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Early childhood in LAC: gender gaps in developmental indicators and in upbinging practices

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Abstract

This study explores gender gaps in early childhood cognitive development and examines the influence of gendered parenting practices in select Latin American and Caribbean (LAC) countries, including the Dominican Republic, Chile, Uruguay, Ecuador, Colombia, and Nicaragua. Through an analysis of self-collected and survey data, we provide a descriptive examination of cognitive performance in boys and girls during early childhood, revealing that girls generally exhibit better cognitive abilities across all domains. Additionally, we employ the Home Observation for Measurement of the Environment (HOME) inventory to investigate how parents engage in gendered parenting practices. Our findings demonstrate that parents provide different play and learning materials based on their child's gender and encourage gender-stereotyped behaviors. Our analysis underscores the importance of utilizing flexible and detailed instruments to measure parental investments, as it enables capturing gender heterogeneity that would otherwise be overlooked but is significant in explaining gender gaps in skills development.

Furthermore, we conduct Oaxaca decompositions for the Dominican Republic, Colombia, and Nicaragua, revealing that although parents invest less in girls, they compensate for this with higher returns on those investments.

This study highlights the need to address gendered parenting practices and their impact on early childhood cognitive development. By recognizing and challenging traditional gender roles, and promoting a more gender-neutral upbringing, we can strive towards reducing gender disparities and fostering equal opportunities for children of all genders.

Keywords: LAC, early childhood, cognitive development, HOME, Oaxaca decomposition

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1 Introduction

Early childhood is a critical phase of development, where parents play a significant role as the primary socialization agents for their children. However, parental influences are not neutral when it comes to their children's gender and how they are raised. Traditional gender roles often become reinforced, with boys being encouraged to be independent and engage in physically active games, while girls are directed towards social role-playing games imitating domestic tasks. Harsher discipline and less encouragement for sensitivity are generally experienced by boys, while the materials and toys provided to children often align with specific genders. These gender-differentiated investments by parents during early childhood are considered the primary factor contributing to the comparative advantage girls develop in non-STEM fields (Chuan et al. (2022)). However, it is challenging to empirically study this phenomenon due to the issue of reverse causality—parents may treat and provide differently for their children based on their gender because the children themselves behave differently from the start.

Despite some progress in recent years, the Latin American and Caribbean (LAC) region lags behind other economies in terms of educational outcomes. All countries in the region score below the OECD average in all disciplines, with Chile performing the best and the Dominican Republic ranking the lowest (Di Gropello et al. (2019)). Gender disparities also persist, although they are lower than the OECD average in LAC countries. In some countries, the gender gap is widening due to improvements in boys' performance while girls' performance remains stagnant (OECD (2019b), OECD (2019a)).

This paper aims to document gender differences in cognitive development during early childhood in a selection of LAC countries, including the Dominican Republic, Chile, Uruguay, Ecuador, Nicaragua, and Colombia. Furthermore, it aims to establish a connection between these gender gaps and gendered parenting practices. To achieve this objective, our study adopts a multi-dimensional approach. Firstly, we will review existing literature on gender differences in cognitive development and gendered parenting practices, drawing from various fields such as psychology, economics, and others. By synthesizing available knowledge, we intend to identify theoretical frameworks and key research findings that will guide our investigation.

Secondly, we will conduct a descriptive analysis of gender gaps in different measures of cognitive ability in the aforementioned countries. Additionally, we will employ Oaxaca decompositions to determine whether these gaps primarily arise from differences in parental investments or differences in the returns on these investments. A significant contribution of this paper lies in the utilization of the Home Observation for Measurement of the Environment (HOME) inventory—an established tool for assessing the quality of the home environment and parental involvement. By analyzing the HOME inventory data from households in the Dominican Republic and survey data from Chile, we will gain valuable insights into specific gendered parenting practices and their relationship with children's cognitive development.

This study anticipates contributing to the existing literature on gender differences in early cognitive development by providing evidence that girls generally outperform boys in all cognitive domains. Furthermore, we emphasize the importance of conducting a detailed analysis of the home environment using more flexible instruments that allow for capturing finer gender heterogeneity. By shedding light on the intricate interplay between gendered parenting practices and cognitive development, we aim to enhance our understanding of the factors influencing gender disparities during early childhood.

2 Literature review

The discussion about gender gaps in returns to different family environments is motivated by, among others, the papers by Bertrand and Pan (2013) and Figlio et al. (2019).

Bertrand and Pan (2013) document gender gaps in externalizing behaviors, internalizing problems, self-control, approaches to learning, and interpersonal skills. They claim that there are two possible explanations behind these gender gaps. The first one is the home environment. In this regard, they find that boys have a special disadvantage when they are raised by a single mother in low SES households because these mothers invest less in their sons compared to their daughters. However, they find that boys are more responsive to investments than girls, but that the higher returns don't compensate for the lower levels of parental input. The second explanation is the school environment, but in this case, there are no significant gender differences.

Figlio et al. (2019) use as identification strategy that the gender gap in behavioral and academic outcomes is orthogonal to the family type they are raised in. Based on this, they estimate gender differences in returns by running a linear regression including the interaction between the gender dummy and the family disadvantage dummy as the main explanatory variable. They find that boys are disproportionately affected by being raised in disadvantaged families.

2.1 Cognitive development in early childhood

García et al. (2018) find that boys have greater vulnerability to adverse socio-economic circumstances than girls. Treatment effects are larger for girls because they grow up in poorer environments than boys, so there is greater scope for improvement for them.

Palejwala and Fine (2015) find that girls aged 2 to 7 demonstrated higher general intelligence, using the Wechsler Primary and Preschool Scale of Intelligence in a sample of American children. In the literature review section, the authors claim that the research on gender differences in general intelligence in early childhood points out either no difference or a female advantage. Much of the literature they review includes only children that are at least 5 years old.

Von Stumm and Plomin (2015) study the relationship between SES and IQ, paying attention to gender differences. The age range of their sample is from 2 to 16 years old. They find that at early ages, girls outperform boys by far, but girls' IQ declines with age, whereas the relationship for boys is inverse U-shaped. Therefore, at later ages boys outperform girls. They don't find gender differences in the relationship between IQ and SES.

Toivainen et al. (2017) study sex differences in verbal and non-verbal abilities in the same sample than the study above-mentioned. They find that females scored significantly higher than males on both verbal and non-verbal abilities at ages 2, 3, and 4. Males scored significantly higher than females on verbal ability at ages 10 and 12.

Masnjak (2017) finds in a small sample of Croatian pre-schoolers that girls have better socio-emotional skills than boys and that boys are more physically active than girls. The average age in the sample was 5.5 years old.

Kent and Pitsia (2018) talks about a program in Ireland (Preparing for Life) targeted to children up to year 5. They assess the cognitive development of boys and girls and find that girls outperform boys in a wide range of areas measured by the British Ability Scales.

Nakajima et al. (2020) analyze gender gaps in early childhood in the rural population in Indonesia, using data from the Indonesia Early Childhood Education and Development Project, for children aged 8 and below. They find that girls outperform boys in all measures of language, mathematics, and social competence and maturity. They perform an Oaxaca decomposition to see which part of the gender gap can be explained by differences in early schooling

and in parental practices. For cognitive skills (language and maths) early schooling mattered the most, whereas for social competencies parenting practices were more important.

Kuchirko et al. (2021) examines the influence of sibling presence and gender composition on the trajectory of early gender-typed behavior and appearance in children from age 2 through 6 in a diverse sample of Dominican Americans, African Americans, and Mexican Americans from low-income households in New York City. Results found that children without older siblings spent more time playing with counterstereotypical toys than children with older siblings. Further, children with at least one other-gender sibling played more frequently with counterstereotypical toys compared with children with only same-gender siblings.

Peyre et al. (2019) use French data to assess gender differences in language and fine and gross motor skills in children aged 2-6 years old. Differences were found in language and fine motor skills, but not in gross motor skills, even after adjusting for environmental factors.

Barnett et al. (2016) make a systematic review of the literature on correlates of gross motor competence. Among other factors, they find that gender (males) correlates with gross motor skills. The age range of the studies they review is 3-18 years old.

Chaplin and Aldao (2013) make a meta-analytic revision of the literature on gender differences in emotion expression. For younger children, results show that boys exhibit more externalizing emotions, but nothing for positive emotions. They claim that gender differences in emotional expression increase with age.

Buczyłowska et al. (2019) find sex differences favoring girls until age 4 in the performance of the Snijders-Oomen Nonverbal Intelligence Test for Children in a sample of Dutch and German children. As children grow older, gender differences vanish or even reverse for some of the sub-scales of the test.

Maguire et al. (2016) analyzes social and emotional development in early childhood (children are between 4 and 6 years old), accounting for gender differences. They find that girls showed better emotional recognition, emotional regulation, and competent emotional expression. Girls also showed more prosocial behavior. Boys experienced more conduct problems and greater levels of hyperactivity.

Drachler et al. (2007) apply the Denver test in a community-based survey of 3389 under-5-year-olds in Porto Alegre, Brazil. They find that the total developmental score is consistently higher for girls than for boys, and the gap increases with age.

Chapple and Johnson (2007) use children data from the NLSY-79, when they are 2-3 y.o. when they are 10-11 y.o. and when they are 12-13 y.o. They find that girls score higher in motor skills, which is the only variable that is measured when children are small enough to match our sample.

Lung et al. (2011) analyze gender differences in development in the Taiwan Birth Cohort Study (TBCS) for children aged 6-60 months. The study found that there were no gender differences in the gross motor domain. In the Fine motor dimension, gender had an effect at 36 and 60 months, language dimension at 36 months, and social dimension at 18, 36 and 60 months of age.

Richter and Janson (2007) assess the validation of the Norwegian version of the ASQ questionnaire in a sample of children aged 4-60 months. They find that girls score higher than boys in all areas (communication, problem-solving, personal-social and fine motor) except for gross motor functions where no gender difference could be detected.

Lung et al. (2009) use the Bayley language sub-test to evaluate the language development of a sample of Taiwanese children aged 6-36 months. They find that boys have a steadier development trajectory compared to girls, mainly driven by the fact that girls develop faster in the language domain.

Celikkiran et al. (2015) analyze the prevalence of developmental problems in a sample of infants (1-48 months old) in Istanbul, using the Denver test. They find that boys are more likely to present developmental abnormalities,

specially at ages between 2 and 4 years old.

