

“Determinants of Psychomotor Development with Special Attention to Maternal Employment and Enrollment in Preschool during the First Three Years: Evidence from the Early Childhood Longitudinal Survey in Chile”

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1. Introduction

Latin America has seen a decade of strong economic growth and is regarded as an economic success story. Its most notable achievements include a sharp decline in the poverty rate and the rise of the middle class, which grew 50% in the last ten years and now constitutes 30% of the population (World Bank, 2013). Much of this success is due in part to greater access to education and job creation. However, 28.8% of the population still lives below the poverty line (ECLAC, 2012) and according to the World Bank and the United Nations Development Program, Latin America is still one of the most economically unequal regions in the world. The most recent available statistics for 18 countries indicate that, on average, the richest 10% of the Latin American population receives 32% of total income, while the poorest 40% receive just 15% of income (ECLAC, 2012).

To change the inequality of outcomes one must equalize *opportunities* amongst children. Past circumstances impact current socioeconomic outcomes, so most people can agree that providing an equal footing in life is a goal toward which a country should strive. This mentality is evident in the recent development of the Human Opportunity Index (HOI) by the World Bank. The HOI measures the level of coverage of basic opportunities necessary for human development. Specifically, it measures how personal circumstances (birthplace, wealth, race or gender) impact a child's opportunity to succeed in life (timely education, running water or connection to electricity). A 2008 World Bank report shows that the most disadvantaged groups, from the perspective of inequality of opportunity, in seven Latin American countries (Brazil, Colombia, Ecuador, Guatemala, Mexico, Panama, and Peru) tend to be members of ethnic minorities or those who hail from agricultural families with low levels of education. According to the report between 25% and 50% of inequality of economic opportunity amongst adults is due to their circumstances during childhood and accounts for between one-fifth and one-third of overall earnings inequality. Additionally, the report indicates that Chile does well in providing basic educational opportunities, but it does not do well in more advanced indicators such as quality learning, completion of secondary on time, access to some tertiary education and bundles of services for early childhood development and youth development (World Bank, 2012).

The principles behind investment in early childhood development are based on neuroscientific research. This research indicates that infants are not born with all their cognitive abilities and that their brains continue to develop after birth, which make nutrition and educational development critical during the first years of life. As the Ministerial Council for Education, Early Childhood Development and Youth Affairs points out, there is consistent agreement in the neuroscience literature that brains are much the same at birth but can be dramatically different by the age of two. This change can be explained by Jean Piaget's famed theory of cognitive development, which states that the first two years of a child's life can be characterized as the "Sensorimotor Stage." In this stage of cognitive development infants "construct an understanding of the world by coordinating experiences with physical, motoric actions," (Santrock, 2008). In the report, *From Neurons to Neighborhoods*, a committee on the science of early childhood development concludes, from hundreds of research studies, that non-genetic influences are the main reason for differences among adults and that interventions to help shape a child's brain development function are critical (Shonkoff and Phillips, 2000). This body of research leads to the conclusion that policies should be aimed at optimizing children's benefits in the sensorimotor stage. One way to do this is by passing policies that provide adequate nutrition and stimulation to all children in the first two years of life.

This paper provides evidence on the determinants of children's psychomotor development¹ in Chile. The purpose of this study is to examine the impact of mother, child, and demographic characteristics on

¹ According to the National Institute of Health (NIH), "Psychomotor' development refers to changes in a child's cognitive, emotional, motor, and social capacities from the beginning of life throughout fetal and neonatal periods, infancy, childhood, and adolescence."

a child's psychomotor development during the first three years of life paying particular attention to (a) the influence of maternal employment during these early years; (b) the influence of participation in day care or preschool on a child's psychomotor development; and (c) the influence of maternal employment combined with enrollment in a day care or preschool during this stage in a child's life. We measure these effects using the Peabody Picture Vocabulary Test (PPVT)² and the Battelle Developmental Inventory³. The Battelle is a measure of the child's psychomotor development and is applied to children between the ages of 2 and 4 in this study. The PPVT is also a measure of the child's psychomotor development, but is applied to children between the ages of 4 and 6 in this study. Therefore, it is important to keep in mind that results presented in this paper reflect two samples of children: one sample for which development is measured (using the Battelle) amongst 2 to 4 year olds and another sample for which development is measured (using the PPVT) amongst children ages 3 to 6. We use two rounds of the *Early Childhood Longitudinal Survey* (Encuesta Longitudinal Primera Infancia, ELPI) which was created in order to increase the amount of information available and advance the creation of longitudinal data regarding children in the first few years of life.

In line with previous research on early childhood development, we find that mother and child characteristics play a significant role in the child's psychomotor development. We pay special attention to maternal employment and enrollment in day care or preschool during the first three years of the child's life and find that maternal employment during the first year was linked to lower Peabody Picture Vocabulary Test scores and Battelle Developmental Inventory scores. This effect is statistically significant for the oldest children in our study, suggesting that the effects are long-term. Enrollment in a day care or preschool during the first year was linked to lower Battelle scores. However, the negative impact of enrollment during the first year of life is not significant when analyzing by age, suggesting that the effects are not long-term. Finally, we find that the combination of enrollment in day care and preschool with maternal employment during the first year of the child's life is linked to lower Battelle scores. This effect is also statistically significant for our oldest children, again suggesting that the impact has lasting effects. All of these effects are more pronounced for male children.

The rest of this paper is organized as follows. The next section provides a broad overview of the case of Chile. Section 3 reviews the *Early Childhood Longitudinal Survey* (Encuesta Longitudinal de Primera Infancia, ELPI) which we use to measure mother, child, and other characteristics and their effects on the child's test results. In section 4 we describe the Peabody Picture Vocabulary Test and Battelle Development Inventory in detail. Section 5 explains the methodology applied. Section 6 explains the theoretical model and offers a review of the literature that explores key factors in early child development. Section 6 provides results and for the final section, 7, we offer a discussion.

2. The Case of Chile

Investment in human capital is a key contributor to economic development. Chile caught on to this theory long ago after enacting liberal economic policies in the mid-1970s. As the economy expanded, so did the incentive to seek more education and engage in growth-enhancing activities. Chile's economy has continued to grow at a fast pace, but at the expense of equity evidenced by high wage inequality. A recent meta-analysis of the available literature on inequality in Chile indicates that education is the single most important factor behind the distribution of earnings and income, accounting for between 13% and 40% of inequality (Palma Aguire 2008). The different types of schooling in Chile also play an important role in outcomes. Contreras et al. analyzed test scores of 10th graders in Chile and future

² The PPVT is a Spanish adaption of the English Peabody Picture Vocabulary Test created in 1959 that provides a quick estimate of verbal ability and scholastic aptitude.

³ The Battelle Development Inventory measures developmental abilities in five major areas: socio-personal, adaptive, motor, communication, and cognitive.

wages and concluded that the different types of schools existing in Chile (public, private-voucher or private-fee-paying schools) are an important source of earnings heterogeneity (Contreras et al. 2012). Another study used Chile's Social Protection Survey to measure inequality of opportunities in the country. It focused on distribution of individual labor income to estimate the impact of inequality of opportunity on inequality of income in the Chilean economy. It concluded that the share of total inequality that can be traced to circumstances is relatively high in Chile, but the degree of overall inequality is lower than in other countries in the region (Contreras et al. 2009). It also found that at least 25% of labor income and household income inequality can be related to circumstances in the parental household and that the father's education is the individual circumstance that contributes the most to income inequality. Furthermore, after splitting the data into three cohorts, they determined that income inequality in labor income is lowest for the youngest cohort. The results of this study suggest that early circumstances have a lasting impact on adult outcomes and that recent educational policies may have produced a more even playing field that benefits the youngest cohort.

While most studies have focused on characteristics of students at the secondary and tertiary level, few studies in Chile have analyzed student characteristics and test scores at the pre-school level. Analyzing family and child characteristics at this stage are key since investments in early childhood development give the highest rates of return to education (Carneiro & Heckman 2003). This investment is especially important for developing countries where young children bear the greatest burden of poverty and lack of educational opportunities. Early childhood programs can provide health, nutrition, and social services to children from low-income families.

