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Determinants of early child development in Chile: Health, cognitive and demographic factors

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ABSTRACT

International evidence shows that intervention in the early childhood years has positive effects on individuals' long-term outcomes. Through the use of an education production function, this article estimates the effect of variables related to health status, cognitive abilities, and demographic factors of Chilean mothers and children on the children's psychomotor development. We use the Early Childhood Longitudinal Survey, which provides measures of children's biopsychosocial development through the application of a psychomotor development test (TEPSI) and the Peabody Picture Vocabulary Test (TVIP). In turn, the application of the Wechsler Adult Intelligence Scale (WAIS) test to the mother allows an estimation of the role that her cognitive ability plays in the psychomotor development of the child. The results show that health, cognitive, and demographic variables are important factors in a child's biopsychosocial development. In the general model, the measures of cognitive ability have a greater impact than the other variables and, in all specific models, they are significant. Additionally, demographic variables and those related to the family environment have a greater impact than health variables. The child's attendance at preschool has a positive impact on psychomotor development, as measured by the TEPSI, and is even more important than the mother's employment status.

1. Introduction

In early childhood[1] the brain develops quickly through the processes of neurogenesis, the growth of axons and dendrites, synaptogenesis, synaptic pruning, myelination, andglycogensis. These ontogenic events occur at different times and build upon each other, therefore small disturbances to them can have long-term effects on a child's brainstructure and capacity (Grantham-McGregor et al., 2007). For this reason, factors related to health status, cognitive ability, and demographics are important determinants in a child's development.

Studies show that providing intellectual stimulation during the first few years of life has a positive impact on individuals' future development and productivity. Different experiments carried out in the United States – including Perry Preschool, Abecedarian Project and the Chicago Child–Parent Center – have found evidence that early intervention translates into lower rates of juvenile delinquency, adolescent pregnancy, and single motherhood. Additionally, there is evidence that children in these treatment groups have slightly higher cognitive abilities than those in the control groups. Although the impact varies according to the type of program implemented and the age of the child, the results are positive and support the idea that public policies focused on early childhood produce benefits not only for the individual but for society as a whole (Heckman and Masterov, 2007).

International evidence also shows that more vulnerable children who have been exposed to less stimulation display a significant gap in their performance compared to children from high socioeconomic backgrounds. Carneiro and Heckman (2003) show that early childhood interventions have a higher rate of return than those carried out at other stages of life. Education has been identified as one of the most important tools for reducing the gap between different segments of the population. It raises the quality and skill level of human capital, which drives productivity and the national growth. This translates into better opportunities for employment and welfare conditions.

Furthermore, the intergenerational effect must also be considered. Currie and Moretti (2003) analyze the effect of the mother's education on the health of the child, using birth weight and gestation age. They analyze four channels through which the mother's education is transmitted into observable results in the child: mothers with more education are less likely to smoke,

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[1] This corresponds to the pre-school period, extending from birth to 4 or 5 years of age (source: www.crececontigo.cl).

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more likely to be married to a man with a high income, to delay motherhood, and to obtain better prenatal care. Their results demonstrate that each additional year of education for the mother reduces the consequences of her child being born both underweight and prematurely. For their part, Carneiro et al. (2007) analyze the impact of the mother's educational level on the cognitive development of the child, using ability test performance. They found that the mother's education increased the mathematics and reading scores of 7–8 year-old children, but found no effect on children 12–14 years-of-age. These studies demonstrate that the failure to take intergenerational effects into account will lead to underestimation of the benefits of education.

In summary, investing in children's first stage of life as a public policy helps to decrease the disadvantages experienced by children born in deprived conditions, while increasing productivity and equity in society as a whole. Identifying the factors that influence psychomotor development in the first few years of life is important precisely because it can enable the focalization of public resources on policies that have the greatest impact and efficiency.

This paper presents evidence on the determinants of children's psychosocial development in Chile. The analysis is made for children at ages between 2 and 4. It considers relevant variables such as health status (including pregnancy), measurements of mothers' cognitive development, and assessments of children's psychosocial development, making an important contribution to the literature.