Moroni et al. (2019) use the Millennium Cohort Study (ages 6-11 years old) to assess how parental inputs (sensitive parenting style, routines parenting style, time investment, family income, mother's cognitive skills and mother's mental health) affect the development of socio-emotional and cognitive skills. They show that for this sample, girls perform in general better than boys in all domains: they have better cognitive skills (except maths), and they are less likely to have emotional, peer, conduct or hyperactivity issues.

2.2 Gender differences in parental investments

The evidence for gender differences in parental investments are very mixed depending on whether the papers focus on quantity, quality or types of investments.

Baker and Milligan (2016) find that parents devote more time to girls than to boys, starting at very young ages, in activities that are closely connected to cognitive development, such as reading, telling stories, singing songs, drawing, and teaching new words and letters, which are activities that can be regarded as promoters of cognitive development. Their evidence comes from the US, the UK, and Canada.

In countries like India, the evidence clearly goes against girls. Borooah (2004) find that girls are less likely than boys to be immunised. With respect to diet, there is no gender discrimination among literate mothers, but girls are less well-fed among illiterate mothers than their brothers. Jayachandran and Kuziemko (2011) find that daughters are weaned sooner than sons and that are less often vaccinated than boys. In the same lines, Barcellos et al. (2014) find that childcare time and quality is higher for boys than for girls. Boys have better anthropometric measures, as they are more likely to be breastfed longer and to be given vitamin supplementation. Conversely to the previous papers, they don't find gender differences in vaccination rates.

Fathers are more responsive than mothers to children's gender. Mammen (2011) find that for the US, fathers spend more time with boys than with girls, but one of the primary activities they do together is watching television. Lundberg et al. (2007) find that married fathers spend more time with their sons than with their daughters, and this time is devoted to sports and recreational activities. For the college-educated married fathers also spend more time with sons than daughters in educational activities. However, mothers spend more time with their daughters. Overall, they find that same-sex parent-child time is stereotypically gendered in the activities they do together.

There is a large literature in psychology documenting that parents don't raise boys and girls the same way. Morawska (2020) do a systematic review of the effects of gendered parenting on child development. She finds that there is evidence of gendered parenting, but limited support for the proposition that gender-differentiated parenting affects children's developmental outcomes. However, the author claims that the studies she reviews don't test directly for the link between gendered parenting and gender differences in developmental outcomes (though there are differences in these outcomes).

Buss et al. (2008) conduct a study on gendered attachment patterns in 2 years-old children. They claim that their results are consistent with the hypothesis that girls are reinforced for behaviors that facilitate interpersonal interaction whereas boys are reinforced for behaviors that facilitate interpersonal achievement and independence. In the same line, Mesman and Groeneveld (2018) find that mothers respond less negatively to a son's risky and disruptive behaviors, and are less encouraging of a son's prosocial behaviors, which is consistent with the stereotype that boys are risk takers and challenging, but girls are nice to others.

Karbownik and Myck (2017) study how expenditures in different goods depend on having a daughter versus having a son in Poland. They find that parents in Poland seem to pay more attention to how girls look and favor boys

with respect to activities and play, which could have consequences in adult life and contribute to sustaining gender inequalities and stereotypes.

Sakata et al. (2018) study the case of Japan. They find that parents spend significantly more on regular schooling, extra-curricular activities, extra-educational activities and pocket money for girls. In the early years, boys get more expenditures, but this reverses as children grow older. They claim that one explanation behind the higher investments in girls could be a desire of parents to compensate for their worse future economic prospects for being females.

Tungodden and Willén (2023) show that parents choose more competitiveness for their sons than for their daughters, using experimental data from middle schools in a Norwegian city. The level of competitiveness that parents choose have a big impact in children's decision to pursue an academic track in high school, and this relationship is mediated mainly by fathers' competitiveness choice.

In broader terms, the conclusion is that parents (especially fathers) don't raise boys and girls in the same way.

3 Differences in children's development outcomes

In the following sections, we present descriptive evidence on gender differences in children's cognitive development and in parental investments. The age range for children in each country is: from 0 to 4 years old in Dominican Republic; from 1 to 2 years old in Colombia at the baseline, and 2.5 and 3.5 years old in the follow-up; and from 0 to around 7 years old at baseline in Nicaragua, and up to 9 years old in the follow-up.

3.1 Dominican Republic

All the gender differences are obtained from linear regressions controlling for mothers' PPVT when it is available and using robust standard errors. The differences are gathered in tables 1 to 5. In the case of the Dominican Republic and Colombia, all the scores are age-standardized, following the procedure described in Attanasio (2015) Online Appendix B.4. In Dominican Republic, results are also cleaned from tester effects. For the case of Nicaragua, measurements of outcomes and inputs are also standardized.

In the Dominican Republic, girls have higher standardized scores in the sub-scales of the Denver test socio-emotional, language, and fine motor. This is reflected in a lower likelihood to be delayed development of socio-emotional skills and language. The gap is sizable since, in both socio-emotional and language scales, scores are around 20% of a standard deviation higher for girls. In gross motor, boys have higher scores than girls, but the difference is not statistically significant.

Table 1: Differences in cognitive development in the Dominican Republic

	Boys		Girls		Difference			
	Mean	SD	Mean	SD	Dif	SD	p-value	N
Denver personal-social	-0.101	1.015	0.12	0.964	0.204	0.045	0.000	1,958
Denver language	-0.082	0.992	0.088	1.002	0.153	0.039	0.000	2,576
Denver fine motor	-0.054	0.974	0.057	1.021	0.091	0.039	0.021	2,547
Denver gross motor	0.016	0.995	-0.011	1.002	-0.052	0.042	0.213	2,257
PPVT	-0.04	0.942	0.041	1.052	0.057	0.054	0.292	1,324

- **Gender differences in cognitive development by siblings' sex composition.**

Table 2: Gender differences in development in Dominican Republic by siblings' sex

	No siblings				I have a sister				I have a brother			
	Dif	SD	p-value	N	Dif	SD	p-value	N	Dif	SD	p-value	N
Denver personal-social	0.342	0.08	0	634	0.123	0.074	0.097	652	0.162	0.079	0.041	661
Denver language	0.251	0.068	0	825	0.196	0.068	0.004	858	0.016	0.066	0.809	876
Denver fine motor	0.27	0.068	0	819	0.055	0.069	0.421	849	-0.024	0.068	0.719	863
Denver gross motor	0.048	0.074	0.511	727	-0.176	0.075	0.018	749	-0.037	0.071	0.596	769
PPVT	0.134	0.098	0.173	430	0.095	0.093	0.307	448	-0.08	0.089	0.371	436

As a reference group, when children have no siblings, the same results as for the whole sample apply: girls do significantly better in socio-emotional, language, and fine motor. The difference is also positive for gross motor and PPVT, but it is not statistically significant.

Analyzing how the gender gaps change as a function of the siblings' sex composition gives us some evidence on whether children are favored by the presence of opposite-sex siblings, as a sort of positive spill-over effect, or if, on the contrary, children benefit from having a same-sex sibling due to, for instance, returns to scale in gendered parental investments. When the child has a sister, girls still do better than boys in everything, but gross motor. Compared to the whole sample, differences are greater in the language and the gross motor sub-scales (the last one in favor of boys) and in PPVT, and they are reduced for the socio-emotional and fine motor sub-scales. Conversely, if the child has a brother, girls no longer do better than boys in the fine motor sub-scale and in PPVT score, but they still do better in the socio-emotional and the language sub-scales, although only the difference in socio-emotional scores is statistically significant.

3.2 Colombia

In Colombia, we will use only the data from the follow-up, as for the baseline there are no measures of the home environment. Girls do significantly better than boys in all the sub-scales of the Bayley test and in the McArthur language test. The same result applies to the baseline. In almost all the other measures of cognitive development, girls perform better than boys, but the differences are not statistically significant at conventional levels. Notice that the signs for the ICQ test are reversed, this is, a higher score means better behavior.

Table 3: Differences in cognitive development in Colombia

	Boys		Girls		Difference			
	Mean	SD	Mean	SD	Dif	SD	p-value	N
Bayley cognitive	0.041	0.995	0.178	1.026	0.151	0.057	0.008	1,189
Bayley receptive language	0.018	0.992	0.134	0.976	0.137	0.056	0.014	1,189
Bayley expressive language	-0.119	1.07	0.119	0.928	0.241	0.057	0.000	1,189
Bayley fine motor	-0.086	0.969	0.111	1.003	0.214	0.056	0.000	1,188
McArthur words	-0.038	0.999	0.121	0.943	0.182	0.054	0.001	1,241
McArthur phrases	-0.087	0.912	0.112	1.008	0.222	0.054	0.000	1,241
Bates ICQ unsociable	0.036	0.996	0.012	0.963	-0.019	0.055	0.728	1,241
Bates ICQ difficult child	0.042	0.97	0.074	1.001	0.053	0.056	0.340	1,241
Bates ICQ unadaptable	-0.036	1.035	-0.02	0.978	0.034	0.057	0.544	1,241
Bates ICQ unstoppable	-0.002	1.002	0.059	1.019	0.07	0.057	0.225	1,241
ECBQ attention	0.06	0.975	0.077	0.994	0.007	0.056	0.897	1,239
ECBQ inhibition	-0.04	0.947	0.056	1.023	0.09	0.055	0.106	1,239
Sociable	0.036	1.067	0.06	0.977	0.027	0.058	0.643	1,239

3.3 Nicaragua

In Nicaragua, we do not have available data for mothers' PPVT scores. In the baseline, only in Denver's language and fine motor sub-scales, we find that girls have significantly higher scores than boys. Boys have higher scores in PPVT, Denver socio-emotional, and memory, and they also have a higher likelihood to experience a delay in all the Denver sub-scales. However, all these differences are not statistically significant. In the follow-up, we find statistically significant differences in favor of girls in Denver's sub-scale for fine motor development, and McCarthy's memory and leg motor scores. All the other differences favor girls, except for PPVT and gross motor development. Only for gross motor development, the difference goes significantly in favor of boys. The fact that there are more significant differences in favor of girls in the follow-up could point to a greater effect of the intervention for them.