This paper focuses on the case of Chile for several reasons. Chile is a developing country that has contributed greatly in the last few years to improving early childhood education through various public policies. The program *Chile Crece Contigo (Chile Grows with You)* was launched in 2006 to promote full support from birth for the country's children from birth to age four. The policy is the first of its kind in Latin America to offer specialized aid in education, maternity care and health services for all children and their families. It is also the first to provide children from the poorest families' eligibility to attend day care centers and pre-schools for free. The United States' early childhood investment program *Head Start* is cited widely and used as an example to show the effects of such programs on early childhood development. However, the rationale for the implementation of these programs in developing countries would be much stronger if it could be supported with data from another developing country. Chile offers the data necessary to apply this analysis. As Chile becomes a leader in economic and social development in the region, other Latin American countries will look at programs and studies developed in Chile to determine the most efficient path towards development. By elucidating the effects of various mother, child, and demographic characteristics on outcomes amongst young children, this paper offers other Latin American countries with similar characteristics (such as countries with high inequality rates or those interested in increasing investment in early childhood education) a source they can use to better support their own policy recommendations.

3. Encuesta Longitudinal de la Primera Infancia

This study uses data from the first (2010) and second (2012) round of the *Early Childhood Longitudinal Survey* (Encuesta Longitudinal de Primera Infancia, ELPI). The survey is representative of the Chilean population and was created to gather information about children in the first few years of life for the purpose of designing and assessing different public policy programs. The 2010 survey is a sample of 15,175 children (boys and girls) born between January 1, 2006 and August 31, 2009. The 2012 survey is a sample of 16,033 children (boys and girls) born between January 1, 2006 and December 31, 2006. The cross-sectional sample is considered representative of children between 2 and 6 years old, from all 15 Chilean regions, including urban and rural areas.

The survey was conducted during two information-gathering visits. During the first visit, surveyors gathered household socio-demographic data for each child included in the survey. The survey was divided into four categories of questions related to the composition of the family, the main caregiver, the first six years of the child's life and the caregiver's work history. The first category gathered data at the household level regarding each person living in the same house. Questions included the composition of family, education level, employment status, and household income. The second gathered information about the primary caregiver of the child. It included questions regarding the biological mother's pregnancy, immunizations, household habits, household chores and family responsibilities, questions regarding the recent Chilean earthquake, activities and heritage, and the biological father. The third gathered information regarding the first few years of the child's life. It elicited data about the child's birth weight and Apgar score⁴, and the respondents were asked if they had the child's health card or log book of medical examinations available which was used to acquire more accurate measures of the child's health status at birth. These questions also covered whether the mother worked the first few years, if the child attended daycare, and characteristics of the day care. The fourth category of questions was also directed to the primary caregiver and gathered information regarding work history for the period January 2004 to the date of the interview some month in 2012.

On the second visit, several instruments were applied to evaluate cognitive, socio-emotional, and physical aspects of the child and the primary care-giver. This survey contains the child's scores on the PPVT and Battelle Development Inventory and his/her primary caregiver's score on the WAIS. The study was conducted with a sample of children whose mothers reported being the primary caregiver. The average age for the sample used to measure effects on the Battelle is 3 years and 3 months and the average age for the sample used to measure effects on the PPVT is 5 years and 8 months. Both samples are evenly distributed by gender.

The first round of the ELPI survey was implemented in 2010 and a preliminary analysis of the data shows that medical, cognitive, and demographic variables are important factors in a child's biopsychosocial development. The measures of cognitive ability had a greater impact than the other variables and, in all specific models, they were significant. Additionally, demographic variables and those related to the family environment had a greater impact than medical variables. The child's attendance at preschool had a positive impact on psychomotor development, as measured by the TEPPI, and was even more important than the mother's employment status. The second round of the ELPI, which was completed in 2012, offers the advantage of observing the same individuals in different moments in time (in this case years). This allows us to study the dynamic behavior of various variables. With the addition of the 2012 data we are able to present more precise estimates of mother, child, and demographic effects on a child's cognitive ability, as well as to measure longer-term effects since the ELPI tracks the same mothers and children.

4. Instruments

4a. Battelle Developmental Inventory

The original version of the Battelle Development Inventory was applied in the 2010 survey which consisted of 288 questions that measure developmental abilities in five major areas: socio-personal, adaptive, motor, communication, and cognitive. It is designed to be applied to children between the ages of 0 and 95 months. For the 2010 ELPI, it was applied to children between the ages of 6 months and 23 months and 30 days. The test can take anywhere between 60 and 90 minutes on average, depending on the child's age. The test collects data through a combination of observation, application

⁴ An Apgar score is a quick method used to assess the health of newborn children immediately after birth.

and responses from the primary caregiver. An abbreviated version of the Battelle was applied in the 2012 survey. Scores for this test were later converted to match the same point structure as the 2010 test. The average score for our sample in 2012 was 53 points with a standard deviation of 4.67 points. The Battelle sample used for this study consists of 3,368 children with a mean age of 3 years. The sample is split evenly by gender and 89% of the children lived in an urban area in 2012. Table 1 below provides an interpretation of scores on the Battelle Inventory Development and the distribution of scores for our sample. While a majority of the children in our sample score average or above, 31% of the children scored below average.

Interpretation	Points	Distribution
High	60 or higher	8%
Average	Between 51 and 59	60%
Low	50 or lower	31%

Source: Centro Microdatos, University of Chile (interpretation and points) and author-constructed (distribution) using 2010 and 2012 data from the Early Childhood Longitudinal Survey of Chile.

4b. Peabody Picture Vocabulary Test (PPVT)

The PPVT test was used for both available rounds of the ELPI. It corresponds to an adaptation of the Peabody Picture Vocabulary Test that was designed for Spanish-speaking children. It offers a measure of auditory vocabulary that is internally valid and consistent and has been used in several international studies. This psychometric test is intended to measure the auditory reception capacity of children between 30 and 60 months-old. In the ELPI it is applied to children from 30 months up to 83 months and 30 days. The test takes an average of 10 to 15 minutes to complete for each child. It is easy to apply and, as it requires no reading or writing skills, it can be given to preschool-aged children.

The test consists of 125 laminated sheets, each containing 4 pictures. The examiner shows the child one of the sheets and says a word out loud. After hearing the word, the child must select the image that best illustrates its meaning. The examiner then repeats the exercise for each of the remaining sheets. Each correct answer earns a point while each incorrect answer earns a zero. The test is applied until it is possible to identify a basal and a ceiling in the responses obtained. The basal is the highest set and is established when a child has 8 consecutive correct responses, while the ceiling is the lowest set and is established when a child incorrectly identifies 6 out of 8 consecutive items. The results are then standardized according to the age group of those interviewed to standards for Mexico or Puerto Rico. The standardized scale of the test ranges from 55 to 145 points, with scores ranging from extremely low to extremely high (Dunn et al., 1986). Table 2 provides an interpretation of the PPVT point structure.⁵ The PPVT sample used for this study consists of 5,612 children, divided evenly by males and females. The average PPVT score in 2012 for the sample used in this study was 105.69 with a standard deviation of 19.16. This means that, on average, students in our sample earned scores categorized as “somewhat high.” However, we can also see that almost a quarter of the sample (23%) scored below average.

⁵ Source: PPVT-R Manual, Peabody Picture Vocabulary Test. Dunn, Padilla, Lugo y Dunn, (1986).

Interpretation	Points	Distribution
Extremely low	55-70	7%
Moderately low	71-85	7%
Somewhat low	86-95	9%
Average	96-103	15%
Somewhat high	104-115	31%
Moderately high	116-130	22%
Extremely high	131-145	8%

Source: Centro Microdatos, University of Chile (interpretation and points) and author-constructed (distribution) using 2010 and 2012 data from the Early Childhood Longitudinal Survey of Chile.

4c. Wechsler Adult Intelligence Scale (WAIS)

The Wechsler Adult Intelligence Scale (WAIS) is designed to measure the overall intelligence of individuals 16 to 64 years-old, regardless of their educational level, socioeconomic status, or reading level. In the test, two scales are applied - the verbal and the performance - and the individual's scores are compared with average scores obtained for the subject's age group. For the second round of the survey, the test was not applied again to the mothers unless they did not participate in 2010. The test was applied to mothers younger than 20 years regardless of past participation.

