and third columns of this table present the coefficients and standard errors from pooled OLS with cluster-robust standard errors. The fourth and fifth columns display the estimated coefficients and standard errors resulting from jointly estimating the achievement equation along with the equations for the endogenous maternal outcomes (equations 2 through 7). These equations are estimated jointly while controlling for permanent family-specific unobserved heterogeneity and time-varying family-specific unobserved heterogeneity.[11]

As expected when using a growth or value-added specification, lagged test score is a strong predictor of current test score. Marriage has a positive and significant effect on test score. With a coefficient of 0.087, the magnitude of this effect is approximately 25 percent smaller when jointly estimating achievement with the maternal outcomes. For reference, a coefficient of 0.087 represents approximately five percent of a PPVT score standard deviation (1.86) in this sample. Comparing the pooled OLS and joint estimation results suggest some positive selection into marriage. Also consistent with the literature, we find positive and significant effects of human capital accumulation on child test scores. There exist large and positive gains for children of mothers with a high school degree and additional gains for a college degree, even with controlling for mother's AFQT score. These effects are similar across specification. Part-time work experience also has a positive effect on child outcomes. When controlling for human capital and work experience there remains a small, but significant, effect of mother's income on cognitive achievement. This result is notable because it may suggest that the non-pecuniary effects of human capital accumulation are more important than the pecuniary rewards in the labor market. In other words, it may not be the additional earnings of the mother that make a difference, rather the human capital stock itself has a positive influence on child achievement.

Both estimation techniques result in progressively larger negative effects of additional children in the household beyond the second child. These negative effects tend to be slightly larger in magnitude when controlling for unobserved heterogeneity, suggesting that parents more likely to have lower achieving children tend to choose to have more children than other types of parents. The significant negative effects of family size vary from six percent of a standard deviation with a second child to eighteen percent of a standard deviation with five or more children. Birth order also has negative and statistically significant effects on picture vocabulary scores.

Regarding child-care arrangements, both approaches show no significant difference between maternal care and formal child care at each of the first three years. However, both estimation techniques result in a decrease of approximately eight percent of a standard deviation of using informal child care in year one, relative to maternal child care in that year. Contrastingly, there is a small positive effect of informal child care in year two. However,

[11] See the appendix for estimated coefficients for the maternal outcome demand equations. Coefficients from the estimated probabilities and points of support for the joint distribution of permanent and time-varying unobserved heterogeneity components are available from the authors at request.

this effect is only statistically significant at the ten percent level. After accounting for the endogeneity of the child-care outcome, the effect of informal care during the third year is negative and statistically significant at the ten percent level.

## 5. Conclusion

This work is an attempt to further measure the effects of various maternal investments on child cognitive achievement as measured by the Peabody Picture Vocabulary Test. By jointly estimating the demand equation for maternal investment outcomes using a flexible discrete factor approximation, we can mitigate the potential effects of both permanent and time-varying unobserved difference across mothers and children.

Our results suggest that maternal human capital stock strongly influences child achievement, even while controlling for mother's AFQT score. These effects are larger than the pecuniary effects of additional mother and household income on achievement. Notably, we find negative effects of family size and birth order on child outcomes. These findings suggest that time resources are being allocated differently across family type and children within the household and may have detrimental effects on child cognitive achievement. Consistent with the recent literature, we provide further evidence of the negative effects of child care, albeit only for informal child-care arrangements. These results expand upon the literature by showing evidence of these negative effects while controlling for household size and structure through the marital and fertility outcomes of the mother.

There remain opportunities and challenges for measuring the household determinants of child achievement, in addition to the pervasive effects of unobserved mother and family types. One hindrance is that common measurable characteristics, such as type of child care or number of siblings, are limited in their description of the environment. While these inputs have been shown to influence child outcomes, more specific characterization of time use and relationship roles within the household may provide a clearer picture of the child cognitive development process.

