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Usage of Child Care and Education Centers: The Proximity Factor

Francisca Dussaillant[1]

Abstract

The Chilean Early Childhood Longitudinal Survey was used to model the choices made by households with respect to day care or preschool (DC/PS) attendance. We also use georeferenced data on the location of centers that could take care of children. We present a detailed analysis of the correlates of DC/PS attendance choices, giving special attention to the distance between the household and the center as predictors. For these purposes, the joint decision of child attendance to DC/PS and mother's employment is modeled. The measurement of this association is relatively new to the literature because it requires georeferenced data, which only recently have begun to be collected systematically by public policy agencies. The association we find between distance and attendance to DC/PS centers is significant but smaller than the association to the age of the child. Separate analyses for 0- to 14-month-olds and 25- to 54-month-olds show some heterogeneous effects on the joint decision of attendance and education.

Keywords

preschool attendance, day care, child care, maternal employment

Introduction

In recent decades, several international studies have shown the importance of preschool education (see, for example, Heckman & Masterov, 2007; Shonkoff & Phillips, 2000, among others). It is generally argued that in addition to being an extremely cost-effective investment in human capital, quality preschool education helps to bridge the sociocultural gaps that become evident very early in a child's life (Becker, 1993; Cunha & Heckman, 2007; Heckman, Krueger & Friedman, 2003).

Recent initiatives launched in Chile, such as the Programa Chile Crece Contigo (Chile Grows With You Program), aim to guarantee the 40% most vulnerable sector of the population access to day care or preschool (DC/PS) services (up to the age of 4). Also, in the last few years, universal (although not compulsory) access has been guaranteed for prekinder and kindergarten children.

These initiatives imply important investments in logistics and infrastructure, as well as the professional and technical capabilities required in each center. For this reason, it is necessary to avoid deficiencies in the services supplied, as this results in an unnecessary increase of public spending in preschool education. This is extremely important because a rational planning of spending on DC/PS centers generates savings that could be used to extend this coverage to sectors with difficulties of access and to improve the quality of the services provided.

This calls for studies to provide an answer to several questions regarding the demand for these services on the part of the homes. In this line, it is important to determine how the distance between the home and the preschool center relates to the way in which the families use this service. In addition to the distance between the center and the home, there are other factors associated with DC/PS use such as the age of the child, the size of the household, the mother's educational and employment status, and others, such as the household member's interests or preferences. This study seeks to look into these correlates as much as the data available allow by estimating a model of the joint decision of child attendance to the DC/PS center and mother's employment. The article not only provides an answer to some of the basic questions related to choice of day care centers in Chile but also raises new questions and uncovers new issues that should be dealt with in greater depth in subsequent studies.

[1]Universidad del Desarrollo, Santiago, Chile

Corresponding Author:
Francisca Dussaillant, Center for Public Policy, School of Government, Universidad del Desarrollo, Avda Plaza 680, Las Condes, Santiago, Chile 00000.
Email: mfdussaillant@udd.cl

Literature Review

The objective of this analysis is to study the correlates of DC/PS use by households. There is a well-established literature that explores the determinants of child care, summarized by Blau and Currie (2006).

The specific subject of the relation of child care and labor supply has also been thoroughly examined. Anderson and Levine (1999), Kalb (2009), and Del Boca (2015) provide comprehensive reviews of that research literature.

Del Boca, Locatelli, and Vuri (2005) and Del Boca and Vuri (2005) study the double decision of Italian mothers to work and send their children to a formal child care center. Both studies conclude that the most important factors that affect this decision are the mother's educational level (the higher her educational level, the greater the probability of her working and using child care services, especially for younger children), the age of the children (the probability increases at the age of 4 or 5 years), factors related to the family structure and home support networks, and so forth. These results are frequently replicated in the specialized literature. For example, both Joesch and Hiedemann (2002) and Reyes and Urzúa (2012) have found similar correlates of preschool attendance, the former in the United States and the latter in Chile.

It has been documented in various studies that the parents' preferences of child preschool attendance vary according to the child's age (see, for example, Del Boca et al., 2005; Del Boca & Vuri, 2005; Joesch & Hiedemann, 2002; Michalopoulos, Robins, & Garfinkel, 1992). Parents of younger children tend to resort to informal child care strategies (Hofferth, Brayfield, Deich, & Holcomb, 1991). This is due to lower availability of formal centers, higher costs, or the fact that families prefer informal arrangements in which the caregiver is a family member or somebody that they trust (Del Boca et al., 2005). Even in the United States, where there is a wide supply of child care centers, Joesch and Hiedemann (2002) have found that a considerable percentage of households with children below 3 years of age would avoid child care centers, even if they were free of charge.

There are few studies that consider the effect of the location of child care centers on the decision to send the children to DC/PS establishments using georeferenced data. Kitano and Uda (2007) studied the accessibility of child care centers in two cities in Japan using georeferenced data of the location of the centers and of the homes with children under 6 years of age, and data on transport and highways. Compton and Pollak (2014) also argued that the mechanism through which proximity increases labor supply is the availability of child care. In their case, they study proximity to mothers and mothers-in-law, as child care providers. The authors find that, in the United States, the probability of employment and labor force participation for married women with young children is higher for those living closer to their mothers or their mothers-in-law.

Herbst and Tekin (2012) have investigated the effect on the actual reception of social services of the distance a parent must cover to get to a social services agency in the United States. Their results show that the greater the distance, the lesser the child's probability of having access to a child care subsidy.

The only study that examines location effects using georeferenced data in a developing country, as of our knowledge, is Reyes and Urzúa (2012). They study the supply and demand of early education using georeferential data of the households and preschool education or child care centers in the metropolitan region (a mostly urban geographical sector of the country where the capital city, Santiago, is located). They obtain the household information through data reported in the Ficha de Protección Social (FPS), an instrument used for the targeting of social benefits. The authors conclude that the distance between the center and the home is an important (although not the only) correlate of attendance. Although parents do not necessarily choose the center that is the nearest to their home, they do choose one that is close.

Another Chilean study (Contreras, Puentes, & Bravo, 2012) evaluates the association between distance from the home or workplace to day care centers and the mother's decision to work. In this study, distance is measured subjectively as perceived physical proximity. The authors find a correlation between their distance variable and labor force participation of mothers.