Table 4: Differences in cognitive development in Nicaragua (baseline)

	Boys		Girls		Difference			
	Mean	SD	Mean	SD	Dif	SD	p-value	N
PPVT	0.165	1.105	0.109	1.152	-0.056	0.053	0.292	1,817
Denver lenguage	0.059	0.912	0.122	0.806	0.064	0.030	0.034	3,287
Denver personal social	0.102	0.927	0.095	0.927	-0.007	0.032	0.833	3,307
Denver fine motor	-0.006	1.22	0.068	0.874	0.074	0.037	0.046	3,265
Denver gross motor	-0.034	1.128	-0.027	1.074	0.007	0.039	0.858	3,253
McCarthy memory	0.053	1.01	0.051	0.99	-0.003	0.047	0.955	1,827
McArthy legmotor	-0.001	0.985	0.002	0.996	0.003	0.046	0.947	1,838
BPI	-0.011	1.007	-0.001	0.992	0.009	0.050	0.855	1,620

Table 5: Differences in cognitive development in Nicaragua (follow-up)

	Boys		Girls		Difference			
	Mean	SD	Mean	SD	Dif	SD	p-value	N
PPVT	0.92	1.65	0.899	1.686	-0.021	0.061	0.726	2,990
Denver lenguage	-0.016	0.967	-0.009	0.995	0.006	0.035	0.857	3,095
Denver personal social	0.092	0.961	0.116	1.126	0.024	0.038	0.531	3,097
Denver fine motor	-0.03	0.878	0.036	0.957	0.066	0.033	0.047	3,085
Denver gross motor	0.076	1.046	-0.014	1.419	-0.09	0.045	0.045	3,080
McCarthy memory	0.529	1.041	0.618	1.046	0.089	0.038	0.019	3,011
McArthy legmotor	0.184	0.827	0.325	0.821	0.141	0.038	0.000	1,881
BPI	-0.729	0.955	-0.686	0.983	0.043	0.036	0.230	2,863

3.4 Uruguay

Table 6: Gender differences in cognitive development in Uruguay (second round)

	Boys		Girls		Difference			
	Mean	SD	Mean	SD	Dif	SD	p-value	N
Communication	-0.098	1.151	0.113	0.768	0.211	0.040	0.000	2,331
Fine motor	-0.043	1.086	0.042	0.902	0.085	0.041	0.039	2,355
Gross motor	-0.149	1.144	0.168	0.771	0.317	0.048	0.000	1,641
Problem resolution	-0.113	1.105	0.134	0.837	0.247	0.040	0.000	2,355
Socio-individual	-0.078	1.119	0.088	0.834	0.167	0.040	0.000	2,355

In Uruguay, girls score higher than boys in all the developmental sub-scales, and the gender difference is statistically significant. The larger gaps are interestingly in gross motor and problem resolution.

These results are partly consistent with Vásquez-Echeverría et al. (2022). Using data from the ENDIS and the INDI (School Readiness - Child Development Inventory) they find that generally, girls show better development than boys, especially in motor skills.

3.5 Ecuador

In Ecuador, several tests to measure cognitive development are conducted. We will report results on scores for four of them: PPVT, Strengths and Difficulties, Behavioral Problem Index (BPI), and Woodcock-Muñoz sub-scales.

Girls score higher than boys in most of the items. Girls' scores are higher in retrieval fluency, applied problems, calculation tests, pair cancellation, and letters and words. In the behavioral sphere, they score significantly better in prosocial behavior, but also in conduct and peer problems, hyperactivity, and in anxiety.

Boys score higher in PPVT, numeric series, spatial integration, and behavioral items for emotional symptoms and aggression.

Table 7: Gender differences in cognitive development in Ecuador

	Boys		Girls		Difference			
	Mean	SD	Mean	SD	Dif	SD	p-value	N
PPVT (round 0)	0.006	0.962	-0.025	1.023	-0.03	0.05	0.546	1,566
PPVT (round 1)	0.012	0.973	-0.026	1.006	-0.038	0.039	0.333	2,532
PPVT (round 2)	0.035	0.999	-0.045	0.965	-0.08	0.032	0.013	3,654
PPVT (round 3)	0.064	1.013	-0.071	0.973	-0.135	0.03	0	4,358
PPVT (round 4)	0.08	1.042	-0.061	0.955	-0.141	0.031	0	4,215
Reading (round 3)	0.028	1.019	-0.031	0.982	-0.059	0.041	0.146	2,437
Reading (round 4)	0.01	0.997	-0.003	1.022	-0.014	0.035	0.695	3,336
Retrieval fluency (round 3)	-0.119	0.982	0.111	1.006	0.231	0.039	0	2,555
Retrieval fluency (round 4)	-0.13	0.972	0.146	1.01	0.276	0.034	0	3,441
Applied problems (round 3)	0.025	1.011	-0.029	0.982	-0.054	0.04	0.171	2,513
Applied problems (round 4)	0.059	1.033	-0.051	0.953	-0.11	0.034	0.001	3,371
Math calculations (round 3)	-0.04	1.026	0.029	0.975	0.069	0.04	0.083	2,507
Math calculations (round 3)	-0.033	1.007	0.042	1.003	0.075	0.035	0.029	3,368
Spatial integration (round 3)	0.051	1.031	-0.056	0.958	-0.107	0.04	0.007	2,514
Verbal comprehension (round 3)	-0.017	1.033	0.01	0.966	0.026	0.04	0.506	2,533
Verbal comprehension (round 3)	-0.011	1.024	0.027	0.958	0.039	0.03	0.204	4,255
Pair cancellation (round 3)	-0.106	1.022	0.104	0.966	0.209	0.039	0	2,535
Pair cancellation (round 3)	-0.069	1.02	0.077	0.978	0.146	0.034	0	3,383
Letters and words (round 2)	-0.083	0.992	0.072	0.969	0.154	0.036	0	2,999
Letters and words (round 3)	-0.102	1.012	0.098	0.965	0.2	0.033	0	3,615
Letters and words (round 4)	-0.141	1.024	0.163	0.957	0.304	0.069	0	830
Numeric series (round 2)	-0.018	1.047	0.011	0.945	0.029	0.037	0.424	2,947
Numeric series (round 3)	0.019	1.048	-0.041	0.946	-0.06	0.033	0.069	3,616
Numeric series (round 4)	0.003	1.027	0.006	0.972	0.004	0.031	0.9	4,204
Math fluency (round 2)	0.02	1.019	-0.029	0.971	-0.049	0.043	0.249	2,155
Math fluency (round 3)	-0.006	1.006	-0.009	0.983	-0.003	0.034	0.928	3,472
Math fluency (round 4)	-0.01	1.017	0.01	0.962	0.02	0.031	0.509	4,150
S&D prosocial behavior (round 3)	-0.056	1.013	0.055	0.985	0.111	0.04	0.005	2,535
S&D prosocial behavior (round 4)	-0.081	1.03	0.08	0.971	0.16	0.034	0	3,378
S&D peer problem (round 3)	-0.016	0.986	0.014	1.014	0.03	0.04	0.444	2,535
S&D peer problem (round 4)	-0.046	1.033	0.056	0.975	0.102	0.035	0.003	3,378
S&D hyperactivity (round 3)	-0.14	0.99	0.136	0.991	0.276	0.039	0	2,534
S&D hyperactivity (round 4)	-0.051	0.992	0.062	1.006	0.113	0.034	0.001	3,378
S&D conduct problem (round 3)	-0.108	1.03	0.106	0.958	0.214	0.04	0	2,534
S&D conduct problem (round 4)	-0.021	1.016	0.035	0.978	0.056	0.034	0.103	3,378
S&D emotional symptoms (round 3)	0.072	0.996	-0.072	0.999	-0.144	0.04	0	2,534
S&D emotional symptoms (round 4)	0.226	0.978	-0.211	0.97	-0.436	0.034	0	3,378
S&D total score (round 3)	-0.073	0.972	0.071	1.023	0.144	0.04	0	2,533
S&D total score (round 4)	0.017	1.014	-0.001	0.987	-0.018	0.034	0.605	3,378
BPI anxiety	6.337	2.829	6.518	2.829	0.18	0.108	0.096	2,727
BPI aggression	4.765	2.947	4.332	2.732	-0.433	0.109	0	2,740
BPI total score	18.842	7.929	18.386	7.636	-0.457	0.298	0.125	2,734

3.6 Chile

In Chile we retrieve measures of cognitive ability and the HOME inventory from the *Encuesta Longitudinal de Primera Infancia*. In its first year, in 2010, the cognitive development of a representative sample of children up to 5 years old were evaluated with a battery of tests: Evaluation Scale of Psychomotor Development (EEDP, by its name in Spanish), Psychomotor Development Test (TEPSI in Spanish), Batelle Development Inventory and PPVT. Socio-emotional development was further evaluated with the Ages Stages Questionnaire (ASQ) and the Child Behavior Checklist (CBCL1).

The measures that we will use for the cognitive tests are the T-scores. The T-scores are obtained from the raw scales through the application of pre-existing conversion tables specific to the child's chronological age.

In all the cognitive tests girls performed significantly better than boys. Boys had a greater risk of delay in the ASQ and presented more signs of externalizing problems, whereas girls presented more signs of internalizing problems.