Table 1: Estimation Results for the Peabody Picture Vocabulary Test

| | **Pooled OLS** | | | **Joint Estimation** | | |
|---|---|---|---|---|---|---|
| Variable | Coefficient | | S.E. | Coefficient | | S.E. |
| Lagged test score | 0.508 | *** | (0.008) | 0.507 | *** | (0.009) |
| Married | 0.117 | *** | (0.029) | 0.087 | ** | (0.042) |
| High school degree | 0.219 | *** | (0.040) | 0.216 | *** | (0.047) |
| College degree | 0.252 | *** | (0.064) | 0.252 | *** | (0.074) |
| Part-time experience (years) | 0.019 | *** | (0.005) | 0.019 | *** | (0.005) |
| Full-time experience (years) | 0.004 | | (0.005) | 0.004 | | (0.006) |
| ln cumulative mother's income | 0.018 | *** | (0.005) | 0.017 | *** | (0.006) |
| ln cumulative exog income | -0.001 | | (0.015) | -0.001 | | (0.017) |
| Number of children in houshold | | | | | | |
| Two | -0.106 | ** | (0.048) | -0.111 | * | (0.057) |
| Three | -0.129 | ** | (0.051) | -0.133 | ** | (0.061) |
| Four | -0.235 | *** | (0.061) | -0.239 | *** | (0.073) |
| Five or more | -0.342 | *** | (0.074) | -0.339 | *** | (0.090) |
| Birth order | -0.105 | *** | (0.018) | -0.108 | *** | (0.021) |
| Child-care arrangement | | | | | | |
| Formal care (year one) | -0.003 | | (0.070) | -0.004 | | (0.080) |
| Formal care (year two) | 0.030 | | (0.055) | 0.034 | | (0.063) |
| Formal care (year three) | -0.038 | | (0.041) | -0.042 | | (0.047) |
| Informal care (year one) | -0.141 | *** | (0.035) | -0.142 | *** | (0.041) |
| Informal care (year two) | 0.085 | ** | (0.037) | 0.085 | * | (0.043) |
| Informal care (year three) | -0.071 | ** | (0.034) | -0.071 | * | (0.041) |
| Mother's age | -0.086 | ** | (0.037) | -0.085 | ** | (0.038) |
| Mother's age squared/100 | 2.454 | *** | (0.944) | 2.449 | ** | (0.961) |
| Child's age | -0.028 | *** | (0.007) | -0.029 | *** | (0.008) |
| Male | 0.060 | ** | (0.024) | 0.060 | ** | (0.030) |
| Black | -0.229 | *** | (0.035) | -0.225 | *** | (0.042) |
| Hispanic | -0.062 | * | (0.037) | -0.068 | | (0.042) |
| Mother's AFQT score | 0.116 | *** | (0.007) | 0.114 | *** | (0.007) |
| Mother's AFQT score missing | 0.445 | *** | (0.071) | 0.442 | *** | (0.085) |
| Constant | 5.162 | *** | (0.358) | 5.190 | *** | (0.414) |
| Observations | 6,662 | | | | | |

*** significant at 1% level, ** significant at 5% level, * significant at 10% level.

# References


Angeles, G., Guilkey, D., & Mroz, T. (1998). Purposive Program Placement and the Estimation of Family Planning Program Effects in Tanzania. *Journal of the American Statistical Association*, 93(443), 884-899.

Angrist, J., Lavy, V., & Schlosser, A. (2006). New Evidence on the Causal Link Between the Quantity and Quality of Children. NBER Working Paper 11835. National Bureau of Economic Research, Cambridge, MA.

Bernal, R. (2008). The Effect of Maternal Employment and Child Care on Children's Cognitive Development. *International Economic Review*, 49(4), 1173-1209.

Bernal, R., & Keane, M. (2010). Quasi-structural estimation of a model of childcare choices and child cognitive ability production. *Journal of Econometrics*, 156(1), 164-189.

Bernal, R., & Keane, M. (2011). Child Care Choices and Children's Cognitive Achievement: the Case of Single Mothers. *Journal of Labor Economics*, 29(3), 459-512.

Bhargava, A. (1991). Identification and Panel Data Models with Endogenous Regressors. *The Review of Economic Studies*, 58(1), 129-140.

