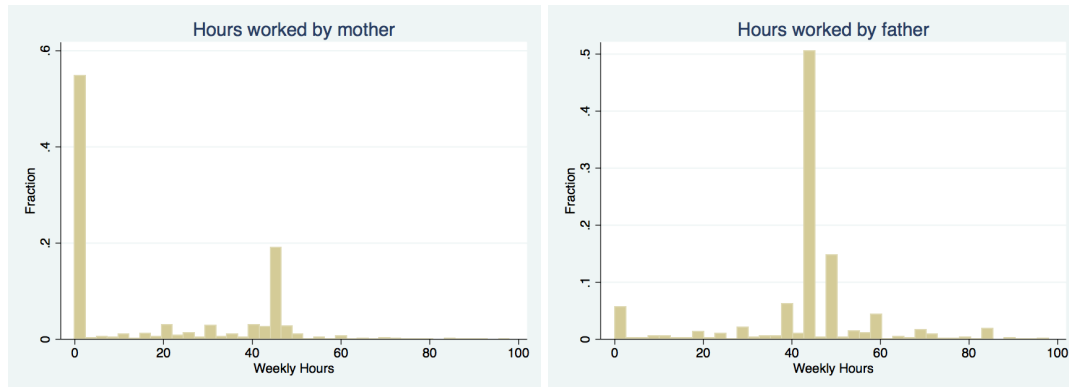# Online Appendix (Not for Publication)

A Labor force participation

Figure A.1: Distribution of work hours in Chile

I report the distribution of hours worked in Figure A.1. As can be seen, there is very little incidence of part-time work, most people work 45 hours a week or do not work at all. The information is taken from the ECLS. Similar results are found using the information from the national household survey of Chile, CASEN.

B   Solution to the model

Given the problem of the household defined in 1-20, the solution to the problem is given by the following:

$$e_2^{m,*} = \frac{\kappa_2^2(\mu_2)\theta_2\gamma_1}{(1-\mu)\alpha_{4,2}^m(1+h_2^m)}\xi_2(m)\exp\left(-\eta_{e_2^m}\right) \tag{42}$$

$$e_2^{f,*} = \frac{\kappa_2^2(\mu_2)\theta_2\gamma_0}{\mu\alpha_{4,2}^f(1+h_2^f)}\xi_2(f)\exp\left(-\eta_{e_2^f}\right) \tag{43}$$

$$I_2^* = \frac{\kappa_2^2(\mu_2)\theta_1\left(h_2^f w_2^f + h_2^m w_2^m + Y_2^f + Y_2^m + \Xi\right)}{\kappa_2^1(\mu_2) + \kappa_2^2(\mu_2)\theta_1 P_I}\exp\left(-\eta_{I_2}\right) \tag{44}$$

$$c_2^{f,*} = \max\{\frac{\alpha_{1,2}^f\mu_2 I_2}{\theta_1\kappa_2^2(\mu)},\zeta\} \tag{45}$$

$$c_2^{m,*} = \max\{\frac{\alpha_{1,2}^f\mu_2 I_2}{\theta_1\kappa_2^2(\mu)},\zeta\} \tag{46}$$

$$e_1^{m,*} = \frac{\left[\kappa_2^2(\mu_2)\theta_2 + \beta\kappa_2^2(\mu_2)\theta_2\theta_0\right]\gamma_1}{(1-\mu)\alpha_{4,2}^m(1+h_2^m)}\xi_1(m)\exp\left(-\eta_{e_1^m}\right) \tag{47}$$

$$e_1^{f,*} = \frac{\left[\kappa_1^2(\mu_1)\theta_2 + \beta\kappa_2^2(\mu_2)\theta_2\theta_0\right]\gamma_0}{\mu\alpha_{4,2}^f(1+h_2^f)}\xi_1(f)\exp\left(-\eta_{e_1^f}\right) \tag{48}$$

$$I_1^* = \frac{\left[\kappa_1^2(\mu_1)\theta_1 + \kappa_2^2(\mu_2)\theta_0\theta_1\beta\right]\left(h_2^f w_2^f + h_2^m w_2^m + Y_2^f + Y_2^m + \Xi - P_a a\right)}{\kappa_1^1(\mu_1) + \kappa_1^2(\mu_1)\theta_1 + \beta\theta_0\theta_1\kappa_2^1(\mu_2)}\exp\left(-\eta_{I_1}\right) \tag{49}$$

$$c_1^{f,*} = \max\{\frac{\alpha_{1,2}^f\mu_2 I_2}{\theta_1\kappa_1^2(\mu_1) + \beta\theta_0\theta_1\kappa_2^2(\mu_2)},\zeta\} \tag{50}$$

$$c_1^{m,*} = \max\{\frac{\alpha_{1,2}^f\mu_2 I_2}{\theta_1\kappa_1^2(\mu_1) + \beta\theta_0\theta_1\kappa_2^2(\mu_2)},\zeta\} \tag{51}$$

where

$$\xi_t(j) = \frac{\left(\gamma_j \mu \alpha^f_{4,t}(1+h^f_t)\right)^{\frac{\phi}{1-\phi}}}{\gamma_0 \left[\gamma_0(1-\mu)\alpha^m_{4,t}(1+h^m_t)\right]^{\frac{\phi}{1-\phi}} + \gamma_1 \left[\gamma_1 \mu \alpha^f_{4,t}(1+h^f_t)\right]^{\frac{\phi}{1-\phi}}} \tag{52}$$

$$\kappa^i_t(\mu) = \mu \alpha^f_{i,t} + (1-\mu)\alpha^m_{i,t} \tag{53}$$

$$\zeta = 1.0e-5 \tag{54}$$

and

$$\gamma_j = \begin{cases} \gamma_0 \text{ if } j = f \\ \gamma_1 \text{ if } j = m \end{cases} \tag{55}$$

The optimal decisions of labor supply and childcare are given by:

$$(h^{f,*}_2, h^{m,*}_2) = \max_{\{h^f_2, h^m_2\}} \mu_2 u^f_2(c^{f,*}_2(h^f_2,h^m_2), h^f_2, e^{f,*}_2(h^f_2,h^m_2), d^f_2(h^f_2,h^m_2), s_2(h^f_2,h^m_2)) +$$

$$(1-\mu_2)u^m_2(c^m_2(h^f_2,h^m_2), h^m_2(h^f_2,h^m_2), e^{m,*}_2(h^f_2,h^m_2), d^m_2(h^f_2,h^m_2), s_2(h^f_2,h^m_2)) \tag{56}$$

$$(h^{f,*}_1, h^{m,*}_1, a) = \max_{\{h^f_1, h^m_1, a\}} \mu_1 u^f_1(c^{f,*}_1(h^f_1,h^m_1,a), h^f_1, e^{f,*}_1(h^f_1,h^m_1,a)), d^f_1(h^f_1,h^m_1,a), s_1(h^f_1,h^m_1,a)) +$$

$$(1-\mu_1)u^m_1 c^m_1(h^f_1,h^m_1,a), h^m_1(h^f_1,h^m_1,a), e^{m,*}_1(h^f_1,h^m_1,a), d^m_1(h^f_1,h^m_1,a), s_1(h^f_1,h^m_1,a))$$

$$+ \beta \left[V_2(\Psi_2(h^f_1,h^m_1,a) \right] \tag{57}$$

C Measure System in the Data

Table C.1: Measures used for parental effort in 2012

Reads Children's storybooks or drawing books
Tells her fffstories
Sings to child
Takes her to parks
Takes her to cultural activities
Spends time with her chatting or drawing
Invites her to participate in household chores
Takes her to the supermarket
Shares a meal with her
Teaches the animals and their sounds
Teaches her the colors
Goes with her to visit friends or family members
Teaches her the numbers and how to count
Teaches her words

For each question parents reply how often, during the last seven days, they perform each activity.
The possible answers are: Never, 1-3 times, 4-6 times.