It has been demonstrated that the test provides highly accurate measurements and has a high predictive capacity regarding the future behavior of an individual. It is updated every ten years to compensate for the intellectual coefficient increase observed in many countries, e.g. the "Flynn effect."

The WAIS test was applied to the sample in two subtests. The digit span subtest measures working memory, processing speed, and short-term auditory memory. A high score on this subtest implies rapid adaptation to the demands of stimuli and flexibility in cognitive adaptation. The vocabulary subtest evaluates cultural level in relation to early childhood environment and education and serves as an indicator of a subject's capacity to receive new information, store it, and use it properly (Apfelbeck et al., 2000). When the test was applied as part of the early childhood longitudinal survey (ELPI), it had a scale of 0 to 19 points, with scoring categories ranging from extremely deficient to excellent. An interpretation of scores provided by Apfelbeck and Hermosilla (2008) shows that a "normal" score ranges from 8 to 11 points. For the Battelle sample, the average score was 7 points with a standard deviation of 2.67. The average score for the vocabulary test was 8.12 with a standard deviation of 3.49. The average score for the PPVT sample is slightly lower for both tests. The average score on the performance test was 6.87 points with a standard deviation of 2.72 points and the average score on the vocabulary test was 8.08 points with a standard deviation of 3.63 points. Table 3 below shows mean scores for our samples for each test and mean scores for the entire ELPI sample. As one can see, the scores are very similar to those of the entire ELPI sample, except for the PPVT digit score which is slightly lower.

	Vocab.	Digit
PPVT Sample	8.08	6.87
Battelle Sample	8.12	7.00
Entire ELPI	8.10	7.00

Source: Centro Microdatos, University of Chile (entire ELPI) and author-constructed (PPVT and Battelle samples) using 2010 and 2012 data from the Early Childhood Longitudinal Survey of Chile.

5. Empirical Approach

Our approach consists of first defining reduced form linear regression models to account for the role of mother and child characteristics as well as demographics as key factors on the psychomotor and cognitive development of children in Chile. We then separately incorporate three categories of mother participation in the labor force and child participation in day cares/preschool: maternal employment during the first three years of the child's life, the child's enrollment in day cares/preschools during the first three years of life, and an interaction variable which is equal to one if the mother participated in the labor force *and* the child attended day care during each year of the first three years of life.

One potential problem with our model in particular is that explanatory variables such as maternal employment and preschool participation may not be totally exogenous. For instance, wealthier families, more motivated families or those with high-ability students may prefer to enroll their child in day care or preschool. On the other hand, maternal employment is also a choice which may be correlated with schooling, family composition, constraints, etc. If we fail to account for this potential endogeneity, estimates from the reduced-form model may be biased. Our identifying assumption consists of including different covariates accounting for family background and proxies for individual's abilities in 2010 (both child and mother) that may be causing this selection bias.

We opt to run an Ordinary Least Squares (OLS) regression instead of running a fixed effects panel regression because several of the variables are related to the mother's health and decision-making during her pregnancy. These variables do not change over time and therefore drop out in a fixed effects model. We run the following model for both the Battelle and the PPVT:

$$Test_{i,t} = Test_{i,t-1} + \beta_1(M_{i,t}) + \beta_2(C_{i,t}) + \beta_3(D_{i,t}) + \beta_4(P_{i,t}) + \varepsilon,$$

Where the M matrix contains information on the medical variables of the mother during her pregnancy such as her nutritional status and use of pharmaceuticals. It also contains current information about the mother's cognitive factors such as her WAIS score and education and other variables like number of children and current age. The C matrix contains information regarding the child's nutrition at birth and right after. It takes into account gender, APGAR scores, whether the child was born underweight and whether or not she was breastfed. It also takes into consideration the child's current nutritional status and cognitive abilities such as current nutritional status. This matrix also includes other factors such as whether or not the child currently lives with both parents and her age. The D matrix includes current demographic factors such as the child's area of residence and her family's household income per capita. Finally, the P matrix contains one of the categories of variables previously described pertaining to the mother's participation in the labor force and the child's participation in day care and preschool. The difficulty in estimating the causal impact of *Participation* is that mothers may select to participate in the labor force and/or enroll their child in day care/preschool on the basis of characteristics that are

unobservable to the researcher. Therefore, we face a certain level of *selection bias* due to unknown reasons that affect the mother's decision to work or a family's decision to put their child in day care.

6. Theoretical Model

The theoretical model of the factors affecting the biopsychosocial development of a child was created using variables from the (ELPI). We postulate that poor cognitive and motor outcomes are caused by medical, nutritional, and ability characteristics for both the mother and child as well as demographic characteristics. Additionally, we investigate the effects of the mother's participation in the labor force and the child's attendance in day cares in preschools.

6a. Mother Characteristics

A significant factor in a child's outcomes is her mother's characteristics. A huge body of literature indicates a strong relationship between a mother and her child's cognitive ability. A recent study also using results from the 2010 ELPI survey measures the impact of out-of-home childcare centers on early childhood development in Chile and finds that for children older than two years old there is a significant correlation between a mother's and child's cognitive scores (Urzua & Veramendi, 2010). Another review conducted by the Inter-American Development Bank in 2010 summarizes the short and long term effects of early childhood stimulation intervention in developing countries. It concludes that interventions in early infancy promote mothers' sensitivity and responsiveness to her infant early in life and can have significant benefits on mother's parenting behaviors, but that there is insufficient evidence to determine if these interventions benefit children's mental or motor development and the evidence of benefits to a mother's mental health is inconsistent. A mother's nutrition during her pregnancy is also a relevant factor in her child's development. Several factors can have lasting negative effects including stress (Talge, et al., 2007; Taylor and Francis, 2006), poor nutrition (Ouellette et al., 1977; Gilliland et al., 2001; Camargo et al., 2007), and consumption of medication (Murai et al., 1966). Fifty percent of mothers in our study reported normal nutrition during pregnancy. In both samples, Battelle and PPVT, mothers in the lower quintiles were less likely to report normal nutrition during pregnancy than mothers in the upper quintiles and mothers affiliated with an indigenous group were also less likely to report normal nutrition than mothers who are not affiliated with an indigenous group. About 76% of mothers in the Battelle sample reported not consuming medications during pregnancy. Only in the Battelle sample were mothers not affiliated to an indigenous group more likely to report consuming medication during pregnancy than mothers who do affiliate with an indigenous group (24% compared to 16%). Mothers in the upper quintiles also reported higher rates of medication consumption during pregnancy.

6b. Child Characteristics

Many studies have measured the effects of proper nutrition on a child's brain development and policy makers propose programs such as Head Start as a way to increase students' academic achievement. Some of these studies have focused on the effects of nutrition in developing countries and have proven that improved nourishment has a significant effect on child outcomes. A study conducted in Jamaica shows that supplementation for undernourished children, who are most likely to come from disadvantaged families, improves mental development (Grantham-McGregor et al. 1991). A more recent study executed in Guatemala concludes that improving nutrition in early childhood leads to substantial increases in wage rates for men, which suggests that investments in early childhood nutrition can be long-term drivers of economic growth (Hoddinott et al. 2008). Another study conducted in the Philippines that uses longitudinal data following children from birth until their primary education

concludes that better nourished children perform significantly better in school (Glewwe et al. 2001). In our study, only 80% of children reportedly had normal nutrition at the time of their 2012 interview as opposed to being malnourished or overweight. Children in the highest quintile were less likely to have poor nutrition. Another important variable to consider is the child's weight at birth. In Currie (1998) the investigator examines long-term effects of low birth-weight (LBW) on educational attainments, labor market outcomes, and health status using data from the National Child Development Study in Great Britain. She focuses on analyzing the interaction between LBW and socioeconomic status (SES) to measure to what extent the negative effects of LBW are mitigated by higher SES. She finds that LBW has significant long-term effects on self-reported health status, educational attainments, and labor market outcomes, but finds little evidence of variation in the effects of LBW by SES. She does note the exception in high SES women of LBW of which were less likely to report that they were in poor or fair health than other LBW women. About 5% of the children in our Battelle sample had a low birth weight and 4% of the children in our PPVT sample had a low birth weight. For our Battelle sample, children from the lower two income quintiles were more likely to have been born with a low birth weight (5% compared to 4%) and for our PPVT sample, children from indigenous families were more likely to have been born with a low birth weight (5% compared to 4%).