Black, S., Devereux, P., & Salvanes, K. (2005). The More the Merrier: The Effect of Family Size and Birth Order on Children's Education. *The Quarterly Journal of Economics*, 120(2), 669-700.

Booth, A., & Kee, H. (2009). Birth Order Matters: the Effect of Family Size and Birth Order on Educational Attainment. *Journal of Population Economics*, 22(2),367-397.

Caceres-Delpiano, J. (2006). The Impacts of Family Size on Investment in Child Quality. *Journal of Human Resources*, 16(4), 738-754.

Cameron, C., & Trivedi, P. (2005). *Microeconometrics: Methods and Applications* Cambridge: Cambridge University Press.

Chetty, R., Friedman, J. N., Hilger, N., Saez, E., Schanzenbach, D. W., & Yagan, D. (2011). How Does Your Kindergarten Classroom Affect Your Earnings? Evidence from Project Star. *The Quarterly Journal of Economics*, 126(4), 1593-1660.

Conley, D., & Glauber, R. (2006). Parental Educational Investment and Children's Academic Risk Estimates of the Impact of Sibship Size and Birth Order from Exogenous Variation in Fertility. *Journal of Human Resources*, 41(4), 722-737.

Cunha, F., Heckman, J., & Navarro, S. (2005). The 2004 Hicks Lecture: Separating Uncertainty from Heterogeneity in Life Cycle Earnings. *Oxford Economic Papers*, 57(2), 191-261.

Cunha, F., Heckman, J.,& Schennach, S. (2010). Estimating the Elasticity of Intertemporal Substitution in the Formation of Cognitive and Non-Cognitive Skills. *Econometrica*, 78(3), 883-931.

Del Boca, D., Flinn, C., & Wiswall, M. (2014). Household Choices and Child Development. *The Review of Economic Studies*, 81(1), 137-185.

Hanushek, E. (1992). The Trade-off between Child Quantity and Quality. *Journal of Political Economy*, 100(1), 84-117.

Heckman, J., & Singer, B. (1984). A Method for Minimizing the Impact of Distributional Assumptions in Econometric Models for Duration Data. *Econometrica*, 52(2), 271-320.

Hotz, V. J., & Xiao, M. (2011). The Impact of Regulations on the Supply and Quality of Care in Child Care Markets. *The American Economic Review*, 101(5), 1775-1805.

Huggett, M., Ventura, G., & Yaron, A. (2011). Sources of Lifetime Inequality. *American Economic Review*, 101(7), 2923-54.

James-Burdemy, S. (2005). The Effect of Maternal Labor Force Participation on Child Development. *Journal of Labor Economics*, 23(1), 177-211.

Jardim, E., Long, M. C., Plotnick, R., Inwegen, E. V., Vigdor, J., & Wething, H. (2017). Minimum Wage Increases, Wages, and Low-Wage Employment: Evidence from Seattle. National Bureau of Economic Research Working Paper Series, No. 23532.

Mroz, T. (1999). Discrete Factor Approximations in Simultaneous Equation Models: Estimating the Impact of a Dummy Endogenous Variable on a Continuous Outcome. *Journal of Econometrics*, 92(2):233-274.

Mroz, T., & Guilkey, D. (1995). *Discrete Factor Approximations For Use In Simultaneous Equation Models With Both Continuous And Discrete Dependent Variables* Department of Economics Working Paper, The University of North Carolina at Chapel Hill, Chapel Hill.

Mroz, T., & Savage, T. (2006). The Long-Term Effects of Youth Unemployment. *Journal of Human Resources*, 41(2), 259-293.

Neumark, D., Schweitzer, M., & Wascher, W. (2004). Minimum Wage Effects throughout the Wage Distribution. *The Journal of Human Resources*, 39(2), 425-450.

Ruhm, C. (2004). Parental Employment and Child Cognitive Development. *Journal of Human Resources*, 39(1), 155-192.

University of Kentucky Center for Poverty Research. 2017. "UKCPR National Welfare Data, 1980-2016." Gatton College of Business and Economics, University of Kentucky, Lexington, KY.