Our study comes to complement Reyes and Urzúa (2012). It differs from theirs in that we use national data from a representative survey of early childhood, Estudio Longitudinal de Primera Infancia (ELPI). As respondents of this survey knew that their reports would be confidential and their names would not be disclosed, they had less incentive to underreport on several key variables (a recognized problem of FPS data). The use of FPS data by Reyes and Urzúa (2012) has some advantage in that it includes the whole population, but their universe is restricted to the metropolitan region and to the households that had decided to give their information to access social benefits. Herrera, Larrañaga and Telias (2010) indicated that this population represented, as of 2010, more than two thirds of the national population, and the group that was left out was mostly the less vulnerable (which, as Reyes & Urzúa state, are the less likely to use the public child care and education services under study).

Institutional Structure of Preschool Education and Care in Chile

Four preschool providers can be identified in the segment of children younger than 5 years old: municipalities, private providers, the Junta Nacional de Jardines Infantiles (JUNJI), and the Fundación Integra. JUNJI is an autonomous organization related to the Ministry of Education, whose purpose is to provide quality education and care to vulnerable children

Table 1. Enrollment in DC/PS Centers, by Type of Provider (2013, Administrative Records).

	Sala cuna menor	Sala cuna mayor	Medio menor	Medio mayor
	(Children aged 0-1 year approximately)	(Children aged 1-2 years approximately)	(Children aged 2-3 years approximately)	(Children aged 3-4 years approximately)
Municipal	11	121	89	931
JUNJI	18,034	40,368	46,520	57,043
Fundación Integra	4,431	11,765	20,459	23,722
Private (no subsidy)[a]	32	407	2,296	5,992
Other	56	257	1,352	55,103
Total	75,482		213,507	

Note. Promotion to the next level is generally produced on December, at the end of the academic year, so age frames in the table are only approximate. DC/PS = day care or preschool; JUNJI = Junta Nacional de Jardines Infantiles.
[a]Only government-certified centers (certification is not mandatory for these providers).

up to 4 years old. JUNJI also supervises and certifies other public centers. Fundación Integra is a private provider of care and education to children of ages younger than school age, and it is fully financed by the government. Municipal centers are autonomous organizations, and they are also financed by the government. Finally, private centers are payed by the families. Even though JUNJI and Fundación Integra work without apparent association, they offer very similar programs. They serve the bulk of the Chilean population (Reyes & Urzúa, 2012).

In the last couple of years, there has been a significant increase of the social protection programs oriented to early childhood. In particular, in the period that goes from 2006 to 2010,[1] preschool education and care services increased their capacity by 113,000 places. This represented an increase of almost 500% in the public supply of nursery facilities that serve children from 0 to 24 months of age and an increase of more than 50% of the public supply for children between 24 and 48 months of age. Nonetheless, this significant increase in service availability did not consider supply and demand issues in its planification, so several issues associated to the quality of the services and their geographic location arose (Reyes & Urzúa, 2012).

As of 2013, administrative records indicate that a little less than 200,000 children were enrolled in these centers and that most of them use JUNJI or Fundación Integra facilities. Table 1 depicts total enrollment by type of provider, as reported by the Chilean Ministry of Education for 2013 (Centro de Estudios MINEDUC, 2014). It should be beared in mind that enrollment and total capacity do not necessarily overlap in Chile (see, for example, Reyes & Urzúa, 2012), where it is not rare to find DC/PS centers working in less than full capacity due to a lack of demand. This will be later discussed in this study.

Most DC/PS centers serve children of ages below 5. After that, children enter the school system. Prekinder and kinder are available in some schools and serve children during the calendar year they turn 5 or 6 years of age, respectively.[2] Kinder education was deemed mandatory in Chile since 2013.

This study focuses on children aged 0 to about 4.5 years old from the birth cohorts of 2006 to the first half of 2009. The eldest of these cohorts, born in 2006, would be ready to enter prekinder in 2011. Thus, by 2010, when data used for the analyses were gathered, these children mostly used the services provided by DC/PS centers and not by schools. DC/PS centers receive children of different ages and internally divide the children into age-differentiated rooms. They frequently serve children of every age, from birth until the moment they enter school. There is no centralized curriculum or directive regarding the services to be provided in these centers. Some of them provide mostly day care, whereas others start giving some education to the children. Educational services come to replace pure day care when the child grows, but the particular care/education time ratio at different ages is a decision of each center. There are no data about the type of service (care or education) provided in each center, so we decided to pool them and give them all the name of "DC/PS centers."

Data and Descriptive Analysis

This section will present a snapshot of preschool education and child care in Chile obtained from the Early Childhood Longitudinal Study (ELPI in Spanish) that was conducted in 2010 to increase the information available on early childhood issues and to establish a baseline for a follow-up study of a cohort.

The information was drawn from a representative sample of each age range included in the survey to study the cohort of children by year of birth, that is, the birth cohorts of 2006, 2007, 2008, and first half of 2009. The sample, which was representative at the time of the survey, consisted of approximately 15,000 children born between January 1, 2006, and August 31, 2009, residing in Chile throughout the country in urban and rural areas. The estimated sample error for each month of birth fluctuates between 5.0% and 5.7%; for a 12-month aggregate or a calendar year, it is around 1.5%, and for the total sample, it decreases to less than 1.0%.

Table 2. Unmet Demand for DC/PS Centers.

	Proportion of households that do not send the children to DC/PS (%)	Proportion of households that do not send the children to DC/PS that claim problems of access (%)	Proportion of households with access problems that claim to have transportation or distance problems (%)
12 months old or less	85.8	4.1	54.9
18-24 months old	81.1	4.9	59.6
18-24 months old	75.1	7.1	55.3
2-3 years old	59.2	8.3	49.3
3-4 years old	34.2	11.0	57.9
4-5 years old	12.3	13.5	80.3

Note. DC/PS = day care and preschool.

The database that was generated contains 15,175 sociodemographic questionnaires applied to the primary caregivers of the children selected. Only one child per household was selected.