Table 8: Gender differences in cognitive development in Chile

	Mean	SD	Mean	SD	Dif	SD	p-value	N
EEDP	1.393	0.653	1.333	0.611	-0.054	0.0184	0.0035	4868
TEPSI. Coordiantion	52.248	13.168	56.736	12.726	4.624	0.2824	0.0000	9167
TEPSI. Language	50.182	11.896	52.903	11.573	2.776	0.2546	0.0000	9201
TEPSI. Motor skills	54.502	11.564	55.578	11.2	1.018	0.2382	0.0000	9167
TEPSI. Total	52.526	12.386	55.895	12.093	3.431	0.2627	0.0000	9167
Batelle. Personal-social	49.095	13.041	51.135	12.427	2.025	0.3669	0.0000	4869
Batelle. Adaptativeness	47.419	14.452	49.926	14.527	2.62	0.4254	0.0000	4869
Batelle. Motor skills	43.434	13.498	42.571	13.449	-0.855	0.3993	0.0323	4869
Batelle. Communication	40.078	11.857	41.89	12.112	1.872	0.3527	0.0000	4869
Batelle. Cognitive	43.969	12.858	45.066	13.04	1.048	0.3892	0.0071	4869
Batelle. Total	45.01	13.257	46.467	13.469	1.499	0.3889	0.0001	4869
PPVT	103.048	15.43	104.474	15.403	1.456	0.4026	0.0003	7282
ASQ (6m)	25.175	15.294	24.479	16.955	-0.128	3.3335	0.9693	105
ASQ (12m)	32.158	19.3	29.625	18.169	-2.294	0.9462	0.0155	1754
ASQ (18m)	40.854	24.896	36.481	23.338	-4.879	1.5263	0.0014	1036
ASQ delay risk (6m)	0.088	0.285	0.146	0.357	0.057	0.0655	0.3874	105
ASQ delay risk (12m)	0.205	0.404	0.143	0.35	-0.063	0.0180	0.0005	1754
ASQ delay risk (18m)	0.325	0.469	0.292	0.455	-0.037	0.0291	0.2021	1036
CBCL1. Internalization	58.905	9.507	59.366	9.425	0.445	0.1938	0.0217	11193
CBCL1. Externalization	60.069	10.645	58.27	10.284	-1.827	0.2091	0.0000	11193
CBCL1. Total	60.301	9.801	59.311	9.68	-1.033	0.1969	0.0000	11193

4 Differences in parental investments

In many LAC countries where interventions were conducted, complementary to the HOME, the UNICEF's Family Care Index (FCI) questionnaire was used (citing the cases of Colombia, Peru (Cuna Mas), and Nicaragua)

(Hamadani et al. (2010)). The FCI is a measure of the home environment that partly builds on the HOME. Within the play materials sub-scale, one can find information on the types of toys, which resemble the HOME materials sub-scale: musical toys, building toys, drawing/writing materials, toys for physical activity, and toys for imaginative play (Kariger et al. (2012)). However, as with the HOME inventory, what is usually reported in papers are the aggregated measures of each sub-scale (play materials and play activities, in the case of the FCI), resulting in the loss of gender patterns shown by the individual items.

4.1 Dominican Republic

As for the outcome variables, the gender differences in inputs are obtained from linear regressions controlling for mothers' PPVT and clustering standard errors.

In the Dominican Republic, we use the Home Observation Measurement of the Environment (HOME) inventory for Toddlers (Bradley and Caldwell (1984)). In the first step, we tested for differences in the scores for the six sub-scales (details in Appendix A). All the scores are internally standardized and are netted from tester effects. We find that parents invest significantly more in girls regarding acceptance, involvement, and variety. The highest gap is in the involvement sub-scale, which is 12.5% of a standard deviation for girls than for boys. For responsiveness and organization, the score is also higher for girls than for boys, but the differences are not statistically significant. The only HOME sub-scales in which boys have an advantage with respect to girls is in materials (the difference is statistically significant at 5%). The only sub-scale in which there is a significant difference favoring boys is in the materials sub-scale, a fact that is consistent with Kuhn et al. (2021).

We can also see that there is no gender difference in the likelihood of having the biological father at home, which goes against the empirical evidence showing that boys increase marital stability (Lundberg (2005), among others).

Table 9: Gender differences in inputs in the Dominican Republic

	Boys		Girls		Difference			
	Mean	SD	Mean	SD	Dif	SD	p-value	N
Biological father in household	0.609	0.488	0.633	0.482	0.019	0.019	0.320	2608
HOME Responsiveness	0.000	0.975	0.008	1.022	-0.004	0.038	0.906	2604
HOME Acceptance	-0.036	0.991	0.055	0.974	0.095	0.039	0.014	2604
HOME Organisation	-0.012	1.004	0.014	0.987	0.026	0.039	0.497	2604
HOME Materials	0.032	0.967	-0.024	1.032	-0.072	0.037	0.051	2604
HOME Involvement	-0.057	1.001	0.067	0.992	0.111	0.038	0.003	2604
HOME Variety	-0.032	0.998	0.039	0.998	0.070	0.039	0.072	2604
HOME Total	-0.019	0.956	0.032	1.036	0.036	0.036	0.322	2604

Some of the HOME items ask whether a certain object is present in the household, so it could be that, especially for materials, some items are shared by the children in the household if the surveyed child has siblings. Therefore, we conduct a more detailed analysis to check whether these differences in the HOME sub-scales scores are driven by items that are child-specific or by items that are common to the household.

Analyzing differences in every HOME item we find an interesting gendered pattern: in households where a surveyed girl is present it is more likely that there are toys that stimulate cognitive and socio-emotional development, such

as learning facilitators, toys for literature and music, and stuffed dolls and role-games toys. Boys are more likely to suffer physical punishment, and in households where a surveyed boy is present, it is more likely that there are toys that stimulate physical development, such as muscle activity toys, push or pull toys, strollers, or walkers (among others). The results of these differences can be seen in the following table:

Table 10: Gender differences in inputs in the Dominican Republic

	Boys		Girls		Difference			
	Mean	SD	Mean	SD	Dif	SD	p-value	N
1. Parent permits child to engage in "messy" play	0.027	0.989	-0.026	1.008	-0.049	0.039	0.209	2,621
2. Parent spontaneously vocalizes to child twice	0.023	0.957	-0.02	1.034	-0.036	0.038	0.350	2,621
3. Parent responds verbally to child' verbalizations	0.034	0.939	-0.034	1.051	-0.083	0.037	0.026	2,621
4. Parent tells child name of object/person during visit	0	0.992	0.004	1.003	0.008	0.038	0.832	2,621
5. Parent's speech is distinct and audible	0.008	0.985	-0.01	1.019	-0.037	0.037	0.324	2,621
6. Parent initiates verbal exchanges with visitor	0.017	0.982	-0.012	1.016	-0.041	0.039	0.284	2,621
7. Parent converses freely and easily	-0.001	1.01	0.002	0.987	-0.011	0.038	0.780	2,621
8. Parent spontaneously praises child at least twice	-0.017	0.994	0.023	0.999	0.027	0.039	0.479	2,621
9. Parent's voice conveys positive feelings toward child	-0.001	0.993	0.01	0.991	-0.002	0.038	0.966	2,621
10. Parent caresses/kisses/hugs child at least once during visit	-0.015	0.992	0.022	1.003	0.038	0.038	0.327	2,621
11. Parent responds positively to praise of child offered by visitor	-0.056	1	0.058	0.992	0.097	0.039	0.012	2,621
12. No more than one instance of physical punishment during past week	-0.042	1.017	0.051	0.972	0.09	0.039	0.021	2,621
13. Family has a pet	-0.014	0.991	0.015	1.005	0.046	0.039	0.231	2,621
14. Parent does not shout at child during visit	0	0.951	0.003	1.046	0.008	0.040	0.831	2,620
15. Parent does not express annoyance with or hostility to child	0	0.987	0.007	0.973	0.007	0.038	0.853	2,621
16. Parent neither slaps nor spanks child during visit	-0.01	1.037	0.024	0.88	0.032	0.038	0.395	2,621
17. Parent does not scold or criticize child during visit	-0.012	1.008	0.02	0.927	0.052	0.038	0.171	2,621
18. Parent does not interfere or restrict child more than three times during visit	-0.036	1.009	0.038	0.989	0.053	0.039	0.175	2,621
19. At least 10 books are present and visible	-0.001	0.983	0.003	1.013	-0.004	0.039	0.915	2,621
20. Substitute care is provided by one of three regular substitutes	-0.008	0.992	0.008	1.006	0	0.039	0.993	2,621
21. Child is taken to grocery store at least once a week	-0.008	1.005	0.009	0.99	0.024	0.039	0.537	2,621
22. Child gets out of house at least four times per week	0.025	0.995	-0.028	1.001	-0.048	0.039	0.224	2,621
23. Child is taken regularly to doctor's office or clinic	-0.007	1.01	0.01	0.984	0.018	0.039	0.647	2,621
24. Child has special place for toys and treasures	-0.048	1.021	0.055	0.967	0.097	0.038	0.011	2,621
25. Child's play environment is safe	0.009	0.987	-0.006	1.003	-0.014	0.038	0.707	2,621
26. Muscle activity toys or equipment available	0.123	0.978	-0.124	1.004	-0.242	0.038	0.000	2,621
27. Push or pull toy activity	0.155	0.975	-0.156	1.001	-0.327	0.038	0.000	2,621
28. Stroller or walker, kiddie car, scooter, or tricycle available	0.178	0.971	-0.179	0.995	-0.35	0.038	0.000	2,621
29. Stuff dolls or role toys	-0.182	1.099	0.189	0.841	0.361	0.037	0.000	2,621
30. Learning facilitators - mobile table and chairs, high chair, play pen	-0.08	0.969	0.085	1.02	0.156	0.039	0.000	2,621
31. Simple eye-hand coordination toys	-0.031	0.987	0.034	1.012	0.054	0.039	0.165	2,621
32. Complex eye-hand coordination toys	-0.028	0.979	0.023	1.015	0.044	0.038	0.253	2,621
33. Toys for literature and music	-0.075	0.944	0.079	1.05	0.129	0.039	0.001	2,621
34. Parent provides children toys to play during the visit	0.012	1.003	-0.008	0.997	-0.047	0.039	0.221	2,621
35. Parent talks to child while doing household work	-0.042	1.017	0.044	0.974	0.101	0.039	0.009	2,621
36. Parent consciously encourages developmental advance	-0.049	1.008	0.048	0.987	0.078	0.038	0.040	2,621
37. Parent invests maturing toys with value via personal attention	-0.031	0.983	0.032	1.01	0.046	0.038	0.225	2,621
38. Parent structures child's play periods	-0.016	0.976	0.015	1.018	0.032	0.039	0.405	2,621
39. Parent provides toys that challenge child to develop new skills	-0.025	0.992	0.027	1.004	0.037	0.038	0.333	2,621
40. Parent keep child in visual range, looks often	-0.056	1.097	0.059	0.873	0.101	0.038	0.007	2,621
41. Father provides some care daily	-0.007	1.003	0.007	0.992	0.013	0.039	0.745	2,621
42. Parent reads stories to child at least three times weekly	-0.024	0.981	0.03	1.022	0.058	0.040	0.146	2,621
43. Child eats at least one meal per way with mother and father	-0.029	1.002	0.029	0.994	0.048	0.039	0.217	2,621
44. Family visits with relatives or friends once a month or so	-0.01	1.01	0.014	0.98	0.031	0.038	0.428	2,621
45. Child has three or more books of his or her own	-0.041	0.921	0.041	1.07	0.079	0.038	0.039	2,621

Regarding all the other questions, practically all the items in the acceptance, materials, involvement, and variety sections favor girls. For the responsiveness and organization sections, results are mixed: in the responsiveness

section most of the items go in favor of boys, and in the organization section, in half of the items boys score higher and girls score higher in the other half.