Waldfogel, J., Han, W., & Brooks-Gunn, J. (2002). The Effects of Early Maternal Employment on Child Cognitive Development. *Demography*, 39(2), 369-392.

Ziliak, J. P. (2007). Making Work Pay Changes in Effective Tax Rates and Guarantees in US Transfer Programs, 1983-2002. *Journal of Human Resources*, 42(3), 619-642.

# Appendix

Table A1: Summary Statistics (all years)

| Variable | Mean | Std. Dev. |
|---|---|---|
| PPVT score | 9.25 | 1.86 |
| Married | 0.64 | 0.48 |
| High school degree | 0.73 | 0.44 |
| College degree | 0.11 | 0.31 |
| Part-time experience (years) | 7.08 | 3.88 |
| Full-time experience (years) | 4.31 | 4.39 |
| ln cumulative mother's income | 9.98 | 3.37 |
| ln cumulative exogenous income | 10.12 | 3.39 |
| Number of children in household | | |
| Two | 0.37 | 0.48 |
| Three | 0.33 | 0.46 |
| Four | 0.13 | 0.34 |
| Five or more | 0.08 | 0.27 |
| Birth order | 1.80 | 0.96 |
| Child-care arrangement | | |
| Formal care (year one) | 0.05 | 0.21 |
| Formal care (year two) | 0.11 | 0.31 |
| Formal care (year three) | 0.18 | 0.39 |
| Informal care (year one) | 0.38 | 0.48 |
| Informal care (year two) | 0.40 | 0.49 |
| Informal care (year three) | 0.36 | 0.48 |
| Mother's age | 18.9 | 3.33 |
| Child's age | 6.69 | 1.93 |
| Male | 0.51 | 0.50 |
| Black | 0.30 | 0.46 |
| Hispanic | 0.20 | 0.40 |
| Mother's AFQT score | 3.49 | 2.76 |
| Exclusion restrictions (county level) | | |
| Births per 1000 | 13.50 | 6.26 |
| Manufacturing empl. | 15.63 | 10.76 |
| Males per females | 0.80 | 0.34 |
| Pct bachelors degree | 0.16 | 0.10 |
| Pct high school degree | 0.61 | 0.27 |
| Poverty rate | 0.12 | 0.08 |
| Unemployment rate | 5.92 | 3.53 |
| Exclusion restrictions (state level) | | |
| Insurance required: daycare center | 0.20 | 0.40 |
| Insurance required: family home center | 0.02 | 0.15 |
| No. annual inspections: daycare center | 0.56 | 0.65 |

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*Table A1 continuing from previous page*

| Variable | Mean | Std. Dev. |
|---|---|---|
| No. annual inspections: family home center | 0.59 | 0.83 |
| Child-worker ratio: daycare center | 3.18 | 2.46 |
| Child-worker ratio: family home center | 2.45 | 2.09 |
| Effective income tax rate | 22.69 | 19.91 |
| Max welfare benefit family of three (100s) | 6.50 | 3.47 |
| State minimum wage | 4.13 | 2.13 |
| Number of mothers | 3,947 | |
| Number of children | 3,964 | |
| Years (1980 to 2000) | 21 | |
| Observed test scores | 6,662 | |

Table A2: Marital Status
(jointly estimated)