6c. Effects of Mother's Participation in the Labor Force During the First Two Years

Maternal employment within the first two years of a child's life has become the norm in most developed countries. An early study analyzes the effects of maternal employment and child-care arrangements on preschoolers' cognitive and behavioral outcomes using data from the children of the US *National Longitudinal Survey of Youth*. It finds that employment in the first year had detrimental effects on the cognitive and behavioral development of all children regardless of gender or poverty status (Baydar and Brooks-Gunn, 1991). The most recent report on this issue by the OECD titled "Early Maternal Employment and Child Development in Five OECD Countries" shows that the average maternal employment rate for mothers with children under three years old is 51.9%. The report analyzes longitudinal data from five OECD countries: Australia, Canada, Denmark, UK and USA and compares the effects of maternal employment on child cognitive and behavioral development. It concludes that a return to paid work by mothers within six months after childbirth may have negative effects on child outcomes, particularly on cognitive development, but that the effects are small and not universally observed (Huerta et al., 2011). Maternal employment in Chile has also increased in the last decades. The OECD Family Database shows that in 2011, maternal employment in Chile for mothers with children ages three and younger was 53.7%, above the OECD average of 51.4% (OECD Family Database, 2012). It is important to note that in measuring the effects of maternal employment during the first three years, we run into a selection bias due to the fact that mothers (and families) make a personal decision based on various unknown factors, whether or not to enter the labor force and when to enter after their child has been born. Table 3 below gives a brief summary of maternal employment in our samples. It shows that maternal employment increases as the child gets older, and that participation rates are higher in all age ranges for more educated mothers, mothers from the upper two quintiles. Participation rates by indigenous affiliation are more mixed, but in most years, mothers who do not affiliate with an indigenous group have higher rates of employment.

Characteristics	Battelle			PPVT		
	1st Yr	2nd Yr	3rd Yr	1st Yr	2nd Yr	3rd Yr
Mother's Education						
Under high school	24%	38%	37%	19%	28%	37%
High School	38%	54%	51%	29%	43%	52%
Higher Education	52%	66%	64%	45%	59%	65%
Indigenous Affiliation						
Yes	32%	54%	49%	29%	38%	47%
No	37%	51%	50%	29%	42%	50%
Income Quintiles						
Quintiles 1 & 2	25%	39%	36%	19%	27%	37%
Quintiles 4 & 5	46%	61%	59%	37%	51%	59%

Source: Author-constructed using 2010 and 2012 data from the Early Childhood Longitudinal Survey of Chile.

6d. Effects of Child’s Participation in Day Care or Preschool in the First 3 Years

When is the right time for a child to start preschool? Several studies explain the importance of early childhood education, but the recommended age in which a child should begin to participate varies. Some studies show that child participation in day cares or preschool too early in life can have negative effects on the child’s social development. Jay Belsky’s widely cited article on the effects of infant daycare reviews the wide range of literature on the subject and concludes that some non-maternal care arrangement in the first year for more than twenty hours per week may be a risk factor in the emergence of developmental difficulties such as increased avoidance of mother following separation, heightened insecurity (especially in males), and subsequent aggression and noncompliance (Belsky, 1988). Another study published in the Harvard Education Review last year delves deeper into the role a mother plays in her child’s cognitive abilities. The author analyzes middle-class families in the United States and how they prepare their preschoolers to understand and produce decontextualized language. The author analyzes only middle-class families in order to dismiss the explanation that variations in the level of literacy in the home are responsible for social class differences in school achievement. The study concludes that parent-child interaction facilitate language acquisition and early reading and writing development, regardless of socioeconomic status (Snow, 2012). However, there are also several studies that contest Belsky’s conclusions on the basis that the effects are not large (Clark-Stewart, 1988) or that they are weak (Thompson, 1988). There is also a wide range of literature showing that participation in day care can have positive effects such as enhanced association between the infant-mother attachment and the mother’s involvement and warmth toward her infant during the first year of life (Burchinal, 1992); demonstration of more physical affection during peer interaction; assignment to gifted programs and higher math grades (Field, 1991); and higher scores on aptitude tests (Andersson, 1989). A 2010 study examining the impact of out-of-home childcare centers on early childhood development in Chile finds that enrollment in childcare centers boost child cognitive development among children older than two, even after controlling for selection, (Urzua et al., 2010).

Again, one must be cautious of the selection bias when measuring effects of enrollment in day care or preschool during the first three years of life. Families *choose* to enroll their child in day care or preschool based on several unknown factors. While we may not know all the reasons why a family decides to enroll their child early on, we can use the data to see what kind of families are enrolling their

children and how soon. Table 4 provides an overview of the proportion of children that attended day care or preschool in the first three years. We compare participation within three groups: the mother's educational level, indigenous affiliation, and income quintiles. The table provides percentages for both the Battelle sample and the PPVT sample. We can see that enrollment rates increase as the child gets older. Enrollment rates are highest for children of mothers with higher education and rates are higher for children whose mothers graduated high school than for children whose mothers did not graduate. Non-indigenous affiliated mothers were also more likely to enroll their children in preschool in the first three years. Finally, families in the higher income quintile group were also more likely to enroll their children in day care or preschool during each year of the first three years of life.

Characteristics	Battelle			PPVT		
	1st Yr	2nd Yr	3rd Yr	1st Yr	2nd Yr	3rd Yr
Mother's Education						
Under high school	11%	26%	41%	8%	17%	39%
High School	15%	32%	47%	10%	23%	48%
Higher Education	17%	36%	53%	16%	32%	57%
Indigenous Affiliation						
Yes	15%	31%	43%	12%	20%	44%
No	14%	31%	47%	11%	23%	47%
Income Quintiles						
Quintiles 1 & 2	12%	28%	43%	7%	19%	41%
Quintiles 4 & 5	16%	34%	50%	13%	26%	51%

Source: Author-constructed using 2010 and 2012 data from the Early Childhood Longitudinal Survey of Chile.

7. Results

One of the objectives of this study is to determine if the impact of mother, child, and demographic characteristics vary among different sociodemographic groups and gender. We also want to see if effects are lasting and do so by analyzing the data by age. It is important to keep in mind that the Battelle test covers children ages 2 to 4 years while the PPVT covers children from ages 3 to 6. Therefore, we will not be analyzing psychomotor development of the same children for both instruments. However, analyzing the effects of both of these samples and tests does help us get a better understanding of how decisions made during pregnancy and in the first three years of life affect the child early on and if these effects persist through the child's first years of schooling. While we offer results for all three models (maternal employment, preschool participation, both) in the annex portion of this paper, in this section we will provide lower-bound estimates. Table 1 of the annex provides a descriptive analysis of the data. The average score both tests increased from 2010 to 2012 as would be expected. For the mother characteristics we can see that the data is roughly the same for the two samples except that the mean age, number of children and medication rate during pregnancy is slightly higher for the TVIP sample. The child characteristics show that the data was divided evenly by male and female children. All other data describing the child is the same for both samples. For demographics we find that the mean household income per capita is slightly higher in the Battelle sample.

Finally, we look at a descriptive analysis of maternal employment and child enrollment in day care or preschool rates. The main difference we find is that the rate for maternal employment during the first year and second year is much higher in the Battelle sample, 37% compared to 29% and 51%

compared to 41%, respectively. Enrollment in a day care or preschool program in the second year is also higher in the Battelle sample, 31% compared to 23%. The combination of maternal employment and child enrollment in day care or preschool is a bit higher in the Battelle sample, 22% compared to 17%. All other data is comparable within two percentage points.

7a. Mother characteristics

In line with the previous literature, we find that, overall, a mother's cognitive abilities (measured by her WAIS performance and vocabulary scores and years of schooling) are significantly correlated with her child's psychomotor development. On average, an additional point on the WAIS vocabulary test increases the child's PPVT test score by .32 points. However, this effect is only significant for the upper quintile group and female children. Additionally, the effect becomes insignificant by age 5. When analyzing by income quintiles, we find that the mother's WAIS performance score has a positive effect on the child's Battelle score, but this effect is only significant for the lower quintile group. An additional point on the WAIS performance test increases, on average, the child's Battelle score by .15 points. Also in line with previous literature that measured the impact of a mother's age on her child's cognitive development, we find that age has a significant and positive effect on the child's psychomotor development (PPVT) for the older sample. An additional year of age is associated with a .12 point increase, on average, on the PPVT. Additional children in the family also have a negative impact on the child's PPVT score, but we find that this effect becomes insignificant by age 5.