- Excluding families with more than one surveyed child. In this case, there are two more items for which girls are significantly better off than boys: simple eye-hand coordination toys and parent reading stories to the child at least three times weekly.

4.1.1 Differences by siblings' gender

During the census phase of the project, demographic information about all the children under 9 years old was collected in all registered households. Thanks to this information, we can analyze the gender gaps in HOME items by the gender composition of the children in the household.

- **Gender differences when the child has at least one sister.** In this case, we still have that the items of the materials sub-scale are significantly different for boys and girls. It is remarkable that, for materials, the differences are smaller in absolute value when they favor boys, and bigger when they favor girls. This means that when the child has a sister if she is a girl, she has more materials compared to the whole sample, and/or if he is a boy, he has fewer materials compared to the whole sample. In most of the cases, the signs of the differences are the same (only in 9 out of the 58 items does the sign flip). We lose some of the differences that were significant in the whole sample, but we obtain other ones: parents permit girls to engage in "messy" play less often than boys, parents shout at boys during the visit more often than at girls, girls get out of the house at least four times per week less often than boys, girls have more complex eye-hand coordination toys than boys, parents report investing in maturing toys more often for girls than for boys, and they provide to girls toys that challenge the child more often than to boys.

- **Gender differences when the child has at least one brother.** For this sub-sample, the signs flip in almost half of the items with respect to the whole sample, most of the time to evidence that boys are now better off than girls (i.e. the differences are negative). In the materials sub-scale, all but one of the statistically significant differences stay. However, we have that signs flip for simple and complex eye-hand coordination toys. This is, whereas girls have an advantage in these two items in the whole sample, when the child has a brother, if the child is a boy, he has more of these toys than if the child is a girl. We lose many of the differences that were significant in the main sample. In turn, in this sub-sample, the following items present a significant advantage for boys: the parent's speech is distinct and audible, the parent converses freely and easily, the parent's voice conveys positive feelings toward the child, and the child's environment is safe. None of the new significant differences goes in favor of girls.

  In general, it does not seem that the toys children have at home are affected much by the siblings' gender composition. If this were the case, the differences in these items would have to become non-significant (for the *"feminine"* toys in the case of having a sister, and for the *"masculine"* toys in the case of having a brother).

- **No siblings.** In this case, the results are very similar to the ones in the whole sample. In most of the cases, the signs of the differences remain the same (only in 7 out of the 58 variables, including the ones that ask for the number of times [something] has happened, the sign flips). Regarding the differences that were statistically significant in the whole sample, we lose some of them (it could well be because of the reduction in the sample size), and three new items reach now statistical significance: parent spontaneously praises child

at least twice, the child is taken to the grocery store at least once a week, and parent reads stories to the child at least three times weekly. Importantly, we still have statistically significant gender differences in the items regarding the materials kids are given to play with.

Table 11: Gender differences in inputs in the Dominican Republic by siblings' sex composition

Diferencias de genero en home controlando por PPVT de la madre	I have no siblings				I have a sister				I have a brother			
	Dif	SD	p-value	N	Dif	SD	p-value	N	Dif	SD	p-value	N
1. Parent permits child to engage in "messy" play	0.023	0.072	0.752	839	-0.144	0.067	0.031	882	-0.011	0.067	0.865	883
2. Parent spontaneously vocalizes to child twice	-0.079	0.059	0.183	839	-0.062	0.068	0.362	882	0.007	0.071	0.922	883
3. Parent responds verbally to child' verbalizations	-0.027	0.059	0.642	839	-0.068	0.065	0.291	882	-0.176	0.07	0.012	883
4. Parent tells child name of object/person during visit	0.021	0.067	0.759	839	0.059	0.064	0.359	882	-0.061	0.068	0.371	883
5. Parent's speech is distinct and audible	-0.009	0.065	0.886	839	0.072	0.055	0.189	882	-0.181	0.069	0.009	883
6. Parent initiates verbal exchanges with visitor	-0.002	0.066	0.975	839	-0.023	0.065	0.722	882	-0.093	0.07	0.181	883
7. Parent converses freely and easily	0.084	0.065	0.199	839	0.038	0.058	0.513	882	-0.175	0.071	0.014	883
8. Parent spontaneously praises child at least twice	0.153	0.067	0.023	839	-0.005	0.067	0.945	882	-0.046	0.067	0.491	883
9. Parent's voice conveys positive feelings toward child	0.091	0.071	0.2	839	0.021	0.067	0.759	882	-0.11	0.06	0.068	883
10. Parent caresses/kisses/hugs child at least once during visit	0.104	0.069	0.133	839	0.061	0.068	0.367	882	-0.039	0.065	0.551	883
11. Parent responds positively to praise of child offered by visitor	0.228	0.069	0.001	839	0.115	0.07	0.102	882	-0.034	0.065	0.604	883
12. No more than one instance of physical punishment during past week	0.041	0.069	0.554	839	0.118	0.067	0.079	882	0.107	0.067	0.112	883
13. Family has a pet	0.112	0.071	0.118	839	0.031	0.065	0.632	882	0.029	0.067	0.663	883
14. Parent does not shout at child during visit	-0.034	0.059	0.565	839	0.135	0.076	0.076	882	-0.06	0.072	0.403	882
15. Parent does not express annoyance with or hostility to child	0.079	0.056	0.16	839	-0.057	0.075	0.448	882	0.017	0.069	0.8	883
16. Parent neither slaps nor spanks child during visit	0.063	0.05	0.206	839	0.096	0.075	0.202	882	-0.034	0.071	0.634	883
17. Parent does not scold or criticize child during visit	0.079	0.049	0.111	839	0.085	0.071	0.235	882	0.019	0.073	0.799	883
18. Parent does not interfere or restrict child more than three times during visit	0.069	0.067	0.304	839	0.116	0.072	0.106	882	-0.01	0.065	0.882	883
19. At least 10 books are present and visible	-0.086	0.074	0.246	839	0.094	0.059	0.113	882	-0.006	0.069	0.933	883
20. Substitute care is provided by one of three regular substitutes	-0.001	0.07	0.988	839	-0.01	0.065	0.878	882	0.002	0.069	0.979	883
21. Child is taken to grocery store at least once a week	0.171	0.066	0.01	839	-0.005	0.067	0.936	882	-0.075	0.069	0.279	883
22. Child gets out of house at least four times per week	-0.092	0.07	0.191	839	-0.11	0.065	0.094	882	0.063	0.069	0.364	883
23. Child is taken regularly to doctor's office or clinic	-0.023	0.069	0.737	839	0.126	0.068	0.065	882	-0.041	0.066	0.528	883
24. Child has special place for toys and treasures	0.092	0.065	0.16	839	0.154	0.065	0.018	882	0.04	0.068	0.551	883
25. Child's play environment is safe	0.035	0.067	0.597	839	0.07	0.067	0.3	882	-0.147	0.064	0.022	883
26. Muscle activity toys or equipment available	-0.204	0.07	0.004	839	-0.245	0.064	0	882	-0.267	0.063	0	883
27. Push or pull toy activity	-0.352	0.069	0	839	-0.246	0.065	0	882	-0.373	0.065	0	883
28. Stroller or walker, kiddie car, scooter, or tricycle available	-0.377	0.068	0	839	-0.343	0.064	0	882	-0.351	0.065	0	883
29. Stuff dolls or role toys	0.395	0.061	0	839	0.455	0.066	0	882	0.238	0.065	0	883
30. Learning facilitators - mobile table and chairs, high chair, play pen	0.222	0.072	0.002	839	0.225	0.064	0	882	0.01	0.065	0.876	883
31. Simple eye-hand coordination toys	0.099	0.074	0.182	839	0.159	0.063	0.011	882	-0.095	0.064	0.141	883
32. Complex eye-hand coordination toys	0.079	0.075	0.293	839	0.14	0.061	0.021	882	-0.076	0.064	0.232	883
33. Toys for literature and music	0.191	0.073	0.009	839	0.142	0.062	0.022	882	0.037	0.067	0.58	883
34. Parent provides children toys to play during the visit	-0.02	0.073	0.786	839	-0.025	0.063	0.691	882	-0.099	0.066	0.133	883
35. Parent talks to child while doing household work	0.198	0.067	0.003	839	0.023	0.068	0.738	882	0.094	0.067	0.158	883
36. Parent consciously encourages developmental advance	0.116	0.067	0.086	839	0.14	0.066	0.035	882	-0.02	0.066	0.76	883
37. Parent invests maturing toys with value via personal attention	0.037	0.072	0.611	839	0.154	0.064	0.016	882	-0.059	0.063	0.35	883
38. Parent structures child's play periods	0.084	0.075	0.258	839	0.108	0.065	0.097	882	-0.102	0.064	0.11	883
39. Parent provides toys that challenge child to develop new skills	0.044	0.071	0.537	839	0.178	0.062	0.004	882	-0.097	0.064	0.131	883
40. Parent keep child in visual range, looks often	0.192	0.058	0.001	839	0.097	0.073	0.186	882	0.025	0.065	0.704	883
41. Father provides some care daily	0.023	0.073	0.752	839	0.012	0.065	0.859	882	0.003	0.065	0.965	883
42. Parent reads stories to child at least three times weekly	0.129	0.074	0.08	839	0.041	0.067	0.538	882	0.015	0.069	0.824	883
43. Child eats at least one meal per way with mother and father	0.039	0.072	0.588	839	0.021	0.065	0.74	882	0.074	0.066	0.256	883
44. Family visits with relatives or friends once a month or so	0.044	0.067	0.517	839	-0.027	0.069	0.691	882	0.064	0.066	0.331	883
45. Child has three or more books of his or her own	0.172	0.079	0.03	839	0.131	0.053	0.014	882	-0.062	0.065	0.341	883

In the Dominican Republic, the only patterns that are found are for the score in the Denver language sub-scale and for Denver fine motor. For the Denver language, the signs of the interaction between the female dummy and the HOME sub-scales are in general positive, but only the interactions with involvement and variety reach statistical significance. For Denver's fine motor, the interaction between the female dummy and the standardized total HOME score is positive and significant, as well as the interactions between the female dummy and two out of the six HOME sub-scales.