| Variable | Coefficient | | S.E. |
|---|---|---|---|
| Enrolled in school in $t-1$ | -1.071 | *** | (0.025) |
| Birth in $t-1$ | 0.837 | *** | (0.025) |
| Years single | -0.480 | *** | (0.004) |
| High school degree | 0.311 | *** | (0.028) |
| College degree | 0.924 | *** | (0.043) |
| Part-time experience (years) | 0.063 | *** | (0.003) |
| Full-time experience (years) | 0.071 | *** | (0.003) |
| Number of children | 0.317 | *** | (0.009) |
| Mother's age | 0.318 | *** | (0.008) |
| Mother's age squared/100 | -7.616 | *** | (0.250) |
| Black | -1.103 | *** | (0.029) |
| Hispanic | -0.167 | *** | (0.032) |
| ln mother's income | -0.017 | *** | (0.002) |
| ln exogneous income | 0.240 | *** | (0.040) |
| Mother's AFQT score | 0.038 | *** | (0.005) |
| Mother's AFQT score missing | 0.700 | *** | (0.061) |
| Births per 1000 | 0.006 | | (0.004) |
| Manufacturing empl. | -0.014 | *** | (0.001) |
| Males per females | 0.014 | *** | (0.002) |
| Pct bachelors degree | -0.021 | *** | (0.002) |
| Pct high school degree | -0.021 | *** | (0.002) |
| Poverty rate | -0.031 | *** | (0.003) |
| Unemployment rate | -0.041 | *** | (0.005) |
| Insurance required: daycare center | -0.012 | | (0.027) |
| Insurance required: family home center | -0.252 | *** | (0.054) |
| No. annual inspections: daycare center | 0.069 | *** | (0.019) |
| No. annual inspections: family home center | 0.006 | | (0.014) |
| Child-worker ratio: daycare center | -0.026 | *** | (0.007) |
| Child-worker ratio: family home center | 0.049 | *** | (0.007) |
| Effective income tax rate | 0.004 | *** | (0.001) |
| Max welfare benefit family of three (100s) | -0.001 | *** | (0.000) |
| State minimum wage | -0.017 | | (0.011) |
| Missing exclusion restriction | -1.530 | *** | (0.265) |
| Constant | 1.817 | *** | (0.278) |
| Observations | 82,887 | | |

*** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table A3: Schooling
(jointly estimated)

| Variable | Coefficient | | S.E. |
|---|---|---|---|
| Enrolled in school in $t-1$ | 3.087 | *** | (0.022) |
| Educational Attainment | 0.056 | *** | (0.007) |
| Married in $t-1$ | -0.866 | *** | (0.030) |
| Birth in $t-1$ | -0.627 | *** | (0.042) |
| Years married | 0.023 | *** | (0.003) |
| Part-time experience (years) | 0.056 | *** | (0.004) |
| Full-time experience (years) | 0.052 | *** | (0.004) |
| Number of children | -0.035 | *** | (0.011) |
| Mother's age | -0.213 | *** | (0.010) |
| Mother's age squared/100 | 5.151 | *** | (0.312) |
| Black | 0.350 | *** | (0.029) |
| Hispanic | 0.228 | *** | (0.032) |
| ln mother's income | -0.044 | *** | (0.003) |
| ln exogneous income | -0.132 | ** | (0.067) |
| Mother's AFQT score | 0.118 | *** | (0.005) |
| Mother's AFQT score missing | 0.096 | | (0.067) |
| Births per 1000 | 0.002 | | (0.004) |
| Manufacturing empl. | -0.003 | ** | (0.001) |
| Males per females | 0.001 | | (0.002) |
| Pct bachelors degree | -0.002 | | (0.002) |
| Pct high school degree | 0.008 | *** | (0.002) |
| Poverty rate | 0.014 | *** | (0.003) |
| Unemployment rate | 0.011 | * | (0.006) |
| Insurance required: daycare center | -0.109 | *** | (0.032) |
| Insurance required: family home center | 0.030 | | (0.075) |
| No. annual inspections: daycare center | 0.012 | | (0.025) |
| No. annual inspections: family home center | 0.031 | * | (0.018) |
| Child-worker ratio: daycare center | -0.001 | | (0.009) |
| Child-worker ratio: family home center | 0.003 | | (0.009) |
| Effective income tax rate | 0.001 | | (0.001) |
| Max welfare benefit family of three (100s) | 0.000 | * | (0.000) |
| State minimum wage | 0.098 | *** | (0.013) |
| Missing exclusion restriction | 0.301 | | (0.291) |
| Constant | -3.313 | *** | (0.313) |
| Observations | 82,887 | | |

*** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table A4: Part-time and Full-time Work Relative to Not Working
(jointly estimated)

| | Part-time | | | Full-time | | |
|---|---|---|---|---|---|---|
| Variable | Coefficient | | S.E. | Coefficient | | S.E. |
| Work status $t-1$ | 5.882 | *** | (0.244) | 7.733 | *** | (0.243) |
| Part-time experience (years) | 0.107 | *** | (0.004) | 0.003 | | (0.004) |
| Full-time experience (years) | -0.086 | *** | (0.006) | 0.090 | *** | (0.006) |
| Enrolled in school in $t-1$ | 0.827 | *** | (0.032) | 0.392 | *** | (0.036) |
| High school degree | 0.344 | *** | (0.024) | 0.545 | *** | (0.030) |
| College degree | -0.477 | *** | (0.047) | 0.207 | *** | (0.052) |
| Married in $t-1$ | -0.001 | | (0.037) | -0.588 | *** | (0.036) |
| Birth in $t-1$ | -0.267 | *** | (0.025) | -0.732 | *** | (0.031) |
| Years married | -0.022 | *** | (0.004) | -0.015 | *** | (0.004) |
| Number of children | -0.089 | *** | (0.008) | -0.237 | *** | (0.010) |
| Mother's age | -0.132 | *** | (0.010) | 0.045 | *** | (0.012) |
| Mother's age squared/100 | 1.778 | *** | (0.321) | -2.740 | *** | (0.375) |
| Black | 0.035 | | (0.024) | 0.296 | *** | (0.028) |
| Hispanic | 0.219 | *** | (0.026) | 0.409 | *** | (0.031) |
| ln mother's income | 1.894 | *** | (0.035) | 1.956 | *** | (0.035) |
| ln exogneous income | 0.595 | * | (0.346) | -0.143 | ** | (0.070) |
| Mother's AFQT score | 0.047 | *** | (0.005) | 0.001 | | (0.005) |
| Mother's AFQT score missing | 0.203 | *** | (0.042) | 0.040 | | (0.050) |
| Births per 1000 | -0.014 | *** | (0.004) | -0.025 | *** | (0.005) |
| Manufacturing empl. | 0.009 | *** | (0.001) | 0.007 | *** | (0.002) |
| Males per females | -0.001 | | (0.002) | 0.000 | | (0.002) |
| Pct bachelors degree | -0.019 | *** | (0.002) | -0.026 | *** | (0.002) |
| Pct high school degree | 0.021 | *** | (0.002) | 0.021 | *** | (0.002) |
| Poverty rate | 0.014 | *** | (0.003) | 0.024 | *** | (0.004) |
| Unemployment rate | -0.052 | *** | (0.005) | -0.071 | *** | (0.006) |
| Insurance required: daycare center | -0.019 | | (0.025) | -0.062 | ** | (0.029) |
| Insurance required: family home center | 0.373 | *** | (0.057) | 0.422 | *** | (0.067) |
| No. annual inspections: daycare center | -0.060 | *** | (0.020) | -0.081 | *** | (0.023) |
| No. annual inspections: family home center | 0.031 | ** | (0.015) | 0.035 | ** | (0.016) |
| Child-worker ratio: daycare center | 0.056 | *** | (0.008) | 0.056 | *** | (0.008) |
| Child-worker ratio: family home center | 0.075 | *** | (0.008) | 0.070 | *** | (0.009) |
| Effective income tax rate | -0.005 | *** | (0.001) | -0.004 | *** | (0.001) |
| Max welfare benefit family of three (100s) | 0.000 | *** | (0.000) | 0.000 | | (0.000) |
| State minimum wage | 0.050 | *** | (0.011) | 0.018 | | (0.013) |
| Missing exclusion restriction | -0.325 | | (0.314) | -0.345 | | (0.355) |
| Constant | -2.341 | *** | (0.368) | -4.847 | *** | (0.411) |
| Observations | 82,887 | | | | | |