Table C.2: Measures used for parental effort in 2010

Reads Childre's storybooks or drawing books
Tells her stories
Sings to her
Takes her to parks
Takes her to cultural activities
Plays with her
Spends time with her talking or drawing

*: For each question the woman provides an answer between 1 to 5 with the following scale: Disagrees very much; disagrees; doesn't know; agrees; agrees very much.

Table C.3: Measures used for Investment in 2012

Reads Children's storybooks or drawing books
Tells her stories
Sings to child
Takes her to parks
Takes her to cultural activities
Spends time with her chatting or drawing
Invites her to participate in household chores
Takes her to the supermarket
Shares a meal with her
Teaches the animals and their sounds
Teaches her the colors
Goes with her to visit friends or family members
Teaches her the numbers and how to count
Teaches her words

*: The possible answers are 1: never,
2: one to two times a month;
3: one to three times a week;
4: four to six times a week;
5: once a day; 6: two or more times a day.

Table C.4: Measures used for Investment in 2010

Child has a special place to store toys
Child has at least one toy that involves muscular activity
Child has toys to pull and push
Child has at least one toy with wheels
Availability of plush toys-stuffed animals
Availability of mobiles for child
Availability of musical or literary toys
Child has three or more books of his own

*: The possible answers are 1: never
2: one to two times a month; 3: one to three times a week;
4: four to six times a week; 5: once a day;
6: two or more times a day.

Table C.5: Measures used for health at birth

Mother diagnosed with Preeclampsia during pregnancy
Mother diagnosed with Cholestasis during pregnancy
Mother diagnosed with Urinary infections during pregnancy
Mother diagnosed with Hemorrages during pregnancy
Mother diagnosed with Hipertension during pregnancy
Mother diagnosed with Placenta Previa during pregnancy
Mother diagnosed with Diabetes G during pregnancy
Mother diagnosed with Anemia during pregnancy
Mother diagnosed with Toxoplasmosis during pregnancy
Mother diagnosed with Depression during pregnancy
Mother diagnosed with Bipolar D. during pregnancy
Mother diagnosed with Anxiety D. during pregnancy
Mother diagnosed with Obsesive compulsive D. during pregnancy
Mother diagnosed with Fobia during pregnancy
Mother diagnosed with Panic D. during pregnancy
Mother diagnosed with PTSD during pregnancy
Cigarrettes consumed during pregnancy
Cigarrettes consumed during the first six months of life of child
Alcohol consumption during pregnancy*
Substance abuse during pregnancy*
Child was born pre-term
Weight at birth (grams)
Height at birth (cm)

*Possible answers are never (0), rarely (1) and often (2).

Table C.6: Measures used for Skills of primary caregiver

Child has a special place to store toys
Child has at least one toy that involves muscular activity
Child has toys to pull and push
Child has at least one toy with wheels
Availability of plush toys-stuffed animals
Availability of mobiles for child
Availability of musical or literary toys
Child has three or more books of his own

All test scores are standardized to be mean zero and variance one.

D Preschool Availability as Cost Shifter of Child Investments

In this section I provide evidence suggesting that the distance to the nearest childcare provider (*DChihldcare*) and the number of childcare providers within 5km of the household (*Dens*) can be used as shifters in the cost of childcare and monetary investments for children, respectively. I estimates the coefficients of the following equation:

$$y_i = \beta_0 + \beta_1 DChildcare_i + \beta_2 Dens_i + \beta_3 X_i + \varepsilon_i \tag{58}$$

where y_i is a given outcome and X_i is a vector including additional controls. As can be seen in the results of the estimates, in Table D.1, distance to the nearest childcare center is negatively related with preschool attendance and availability of music for children. The number of childcare providers in the neighborhood is positively related with availability of music for children, toys, and vegetable consumption. Addition-

ally, I use different measures of availability of childcare centers to the household, including centers within 1, 2, and 10km. These results are reported in Table D.2. We see that all coefficients are significant except for availability of childcare centers at 1km.

Table D.1: Cost Shifters

VARIABLES	(1) Attends preschool	(2) Music for children	(3) Toys FE	(4) Vegetable Consumption
Childcare providers	0.00	0.01**	0.01**	0.03***
	(0.01)	(0.00)	(0.01)	(0.01)
Distance to childcare	-0.01**	-0.02***	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Observations	4,827	4,827	4,827	4,827
Adjusted R-squared	0.25	0.15	0.29	0.12

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

ToysFE: Toys for free expression

Childcare providers: Number of childcare providers within 5km to the household (hundreds)

Vegetable consumption: weekly frequency. Standardized (mean 0, sd 1)

Distance to childcare: Distance to nearest childcare-preschool service provider (km)

Additional controls: grades of schooling of both parents, WAIS verbal and numerical test scores for the mother, big-five personality traits test score for the mother, age of child, number of members living in the household, age of both parents, total income, activities that parents perform with their children and other investments done by parents

Table D.2: Distance: Robustness

VARIABLES	(1) Toys FE	(2) Toys FE	(3) Toys FE	(4) Toys FE
Within 1km	1.09 (0.87)			
Within 2km		0.55** (0.28)		
Within 5km			0.12** (0.05)	
Within 10km				0.03** (0.01)
Observations	4,827	4,827	4,827	4,827
Adjusted R-squared	0.29	0.29	0.29	0.29

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Additional controls: grades of schooling of both parents, WAIS verbal and numerical test scores for the mother, big-five personality traits test score for the mother, age of child, number of members living in the household, age of both parents, total income, activities that parents perform with their children and other investments done by parents

E   Female Labor Force Participation

As mentioned before, mothers participate in the labor market , on average, for18 hours a week. The corresponding figure for fathers is 44 hours. One plausible explanation can be due to involuntary unemployment: it is harder for women to find a job offering a wage higher than their reservation wage, and because of that they do not actively participate in the labor market. However, it turns out to be the case that female unemployment in the population analyzed is low, below 5%. The main reason for observing these low levels of female participation in the labor market is due to voluntary unemployment: women with young children decide not to participate in the labor market. As can be seen in Figure E.1, this is characteristic of women across all age groups. Most of them are not working or looking for a job and 83% of them state that the main reason is that they do not do it is because they are taking care of children.

The fact that unemployment plays a small role in explaining the low levels of female activity in the labor market should guide the economic model as to how to approach the problem of deciding whether or not to work. Including frictions in the model, as is usually done in the literature in order to explain unemployment and variation in earnings for observationally equivalent agents, would complicate the model and the gains from doing so might not be significant. Because of this, I will simplify the usual decision about labor force participation, as is usually done in the neoclassical model of household behavior, where people decide whether or not to work at a given wage determined by the market.

Figure E.1: Female Labor Force Participation (%)
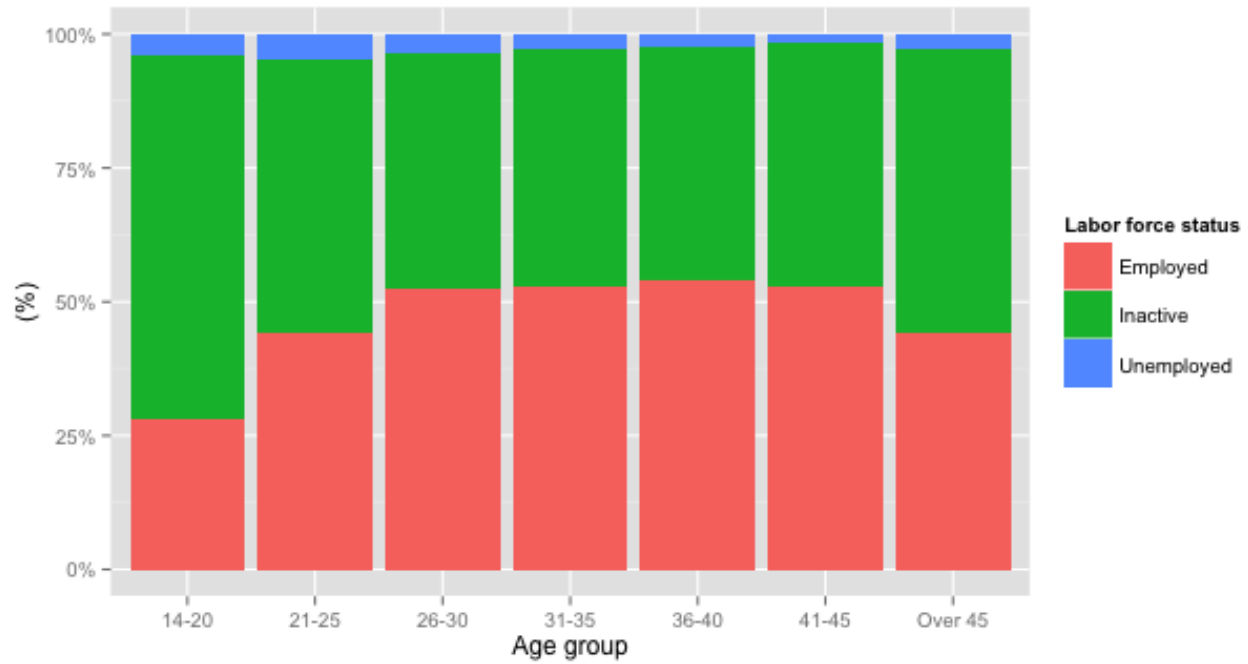
F   Parental Activities with Children