7b. Child characteristics

Females scored higher than males in all models, regardless of socioeconomic status or age. When analyzing data by gender, we find that having been breastfed has a positive impact on male children. Male children who were breastfed scored, on average, 6 points higher on the PPVT. Low birth weight was found to be detrimental to psychomotor development for females and children in the upper quintile group. It is associated with a 4.2 point decrease on the PPVT for girls and a 3.8 point decrease on the PPVT for children in the upper quintile group. The detrimental effects of low birth weight on a child's psychomotor development show to be significant at later stages in life. Low birth weight for children between 6 and 7 years old decreases their scores, on average, by 6.6 points. Normal nutrition has a positive impact on psychomotor development for children ages 2 to 3, but becomes insignificant for children ages 3 to 4. It becomes positive and significant again by age 5; increasing a child's PPVT score by 3.2 points, on average. The effect is not statistically significant by age 6.

7c. Other characteristics

In line with the findings of a wide body of research, we also determined that household income per capita and indigenous affiliation plays a vital role in a child's psychomotor development. Children from families with an indigenous affiliation scored significantly lower on both tests, resulting in a 3.8 point decrease on the PPVT and a .83 decrease on the Battelle, on average. This effect disappears for the upper quintile group and for girls when analyzing data by quintiles and gender. Household income per capita is found to have a positive effect on the child's psychomotor development, but we find that the effect is only statistically significant for male children when analyzing by gender. Overall, every additional thousand Chilean pesos is associated with a 9 point increase on the PPVT and a 4 point increase on the Battelle, on average. The area where a child lives, urban or rural, plays a significant role in the child's cognitive development as well. Children who live in urban areas scored .85 points higher on the Battelle than children in rural areas.

7d. Maternal employment during the first 3 years

Maternal employment during the first year of the child's life is found to be detrimental to the child's psychomotor development. Overall, maternal employment is associated with a 2.13 point decrease on the PPVT, on average, and a .77 point decrease on the Battelle. Analyzing by gender, we find that this effect is only negative and statistically significant for male children. Male children whose mothers worked during the first year of life scored, on average, 4.68 points less on the PPVT and 1.04 points less on the Battelle. For the Battelle, this negative effect is statistically significant for both 2 and 3 year olds and for the PPVT; the effect is statistically significant for 5 and 6 year olds. This evidence suggests that the impacts of maternal employment during the first year of life may be long-term.

Maternal employment during the second and third year of life are found to have a positive impact on the child's cognitive development, however the effect is only significant overall for second year. Analyzing by gender, we find that the effect of maternal employment during the second year is only significant for male children. Male children whose mothers worked during their second year of life scored, on average, 3.13 points higher on the PPVT and 1.17 points higher on the Battelle. This effect is also significant for our eldest age groups, suggesting again, that the effects of maternal employment are long-term. Maternal employment during the third year is most beneficial for children in the lower quintile group where employment is associated with a 3.16 point increase on the PPVT and a .79 point increase on the Battelle, on average.

7e. Enrollment in day care or preschool during the first 3 years

Overall, we find that children who participated in a day care or preschool during their first year of life scored lower on the Battelle. Enrollment during the first year of life is associated with a .94 point decrease on the child's Battelle score, on average. When analyzing by gender, we find that the effect of participation in a day care or preschool during the first year is only statistically significant amongst male children. Male children who participated during their first year of life scored, on average, 3.76 points less on the PPVT and .99 points less on the Battelle. When analyzing by age, we do not find any statistical differences for children ages 4-7, suggesting that that any negative impact caused by participating during the first year does not have lasting effects, or that this effect can be reversed.

Enrollment in the second year of life is found to have a positive impact on a child's psychomotor development. However, this effect is only statistically significant on the Battelle. Enrollment during the second year is associated with a .66 point increase on the Battelle, on average. When analyzing by gender, we find that the effect is only statistically significant for male children. Analyzing the data by age shows that the effects of enrollment during the second year may not be long-term, as they lose statistical significance by age 3.

Finally, we find that enrollment in a day care or preschool during the third year of life may have a positive impact on a child's psychomotor development, the effect was not statistically significant for either instrument, regardless of socioeconomic status and gender.

One of the central themes in education in Chile is the difference in quality amongst its three types of schools: private, public, and publicly subsidized private schools. In addition to measuring the impacts of participation in a day care or preschool during the first three years of life, we provide estimates in the annex portion of this paper showing the impacts of enrollment in day care or preschool by type. There are five types: public (municipal), private (subsidized and not subsidized), integral, Junji, and other (provided by the mother's employer or financed by another source). While we provide these estimates, the results and conclusions that can be made are beyond the scope of this paper. However, they do provide support for the argument that the *quality* of the day care or preschool matters.

7f. Maternal employment combined with enrollment in day care or preschool during the first 3 years

Maternal employment combined with enrollment in day care during the first year of life is found to have a detrimental effect on the child's psychomotor development. However, this effect is only

statistically significant overall for the Battelle, where it is associated with a .88 point decrease in a child's score, on average. When analyzing by socioeconomic status, we find that the effect becomes significant for children from the upper quintile group. The effect is not statistically significant amongst female children, but we do find a large impact amongst male children. Male children who were enrolled in a day care or preschool during their first year of life while their mothers worked scored, on average, 5.83 points lower on the PPVT. This effect may have long-term impact as it continues to be statistically significant amongst 6 year old children. For this group, a combination of maternal employment and enrollment in day care or preschool is associated with a 6.26 point decrease on the PPVT.

Overall, maternal employment and enrollment in day care during the second year has a positive impact on a child's psychomotor development. However, this effect is only statistically significant on the Battelle. Children who were enrolled during their second year of life while their mothers worked scored, on average, .9 points higher on the Battelle. This effect is significant regardless of gender and is statistically significant for the oldest age group in our sample, suggesting that the effects are long-term.

The combination of enrollment in day care or preschool and maternal employment during the third year of life does not have a significant impact on psychomotor development, overall. However, when analyzing by socioeconomic status, we find that the impact is positive and statistically significant for our lower quintiles group. The children in this group who were enrolled in day care or preschool while their mothers worked scored, on average, 4.06 points higher on the PPVT. This suggests that the children who have the most to gain from day care or preschool education and working mothers are the country's most vulnerable children.

8. Discussion

As the previous literature on early childhood development and the data from the ELPI survey show, several mother, child, and demographic characteristics during the first few years of life play a significant role in the child's psychomotor development. Policy makers have the ability to alter non-genetic influences and public policies that promote greater access to the resources necessary for a child to be successful later in life. As proven again by this study, maternal cognitive ability is highly linked with a child's psychomotor development, which is why it is important that children with mothers with less cognitive ability have access to resources that will aid the development of their cognitive and psychomotor skills.

Families also have to make decisions about working and placing the child in a day care in the first few years. These are often made based on family circumstances rather than on informed decisions since the data on this subject are not as readily available in developing countries as it is in developed ones. As female participation in the Chilean labor force increases, families will require research on the matter to make better informed decisions about if and when to enter the labor force after the child has been born. Evidence from this paper provides mothers with information that may influence their decision in how long to take advantage of that maternity-leave. This study provides families in Chile and in similar developing countries a resource for making informed decisions which are highly crucial to their children's development.