For the purposes of this study, we used the ELPI sociodemographic database, which has the particular feature of collating the children's "history"; that is, the questionnaire not only refers to their current situation but also collects data related to points or periods of time prior to the survey. Thus, every child is described as a set of "moments" or ages: The characteristics associated with the child vary according to the "moment" recorded. However, especially when it comes to attendance to DC/PS establishments, we have only considered the children at the "moment" corresponding to the interview (excluding their history). This is due to the fact that using the history of the child's attendance would lead to bias, particularly considering that the supply of establishments has increased dramatically in recent times.

The Ministry of Education also provided data about the distance from 12,575 households surveyed by ELPI to the government-funded education and child care centers ran by the JUNJI and Fundación Integra. Only centers within a radius of 10 km were matched to each household. Data about the age range serviced by each center were also provided. Two thousand six hundred cases were not matched because there were no DC/PS centers in the 10-km radius or because it was not possible for the ministry to georeferenciate them (no information regarding which cases corresponded to the first or second explanation was provided).

This means that in the descriptive sections of our study, we were able to use about 83% of the original ELPI sample.

The 2,600 cases that were not matched are disproportionally rural and belonged disproportionally to geographical regions different from the metropolitan, where the capital city, Santiago, is located. Therefore, 6.8% of the households of the restricted sample are rural, whereas in the original sample, the figure was 10.0%. Also, in the restricted sample, 42.1% of the households belonged to the metropolitan region, whereas on the original sample, only 37.4% belonged to that geographical zone. On other relevant variables, the restricted and the original samples do not differ significantly. For example, in the original sample, 35.3% of the children assist to DC/PS centers, 44.5% of the mothers are employed, mean child age is 30.4 months, and the average age of the mother at childbirth was 27.3 years. In the restricted sample, these figures change very subtly to 36.0%, 45.8%, 30.5%, and 27.4%.

Our final statistical analysis, a bivariate probit that models the joint probability of a woman to work and use child care facilities for her child, required further restriction of the sample to 9,604 cases. This, due to missing values in the labor status of the mother or, in a minority of cases, because the main caretaker of the child was not the biological or adoptive mother. Descriptive statistics of this estimation sample are available in Table 2.

The following subsections aim to briefly describe the situation of females and their children in terms of labor, access and use of child care, and the availability of child care and education facilities near the households. These descriptive analyses make use of the matched ELPI-distance database described above (12,575 cases).

Maternal Employment, Child Age, and Child Care Use

There is a direct relationship between the mother's employment status and the age of her children. The survey reveals that when the selected child was under 12 months of age, less than 35% of the mothers were employed. On the contrary, when the children were between 4 and 5 years of age, this proportion climbed to 52.1%. Maternal working hours do not appear to vary by age of the child and are always about 40 to 41 hr on average per week, distributed over a 5-day working week (with the exception of the 0- to 3-month-old age range, in which some mothers do not report to work due to maternity leave and the mothers of 4-year-olds that mostly report full-time 45-hr jobs).

Our data show that in Chile, children of employed mothers are more likely to attend preschool than those whose mothers are not employed (see Figure 1). The difference is more striking in the case of younger children (under 1 year of age) and becomes less noticeable at successively older ages.

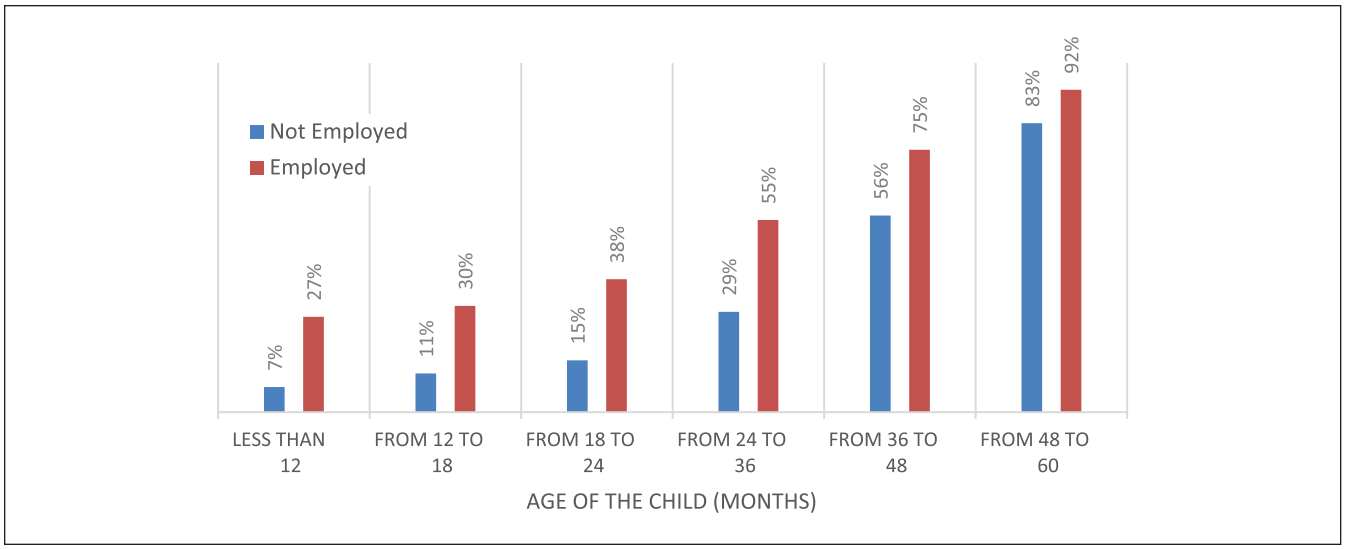

Figure 1. Attendance to preschool or day care establishments according to maternal employment status.

This may be indicating that preschool services are perceived by mothers as instances of educational value for their children, whereas mothers of young children would only regard day care establishments as a child care solution. The respondents who send their child to preschool or day care assess these establishments quite positively (means are always above 6.4 on a scale of 1-7) as regards infrastructure, cleanliness, treatment of the children by their teachers, education provided to the children, and schedules. The assessments do not vary from item to item or according to the age range of the child attending the center.