Tables 3 and 4 describe the questions asked about parents' time spent with their children. In each question, a categorial response ranging from 1-5 depending on the intensity of each activity is reported for the 2012 survey.

As shown in Figure F.1, mothers spend more time with their children, in every activity, than fathers do. This happens even when taking into account differences in labor supplies, as seen in Figures F.2. In Tables F.1 and F.2, I analyze the relationship between labor supply of both spouses and time spent with the child. In order to simplify the analysis, I construct a measure of time investment via principal component analysis and I regress the predicted factor with other covariates of the family. We observe that there is a negative correlation between time spent with the child and labor supply decisions for both fathers and mothers, in the two waves of the dataset being used, as can be seen in Tables F.1 and F.2.

Figure F.1: Weekly frequency of activities between parents and children
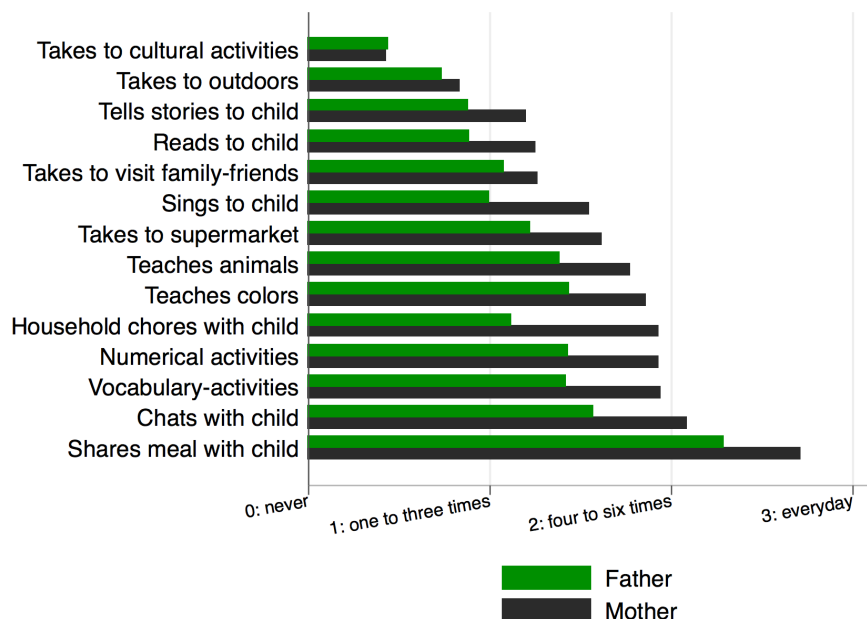
For each activity there are possible answers: 0: never, 1: one to three times a week; 2: four to six times a week; 3: everyday.

Figure F.2: Frequency of activities by parental labor supply
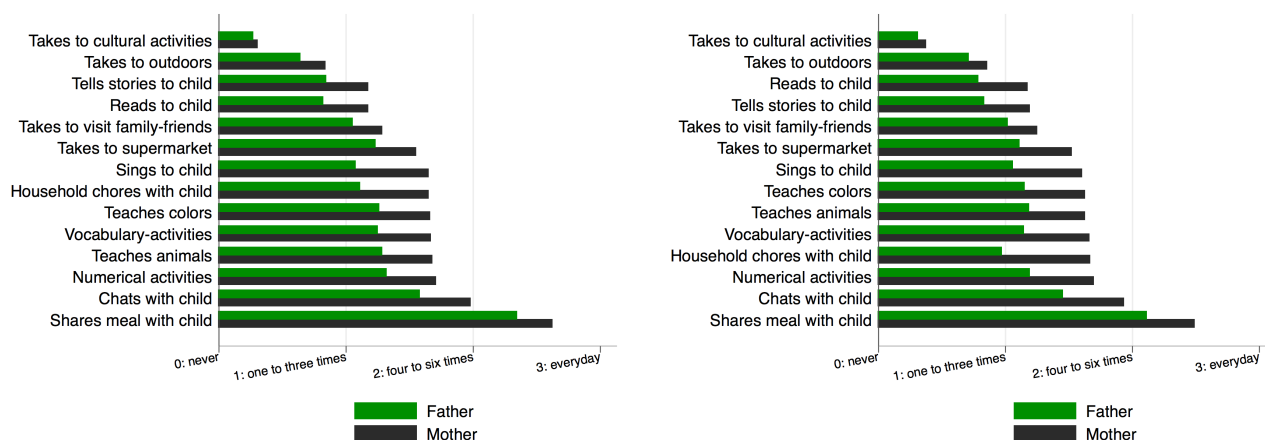
For each activity there are possible answers: 0: never, 1: one to three times a week; 2: four to six times a week; 3: everyday. The left panel corresponds to parents who do not work whereas the right panel is the corresponding figure for those parents who work.

Additionally, we observe a positive correlation between each parent's own effort and the labor supply of his/her spouse. This might be evidence of compensating behavior by parents. For example, when one parent increases his/her labor supply, that parent decreases the amount of time spent with the child and thus the other parent might react by increasing the amount of time spent interacting with the child. This compensating behavior might diminish the plausible negative impact on child development of an increase in female labor force participation.

The evidence from these regressions is complemented with the estimates of regressions in differences reported in Table F.3. The results again seem to suggest that, as members participate more in the labor market, they decrease the amount of time spent with their child, but this is compensated by an increase in the spouse's time with their child.

Table F.1: Time investments and labor supply (2010)

VARIABLES	(1) Mother's effort (2010)	(2) Father's effort (2010)
Mother: hours worked weekly	-0.00***	0.00***
	(0.00)	(0.00)
Father: hours worked weekly	0.00***	-0.00***
	(0.00)	(0.00)
Total household income	0.00	0.00***
	(0.00)	(0.00)
Age of child (months)	0.01***	0.00*
	(0.00)	(0.00)
BFI-Extraversion	0.05***	0.07***
	(0.02)	(0.02)
BFI-Kindness	0.05**	0.04*
	(0.02)	(0.02)
BFI-Responsibility	0.06***	0.05**
	(0.02)	(0.02)
BFI-Neuroticism	-0.05***	-0.02
	(0.01)	(0.02)
BFI-Openness	0.15***	0.02
	(0.02)	(0.02)
Wais-digits	0.01	0.01*
	(0.01)	(0.01)
Wais-Vocabulary	-0.00	-0.00
	(0.00)	(0.00)
Number of siblings	-0.07***	-0.06***
	(0.01)	(0.01)
Observations	7,058	7,058
Adjusted R-squared	0.07	0.04

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Additional controls include age of child, race, age of both parents and test scores of primary caregiver.