We provide evidence for policy makers who are working to improve labor market outcomes for women. A law passed in Chile in 2011 extended maternity leave from three to six months. It gives women the right to choose between two forms of maternity leave: 12 weeks of full-time maternity leave with 100 percent subsidized pay up to 66UF or 18 weeks of part-time maternity leave with 50 percent subsidized pay. Mothers also have the option to pass part of the benefits onto the father.⁶ The policy has sparked significant debate. On the one hand, extending maternal employment is "pro-child" because it is beneficial for the children whose mothers have the opportunity to spend more time with

⁶ Law N° 20.545 went into effect on October 17, 2011.

them. On the other, it has been argued that prolonging maternity leave may have negative effects on labor market outcomes for women. While it is too soon to measure the impacts of this new policy, we can look at studies that examine how the extension of maternity care affects labor market outcomes for women in other countries. A recent study by the OECD looks at the long-run consequences of extended paid leave on female, male, and gender differences in prime-age (25-54) employment rates, average working hours, and earnings in 30 OECD countries from 1970 to 2010. The authors employ a fixed-effects model to estimate the impact of within-country changes in leave duration on employment outcomes for men and women separately and estimate the effect on the gender gap. Time dummies and country-specific (linear) time trends are also added in order to eliminate the effect of exogenous factors on (changes in) labor market outcomes. They find that extensions of paid leave lengths have a positive, but small, influence on female employment rates and on the gender ratio of employment, as long as the total period of paid leave is no longer than approximately two years. They also conclude that weeks of paid leave positively affect the average number of hours worked by women relative to men on the condition that the total duration of leave does not exceed two years. However, they find that the provision of paid leave widens the earnings gender gap among full-time employees. They suggest that this may reflect the fact that women experience slower career earnings progression on returning from leave to full-time employment than men, much fewer of whom take leave. Time will tell how extending maternity leave to six months affects labor market outcomes for women in Chile, but what we can conclude now based on this study is that the policy may improve children's psychomotor development by giving parents more time with their children right after birth.

Although we find that enrollment in preschool during the first year of life has a detrimental impact on a child's psychomotor development, this does not necessarily mean it is a bad idea to do so. One way to bridge the large gap between the upper and lower quintile groups is by providing good quality day-care and preschool programs. This year it was reported by the National Coalition of Day Care (Junta Nacional de Jardín Infantiles, JUNJI) that 43% of private daycares in Chile do not comply with quality standards. JUNJI also reported that 22% of establishments, 397, do not have patents or enough health educators for the number of children for whom, they provide services, (Acuna, 2013). Our data finds that municipal schools are actually doing the worst job of providing effective day care programs during the child's first three years of life. According to the Ministry of Education in Chile, government funding for preschool and day care programs is provided separately to Junji and Integra as well as to municipalities who decide how to utilize these funds. One way to improve the quality of day care in public schools is to consolidate programs. Junji and Integra specialize in early childhood education. By redirecting funds for day care and preschool programs from municipalities to Junji and Integra, we make it easier to hold them accountable and also providing them with the resources necessary to provide effective programs. Just as educational standards and accountability are required of primary, secondary, and tertiary education, they need to be required for pre-primary education. It is not enough to simply offer the service. A wide body of research has demonstrated that there is a relationship between effective schools and student outcomes. Just as effective schools can have a positive impact on student graduation rates, effective day-care and preschool programs can have a positive impact on a child's cognitive and psychomotor development. This is especially important for disadvantaged children who could potentially benefit the most from effective programs that can help them catch up to their peers by the time they enter formal education.

Chile has already demonstrated its initial dedication to the investment of early childhood development through various policies enacted in recent years. The program *Chile Grows with You (Chile Crece Contigo)* is the first of its kind in the region. Continued support and investment in this program and others like it are essential to closing the high level of inequality of opportunities amongst the country's children. However, in order for these programs to having lasting effects, good quality education has to be provided to these children or all the gains made from programs like *Chile Grows*

with You are lost. This has already occurred in the United States with their *Head Start* program. The U.S. government's principal early childhood program *Head Start* was launched in 1981 and recently reauthorized in 2007. Of course with a budget as large as \$8.1 billion, many studies have been done to estimate the effectiveness of the program. These studies have found that the program has large impacts on test scores (Currie and Thomas 1995), grade repetition (Currie and Thomas, 1995; Deming 2009; Garces et al. 2000; Joo 2010), access to preventative health (Currie and Thomas 1995; Deming 2009), and mortality rates (Ludwig and Miller 2007). Additionally, several cost-benefit analyses of *Head Start* conclude that the benefits of the program far outweigh the costs (Barnett, 1998 and Ludwig & Miller, 2008). *However*, effects of the program have been shown to have long-term, positive effects only for white children. In Currie and Thomas' 1995 evaluation of *Head Start* they find that for black children, any gains made by *Head Start* disappear in the long run because the schools they attended were effective. Early childhood development is a great investment, but it is not cheap. We cannot afford to lose all the gains made by these programs. This is especially true for developing countries who cannot afford to spend millions of dollars on a program that becomes insignificant in the long-run because children attended ineffective schools that reversed all the benefits gained early-on.

Investing in early childhood programs is the first step in closing the gap in the inequality of opportunities. Neuroscientific research has proven that the brain is much more "plastic" in early life than in maturity. This study provides evidence that allows public policy-makers to target the country's most vulnerable children and offer services that provide them with the proper nutrition and education necessary to develop properly. Giving a child the opportunity to develop to her full potential benefits not only her, but her community as well. Developing countries have an opportunity to benefit both economically and socially through early childhood programs.

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Table 1: Descriptive Analysis of variables

Variables	TVIP		Battelle	
	Mean	Std. Dev.	Mean	Std. Dev.
tvip2012	105.69	19.16	53.00	4.67
tvip2010	103.90	15.32	45.89	13.39
Mother Characteristics				
Age	32.53	7.05	30.02	7.01
Years of schooling	11.40	3.07	11.56	2.97
Number of children	2.13	0.99	1.96	0.99
1=Normal nutrition during pregnancy	50%	50%	50%	50%
1=No medication during pregnancy	81%	39%	76%	42%
WAIS Math score	6.87	2.72	7.00	2.67
WAIS Vocabulary score	8.08	3.63	8.12	3.49
Child Characteristics				
1=Male	50%	50%	51%	50%
Age	5.07	0.70	3.02	0.45
1=Normal nutrition	90%	30%	91%	29%
1=Lives with both parents	68%	47%	68%	47%
Apgar score	9.23	0.78	9.28	0.66
1=Low birthweight	4%	20%	5%	21%
1=Breastfed	97%	16%	97%	16%
Other Characteristics				
1=Urban	89%	32%	89%	31%
HH Income per cap (thousands of Chilean pesos)	111.98	114.58	113.96	116.33
1=Indigenous affiliation	8%	27%	8%	27%
Maternal Employment and Child Participation in Day Care/Preschool				
Worked first year	29%	45%	37%	48%
Worked second year	41%	49%	51%	50%
Worked third year	50%	50%	50%	50%
Participated first year	11%	31%	14%	35%
Participated second year	23%	42%	31%	46%
Participated third year	47%	50%	46%	50%
Both first year	8%	28%	10%	30%
Both second year	17%	37%	22%	41%
Both third year	30%	46%	28%	45%

Source: Author-constructed using data from the 2010 and 2012 Early Childhood Longitudinal Survey in Chile.

Table 2: Linear Regression of child's test score

Variables	TVIP			Battelle		
	Mat. Emp.	Day Care/Pre.	Both	Mat. Emp.	Day Care/Pre.	Both
Test 2010	.42***	.42***	.42***	.03***	.03***	.04***
Mother Characteristics						
Age	.13**	.12**	.12**	-0.02	-0.01	-0.02
Years of schooling	.38**	.41**	.39**	.16***	.16***	.16***
Number of children	-1.13**	-1.18**	-1.16**	-0.03	-0.04	-0.04
1=Normal nutrition during pregnancy	-0.52	-0.57	-0.51	0.24	0.27	0.26
1=No medication during pregnancy	0.78	0.64	0.6	-0.31	-0.26	-0.28
WAIS Math score	-0.07	-0.08	-0.08	0.06	0.07	0.06
WAIS Vocabulary score	.32**	.32**	.32**	0.02	0.02	0.02
Child Characteristics						
1=Male	-2.97***	-2.97***	-2.95***	-1.17***	-1.22***	-1.20***
Age	2.21***	2.13***	2.18***	1.33***	1.41***	1.39***
1=Normal nutrition	0.69	0.72	0.72	0.49	0.56	0.53
1=Lives with both parents	-0.19	-0.37	-0.21	0.12	0.08	0.12
Apgar score	0.18	0.19	0.21	-0.08	-0.1	-0.09
1=Low birthweight	-1.94	-1.95	-1.92	-0.39	-0.32	-0.33
1=Breastfed	0.8	0.58	0.73	0.77	0.82	0.81
Other Characteristics						
1=Urban	1.26	1.33	1.26	.92**	.84**	.85**
1=Indigenous affiliation	-3.77**	-3.79**	-3.80**	-.95**	-.83**	-.86**
HH Income per cap (thousands of Chilean pesos)	.009**	.009**	.009**	.004***	.004***	.004***
Maternal Employment and Child Participation in Day Care/Preschool						
Worked first year	-2.13**			-.77**		
Worked second year	2.11*			.81**		
Worked third year	0.64			0.3		
Participated first year				-.94**		
Participated second year				.66**		
Participated third year				0.43		
Both first year				-2.44		
Both second year				0.69		
Both third year				1.13		
R Squared	0.22	0.22	0.22	0.13	0.13	0.13
Observations	2540	2538	2538	1739	1738	1738

Source: Author-constructed using data from the 2010 and 2012 Early Childhood Longitudinal Survey in Chile.