When mothers or caregivers who have decided not to send the child to preschool establishments are asked why, the answers provided are multiple but can be grouped into two main types: those that arise from availability issues and others that are explained by the preferences of the households. Only the former can be regarded as an unmet demand. Table 2 gives an idea of the proportional size of that unmet demand in Chile.

Respondents who say that they need a preschool center but do not have access to one (because of distance, money, availability, or schedule issues) are potential users if the supply is improved. When studying nonattendance of children under 12 months of age, it appears that less than 4.5% report such supply issues. This proportion slightly increases with the age of the child to about 8.3% for 2-year-olds, 11.0% for 3-year-olds, and 13.5% for 4-year-olds. These results are in line with those of Del Boca et al. (2005), Joesch and Hiedemann (2002), and Hofferth et al. (1991).

The Distance Factor

We define as "potential DC/PS demanders" those households that, although reporting a need of the service, say that they do not have access to it. As Table 2 shows, although the highest proportion of people who do not send their child to DC/PS centers report doing so because they do not want to, the group that indicates that their decision is due to supply issues still represents a significant number of households. Most (between 49% and 80%, according to age) of the households that reported difficulties in terms of access specify as their main constraint the distance to and from the facilities. This is the most frequently mentioned reason in each age range, although it is particularly significant for children between 4 and 5 years old.

To deepen our understanding of the association of the distance factor to the household decision of sending their child to DC/PS centers, we study the data on the existence of a DC/PS center[3] within a 10-km radius of the household. The data include the linear distance between the household and each of these centers inside the 10-km radius, and the type of services (in terms of age) they provide. Therefore, data made it possible to match children with every center close to their household that provided care for their age. If a 4-year-old child was matched to 10 DC/PS centers in a 10-km radius, we were sure that all these centers did attend 4-year-olds. On the contrary, a nursery attending 0- to 2-year-olds was never counted as a potential choice for these 4-year-olds, even if it was located close to the household.

The number of establishments within a 10-km radius is, in general, large, particularly in the metropolitan region (where Santiago, the capital and most populated city, is located), due to its greater population density. In this region, the households with children below a year of age have an average of 115.6 centers that attend to that age in the 10-km radius. This number reduces to 82.6 when 4-year-olds are considered. When the radius is narrowed to 2 km, the number of centers descends to 8 for children below a year of age, and 5.4 for 4-year-olds. Unfortunately, this information does not allow us to infer whether there are open vacancies.

Table 3. Average Distances From the Household to Available Establishments.

	Average distance (m) from the household					
	To nearest DC/PS		To third nearest DC/PS		To fifth nearest DC/PS	
	Attends	Does not attend	Attends	Does not attend	Attends	Does not attend
Under 12 months old	593	895	1,737	1,782	2,164	2,338
1-2 years old	576	826	1,318	1,578	1,878	2,131
2-3 years old	685	893	1,445	1,653	2,046	2,240
3-4 years old	692	855	1,304	1,469	1,783	1,921
4-5 years old	1,088	1,025	2,135	1,877	3,060	2,759

Note. DC/PS = day care and preschool.

Table 3 shows the average distance between DC/PS centers in the area around the household. The table differentiates between children who report attending DC/PS centers and those not attending.

We see that children who attend DC/PS centers tend, on average, to have facilities available at a shorter distance from the household. This is particularly observable when we consider the distance to the nearest facility and when children are younger. However, it still remains valid when we compare the third and fifth facilities nearest to the household. The trend is reversed for the case of children between 4 and 5 years of age. This might be reflecting the fact that, in many of these cases, these children already started attending the prekinder and kinder supplied by public schools, establishments not considered in the database.

However, the results on Table 3 refer only to average distances. Further analysis of the data shows that, at least for younger ages, the distribution of distances for those attending DC/PS centers dominates stochastically the distribution of distances for those not attending, regardless of whether we look at the nearest, the third, or the fifth preschool establishment in the distance ranking.

The relations between DC/PS attendance and distance shown in Table 3 should be handled with caution. The associations do not imply causality. They do not necessarily tell us that increasing the number of establishments near households would increase the proportion of mothers who decide to send their child to these establishments. The association, as mentioned above, may have arisen because of the following:

a. The existence of DC/PS establishments near the household induces the use of the available supply.
b. The sectors in which there is a larger proportion of mothers willing to send their child to DC/PS centers induce the installation of new establishments there.

It is quite likely that both phenomena are taking place, and the data on Table 3 do not make it possible for us to discern which of either effect is stronger. If we were to assume, for instance, that DC/PS centers were distributed throughout the national territory at random, as a result of a central planning that does not take into account demand issues, then the cause could be attributed to (a). However, even admitting that the governmental plan to build new DC/PS centers was not solely driven by considerations of demand, it is hard to believe that there were no major local pressures (possibly acknowledged by the government) in areas where such facilities were more needed. In that sense, the effect described in (b) should also be of some importance.

Econometric Analysis

We modeled the decisions of the selected children's mothers about whether or not to opt for paid employment and whether or not to send their children to day care centers or preschool. Hence, the joint distribution model for the binary variables "attends" and "employed" is constructed, where the former indicates whether the child attends a DC/PS center and the latter indicates whether the mother is employed or not[4] by using a bivariate probit. The joint model is appropriate when the errors of each individual equation are not independent.[5]

Thus, the estimates describe the size and strength of the association of the independent variables with the mother's choice of employment, child care, or education.

Table 4 shows the descriptive statistics of the sample used in this analysis. The independent variables include dummies by geographical region, age of the child in months (and its square), age of the mother when the child was born, number of people in the household, education of the mother, distance between the house and the nearest DC/PS center (providing a service suitable to the age of the child), gender of the child, and a dummy indicating whether the father lives in the household. In the particular case of Chile, price does not have a significant role in the decision to attend to DC/PS centers because most centers are free. Therefore, we can interpret in our results that the availability and distance variables represent what families perceive as the cost of sending their child to a center.

It can be argued that the distance of DC/PS center from home has a different meaning according to rurality. The same

Table 4. Descriptive Statistics: Variables Used for the Bivariate Probit Model Estimation.