The measure of effort is constructed via Principal component analysis, extracting one factor for the variables used as measures of time investments by parents. The measures of parental effort, together with the big five personality s and the Wais cognitive assessments are all standardized to have mean zero and one standard deviation. In the regression the measure of effort is in hundreds.

Table F.2: Time investments and labor supply (2012)

VARIABLES	(1) Mother's effort (2012)	(2) Father's effort (2012)
Mother: hours worked weekly	-0.01***	0.00***
	(0.00)	(0.00)
Father: hours worked weekly	0.00	-0.01***
	(0.00)	(0.00)
Total household income	0.00	0.00
	(0.00)	(0.00)
Age of child (months)	0.01***	0.00***
	(0.00)	(0.00)
BFI-Extraversion	0.01	0.05*
	(0.03)	(0.03)
BFI-Kindness	0.06	-0.00
	(0.04)	(0.03)
BFI-Responsibility	0.11**	0.11***
	(0.04)	(0.03)
BFI-Neuroticism	-0.05	-0.04
	(0.03)	(0.03)
BFI-Openness	0.19***	0.05*
	(0.04)	(0.03)
Wais-digits	-0.02	-0.00
	(0.01)	(0.01)
Wais-Vocabulary	0.01***	0.01***
	(0.00)	(0.00)
Number of siblings	-0.09***	-0.06***
	(0.02)	(0.02)
Observations	8,020	7,956
Adjusted R-squared	0.04	0.03

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Additional controls include age of child, race, age of both parents and test scores of primary caregiver.

The measure of effort is constructed via Principal component analysis, extracting one factor for the variables used as measures of time investments by parents. The measures of parental effort, together with the big five personality test scores and the Wais cognitive assessments are all standardized to have mean zero and one standard deviation. In the regression the measure of effort is in hundreds.

Table F.3: Regressions of effort in differences

VARIABLES	(1) ΔEffort father	(2) ΔEffort mother
ΔHours worked mother	0.03***	-0.02***
	(0.01)	(0.01)
ΔHours worked father	-0.03***	0.01**
	(0.01)	(0.01)
ΔEffort mother	0.37***	
	(0.01)	
ΔEffort father		0.36***
		(0.01)
Observations	4,531	4,531
R-squared	0.14	0.15

*** p<0.01, ** p<0.05, * p<0.1.
Standard error in parentheses.

$\Delta X = X_{2012} - X_{2010}$. The measure of effort is the same used as in Table F.2 but in differences. The same controls as in Table F.2 are used.

Although labor market behavior might explain part of the differences in the time investments between mothers and fathers, there are other stories consistent with such a result. The differences might be due to preferences, as mothers find it less costly to invest time in their children, or due to differences in productivity, as the amount of time that mothers spend with their children might be more efficient in enhancing children's skills than that of fathers. Moreover, there is a possible explanation related to the fact that the utility derived from children's skills is a public good but the time investments are privately exerted. As women are relatively less empowered than men, the cost of effort exerted by women is less than the cost of effort exerted by men. This implies that, even with the same preferences and resources, women would spend more time taking care of children. In the economic model, I allow all these aforementioned factors to be a possible explanation of the differences in time investment between fathers and mothers.

G   Distribution of Childcare providers

Figure G.1 reports the distribution of institutions within a neighborhood (within 5km from household) as well as the distance to the nearest preschool provider from households.

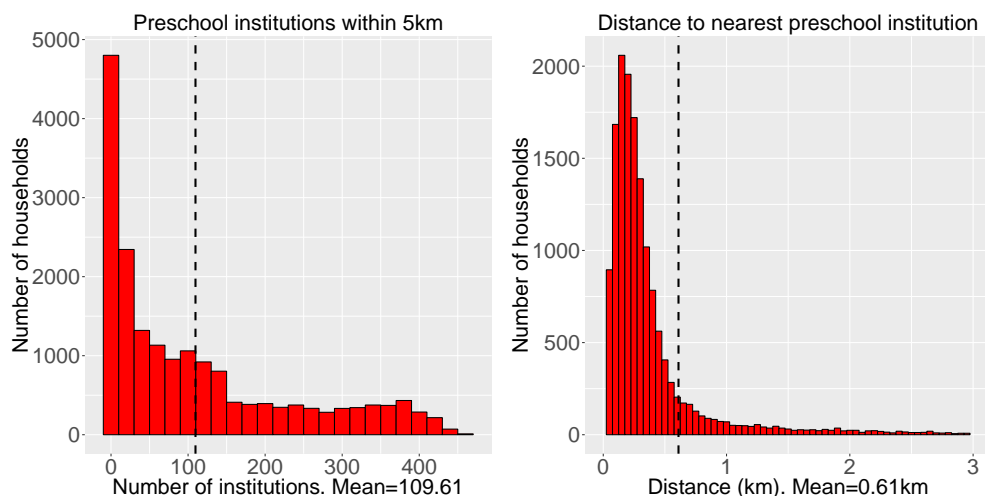Figure G.1: Information on Preschool Providers

Figure G.2 is an example of the distribution of childcare and preschool providers in the City of La Serena, Chile.

Figure G.2: Example of distribution of childcare providers. City of "La Serena", Chile

■ Public Institution

■ Private-subsidized institution

■ Private institution

H Cash Transfer Programs in Chile

The basic program through which poor families receive cash transfers from the central government is the "Unique Family Subsidy".[31] Such program established a monthly transfer of $14,340 CLP in 2012, for a

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[31]Subsidio Unico familiar in Spanish.

family in conditions of vulnerability[32] with one child.[33] The recipient of the transfer is always set to be the mother of the children who generate the transfer. In addition to be within the 40% most vulnerable, in order for the mother should be economically inactive in order to receive the transfer. However, the alternate program "Family Assignment" cash transfers of the same value for those mothers who were working, with a fadeout scheme.[34]

In 2016, the basic amount of a transfer in the programs "Unique Family subsidy" and "Family Assignments" corresponded to $10,577. When compared to the $7,170 CLP of 2012, this represents an increase of 29% in real terms. Additionally, in 2014 the government of Michelle Bachelet implemented the implemented the "Permanent Family Contribution Program". In 2016, those families who were eligible to either "Unique Family Subsidy" or "Family Assignments" were automatically eligible to be part of the "Permanent Family Contribution Program". which consisted in a transfer of $43,042 anually for each children and one for the family as a whole. Thus, a family one child would be eligible to receive $86,084 CLP.

Overall, a family of one child that was receiving transfers from the "Unique Family Subsidy" program in 2012, would see an increase in the monetary transfers from the central government equivalent to 72.8% in real terms.

I   Reduced-form Evidence

In this section, I present four facts found in the dataset that motivate the economic model developed in the next section.

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[32]The condition of vulnerability corresponds to a score below 11.734 in the Social protection card. Approximately 40% of Chilean families lie below this threshold

[33]The $14,340 CLP were generated by the mother and the child, each generating a transfer of $7,170 CLP.