4.2 Chile

Unlike other countries in which we only have a short version of the HOME inventory, the information collected by the *Encuesta Longitudinal de Primera Infancia* allows us to perform aa detailed analysis of each of the HOME questions, as we did in the Dominican Republic.

For the majority of the items, girls score higher than boys, though not all the differences are statistically significant. For the items in the materials sub-scale (questions 26 to 33), we can see a clear gender pattern in the toys that parents provide children with: boys are more likely to own toys that promote their motor skills, whereas girls are more likely to have dolls and role toys, learning facilitators and toys for literature and music, which are more likely to enhance their social and language abilities. From the remaining questions, it seems that parents are more likely to treat boys more harshly than girls.

Table 12: Gender differences in inputs in Chile

	Boys		Girls		Difference			
	Mean	SD	Mean	SD	Dif	SD	p-value	N
02. Parent spontaneously vocalizes to child twice	0.955	0.208	0.96	0.195	0.006	0.003	0.101	14146
05. Parent's speech is distinct and audible	0.956	0.206	0.965	0.184	0.009	0.003	0.004	14146
06. Parent initiates verbal exchanges with visitor	0.911	0.285	0.908	0.289	-0.003	0.005	0.572	14146
07. Parent converses freely and easily	0.9	0.3	0.9	0.299	0.001	0.005	0.888	14146
08. Parent spontaneously praises child at least twice	0.775	0.418	0.79	0.407	0.015	0.007	0.031	14146
10. Parent caresses/kisses/hugs child at least once during visit	0.768	0.422	0.779	0.415	0.011	0.007	0.120	14148
11. Parent responds positively to praise of child offered by visitor	0.863	0.344	0.868	0.338	0.005	0.006	0.377	14148
13. Family has a pet	0.569	0.495	0.567	0.495	-0.002	0.011	0.878	8421
14. Parent does not shout at child during visit	0.859	0.348	0.88	0.324	0.022	0.006	0.000	14146
15. Parent does not express annoyance with or hostility to child	0.846	0.361	0.859	0.348	0.013	0.006	0.034	14148
16. Parent neither slaps nor spanks child during visit	0.886	0.317	0.899	0.301	0.013	0.005	0.014	14148
17. Parent does not scold or criticize child during visit	0.849	0.359	0.866	0.34	0.018	0.006	0.002	14146
19. At least 10 books are present and visible	0.178	0.382	0.19	0.392	0.012	0.007	0.068	14148
22. Child gets out of house at least four times per week	0.79	0.407	0.788	0.409	-0.002	0.007	0.737	15110
23. Child is taken regularly to doctor's office or clinic	0.917	0.275	0.915	0.279	-0.002	0.005	0.639	15151
24. Child has special place for toys and treasures	0.887	0.316	0.892	0.31	0.005	0.005	0.306	15139
26. Muscle activity toys or equipment available	0.831	0.375	0.773	0.419	-0.058	0.006	0.000	15123
27. Push or pull toy activity	0.877	0.328	0.812	0.391	-0.065	0.006	0.000	15136
28. Stroller or walker, kiddie car, scooter, or tricycle available	0.845	0.362	0.798	0.401	-0.047	0.006	0.000	15133
29. Stuff dolls or role toys	0.885	0.319	0.928	0.259	0.043	0.005	0.000	15141
30. Learning facilitators - mobile table and chairs, high chair, play pen	0.702	0.458	0.74	0.439	0.038	0.007	0.000	15126
33. Toys for literature and music	0.779	0.415	0.791	0.406	0.013	0.007	0.055	15122
36. Parent consciously encourages developmental advance	0.708	0.455	0.714	0.452	0.007	0.008	0.373	14146
37. Parent invests maturing toys with value via personal attention	0.469	0.499	0.479	0.5	0.01	0.008	0.236	14148
38. Parent structures child's play periods	0.346	0.476	0.354	0.478	0.008	0.008	0.290	14148
39. Parent provides toys that challenge child to develop new skills	0.401	0.49	0.416	0.493	0.015	0.008	0.068	14148
40. Parent keep child in visual range, looks often	0.835	0.371	0.853	0.354	0.018	0.006	0.003	14148
41. Father provides some care daily	0.793	0.405	0.793	0.405	0	0.007	0.988	15107
42. Parent reads stories to child at least three times weekly	0.608	0.488	0.642	0.479	0.035	0.008	0.000	14989
43. Child eats at least one meal per way with mother and father	0.935	0.246	0.936	0.245	0.001	0.004	0.894	15138
45. Child has three or more books of his or her own	0.695	0.461	0.721	0.449	0.026	0.007	0.000	15074

5 Oaxaca decomposition

The Oaxaca decomposition implemented in Stata (Jann et al. (2008)) is a statistical method that explains the difference in the means of a dependent variable between two groups (namely, boys and girls) by decomposing the gap into that part that is due to differences in the mean values of the independent variable within the groups (differences in the level of inputs), on the one hand, and group differences in the effects of the independent variable, on the other hand (differences in returns to the inputs).

In the second, third, and fifth columns of tables 13-15 it is expressed the decomposition components of the three-fold decomposition, with the percentage of the gap that corresponds to the endowments and the coefficients. The sixth and the seventh columns gather the results for the two-fold decomposition. The difference between the two-fold and the three-fold decomposition is how the estimation is performed: in the three-fold decomposition, a separate model for boys and girls is estimated, whereas, in the two-fold decomposition, a pooled regression is run.

All these results are for the part of the gap explained by the inputs, and they do not sum up to the total difference because the part corresponding to the covariates is missing from these tables. The covariates included for the three countries are children's age, maternal education, household size, and an indicator for whether the mother works. The numbers in the table represent the part of the gap attributed to differences in inputs, netting out the effect of the controls (that is why the sum is not equal to the total gap).

In the Dominican Republic, we can see that for the outcomes variables in which we find significant gender differences (personal-social, language, and fine motor), the differences in inputs explain a higher proportion of the gender gap that the differences in the returns, with the exception of the language score. The outcome variable in which differences in inputs account for a larger proportion of the gap is the score in the fine motor Denver sub-scale, whereas the other two variables both, inputs and returns, account for a small proportion of the gap. Both parts of the gap attributable to the differences in the inputs and in the returns have negative signs, evidencing that girls are better off in both instances. Differences in the levels of the covariates account for a low proportion of the gender gap. However, their returns account for a higher proportion (i.e. regarding the covariates, girls and boys are similar, but the returns to them are generally higher for girls).

Table 13: Oaxaca decomposition for the Dominican Republic

	Difference	Endowments	Coefficients	% endow	% coeff	Interaction	Explained	SD	Unexplained	SD
Denver personal-social	-0.2	-0.004	-0.002	1.756	0.785	0.005	-0.001	0.008	0.001	0.004
Denver language	-0.159	0	-0.002	0.093	1.517	0.001	0.001	0.008	-0.002	0.003
Denver fine motor	-0.089	-0.016	-0.007	18.401	7.497	0.012	-0.01	0.005	-0.001	0.004
Denver gross motor	0.049	-0.002	-0.003	4.007	5.183	0.005	0.001	0.006	0	0.003
PPVT	-0.077	-0.043	-0.025	56.34	31.875	0.033	-0.026	0.015	-0.009	0.007

For Colombia, the part of the gap explained by differences in the returns is always positive, meaning that boys have higher returns to the inputs than girls, except for the score in the McArthur test score for phrase construction. For the part of the gap explained by differences in inputs, for half of the outcome variables, the differences go in favor of boys.

Table 14: Oaxaca decomposition for Colombia

	Difference	Endowments	Coefficients	% endow	% coeff	Interaction	Explained	SD	Unexplained	SD
Bayley cognitive	-0.156	-0.006	0.025	3.914	16.18	-0.041	-0.022	0.029	0.000	0.044
Bayley receptive language	-0.154	0.015	0.053	9.732	34.363	-0.035	-0.004	0.029	0.037	0.042
Bayley expressive language	-0.258	-0.048	0.021	18.532	7.979	0.017	-0.039	0.027	0.029	0.049
Bayley fine motor	-0.221	0.073	0.041	32.877	18.62	-0.179	-0.028	0.028	-0.037	0.045
McArthur words	-0.176	0.03	0.096	16.968	54.385	-0.106	-0.031	0.030	0.050	0.042
McArthur phrases	-0.235	-0.014	-0.029	6.038	12.392	-0.042	-0.028	0.027	-0.057	0.044
Bates ICQ unsociable	0.007	-0.001	-0.041	15.684	567.079	0.031	0.021	0.028	-0.032	0.041
Bates ICQ difficult child	-0.065	0.06	0.036	91.876	55.316	-0.095	0.004	0.028	-0.002	0.046
Bates ICQ unadaptable	-0.022	-0.041	0.083	186.662	377.022	0.033	-0.017	0.027	0.092	0.046
Bates ICQ unstoppable	-0.083	0.042	0.021	49.919	24.731	-0.069	0.001	0.030	-0.008	0.048
ECBQ attention	-0.042	0.009	-0.014	20.999	32.753	0.004	0.010	0.030	-0.011	0.044
ECBQ inhibition	-0.097	0.054	0.075	55.925	76.777	-0.096	0.000	0.030	0.034	0.045
Sociable	-0.046	0.061	0.127	130.357	274.175	-0.083	0.010	0.028	0.095	0.045

In Nicaragua, for the various standardized scores, the part of the gap explained by differences in the returns has always had a negative sign, indicating that girls have higher returns. However, for the differences in the input levels, it happens the opposite. Therefore, despite having fewer investments done on them, girls compensate by having larger returns. In the case of Nicaragua, the proportion of the gap explained by differences in the returns is much higher than in any of the other two countries.