	M	*SD*	Minimum	Maximum
Child attends to DC/PS	0.447	0.497	0	1
Mother employed	0.470	0.499	0	1
Age of the child (months)	29.653	12.786	7	54
Mother's age when the child was born (years)	27.413	6.999	11.833	54.333
Mother's education				
Complete or incomplete primary education	0.150	0.357	0	1
Complete or incomplete high school education	0.582	0.493	0	1
Incomplete higher education (technical education, professional institutes, college)	0.111	0.315	0	1
Complete technical or professional institute education	0.071	0.257	0	1
Complete college	0.086	0.281	0	1
Distance to the nearest DC/PS (km)	0.832	1.170	0.003	9.973
Father living in the household	0.683	0.465	0	1
Number of people in the household	4.930	1.686	2	21
Gender of the child = female	0.496	0.500	0	1
Rural	0.060	0.237	0	1
Number of observations: 9,604				

Note. Coefficients for regional dummies are not reported. DC/PS = day care or preschool.
*$p < .05$. **$p < .01$. ***$p < .001$.

distance can be perceived as very different if the household is located in a big town (where traffic is an issue) or in the countryside (where traffic is not an issue but access to public transportation may be problematic). These heterogeneous effects are studied by separating the sample into two groups: rural and urban households. Estimates for the whole sample are also reported, including rurality as an independent variable.

Another potential source of heterogeneity is the age of the child. It can be argued that the essence of the DC/PS service, from the point of view of the mother, is related to child care for the smaller children, but to education and socialization for the older. Therefore, we also perform separate estimations for children up to 24 months old and for children from 25 to 54 months old.

The appendix shows the marginal effects calculated using the models described above. Each column of Tables A1 to A3 represents the marginal effects on the probability of choosing any combination of actions associated with employment decisions and attendance to DC/PS establishments. For example, the first column of each of the tables shows how each one of the independent variables affects the joint probability of the mother being employed and the child being sent to a DC/PS center.

Table 5, which we include in the main text, is a simpler display of the effects[6] of the independent variables on the *marginal probability* of DC/PS attendance and on the employment decision of the mother.[7] The table reports the results for the whole sample estimation and for the urban and rural samples. Table 6 reports results for the age-specific samples. To provide a benchmark for the reported marginal effects, predictive margins and predicted joint probabilities in each model are reported in Table 7. Also, in the same table, values for the predicted conditional probability of employment given that the child attends to a DC/PS center, and for the conditional probability of attendance given that the mother is employed, are provided.

The whole-sample model estimation of Table 6 shows that each month in the child's life results in an increase of 1.7 percentage points in the probability of DC/PS attendance and has an effect of 0.4 percentage points on the mother's employment probability. Also, the older the mother when the child was born, the lower the probability of using DC/PS services, and the higher the probability of her being employed, although the size of these effects is not too large (0.3 percentage points per every year of age of the mother in the case of probability of DC/PS attendance and 0.7 in that of the mother's employment probability). Mothers with a college degree display the highest probability of sending their children to DC/PS centers (and are also the group with the highest employment) followed by those with some level of higher education (complete or incomplete). Mothers with primary education or less have a probability of being employed that is 47 percentage points lower than that of mothers with a university education. Also, mothers with primary education or less send their children to DC/PS centers with a frequency that is 17 percentage points lower than that of mothers with a college education. Distance to the nearest DC/PS center is decisive for the household choice to use these services and an important correlate in the employment decision of the mother. An extra kilometer to the nearest DC/PS center is associated

Table 5. Marginal Effects of the Different Variables on the Marginal Probability of Attending DC/PS and Maternal Employment, Complete, and Rural/Urban Samples.

	Complete sample		Rural sample		Urban sample	
	Probability of attending DC/PS	Probability of maternal employment	Probability of attending DC/PS	Probability of maternal employment	Probability of attending DC/PS	Probability of maternal employment
Age of the child (months)	.0171***	.0044***	.0161***	.0041**	.0172	.0044***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Mother's age when the child was born	−.0033***	.0064***	−.0020	.0038	−.0034***	.0066***
	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)
Mother's education (reference: complete college education)						
Complete or incomplete primary education	−.1711***	−.4666***	−.1345	−.5445***	−.1709***	−.4622***
	(0.021)	(0.022)	(0.111)	(0.100)	(0.022)	(0.023)
Complete or incomplete high school education	−.1324***	−.3526***	−.0761	−.4266***	−.1362***	−.3507***
	(0.019)	(0.020)	(0.110)	(0.098)	(0.019)	(0.020)
Incomplete higher education (technical or college)	−.0901***	−.3629***	.0491	−.4702***	−.0946***	−.3588***
	(0.022)	(0.024)	(0.134)	(0.133)	(0.023)	(0.024)
Complete technical	−.0852***	−.1177***	−.1528	−.1964	−.0835**	−.1163***
	(0.026)	(0.026)	(0.129)	(0.133)	(0.026)	(0.026)
Distance to the nearest DC/PS (km)	−.0323***	−.0158**	−.0223***	−.0100	−.0344***	−.0174*
	(0.005)	(0.006)	(0.006)	(0.007)	(0.007)	(0.008)
Rural area	−.0875***	−.0719**				
	(0.023)	(0.024)				
Father living in the household	−.0650***	−.1548***	−.0415	−.2036***	−.0658***	−.1522***
	(0.010)	(0.011)	(0.039)	(0.044)	(0.010)	(0.011)
Number of people in the household	−.0162***	−.0151***	−.0257*	−.0252*	−.0155***	−.0146***
	(0.003)	(0.003)	(0.010)	(0.011)	(0.003)	(0.003)
Gender of the child = female	.0001	−.0047	.0320	.0523	−.0022	−.0077
	(0.009)	(0.010)	(0.032)	(0.035)	(0.009)	(0.010)
n	9,604		624		8,980	

Note. Standard errors between parentheses. Coefficients for regional dummies are not reported. DC/PS = day care or preschool.
*$p < .05$. **$p < .01$. ***$p < .001$.

with a decrease of more than 3 percentage points in the probability of sending the child to the establishment and results in lower probability of maternal employment (1.6 percentage points).[8]

When the father lives in the household, attendance to the DC/PS center falls by almost 7 percentage points, as does the probability of maternal employment, which decreases by more than 15 percentage points. Similarly, the larger the number of people living in the household, the lower the probability of the child attending the DC/PS center or the mother being employed (an additional member of the household makes the attendance probability decrease by 1.6 percentage points and the maternal employment probability decreases by 1.5 percentage points). The gender of the child does not seem to be associated with the decision of the home.