[34]The transfer scheme consisted of $7,179CLP for women with monthly wages below $187,515 CLP; $5,054 CLP for women whose wages was in between $187,515 CLP and $307,863 CLP; and $1,600 CLP for women whose wages was between $307,863 CLP and $480,163.
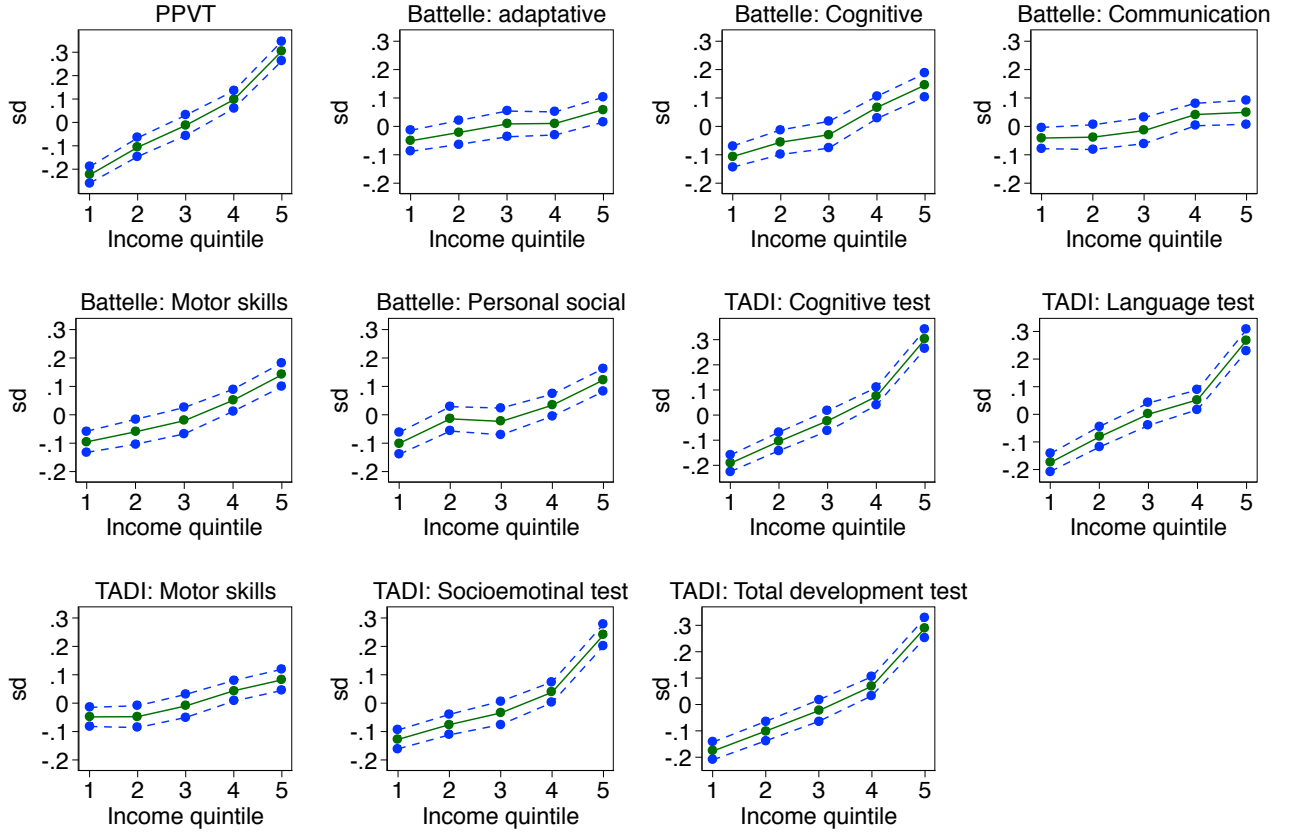
I.1 Gaps in skills emerge early in life

Figure I.1: Gaps in health at birth
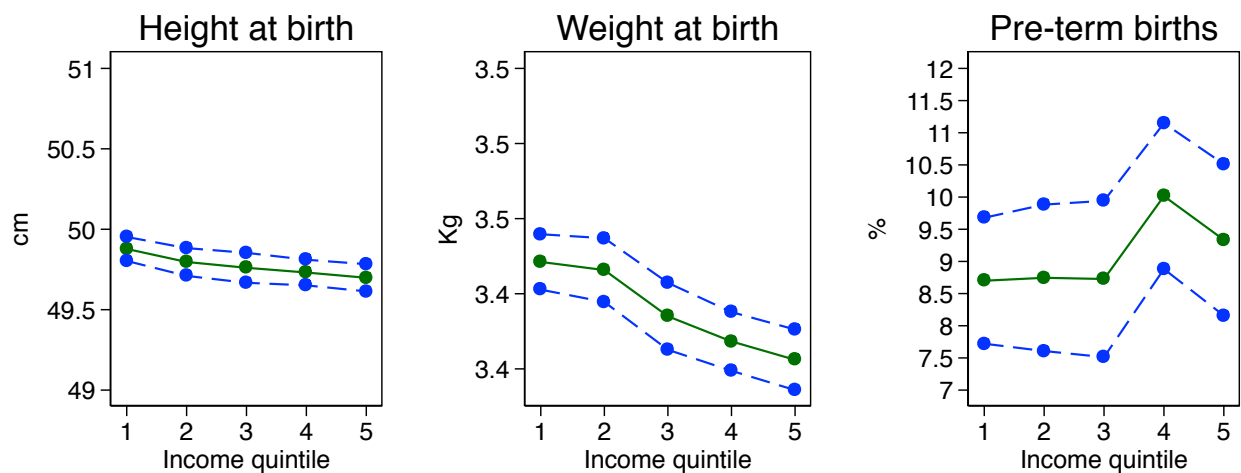
The green (solid) line is the mean score, the blue (dashed) line is the 95% confidence interval.

Figure I.2: Gaps in skills at age 5

The green (solid) line is the mean score, the blue (dashed) line is the 95% confidence interval. All test scores and parental assessments are normalized to have mean zero and variance one. PPVT stands for Peabody Picture Vocabulary Tests. Battelle is an instrument containing different scales to measures development of children. TADI is a test of learning and child development[a]. In all tests, differences between the scores of children in the lowest quintile of the income distribution is statistically different to those children who are in the highest quintile of the income distribution.

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[a]"Test de Aprendizaje y Dessarollo Infantil" in Spanish.

When analyzing height at birth, weight at birth and the incidence of pre-term births[35], for different income groups, we do not observe dramatic differences between poor and rich children, as can be seen in Figure I.1. However, we do observe differences in various dimensions of development, such as vocabulary, communication skills, motor skills and cognitive achievement, when children are five years old. This can be seen in Figure I.2. The figure reports the scores in different tests and parental assessments. All of them are standardized to be mean zero and variance one. We see, for instance, that children in the lowest income quintile score 0.1 of a standard deviation below the mean on the Battelle test score for Motor Skills, whereas children in the richest quintile score 0.15 of a standard deviation above the mean. The most dramatic case is vocabulary, where children in the lowest income quintile score 50% of a stan-

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[35]These are variables that have often been used as a measure of health at birth (Sørensen et al., 1999).

17

dard deviation below children located in the richest income quintile. This early emergence of gaps in the development of children is consistent with the literature (Schady et al., 2015; Cunha et al., 2010).

I.2 Female empowerment and child outcomes

The last point to be mentioned in the Reduced-form evidence section is the correlation between female empowerment and child outcomes. There is evidence in the literature pointing to the fact that women's empowerment is associated with better child outcomes in various contexts (Attanasio & Lechene, 2014; Thomas, Contreras, & Frankenberg, 2002).

We do observe evidence of a positive relationship between female empowerment and child outcomes. Table I.1 presents the results of various regressions showing positive correlations between child outcomes and the share of income earned by women. Even after controlling for variables such as the IQ level of the primary caregiver, total household income, grades of schooling of both parents and their ages, we observe a positive relationship between the share of the total household income earned by mothers and children's outcomes.

When analyzing the responses to the female empowerment questionnaires, we also observe a positive relationship between female empowerment and investments in children. In Table I.2, some regressions of child investments and female empowerment are presented. I show again that, even after controlling for the same variables as mentioned before, those households where women are relatively less empowered make fewer investments in their children. Those households where the woman manages the income are more likely to have toys for the development of children, and the frequency of consumption of fruits and vegetables is higher whereas that of bread is smaller. Similarly, households that are more accepting of the opinion that women should not work and should exclusively take care of their children are more likely to have the children sharing their bed with someone else, which might be an indicator of lower investments in children.

The results of these regressions cannot be interpreted as incorruptible evidence of a causal relationship between female empowerment and child outcomes. Nonetheless, they suggest that there are either some unobservables that are not captured in the regressions, which are also correlated with female empowerment, and which positively affect child outcomes, or that it is indeed female empowerment that improves the conditions of children in the households. In order to incorporate such findings in the economic model, I allow parents to have different preferences regarding leisure, consumption, and skills of children, among other preferences, so that we can understand whether the relationship between female empowerment and child outcomes arises from such patterns or either due to unobserved heterogeneity.