Table 15: Oaxaca decomposition for Nicaragua

	Difference	Endowments	Coefficients	% endow	% coeff	Interaction	Explained	SD	Unexplained	SD
PPVT	0.037	0.012	-0.105	31.615	285.346	-0.015	0.001	0.010	-0.110	0.196
Denver lenguage	-0.054	0.001	-0.083	1.236	153.115	0.000	0.001	0.006	-0.083	0.090
Denver personal social	0.008	-0.004	-0.018	53.771	241.553	-0.003	-0.005	0.008	-0.021	0.108
Denver fine motor	-0.063	-0.001	-0.078	1.724	123.126	-0.002	-0.002	0.006	-0.080	0.128
Denver gross motor	0.027	0.001	-0.063	5.155	229.079	-0.006	-0.001	0.006	-0.066	0.131
McCarthy memory	0.046	-0.011	-0.077	23.523	168.169	0.002	-0.009	0.008	-0.077	0.167
McArthy legmotor	0.011	-0.01	-0.056	88.276	500.76	0.003	-0.008	0.011	-0.055	0.159
BPI	0.04	-0.011	-0.283	27.627	705.875	0.002	-0.010	0.013	-0.281	0.202

5.1 Ñopo's decomposition

Applying this method has two caveats. The first one is due to the way the results are displayed, using the *nopomatch* command in Stata (Atal et al. (2013)). The components of the decomposition are expressed as a percentage of the mean outcome for boys. Since this mean might be positive or negative (standardized variables), we cannot interpret the sign of a specific component as going in favor of boys or girls. The second one is the lack of overlapping in the distributions of the characteristics, that is as much, around 15%. This is confirmed by the graph plotting the propensity scores for boys and girls based on the same characteristics that we include in Ñopo's decomposition.

6 Conclusions

In this paper, we have conducted a descriptive analysis of gender gaps in early childhood cognitive development and explored gendered upbringing practices in Latin American and Caribbean (LAC) countries using self-collected and survey data. Our findings indicate that, in general, girls outperform boys across all cognitive domains during this stage of development. Furthermore, by utilizing the HOME inventory, we have provided insights into how parents engage in gendered parenting practices, shaping their children's experiences through the provision of different playing and learning materials based on their gender.

More specific research should be conducted in order to understand how gendered parenting practices are shaped and how they affect children's cognitive development early in infancy in order to promote measures advocating for a more gender-neutral upbringing.

A Gender differences by age

A.1 Gender differences by age in cognitive development

The next exercise we perform is to plot the gender gap in standardized scores for the development outcomes by age group. The following plots are local polynomial smooth plots with the corresponding 95% confidence intervals.

In the Dominican Republic, scores for the socio-emotional sub-scale of the Denver test converge for girls and boys as they age. For the language and fine motor sub-scales, the age patterns are divergent first, and then they converge as children get older. In the gross motor sub-scale and PPVT scores no gender differences can be appreciated for any age.

The patterns in Colombia are much clearer. Girls perform better than boys in all Bayley's sub-scales. However, the gender differences are statistically significant only for the two language sub-scales. The gender gap increases as children get older.

In Nicaragua[1] no gender differences can be appreciated for any age and Denver sub-scale, in line with the general results.

Results in Uruguay are similar to the ones in the Dominican Republic. For the communication and socio-individual sub-scales of the ASQ-SE questionnaire, the gender gap in scores is first divergent and then convergent, with differences only significant for middle ages. The gender gap is increasing with age for the gross motor and problem resolution sub-scales. There are no remarkable gender differences in the scores of the fine motor sub-scale.

For Ecuador, we only plot the scores by gender of the PPVT for the two first waves (when children still match the age-range of our sample in the Dominican Republic). No gender differences can be appreciated for any age.

In Chile, the gender gap favoring girls remain quite stable with age in the TEPSI coordination and language sub-scales, whereas for the motor skills, the gap peaks around 45 months, and it decreases a bit afterwards.

[1] For both countries (Colombia and Nicaragua) plots are made taking the measures at the baseline.