Table A5: Fertility Outcome
(jointly estimated)

| Variable | Coefficient | | S.E. |
|---|---|---|---|
| Enrolled in school in $t-1$ | -0.371 | *** | (0.026) |
| Married in $t-1$ | 1.390 | *** | (0.023) |
| Years married | -0.086 | *** | (0.003) |
| High school degree | -0.228 | *** | (0.022) |
| College degree | 0.096 | *** | (0.036) |
| Part-time experience (years) | 0.000 | | (0.003) |
| Full-time experience (years) | 0.036 | *** | (0.004) |
| Number of children | -0.179 | *** | (0.008) |
| Mother's age | 0.076 | *** | (0.009) |
| Mother's age squared/100 | -5.257 | *** | (0.345) |
| Black | 0.066 | *** | (0.022) |
| Hispanic | 0.055 | ** | (0.022) |
| ln mother's income | -0.032 | *** | (0.002) |
| ln exogneous income | -0.029 | | (0.034) |
| Mother's AFQT score | -0.029 | *** | (0.004) |
| Mother's AFQT score missing | 0.001 | | (0.037) |
| Births per 1000 | 0.025 | *** | (0.004) |
| Manufacturing empl. | 0.006 | *** | (0.001) |
| Males per females | 0.004 | ** | (0.002) |
| Pct bachelors degree | 0.001 | | (0.002) |
| Pct high school degree | 0.005 | ** | (0.002) |
| Poverty rate | 0.010 | *** | (0.003) |
| Unemployment rate | 0.004 | | (0.004) |
| Insurance required: daycare center | 0.074 | *** | (0.022) |
| Insurance required: family home center | -0.129 | *** | (0.050) |
| No. annual inspections: daycare center | 0.018 | | (0.018) |
| No. annual inspections: family home center | 0.022 | * | (0.013) |
| Child-worker ratio: daycare center | 0.008 | | (0.006) |
| Child-worker ratio: family home center | -0.020 | *** | (0.007) |
| Effective income tax rate | 0.000 | | (0.001) |
| Max welfare benefit family of three (100s) | 0.000 | *** | (0.000) |
| State minimum wage | -0.013 | | (0.010) |
| Missing exclusion restriction | 1.017 | *** | (0.224) |
| Constant | -3.928 | *** | (0.257) |
| Observations | 82,887 | | |

*** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table A6: Formal and Informal Child Care Relative to Maternal Child Care (jointly estimated)

| | Informal | | | Formal | | |
|---|---|---|---|---|---|---|
| Variable | Coefficient | | S.E. | Coefficient | | S.E. |
| Enrolled in school in $t-1$ | 0.314 | *** | (0.104) | 0.351 | *** | (0.079) |
| Married in $t-1$ | -0.535 | *** | (0.083) | -0.427 | *** | (0.059) |
| Birth in $t-1$ | -0.394 | *** | (0.054) | 0.005 | | (0.038) |
| High school degree | 0.496 | *** | (0.098) | 0.284 | *** | (0.056) |
| College degree | 0.543 | *** | (0.132) | 0.239 | *** | (0.090) |
| Part-time experience (years) | 0.069 | *** | (0.012) | 0.051 | *** | (0.008) |
| Full-time experience (years) | 0.161 | *** | (0.013) | 0.145 | *** | (0.009) |
| Number of children | -0.341 | *** | (0.032) | -0.185 | *** | (0.021) |
| Mother's age | 0.108 | *** | (0.029) | 0.089 | *** | (0.021) |
| Mother's age squared/100 | -5.552 | *** | (0.954) | -6.652 | *** | (0.734) |
| Black | 0.793 | *** | (0.075) | 0.388 | *** | (0.056) |
| Hispanic | -0.001 | | (0.087) | 0.352 | *** | (0.057) |
| ln mother's income | 0.149 | *** | (0.007) | 0.212 | *** | (0.005) |
| ln exogneous income | -0.024 | | (0.089) | -0.042 | | (0.050) |
| Mother's AFQT score | 0.045 | *** | (0.014) | 0.044 | *** | (0.009) |
| Mother's AFQT score missing | 0.071 | | (0.156) | 0.275 | *** | (0.096) |
| Births per 1000 | 0.001 | | (0.013) | 0.001 | | (0.008) |
| Manufacturing empl. | -0.006 | | (0.004) | -0.001 | | (0.002) |
| Males per females | 0.012 | ** | (0.006) | 0.008 | ** | (0.004) |
| Pct bachelors degree | -0.005 | | (0.006) | -0.008 | ** | (0.004) |
| Pct high school degree | -0.002 | | (0.006) | -0.012 | *** | (0.004) |
| Poverty rate | 0.008 | | (0.009) | 0.005 | | (0.006) |
| Unemployment rate | -0.063 | *** | (0.015) | -0.036 | *** | (0.009) |
| Insurance required: daycare center | -0.231 | *** | (0.074) | -0.095 | * | (0.052) |
| Insurance required: family home center | -0.280 | | (0.181) | -0.171 | | (0.107) |
| No. annual inspections: daycare center | -0.094 | * | (0.057) | 0.056 | | (0.041) |
| No. annual inspections: family home center | -0.072 | * | (0.040) | -0.057 | ** | (0.029) |
| Child-worker ratio: daycare center | 0.010 | | (0.019) | 0.026 | * | (0.014) |
| Child-worker ratio: family home center | 0.079 | *** | (0.021) | -0.012 | | (0.016) |
| Effective income tax rate | -0.003 | | (0.003) | 0.004 | * | (0.002) |
| Max welfare benefit family of three (100s) | -0.001 | *** | (0.000) | 0.000 | *** | (0.000) |
| State minimum wage | 0.102 | *** | (0.035) | -0.033 | | (0.024) |
| Missing exclusion restriction | 0.699 | | (0.676) | -0.210 | | (0.507) |
| Constant | -3.057 | *** | (0.749) | -1.228 | ** | (0.573) |
| Observations | 11,892 | | | | | |

*** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table A7: Wages
(jointly estimated)

| Variable | Coefficient | | S.E. |
|---|---|---|---|
| Enrolled in school in $t-1$ | 0.013 | *** | (0.004) |
| Married in $t-1$ | -0.024 | *** | (0.003) |
| Birth in $t-1$ | -0.018 | *** | (0.004) |
| High school degree | 0.022 | *** | (0.005) |
| College degree | 0.264 | *** | (0.007) |
| Part-time experience (years) | 0.036 | *** | (0.001) |
| Full-time experience (years) | 0.056 | *** | (0.001) |
| Number of children | -0.005 | *** | (0.001) |
| Mother's age | 0.080 | *** | (0.002) |
| Mother's age squared/100 | -1.349 | *** | (0.048) |
| Black | 0.030 | *** | (0.005) |
| Hispanic | 0.018 | *** | (0.005) |
| ln mother's income | 0.005 | *** | (0.000) |
| ln exogneous income | -0.015 | *** | (0.004) |
| Mother's AFQT score | 0.016 | *** | (0.001) |
| Mother's AFQT score missing | 0.039 | *** | (0.010) |
| Births per 1000 | 0.006 | *** | (0.001) |
| Manufacturing empl. | -0.001 | *** | (0.000) |
| Males per females | 0.000 | | (0.000) |
| Pct bachelors degree | 0.007 | *** | (0.000) |
| Pct high school degree | 0.000 | | (0.000) |
| Poverty rate | -0.003 | *** | (0.001) |
| Unemployment rate | 0.005 | *** | (0.001) |
| Insurance required: daycare center | 0.000 | | (0.004) |
| Insurance required: family home center | -0.106 | *** | (0.008) |
| No. annual inspections: daycare center | 0.009 | *** | (0.003) |
| No. annual inspections: family home center | -0.003 | | (0.002) |
| Child-worker ratio: daycare center | -0.008 | *** | (0.001) |
| Child-worker ratio: family home center | -0.016 | *** | (0.001) |
| Effective income tax rate | -0.001 | *** | (0.000) |
| Max welfare benefit family of three (100s) | 0.000 | *** | (0.000) |
| State minimum wage | 0.012 | *** | (0.002) |
| Missing exclusion restriction | 0.212 | *** | (0.042) |
| Constant | 2.045 | *** | (0.044) |
| Observations | 49,106 | | |

*** significant at 1% level, ** significant at 5% level, * significant at 10% level.