Table I.1: Child outcomes in 2012 and share of income earned by women

VARIABLES	(1) Motor skills 2 (B3)	(2) Cognitive test (B5)	(3) Batelle Total
Mother's income share	0.09*	0.09*	0.10**
	(0.05)	(0.05)	(0.05)
Total household income	0.00	0.00**	0.00**
	(0.00)	(0.00)	(0.00)
Mother's years of schooling	0.01**	0.02***	0.03***
	(0.01)	(0.01)	(0.01)
Father's years of schooling	0.02***	0.01**	0.02***
	(0.01)	(0.01)	(0.00)
Number of siblings	0.02	-0.00	-0.03*
	(0.01)	(0.01)	(0.01)
Age of child (months)	0.00***	0.00***	0.01***
	(0.00)	(0.00)	(0.00)
BFI-Extraversion	0.06***	0.04**	0.04***
	(0.02)	(0.02)	(0.02)
BFI-Kindness	-0.00	0.09***	0.02
	(0.02)	(0.02)	(0.02)
BFI-Responsibility	0.10***	0.08***	0.07***
	(0.02)	(0.02)	(0.02)
BFI-Neuroticism	-0.02	-0.03*	-0.01
	(0.02)	(0.02)	(0.02)
BFI-Openness	0.07***	0.03	0.03
	(0.02)	(0.02)	(0.02)
Wais-digits	0.01	0.01	0.02***
	(0.01)	(0.01)	(0.01)
Wais-Vocabulary	0.00	0.00***	0.00***
	(0.00)	(0.00)	(0.00)
Observations	6,823	6,823	6,822
Adjusted R-squared	0.03	0.05	0.08

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Additional controlsi include age of child, race, age of both parents, test scores of primary caregiver and number of siblings. +: lower scores indicate lower incidence of behavioral problems.

Table I.2: Female empowerment and Child outcomes

VARIABLES	(1) Toys for development	(2) Fruits and vegetables	(3) People sharing bedroom with child
Total household income	0.00***	0.00	-0.00***
	(0.00)	(0.00)	(0.00)
Mother's years of schooling	0.01***	0.01**	-0.03***
	(0.00)	(0.01)	(0.00)
Father's years of schooling	0.01***	0.01**	-0.02***
	(0.00)	(0.00)	(0.00)
Number of siblings	0.00	0.04**	0.08***
	(0.01)	(0.01)	(0.01)
People in household	-0.01**	0.01	0.13***
	(0.01)	(0.01)	(0.01)
Woman administers+	0.03**	0.09***	-0.00
	(0.01)	(0.02)	(0.02)
Gender roles -Woman++	-0.01	-0.03**	0.02*
	(0.01)	(0.01)	(0.01)
Gender roles - Man++	-0.01	-0.05*	0.06**
	(0.01)	(0.03)	(0.02)
Observations	6,344	8,245	8,246
Adjusted R-squared	0.04	0.03	0.19

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Consumption of bread, fruits and vegetables and cookies and candies is related to the frequency of consumption of this food on a weekly basis. More details can be found in Table C.3. + dummy variable indicating whether the mother is the person in charge of administering the resources of the household (1) or no (0). ++ opinion of gender roles according to the man and the woman. A value of one indicates that the person agrees with the sentence "Women should not work and should only take care of children".

J Smoothing distribution

The smoothing distribution is useful if we are interested in making inference about the state of the unobserved factors. In this case, it is particularly interesting to make inference about the skills of children. The following procedure describes how to use the information provided in the model and in the data in order to derive the smoothing distribution of the unobserved latent factors. This procedure is adapted from Klaas et al. (2006):

I use as main input for this file the article "Fast Particle Smoothing: If I had a Million Particles". I translate the notation in the one used in the paper. Define $O_{0:t} = \{O_0, O_1..., O_t\}$. Let f be a generic probability density function. Then, the smoothed density is:

$$f(K_t|O_{0:2}) \tag{59}$$

where we basically condition on all the measures we have. Note that we can write Equation 59 as:

$$f(K_t|O_{0:2}) = f(K_t|O_{0:t}) \int \left(\frac{f(K_{t+1}|O_{0:2})f(K_{t+1})}{\int f(K_{t+1})f(K_1|O_{0:t})dK_t} \right) dK_{t+1} \tag{60}$$

And then we can approximate this distribution $\hat{f}(K_t|O_{0:2})$ by getting $rr = 1..RR$ draws according to:

$$\hat{f}(K_t|O_{0:2}) = \sum_{rr=1}^{RR} w_{t|T}^{(rr)} \delta_{K_t^{(rr)}}(K_t) \tag{61}$$

where $\delta_{K_t^{(rr)}}(K_t)$ is the Dirac distribution and

$$w_{t|T}^{(mm)} = w_t^{(mm)} \left[\sum_{rr=1}^{RR} w_{t+1|T}^{(rr)} \left(\frac{f\left(K_{t+1}^{(rr)}|K_t^{(mm)}\right)}{\sum_{kk=1}^{KK} w_t^{(kk)} f\left(K_{t+1}^{(rr)}|K_t^{(kk)}\right)} \right) \right] \tag{62}$$

where $w_{T|T} = w_T$

Smoothing algorithm

1. For t=0,1,2 perform the particle filtering to obtain $\{K_t^{rr}, w_t^{rr}\}_{rr=1}^{RR}$

2. Set $w_{2|2}^{rr} = w_2^{rr}$ for $rr = 1...RR$

3. For t=1,0 define $w_{t|2}^{(mm)} = w_t^{(mm)} \left[\sum_{rr=1}^{RR} w_{t+1|2}^{(rr)} \left(\frac{f\left(K_{t+1}^{(rr)}|K_t^{(mm)}\right)}{\sum_{kk=1}^{KK} w_t^{(kk)} f\left(K_{t+1}^{(rr)}|K_t^{(kk)}\right)} \right) \right]$

Figure J.1: Smoothing Distribution of Skills According to Household's Income Percentile
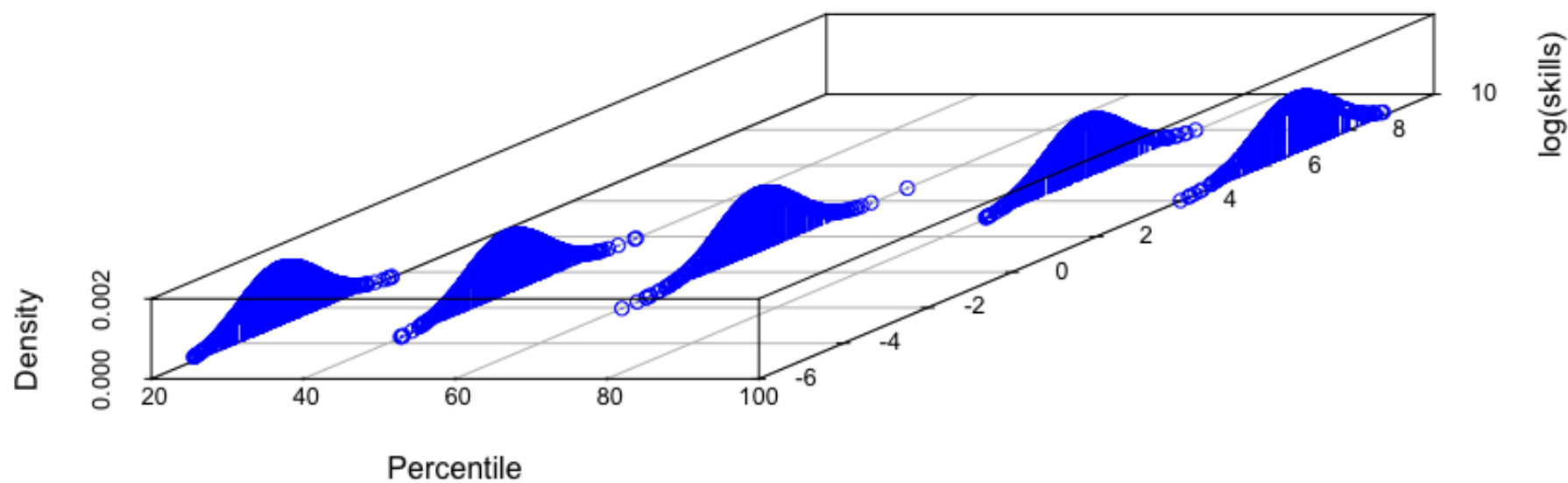
The distribution of $log(skills)$ is plotted for representative households. Households located in the 20th, 40th, 60th, 80th and 100th percentile of total household income. The smoothed distribution of all the households is presented in Figure 2