We use the first round of a study designed especially to examine these determinants. The *Encuesta Longitudinal de Primera Infancia* (Early Childhood Longitudinal Survey, ELPI) is a representative survey of the Chilean population and was intended for gathering information about children in the first few years of life for the purpose of designing and assessing different public policy programs. The variables studied are classified primarily into three categories: health, cognitive, and demographic.[2]

The group of health variables includes nutritional status of and use of pharmaceuticals by the mother during pregnancy. This category also includes variables such as premature birth, birth weight, APGAR scores,[3] breastfeeding duration, and current nutritional status of the child. Variables in the cognitive ability category include the mother's educational level and performance on the Wechsler Adult Intelligence Scale (WAIS) intelligence test, while the child's psychomotor development is measured by the psychomotor development test (TEPSI)[4] and the Peabody Picture Vocabulary Test (TVIP).[5] For TEPSI we also include the analysis of the three dimension of the test: coordination, language and motor skills.

Demographic variables include the child's area of residence and indigenous/non-indigenous status. Other child variables include age, gender, preschool attendance, and whether or not the child lives with both parents. Regarding the mother, additional variables include age, number of children, employment status during the first year of the child's life, number of hours currently works per month, and the per capita income of the household.

This article is organized as follows. Section 2 presents a descriptive analysis of the ELPI database, with emphasis on measures of children's psychosocial ability and maternal cognitive ability in the sample analyzed. Section 3 describes the methodology. Section 4 presents the results. Lastly, Section 5 offers conclusions and implications from a public policy perspective.

2. Data

This study uses data from the first round of the 2010 Early Childhood Longitudinal Survey[6] (ELPI). The survey is a sample of 15,175 children (boys and girls) born between January 1, 2006 and August 31, 2009, and is considered representative of children between 6 months and 5 years-of-age. The survey consisted of two information-gathering visits. The first was a household sociodemographic survey for each child included in the survey. On the second visit, three instruments were applied to evaluate cognitive, socioemotional, and physical aspects.

An important aspect of the survey is that it does not just provide information required to characterize the family environment of the children studied. It also enables a profile of mothers to be built that includes prenatal care, cognitive ability, and employment status. Additionally, the survey enables the identification of factors that are important in the psychomotor development of children up to 5 years-of-age, such as preschool education, health status, and environment.

Because of its design, the ELPI can be used to analyze factors that are not considered by other surveys but that are relevant to children's physical and psychomotor development: health factors during the mother's pregnancy and in the first few years of the child's life. By applying the Psychomotor Development Test (TEPSI) and the Peabody Picture Vocabulary Test (TVIP), a measure of a child's biopsychosocial status can be obtained. In addition, the application of the WAIS[7] digit span and vocabulary subtests provided a measure of the mother's cognitive ability. Using this information, it was possible to identify the effect, in terms of direction and magnitude, of maternal cognitive development on the child's biopsychosocial development.

The study was conducted with a sample of children whose mothers reported being the primary caregiver.[8] The TEPSI consisted of 8342 children ranging from 2 to 4 years, while the TVIP included a sample of 6397 children from 30 months to 4 years.

The average age of those taking the TEPSI was 2.72 and 49.8% were female. Fig. 1 shows that the distribution of the girls' scores slopes slightly to the right, averaging 56 points, while the boys subsample shows a distribution of around 52.4 points. Meanwhile, those taking the TVIP had an average age of 2.91 and 49.4% were female. Fig. 2 displays the distribution of the scores, with boys having a mean of 105.4 points and girls 106.3 points.

When analyzing the scores by income quintile, as shown in Figs. 3 and 4, a significant gap can be observed in the TEPSI and TVIP. Children from the lower quintile obtain, on average, a score of 50.8 points on the TEPSI and 100.6 points on the TVIP. In contrast, children from the upper quintile obtained an average of 57.7 points and 111.8 points respectively. These gaps are significant at the 95% confidence interval.

Lastly, the results of the TEPSI showed that 4-year old children perform better than 2 and 3 year-olds; in the TVIP older children also perform better. These results are significant for a 95% confidence interval.

2.1. Test of psychomotor development (TEPSI)

This test is used internationally to provide a rough assessment of psychomotor development among children 2–5 years-old. It is

[2] The second round of the survey (panel data) will be available in 2013.
[3] A neonatal clinical exam applied to study the vitality of a newborn child.
[4] Test to assess psychomotor development in children 2 to 5 years-of-age (Haeussler and Marchant, 2007). See Section 2.1 for more details.
[5] A psychometric test that measures an individual's receptive or auditory vocabulary (Dunn et al., 1986). See Section 2.2 for more details.
[6] The ELPI was commissioned by the Ministry of Education and implemented by the Centro de Microdatos in the Department of Economics of the Universidad de Chile. www.elpi.cl.
[7] Test that measures the overall intelligence of individuals 16–64 years of age (Apfelbeck and Hermosilla, 2000). See Section 2.3 for more details.
[8] See Annex 1 for a descriptive analysis of the variables.

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