Table 3: Linear regression of child's test score by income quintiles

Variables	PPVT						Battelle					
	Maternal Employment		Enrollment in Day Care/Preschool		Both		Maternal Employment		Enrollment in Day Care/Preschool		Both	
	Quints 1&2	Quints 4&5	Quints 1&2	Quints 4&5	Quints 1&2	Quints 4&5	Quints 1&2	Quints 4&5	Quints 1&2	Quints 4&5	Quints 1&2	Quints 4&5
Test 2010	.49***	.40***	.49***	.40***	.49***	.40***	.03**	.04***	.03**	.04***	.03**	.04***
Mother Characteristics												
Age	.16*	.15*	.17**	.15*	.16*	.16*	0.04	-.05*	0.03	-.05*	0.03	-.05**
Years of schooling	.51**	.51**	.54**	.51**	.50**	.52**	.17**	.26***	.17**	.25***	.17**	.25***
Number of children	-1.17**	-.95*	-1.15**	-.95*	-1.19**	-.94*	-0.16	0.18	-0.11	0.2	-0.14	0.2
1=Normal nut during preg.	-1.23	-0.07	-1.33	-0.09	-1.12	-0.11	0.32	0.06	0.3	0.08	0.31	0.08
1=No medication during preg.	-0.04	1.21	-0.29	1.15	-0.51	1.17	-0.42	-0.34	-0.43	-0.31	-0.44	-0.31
WAIS Math score	-0.03	0.12	-0.02	0.12	-0.04	0.12	.14*	0.04	.15**	0.04	.15*	0.03
WAIS Vocabulary score	0.07	.29**	0.11	.30**	0.11	.29**	-0.01	0.01	0	0	0	0
Child Characteristics												
1=Male	-3.72**	-2.58**	-3.88***	-2.59**	-3.79**	-2.62**	-1.30***	-1.44***	-1.31***	-1.44***	-1.30***	-1.46***
Age	3.53***	2.00**	3.24***	1.93**	3.36***	1.95**	1.86***	.92**	1.83***	.99**	1.85***	.99**
1=Normal nutrition	0.25	2.08	0.53	2.09	0.36	2.06	0.55	0.46	0.62	0.57	0.62	0.52
1=Lives with both parents	0.32	0.24	-0.34	0.12	0.08	0.16	-0.13	0.44	-0.21	0.45	-0.17	0.44
Apgar score	0.98	-0.59	0.96	-0.58	0.98	-0.57	-0.4	0.05	-0.36	0.02	-0.38	0.03
1=Low birthweight	4.01	-3.83*	4.07	-3.94*	3.79	-3.90*	1.03	-0.83	1.04	-0.75	1.04	-0.74
1=Breastfed	-1.07	1.43	-1.63	1.71	-1.29	1.61	0.82	0.84	0.91	0.78	0.8	0.8
Other Characteristics												
1=Urban	-0.03	1.37	-0.12	1.37	-0.17	1.45	.80**	0.64	.82**	0.52	.82**	0.52
1=Indigenous Affiliation	-5.55**	0.81	-5.47**	0.88	-5.52**	0.92	-1.07*	-0.18	-1.02*	-0.13	-1.03*	-0.13
Maternal Employment and Child Participation in Day Care/Preschool												
Worked first year	0.32	-1.88					-0.27	-0.62				
Worked second year	0.85	1					-0.25	0.49				
Worked third year	3.15**	0.95					.79*	0.1				
Participated first year			1.85	-3.94**					-1.36**	-0.64		
Participated second year			0.8	1.46					0.21	0.61		
Participated third year			0.56	-0.11					0.36	0.34		
Both first year					-0.16	-3.92**					-0.83	-0.32
Both second year+A7					0.72	1.52					-0.19	0.34
Both third year					4.06**	-0.09					0.59	0.38
R Squared	0.18	0.2	0.18	0.21	0.18	0.21	0.11	0.08	0.11	0.08	0.11	0.08
Observations	1019	1581	1019	1578	1019	1578	692	1077	691	1077	691	1077

Source: Author-constructed using data from the 2010 and 2012 Early Childhood Longitudinal Survey in Chile.

Table 4: Linear regression of child's test scores by gender

Variables	TVIP						Battelle					
	Mat. Emp.		Day Care/Preschool		Both		Mat. Emp.		Day Care/Preschool		Both	
	male	female	male	female	male	female	male	female	male	female	male	female
Test 2010	.40***	.43***	.41***	.43***	.41***	.43***	.04**	.04***	.03**	.05***	.04**	.05***
Mother Characteristics												
Age	0.08	.21**	0.06	.22**	0.06	.21**	-0.03	-0.01	-0.02	0	-0.03	-0.01
Years of schooling	0.2	.58**	0.19	.60**	0.18	.59**	0.06	.29***	0.08	.28***	0.06	.28***
Number of children	-0.84	-1.40**	-0.92	-1.46**	-0.88	-1.44**	0.08	-0.08	0.05	-0.09	0.06	-0.09
1=Normal nutrition during preg.	-0.69	-0.4	-0.65	-0.5	-0.63	-0.41	0.36	0.2	0.37	0.24	0.36	0.22
1=No medication during preg.	-0.03	1.7	-0.03	1.55	-0.13	1.52	-0.17	-0.33	-0.1	-0.29	-0.14	-0.3
WAIS Math score	0.07	-0.22	0.09	-0.21	0.08	-0.21	0.11	0.01	0.1	0.03	0.1	0.02
WAIS Vocabulary score	0.27	.32**	0.26	.33**	0.24	.33**	0.03	0	0.04	0	0.04	0
Child Characteristics												
Age	2.63***	1.87**	2.53**	1.86**	2.64***	1.87**	1.85***	.79**	1.99***	.82**	1.98***	.79**
1=Normal nutrition	-0.94	2.41	-1.02	2.38	-1.03	2.4	0.54	0.45	0.57	0.5	0.5	0.51
1=Lives with both parents	0.48	-1.06	0.35	-1.28	0.61	-1.19	0.15	0.1	0.11	0.02	0.14	0.07
Apgar score	0.99	-0.52	0.94	-0.57	0.98	-0.56	-0.15	0.03	-0.17	0	-0.17	0.02
1=Low birthweight	1.92	-4.16**	1.97	-4.18**	1.98	-4.20**	0.05	-0.57	0.16	-0.52	0.11	-0.5
1=Breastfed	6.00**	-2.4	6.11**	-2.65	6.27**	-2.57	1.16	0.46	1.14	0.58	1.14	0.55
Other Characteristics												
1=Urban	2.84*	0.22	2.73*	0.36	2.77*	0.25	0.58	1.20**	0.48	1.17**	0.51	1.16**
1=Indigenous affiliation	-6.49**	-1.42	-6.35**	-1.41	-6.35**	-1.4	-0.28	-1.59**	-0.15	-1.50**	-0.22	-1.47**
HH Income per cap (thousands of Chilean pesos)	.02***	0	.02***	0.01	.02**	0.01	.01***	0	.01***	0	.01***	0
Maternal Employment and Child Participation in Day Care/Preschool												
Worked first year	-4.68**	0.13					-1.04**	-0.52				
Worked second year	3.13*	1.24					1.17**	0.65				
Worked third year	0.5	0.82					-0.1	0.55				
Participated first year			-3.76*	2.02					-0.99*	-0.84		
Participated second year			0.78	-0.44					.79*	0.6		
Participated third year			-0.27	0.06					0.42	0.32		
Both first year					-5.83**	0.46					-0.94	-0.8
Both second year					1.49	0.62					1.01*	.86*
Both third year					1.39	0.77					0.24	0.34
R Squared	0.21	0.23	0.2	0.23	0.21	0.23	0.1	0.13	0.1	0.13	0.09	0.13
Observations	1228	1312	1227	1311	1227	1311	870	869	869	869	869	869

Source: Author-constructed using data from the 2010 and 2012 Early Childhood Longitudinal Survey in Chile.