K Signal to Nose ratio

Table K.1: Maternal effort 2012

Measure	Signal (%)
Teaches her words	95.94
numerical activities	95.73
Teaches colors	35.58
Teaches animals and their sounds	32.52
chatting or drawing	13.67
household chores	12.41
Sings to child	10.32
supermarket	9.24
Visit friends-family	8.93
Reads to child	7.28
Shares a meal	7.07
Tells her stories	6.47
Takes her to parks	3.85
Takes her to museums-zoo-park	2.56

Table K.2: Paternal effort 2012

Measure	Signal (%)
Teaches her words	96.94
numerical activities	96.78
Teaches colors	42.59
Teaches animals and their sounds	39.29
chatting or drawing	17.53
household chores	15.99
Sings to child	13.39
supermarket	12.02
Visit friends-family	11.64
Reads to child	9.54
Shares a meal	9.27
Tells her stories	8.50
Takes her to parks	5.10
Takes her to museums-zoo-park	3.41

Table K.3: Maternal effort 2010

Measure	Signal (%)
Spends time with her talking or drawing	66.43
Plays with her	30.33
Sings to her	20.86
Reads Childre's storybooks or drawing books	19.01
Tells her stories	14.37
Takes her to parks, museums, zoos, libraries or other cultural activities	13.96

Table K.4: Paternal effort 2010

Measure	Signal (%)
Spends time with her talking or drawing	72.66
Plays with her	36.90
Sings to her	26.14
Reads Childre's storybooks or drawing books	23.97
Tells her stories	18.40
Takes her to parks, museums, zoos, libraries or other cultural activities	17.89

Table K.5: Investments 2010

Measure	Signal (%)
Child has at least one toy that involves muscular activity	83.50
Child has at least one toy with wheels	75.78
Child has toys to pull and push	72.95
Child has a special place where to store toys and belongings	49.40
Availability of musical or literary toys	38.25
Availability of plush toys-stuffed animals	32.57
Child has three or more books of his own	19.19
Availability of mobiles for child	9.98

Table K.6: Investments 2012

Measure	Signal (%)
There are two or more toys in the household that can help with learning numbers	99.98
There are two or more toys for free expression or impersonations such as tools and customs	99.97
Child has three or more puzzles	26.37
At first sight, there is very little evidence that there is a child living in the household	24.39
There are two or more toys in the household where child can learn colors, sizes and shapes	20.76
There are at least ten books for adults	18.49
There is a music device where child can listen children's music	16.27
There are at least ten children's books available in the house	4.35
Number of people with whom child shares bed	1.40
Number of people with whom child shares room	1.26
Consumption of juice*	1.25
Consumption of milk*	0.53
Consumption of fruits and vegetables*	0.34
Consumption of Chocolate-Candy*	0.26
Consumption of legumes*	0.22
Consumption of cookies*	0.19
Consumption of Fish-Beef-Chicken*	0.16
Consumption of water*	0.10
Consumption of hamburger-pizza-fries*	0.04
Consumption of bread-rice-pasta	0.00
Consumption of snacks in bags*	0.00

*: The possible answers are 1: never, 2: one to two times a month; 3: one to three times a week;
4: four to six times a week; 5: once a day; 6: two or more times a day.

Table K.7: Health at birth

Measure	Signal (%)
Cigarrettes consumed during pregnancy	100.00
Substance abuse during pregnancy*	100.00
Alcohol consumption during pregnancy*	99.98
Cigarrettes consumed during the first six months of life of child	99.97
Mother diagnosed with Depression during pregnancy	98.68
Mother diagnosed with Obsesive compulsive D. during pregnancy	98.13
Mother diagnosed with Fobia during pregnancy	97.07
Mother diagnosed with Hemorrages during pregnancy	94.94
Mother diagnosed with Toxoplasmosis during pregnancy	94.26
Mother diagnosed with Preeclampsia during pregnancy	94.17
Mother diagnosed with Placenta Previa during pregnancy	93.93
Mother diagnosed with Cholestasis during pregnancy	93.43
Child was born pre-term	91.73
Mother diagnosed with Anemia during pregnancy	88.98
Mother diagnosed with Anxiety D. during pregnancy	86.66
Mother diagnosed with Urinary infections during pregnancy	83.93
Mother diagnosed with Panic D. during pregnancy	82.63
Mother diagnosed with PTSD during pregnancy	82.33
Mother diagnosed with Hipertension during pregnancy	76.81
Mother diagnosed with Bipolar D. during pregnancy	71.58
Mother diagnosed with Diabetes G during pregnancy	68.55
Weight at birth (grams)	13.80
Height at birth (cm)	1.81

*Possible answers are never (0), rarely (1) and often (2).

Table K.8: Skills 2010

Measure	Signal (%)
CBCL-Aggressive behavior	99.84
CBCL-Emotional intelligence	9.66
CBCL-Attention deficit	7.13
CBCL-anxiety -depression	6.34
CBCL-Isolation	3.83
CBCL-Sleeping disorder	2.90
CBCL-somatic complaints	2.33
TEPSI-Coordination subdomain	0.67
TEPSI-Language subdomain	0.41
TEPSI-Motor skills subdomain	0.31

Table K.9: Skills 2012

Measure	Signal (%)
Battelle-Cognitive	52.09
Battelle-Motor	50.07
Battelle-Comunication	44.71
Tadi-Language	42.30
Tadi-Cognitive	37.89
Tadi-Socioemotional	36.73
Battelle-Personal-Social	32.98
Tadi-Motor	30.89
Battelle-Adaptative	29.45
PPVT-Vocabulary	27.63

Table K.10: Pareto weight

Measure	Signal (%)
Women should work full time and delegate childcare to a third party	81.27
Men are the best suited to take care of children	81.14
Women should take care of chidlren and work part time	44.08
Both, father and mother, decide how to spend income	34.80
Mothers should take care of children	32.66
Women's only activity should be taking care of children	29.47
Father decides how to spend income	12.05
A woman who is in charge of most part of tasks of the household has no time to work*	5.77
Fathers should take care of chidlren	5.75
After having children, the best for a woman is to develop her carreer*	2.23
If my spouse earned enough there is no reason for me to work*	1.85
Having a payed job is very important in life*	1.36
Fathers time is as important as mothers time for child development*	1.12
Both spouses should contribute to household income*	0.98
Mother decides how to spend income	0.76
Men should go to work and women should stay home*	0.62
It is better to have a bad marriage than to remain single*	0.11
Men should participate in household chores more actively than they actually do*	0.03
Having a payed job is the best way for a woman to become independent*	0.03

*: For each question the woman provides an answer between 1 to 5 with the following scale:
Disagrees very much; disagrees; doesn't know; agrees; agrees very much.

Table K.11: Skills of primary caregiver

| Measure	Signal (%)
BFI-Openness	23.60
BFI-Extroversion	22.94
BFI-Neuroticism	21.76
WAIS-Vocabulary test	18.70
BFI-Conscientiousness	17.24
BFI-Agreeableness	12.73
WAIS-Numerical test	10.71

L   Bootstrap model fit

The model fit presented in the main body of the paper is done by setting all the shock levels equal to their mean value. Alternatively, a model fit can be reported by getting the corresponding draws from the distribution of the shocks. In this subsection, I report the results of the model fit when, rather than setting the shocks at their mean values, I draw from their distribution. This allows me to obtain a distribution of the relevant variables for the model fit. Figure L.1 I report the bootstrap fit of labor force participation for women and men in 2012. Figure L.2 reports the corresponding distribution for childcare demand. As can be seen from both figures, in the case of the bootstrap fit, the model does a good job fitting the observed levels.