If we consider the estimation for the whole sample, the results indicate that the probability of using DC/PS services in rural areas (with respect to urban) decreases by almost 9 percentage points and the probability of the mother of being employed decreases by 7.2 points. Although there seems to be some heterogeneity in the behavior of rural and urban households, as seen in the separate estimations for the rural and urban samples, estimated marginal effects are not substantially different. Nonetheless, several coefficients for the rural sample deem insignificant (e.g., the marginal effect of distance on the marginal probability of maternal employment). This may mean that the effect is absent, or it might simply reflect the smaller size of the sample ($N = 624$) over which the rural estimation was performed. Distance seems to matter less in the decision to send the child to the DC/PS center: Each extra kilometer of distance to the nearest center is associated to a descent of 3.4 percentage points in the probability to attend in urban zones but only 2.2 percentage points in rural zones.

When the estimation is performed separately by age of the child (see Table 6), there seems to be some indication of heterogeneous response. Attendance decisions are more associated to mother's education for older children. This might be occurring due to a higher salience of the educational attributes of DC/PS services for older children, and

Table 6. Marginal Effects of the Different Variables on the Marginal Probability of Attending DC/PS and Maternal Employment, Samples by Age of the Child.

	0- to 24-month-old sample		24- to 54-month-old sample	
	Probability of attending DC/PS	Probability of maternal employment	Probability of attending DC/PS	Probability of maternal employment
Age of the child (months)	.0094***	.0078***	.0213***	.0045***
	(0.001)	(0.002)	(0.001)	(0.001)
Mother's age when the child was born	−.0026*	.0091***	−.0039***	.0049***
	(0.001)	(0.001)	(0.001)	(0.001)
Mother's education (reference: complete college education)				
Complete or incomplete primary education	−.0831*	−.5049***	−.2255***	−.4436***
	(0.036)	(0.038)	(0.026)	(0.027)
Complete or incomplete high school education	−.0456	−.3591***	−.1890***	−.3459***
	(0.033)	(0.035)	(0.022)	(0.024)
Incomplete higher education (technical, college)	−.0546	−.3604***	−.1117***	−.3619***
	(0.037)	(0.041)	(0.027)	(0.030)
Complete technical	.0123	−.1342**	−.1403***	−.1058***
	(0.043)	(0.046)	(0.031)	(0.031)
Distance to the nearest DC/PS (km)	−.0562***	−.0072	−.0272***	−.0193**
	(0.011)	(0.008)	(0.006)	(0.007)
Rural area	.0164	−.0822*	−.1306***	−.0723*
	(0.039)	(0.039)	(0.028)	(0.030)
Father living in the household	−.0581***	−.1282***	−.0670***	−.1730***
	(0.015)	(0.018)	(0.013)	(0.014)
Number of people in the household	−.0099*	−.0103*	−.0207***	−.0173***
	(0.004)	(0.005)	(0.004)	(0.004)
Gender of the child = female	.0048	−.0200	−.0016	.0042
	(0.014)	(0.016)	(0.012)	(0.013)
n	3,595		6,009	

Note. Standard errors between parentheses. Coefficients for regional dummies are not reported. DC/PS = day care/preschool.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 7. Predictive Margins, Joint Probabilities, and Conditional Probabilities After Bivariate Probit.

		Whole sample	Urban sample	Rural sample	0- to 24-month olds' sample	24- to 54-month olds' sample
Marginal probabilities	P(A = 1)	.4461	.4546	.3114	.2050	.5903
		(0.005)	(0.005)	(0.019)	(0.007)	(0.007)
	P(W = 1)	.4701	.4796	.3212	.4126	.5044
		(0.005)	(0.006)	(0.019)	(0.009)	(0.007)
Joint probabilities	P(A = 1, W = 1)	.2700	.2772	.1561	.1357	.3498
		(0.005)	(0.005)	(0.014)	(0.006)	(0.006)
	P(A = 1, W = 0)	.1762	.1774	.1553	.0693	.2405
		(0.004)	(0.004)	(0.014)	(0.004)	(0.006)
	P(A = 0, W = 1)	.2001	.2024	.1651	.2769	.1546
		(0.004)	(0.004)	(0.015)	(0.008)	(0.005)
	P(A = 0, W = 0)	.3537	.3430	.5235	.5180	.2551
		(0.005)	(0.005)	(0.020)	(0.009)	(0.006)
Conditional probabilities	P(A = 1, W = 1)	.5378	.5448	.4315	.3310	.6672
		(0.007)	(0.008)	(0.033)	(0.013)	(0.009)
	P(A = 1, W = 1)	.5909	.5983	.4815	.6514	.5760
		(0.008)	(0.009)	(0.041)	(0.019)	(0.009)

Note. A = 1 ==> child attends to DC/PS; W = 1 ==> mother works. Standard errors between parentheses. DC/PS = day care/preschool.

more educated mothers value more early education. On the contrary, services for smaller children might be perceived to be less educative and only related to day care and, therefore, are similarly valued across educational groups. Distance also seems to matter more for the probability of attending of older children. These results are more difficult to interpret, but they might be due to the fact that mothers sometime get help from their employers to care for their 0- to 24-month-old children (this is mandated by law for some employers). Employer-provided centers are frequently located close to the mother's workplace, and not necessarily to the child's household. On the contrary, employers do provide DC/PS centers for older children. Rurality also seems to work differentially depending on the age of the child: The probability of attending DC/PS centers is lower in rural areas only for older children (by more than 13 percentage points).

Discussion and Conclusion

The analysis in this article indicates that a number of factors are relevant when explaining the decision of households to send their children to DC/PS centers. The analysis points to the employment status of the mother as one of the main predictors of the use of preschool services (especially for younger children). This is evident from our analysis in that the correlation between the errors of the attendance equation and the employment equation of the bivariate probits ranges from .30 to .48 depending on the sample over which the estimation was performed. As would be expected, the higher correlations were found for the estimation over the sample restricted to 0- to 24-month-olds. This implies that in a country where female employment is on the rise, an increase in demand for day care and preschool establishments is to be expected.