Table 5: Linear regression on child's TVIP score by age

Variables	Maternal Employment			Day Care/Preschool			Both		
	Age 4-5	Age 5-6	Age 6-7	Age 4-5	Age 5-6	Age 6-7	Age 4-5	Age 5-6	Age 6-7
TVIP 2010	.51***	.43***	.40***	.51***	.43***	.40***	.52***	.43***	.40***
Mother Characteristics									
Age	0.17	0.1	0.14	0.17	0.1	0.12	0.17	0.1	0.11
Years of schooling	0.2	.44**	0.41	0.18	.49**	0.45	0.18	.46**	.45*
Number of children	-1.91**	-0.61	-1.1	-1.93**	-0.68	-1.29*	-1.87**	-0.68	-1.17
1=Normal nutrition during pregnancy	-0.49	-1.43	1.84	-0.53	-1.47	1.69	-0.58	-1.43	2.06
1=No medication during pregnancy	0.29	1.34	0.86	0.24	1.29	0.39	0.15	1.22	0.33
WAIS Math score	-0.3	-0.14	0.42	-0.3	-0.14	0.35	-0.3	-0.14	0.41
WAIS Vocabulary score	.69**	0.19	0.1	.68**	0.19	0.13	.68**	0.18	0.09
Child Characteristics									
1=Male	-4.19**	-2.22**	-3.26**	-4.00**	-2.21**	-3.62**	-4.07**	-2.22**	-3.17**
1=Normal nutrition	-5.85**	3.24*	2.95	-6.01**	3.27*	3.04	-5.97**	3.30*	3.2
1=Lives with both parents	-2.29	0.14	0.27	-2.13	0.03	-0.18	-2.06	0.22	-0.21
Apgar score	1.43	-0.67	1.07	1.45	-0.66	1.16	1.46*	-0.65	1.16
1=Low birthweight	-2.13	0.13	-6.62**	-1.94	-0.06	-6.72**	-1.85	0.06	-6.72**
1=Breastfed	-8.42	1.16	4.9	-8.62	0.76	4.43	-8.47	1.09	4.48
Other Characteristics									
1=Urban	4.39*	0.33	-0.73	4.25*	0.54	-0.53	4.23*	0.41	-0.59
1=Indigenous affiliation	-5.38	-2.46	-5.94*	-5.38	-2.36	-5.77*	-5.52	-2.35	-5.88*
HH Income per cap (thousands of Chilean pesos)	0.01	.015***	0	0.01	.015***	0	0.01	.015***	0
Maternal Employment and Child Participation in Day Care/Preschool									
First year	-0.48	-2.67*	-3.50*	-1.77	-1.2	0.93	-0.61	-2.49	-6.26**
Second year	0.98	1.14	5.30**	2.12	-0.51	-1.21	0.2	0.08	3.89*
Third year	-0.28	1.41	0.31	-0.29	-0.45	1.23	0.96	1.24	0.51
R Squared	0.17	0.21	0.31	0.18	0.2	0.3	0.17	0.2	0.3
Observations	670	1283	580	668	1283	580	668	1283	580

Source: Author-constructed using data from the 2010 and 2012 Early Childhood Longitudinal Survey in Chile.

Table 6: Linear regression on child's Battelle score by age

Variables	Maternal Employment		Day Care/Preschool		Both	
	Age 2-3	Age 3-4	Age 2-3	Age 3-4	Age 2-3	Age 3-4
Battelle 2010	0.01	.05***	0.01	.05***	0.02	.04***
Mother Characteristics						
Age	-.09**	-0.01	-.08**	0	-.09**	-0.01
Years of schooling	0.09	.24***	0.1	.23***	0.09	.24***
Number of children	0.19	-0.08	0.22	-0.1	0.17	-0.09
1=Normal nutrition during pregnancy	0.28	0.18	0.36	0.19	0.34	0.19
1=No medication during pregnancy	-0.1	-0.32	-0.09	-0.25	-0.14	-0.27
WAIS Math score	0.14	0.02	.16*	0.04	0.14	0.03
WAIS Vocabulary score	-0.02	0.01	-0.03	0	-0.03	0
Child Characteristics						
1=Male	-1.98***	-.95***	-2.11***	-.99***	-2.06***	-.99***
1=Normal nutrition	2.06**	0.28	2.18**	0.38	2.12**	0.34
1=Lives with both parents	-0.56	0.33	-0.41	0.21	-0.39	0.29
Apgar score	0.13	0.03	0.11	-0.01	0.12	-0.01
1=Low birthweight	1.06	-0.42	1.43	-0.42	1.29	-0.38
1=Breastfed	2.38	0.7	2.4	0.77	2.49	0.7
Other Characteristics						
1=Urban	-0.16	1.16**	-0.39	1.09**	-0.33	1.11**
1=Indigenous affiliation	-1.38	-.74*	-1.37*	-0.61	-1.46*	-0.61
HH Income per cap (thousands of Chilean pesos)	.006**	.003**	.006**	.003**	.006**	.003**
Maternal Employment and Child Participation in Day Care/Preschool						
First year	-1.02*	-.84**	-1.31*	-.95**	-1.25	-1.13**
Second year	1	.80**	1.11*	0.52	1.62**	.82**
Third year	-0.43	.73**	0.21	.72**	-0.22	.81**
R Squared	0.1	0.13	0.1	0.13	0.1	0.13
Observations	398	1235	398	1234	398	1234

Source: Author-constructed using data from the 2010 and 2012 Early Childhood Longitudinal Survey in Chile.

Table 7: Linear regression of child's Battelle scores by type of day care or preschool

Variables	PPVT			Battelle		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Test 2010	.43***	.43***	.42***	.04***	.04***	.04***
Mother Characteristics						
Age	.13**	.13**	.14**	-0.02	-0.02	-0.01
Years of schooling	.43**	.43**	.44**	.18***	.17***	.17***
Number of children	-1.19**	-1.23**	-1.25**	-0.03	-0.05	-0.05
1=Normal nutrition during preg.	-0.52	-0.58	-0.51	0.22	0.22	0.24
1=No medication during preg.	0.65	0.65	0.73	-0.29	-0.21	-0.25
WAIS Math score	-0.09	-0.09	-0.09	0.06	0.06	0.07
WAIS Vocabulary score	.33**	.33**	.34**	0.02	0.02	0.02
Child Characteristics						
1=Male	-2.98***	-3.01***	-2.94***	-1.19***	-1.25***	-1.21***
Age	2.12***	2.15***	2.14***	1.43***	1.41***	1.42***
1=Normal nutrition	0.57	0.83	0.63	0.54	0.54	0.49
1=Lives with both parents	-0.33	-0.28	-0.32	-0.01	0.07	0.04
Apgar score	0.22	0.17	0.16	-0.04	-0.07	-0.1
1=Low birthweight	-1.95	-1.92	-1.73	-0.35	-0.37	-0.31
1=Breastfed	0.67	0.41	0.46	0.99	1	0.9
Other Characteristics						
1=Urban	1.21	1.37	1.26	1.01**	.91**	.83**
1=Indigenous affiliation	-3.73**	-3.70**	-3.78**	-.80**	-.81**	-.87**
HH Income per cap (thousands of Chilean pesos)	.009**	.009**	.009**	.004***	.004***	.004***
Type of Day Care or Preschool						
Private	-0.33	0.54	-0.46	0.19	1.17**	.83**
Municipal	4.84	-1.63	-1.79	-2.58**	-0.24	0.53
Junji	-1.05	0.73	0.75	-0.12	0.31	0.35
Integra	0	0.49	0.64	-0.81	0.58	.92**
Other	-4.25	-3.98	-1.17	-0.47	-0.7	0.16
R Squared	0.22	0.22	0.22	0.12	0.13	0.12
Observations	2536	2541	2531	1751	1752	1739

Source: Author-constructed using 2010 and 2012 data from the Early Childhood Longitudinal Survey of Chile.