Figure L.1: Bootstrap fit: Parents' Labor Force Participation in 2012
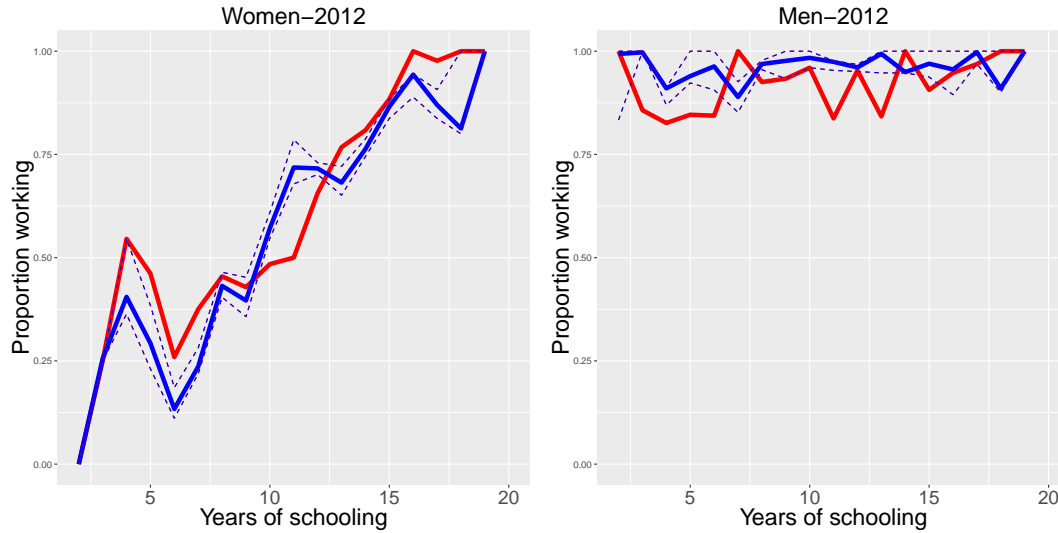
Dashed lines represent the 95% confidence interval

Figure L.2: Bootstrap fit: Childcare decisions (%)
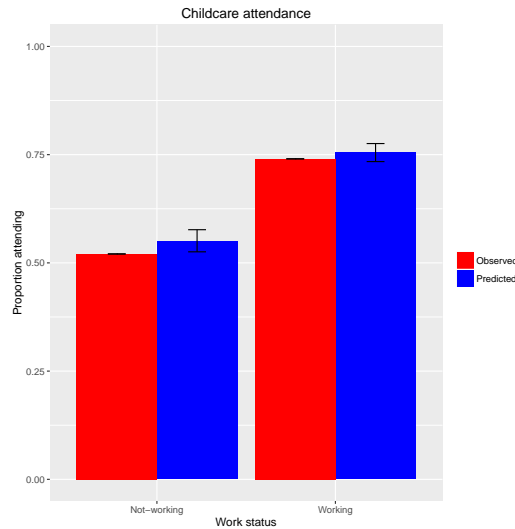
Brackets include the 95% confidence interval

M   Child Investments and Bargaining Power

As shown in the Reduced-form evidence, women spend more time with their children even when controlling for labor supply. This, together with the evidence that cash in the hands of women translates into better child outcomes than cash in the hands of men, is often used as evidence that women have stronger preferences for children and thus monetary transfers should be given to women if the objective is to invest more in children. Nonetheless, this evidence is explained by several other factors.

First of all, mothers' time seems to be more productive than fathers' time, as shown by the estimation results of the model. Additionally, mothers have stronger preferences for children and the utility penalty

of time investments is lower for mothers than for fathers. However, in addition to these facts, the relative empowerment of each member distorts time decisions, which explains part of the differences in time investments. Given that both parents are making investments in a public good (skills of their child) and that effort is costly and privately exerted, the fact that women spend more time with children is also a consequence of their relative disempowerment in the household rather than simply a result of different preferences.[36]

The allocation of time investments is a result of maximizing the household's welfare, which includes the skills of children, taking into account the utility penalty of time investments. The time cost of each member is not equally weighted, it depends on the relative empowerment of each household member. If the mother is relatively less empowered, the cost of her time is lower than that of the father. This difference in empowerment levels distorts the cost of providing effort and implies inefficiencies in the allocation of resources for children. Put it differently, with the same amount of total effort being provided, we can find an alternative allocation of time investments that would make the child better off.

Consider the centralized problem of choosing the effort levels for the second period in order to maximize the skills of children -taking all other inputs as fixed- subject to the fact that the total amount of effort exerted should not exceed the total amount of effort found in the problem of the household described in 42-43. We are basically asking whether or not it is possible to find an alternative allocation of time that would make children better off, whitout modifying the total amount of effort exerted by both parents. The problem is formally defined as:

$$\max_{e^f, e^m} s_2(e^f, e^m, .) \text{ subject to } e^f + e^m = e^{f,*} + e^{m,*} \tag{63}$$

where $e^{j,*}$ is the optimal solution to the maximization of the household welfare problem described in Equation 6. Define the solution to the problem in 63 as $\left(e^{f,c_1}, e^{m,c_1}\right)$.

Similarly, we can define an alternate centralized problem where we maximize skills subject to the fact that the total time-cost exerted in the production of skills should not exceed that found in the household's problem. Formally:

$$\max_{e^f, e^m} s_2(e^f, e^m, .) \text{ subject to } c\left(e^f\right) + c\left(e^m\right) = c\left(e^{f,*}\right) + c\left(e^{m,*}\right) \tag{64}$$

where the cost of effort is given by $c^j(e^j) = \alpha_{4,2}^j e^j (1 + h^j)$. I call the solution to 64 $\left(e^{f,c_2}, e^{m,c_2}\right)$. In both cases, for $l = 1, 2$, we do find that:

$$\frac{\left(\frac{e^{f,c_l}}{e^{m,c_l}}\right)}{\left(\frac{e^{f,*}}{e^{m,*}}\right)} \propto \left[\frac{(1-\mu)}{\mu}\right]^{\phi/(1-\phi)} \tag{65}$$

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[36] Doepke and Tertilt (2014) develop a non-cooperative model of household behavior to answer the question of how female empowerment might promote economic development. The authors argue that the reason to develop a non-cooperative model of household behavior lies in the fact that the only mechanism capable of generating differences in investments in children in a collective approach would be that of preferences. However, in this paper I present a collective model of household behavior where differences in investment can arise for a variety of reasons other than preferences.

The difference of ratios of effort in the centralized solutions and in the household problem depends on the Pareto weight and the degree of substitutability between parental efforts. If the Pareto weight heavily favors one member, and if there is some degree of substitutability between parental effort, there would be an inefficient allocation in time investments given that we can find an alternative allocation with the same amount of cost, or the same amount of total effort, that will yield better child outcomes. I find that this mechanism explains 15% of the differences in time investments between mothers and fathers.

It is often argued in the literature that, in a collective model of household behavior, observing different child outcomes when there is a shift in the bargaining power can only be explained by differences in preferences or productivities between parents (Doepke & Tertilt, 2014). Nonetheless, if we take into account that child skills are a public good produced with effort, the cost of which is privately exerted, shifts into bargaining power can translate in changes in child skills even when parents are identical in terms of preferences and productivities.

This result can be interpreted as an additional argument for female empowerment within households, not invoking an argument of equality but one of efficiency: disparities in bargaining power lead to inefficient allocations within the household. Taking this into account, and with the estimates of the economic model, we can quantify the extent to which the differences observed in time spent with children are due to productivity, preferences or empowerment differences.