Appendix

Table A1. Marginal Effects of the Different Variables on the Joint Probability of Attending DC/PS Centers and Maternal Employment, Complete Sample.

	Child attends DC/PS and mother employed	Child attends DC/PS and mother not employed	Child does not attend DC/PS and mother employed	Child does not attend DC/PS and mother not employed
Age of the child (months)	.0100***	.0072***	−.0056***	−.0115***
	(0.000)	(0.000)	(0.000)	(0.000)
Mother's age when the child was born	.0013*	−.0046***	.0052***	−.0018**
	(0.001)	(0.000)	(0.000)	(0.001)
Mother's education (reference: complete college education)				
Complete or incomplete primary education	−.3096***	.1386***	−.1570***	.3280***
	(0.018)	(0.012)	(0.019)	(0.016)
Complete or incomplete high school education	−.2421***	.1097***	−.1104***	.2429***
	(0.017)	(0.010)	(0.018)	(0.012)
Incomplete higher education (technical or college)	−.2279***	.1378***	−.1351***	.2252***
	(0.020)	(0.013)	(0.020)	(0.016)
Complete technical	−.1137***	.0285*	−.0040	.0892***
	(0.022)	(0.013)	(0.024)	(0.017)
Distance to the nearest DC/PS (km)	−.0232***	−.0092*	.0074	.0250***
	(0.004)	(0.004)	(0.004)	(0.004)
Rural area	−.0759***	−.0116	.0040	.0835***
	(0.017)	(0.014)	(0.016)	(0.019)
Father living in the household	−.1043***	.0393***	−.0505***	.1155***
	(0.008)	(0.006)	(0.007)	(0.008)
Number of people in the household	−.0149***	−.0013	−.0003	.0164***
	(0.002)	(0.002)	(0.002)	(0.002)
Gender of the child = female	−.0021	.0021	−.0026	.0025
	(0.007)	(0.006)	(0.006)	(0.008)
n	9,604			

Note. Standard errors between parentheses. Coefficients for regional dummies are not reported. DC/PS = day care/preschool.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table A2. Marginal Effects of the Different Variables on the Joint Probability of Attending DC/PS Centers and Maternal Employment, Urban, and Rural Samples.

	Urban sample				Rural sample			
	Child attends DC/PS and mother employed	Child attends DC/PS and mother not employed	Child does not attend DC/PS and mother employed	Child does not attend DC/PS and mother not employed	Child attends DC/PS and mother employed	Child attends DC/PS and mother not employed	Child does not attend DC/PS and mother employed	Child does not attend DC/PS and mother not employed
Age of the child (months)	.0102***	.0071***	−.0057***	−.0115***	.0071***	.0091***	−.0030***	−.0131***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Mother's age when the child was born	.0013*	−.0047***	.0053***	−.0019**	.0006	−.0026	.0032	−.0012
	(0.001)	(0.000)	(0.000)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)
Mother's education (reference: complete college education)								
Complete or incomplete primary education	−.3119***	.1411***	−.1502***	.3211***	−.2517**	.1172**	−.2929*	.4273***
	(0.019)	(0.013)	(0.019)	(0.016)	(0.089)	(0.041)	(0.122)	(0.075)
Complete or incomplete high school education	−.2465***	.1103***	−.1042***	.2404***	−.1876*	.1115**	−.2390*	.3151***
	(0.017)	(0.010)	(0.018)	(0.012)	(0.089)	(0.038)	(0.121)	(0.072)
Incomplete higher education (technical or college)	−.2313***	.1367***	−.1275***	.2221***	−.1639	.2130**	−.3063*	.2572*
	(0.020)	(0.013)	(0.020)	(0.016)	(0.107)	(0.075)	(0.128)	(0.103)
Complete technical	−.1132***	.0297*	−.0031	.0866***	−.1632	.0104	−.0332	.1860
	(0.023)	(0.013)	(0.024)	(0.016)	(0.104)	(0.045)	(0.147)	(0.106)
Distance to the nearest DC/PS (km)	−.0252***	−.0092	.0078	.0266***	−.0124**	−.0099*	.0024	.0199**
	(0.005)	(0.005)	(0.006)	(0.006)	(0.004)	(0.004)	(0.005)	(0.006)
Father living in the household	−.1047***	.0389***	−.0475***	.1133***	−.0918***	.0503*	−.1118***	.1533***
	(0.008)	(0.006)	(0.007)	(0.008)	(0.026)	(0.024)	(0.032)	(0.037)
Number of people in the household	−.0144***	−.0011	−.0001	.0156***	−.0193**	−.0063	−.0058	.0315**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.006)	(0.007)	(0.008)	(0.010)
Gender of the child = female	−.0047	.0025	−.0031	.0053	.0318	.0001	.0205	−.0525
	(0.007)	(0.006)	(0.007)	(0.008)	(0.020)	(0.021)	(0.023)	(0.032)
n	8,980				624			

Note. Standard errors between parentheses. Coefficients for regional dummies are not reported. DC/PS = day care/preschool.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table A3. Marginal Effects of the Different Variables on the Joint Probability of Attending DC/PS Centers and Maternal Employment, Samples by Age of the Child.

	0- to 24-month-old children sample				25- to 54-month-old children sample			
	Child attends DC/PS and mother employed	Child attends DC/PS and mother not employed	Child does not attend DC/PS and mother employed	Child does not attend DC/PS and mother not employed	Child attends DC/PS and mother employed	Child attends DC/PS and mother not employed	Child does not attend DC/PS and mother employed	Child does not attend DC/PS and mother not employed
Age of the child (months)	.0066***	.0028***	.0013	−.0107***	.0123***	.0089***	−.0079***	−.0134***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Mother's age when the child was born	.0005	−.0031***	.0086***	−.0060***	.0010	−.0049***	.0038***	.0001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mother's education (reference: complete college education)								
Complete or incomplete primary education	−.1463***	.0632***	−.3586***	.4417***	−.4019***	.1764***	−.0417*	.2672***
	(0.029)	(0.012)	(0.043)	(0.035)	(0.025)	(0.019)	(0.019)	(0.016)
Complete or incomplete high school education	−.0962***	.0507***	−.2629***	.3085***	−.3307***	.1417***	−.0151	.2041***
	(0.028)	(0.008)	(0.041)	(0.030)	(0.023)	(0.016)	(0.018)	(0.011)
Incomplete higher education (technical or college)	−.1014***	.0468***	−.2590***	.3136***	−.3073***	.1956***	−.0545**	.1663***
	(0.030)	(0.011)	(0.045)	(0.037)	(0.027)	(0.022)	(0.020)	(0.016)
Complete technical	−.0125	.0248*	−.1217*	.1094**	−.1669***	.0266	.0611*	.0792***
	(0.036)	(0.011)	(0.051)	(0.041)	(0.030)	(0.021)	(0.026)	(0.015)
Distance to the nearest DC/PS (km)	−.0331***	−.0231***	.0259***	.0303***	−.0244***	−.0028	.0050	.0221***
	(0.007)	(0.005)	(0.008)	(0.009)	(0.005)	(0.005)	(0.004)	(0.004)
Rural area	−.0110	.0274	−.0712*	.0548	−.0994***	−.0312	.0272	.1035***
	(0.024)	(0.020)	(0.028)	(0.042)	(0.021)	(0.020)	(0.018)	(0.023)
Father living in the household	−.0612***	.0031	−.0670***	.1250***	−.1367***	.0698***	−.0362***	.1032***
	(0.011)	(0.006)	(0.015)	(0.016)	(0.012)	(0.009)	(0.008)	(0.009)
Number of people in the household	−.0077**	−.0021	−.0026	.0124**	−.0201***	−.0006	.0028	.0179***
	(0.003)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)	(0.003)
Gender of the child = female	−.0015	.0064	−.0185	.0136	.0017	−.0033	.0024	−.0009
	(0.009)	(0.006)	(0.013)	(0.015)	(0.010)	(0.009)	(0.007)	(0.009)
n	3,595				6,009			

Note. Standard errors between parentheses. Coefficients for regional dummies are not reported. DC/PS = day care/preschool.
*$p < .05$. **$p < .01$. ***$p < .001$.

Another very important correlate of the demand for DC/PS centers is the age of the child. Our estimates indicate that there is evidence of heterogeneous response in the decision to send older versus younger children to DC/PS centers in Chile. Attendance is significantly more associated to education of the mother and to rurality when the child is older (25 to 54 months old). Distance to the nearest DC/PS center also seems to matter most in households of older children. Some explanations can be ventured for these results, although more research would be needed to check whether these hypotheses are correct. The fact that attendance decisions are more associated to mother's education for older children might be due to a higher salience of the educational attributes of DC/PS services for older children, as more educated mothers value more early education. Services for smaller children might be perceived to be less educative and only related to day care and, therefore, are similarly valued across educational groups. The fact that distance to the nearest DC/PS center seems to be more associated to the probability of attending of older children is more difficult to interpret. One reason might be the fact that there is a law that mandates some employers to help Chilean mothers by proving or financing child care for their 0- to 24-month-old children. But employer-provided centers are frequently located close to the mother's workplace, and not necessarily to the child's household. There is no legal mandate for Chilean employers to provide DC/PS centers for older children.

Distance from the household to the nearest the DC/PS establishment relates to the mothers' decision to send their children to these establishments and shows a variation of around 3 percentage points in the attendance rate. The measurement of this effect is relatively new to the literature as it requires georeferenced data, which only recently have begun to be collected systematically by public policy agencies. The association we find between distance and attendance to DC/PS centers is significant but smaller than that which relates attendance to the age of the child or education of the mother.

Unfortunately, we have no information on the distance between the DC/PS establishment and the *workplace* of the mother. This leads us to think that the *distance* effect estimated here is only partial. There may be a stronger association when the "mother–child distance" and not the decision to send the child to the DC/PS center are considered. This proposed "mother–child distance" variable, however, is different from the "household–child distance" variable, which is the one used in this estimation, because the mother is not necessarily at home during the day. If we had such data, we would expect, if anything, an increase in the strength of the association between distance and child attendance. It is interesting that the relationship is still showing, even considering the abovementioned drawbacks.

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Notes

1. That period's institutional circumstances are of special relevance because this study examines data gathered in 2011.
2. In Chile, calendar and academic years overlap. The Chilean academic year commences in March and ends in December.
3. Most government-funded centers were included in the database, with the exception of a small percentage of centers belonging to municipalities. Private centers were not identified either, but most children attend government-funded facilities because they are free of charge.
4. The estimates were based on the subsample of children living with their biological or adoptive mothers (a majority).
5. In fact, in the estimation of the bivariate probit, a .30 to .49 ($p < .01$) correlation was obtained between the errors of the attendance equation and the employment equation. The smallest corresponded to the estimation for the sample of older children, and the highest to that of the sample of older children.
6. Throughout this document, "effects" should be understood as the marginal effects of a variable on the probability of attending day care/preschool (DC/PS) centers or on that of the mother being employed. A marginal effect indicates how the probability varies if the variable in question is modified by one unit.
7. It should be borne in mind that according to the Bayes's rule, the joint probability P(A, E), where A = attends and E = employed breaks down into P(A/E)xP(E) or into P(E/A) xP(A), where P(A/E) and P(E/A) are conditional probabilities and P(A) and P(E) are marginal probabilities. Thus, the aforementioned table shows the marginal effects on the marginal attendance probability P(A), where P(A) = P(A/E = 1)xP(E = 1) + P(A/E = 0)xP(E = 0) and, similarly, for the employment probability P(E).
8. This relation, as well as all the ones estimated, does not imply causality. In this particular case, for instance, we cannot conclude that a larger number of DC/PS establishments near the household would lead to a greater use of them: It is possible that the relation observed occurs because in areas more willing to send children to these centers, there are more of them.

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Author Biography

Francisca Dussaillant, PhD, is the director of the Center for Public Policy at the Universidad del Desarrollo, Chile.