A.1.1 Dominican Republic

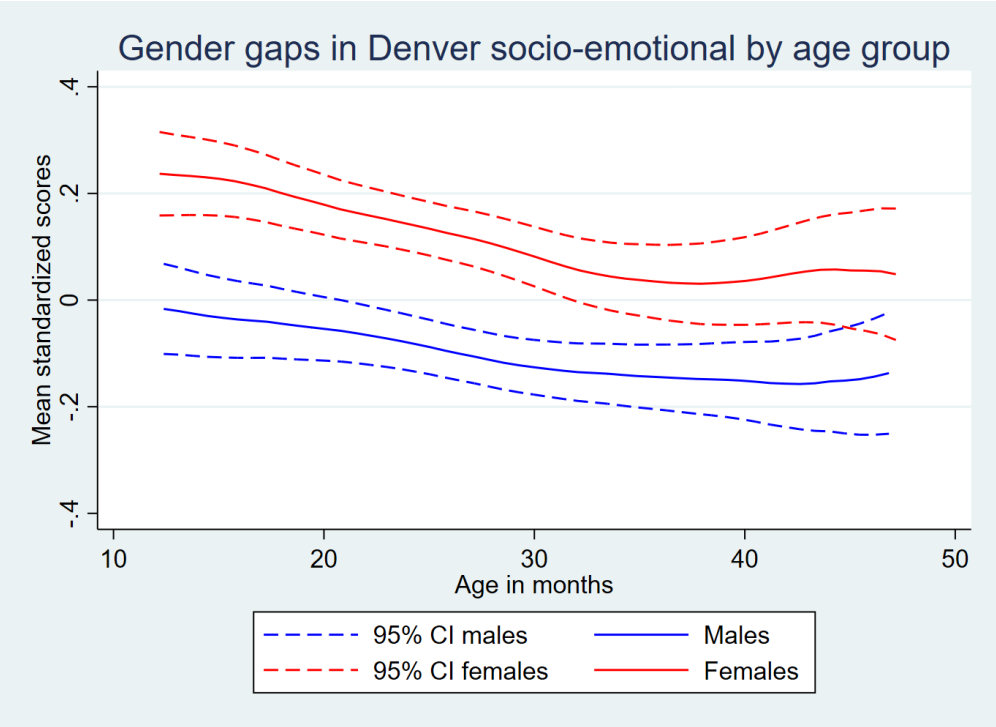

Figure 1: Age distribution of the gender gap in Denver socio-emotional score

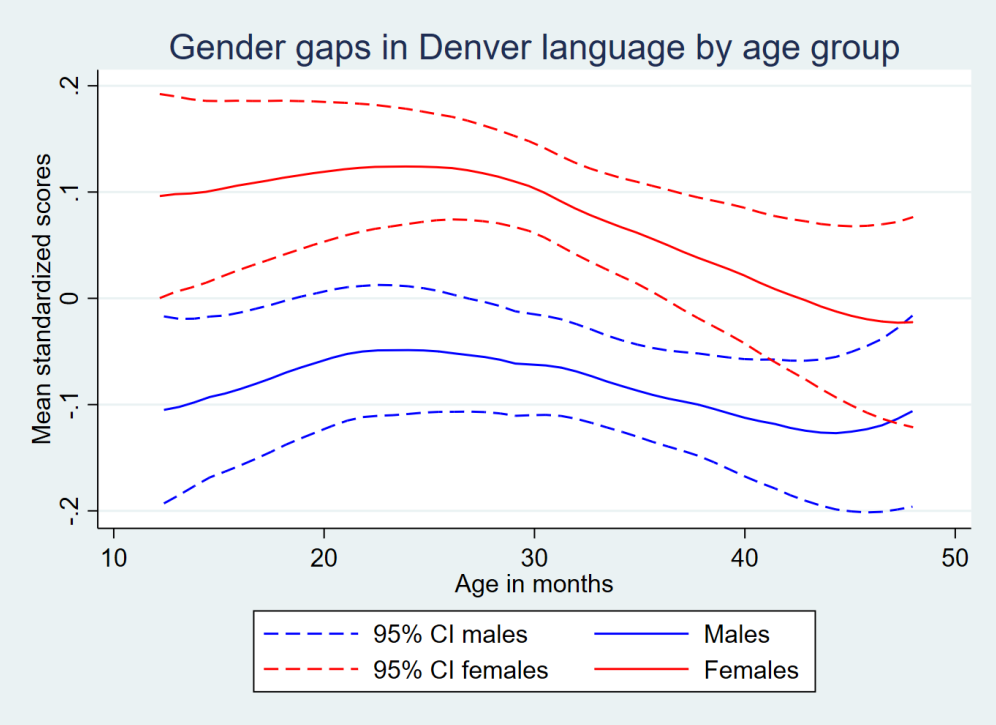

Figure 2: Age distribution of the gender gap in Denver language score

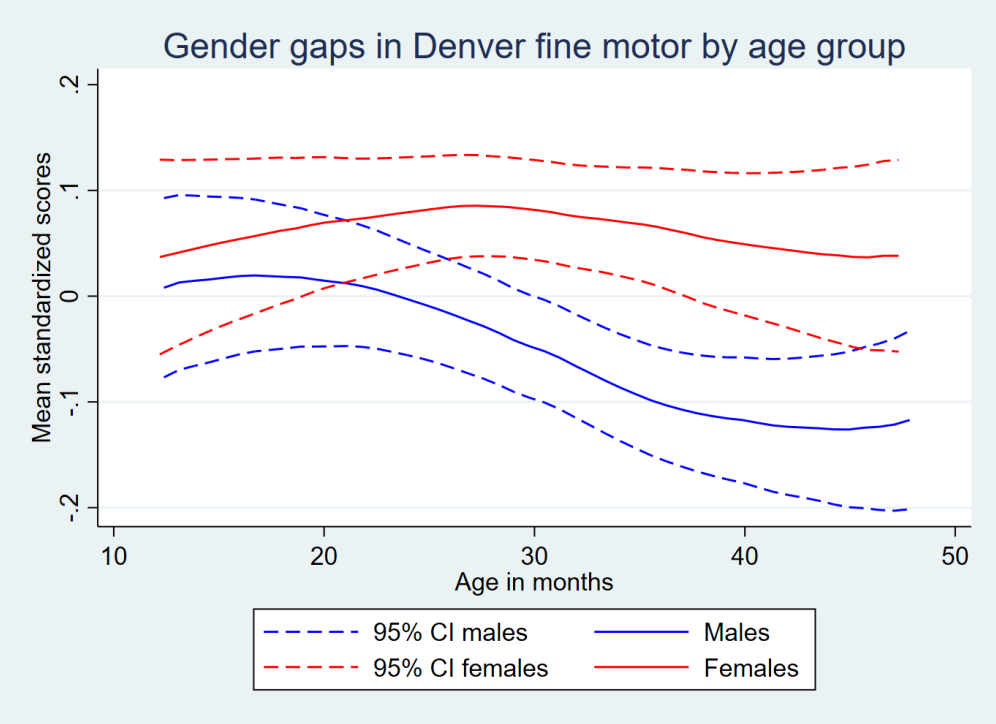

Figure 3: Age distribution of the gender gap in Denver fine motor score

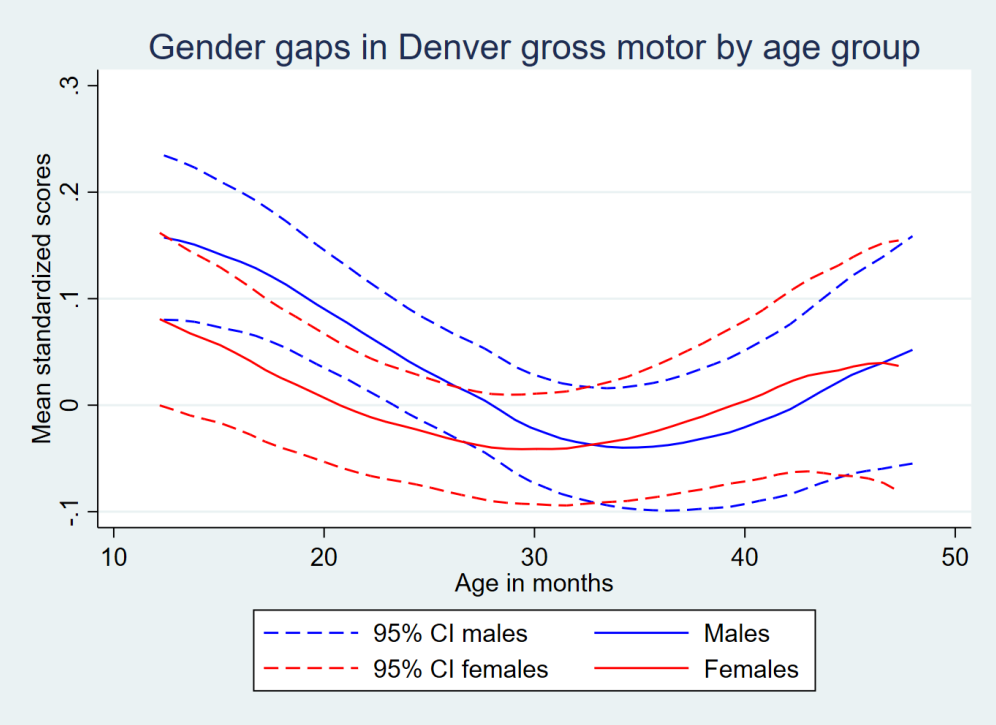

Figure 4: Age distribution of the gender gap in Denver gross motor score

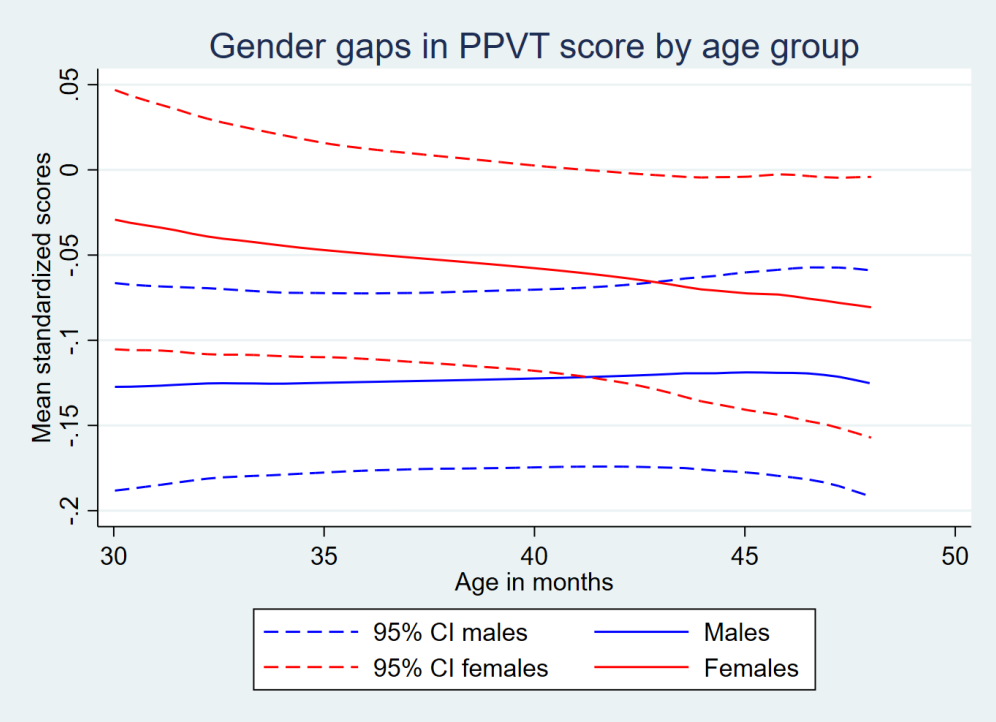

Figure 5: Age distribution of the gender gap in PPVT score

A.2 Colombia

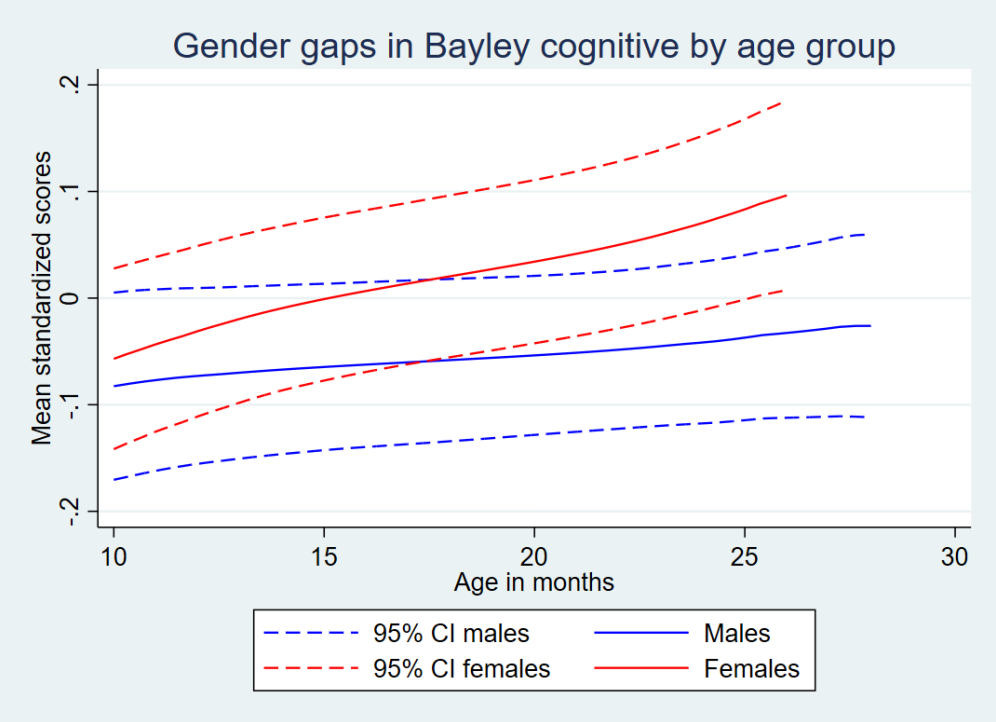

Figure 6: Age distribution of the gender gap in Bayley cognitive score

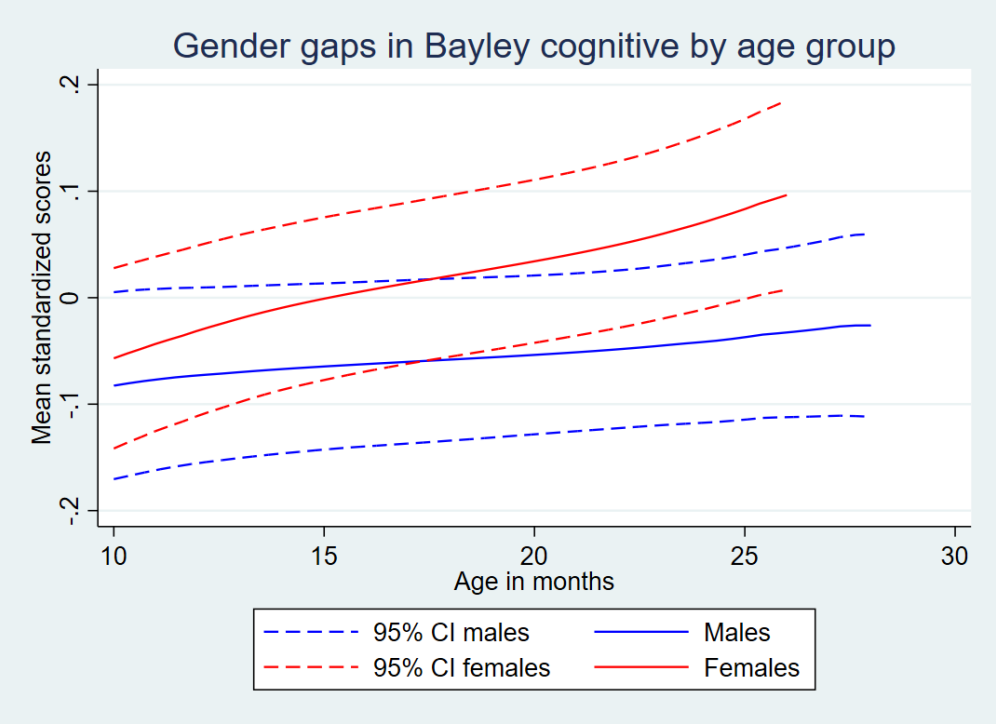

Figure 7: Age distribution of the gender gap in Bayley cognitive score

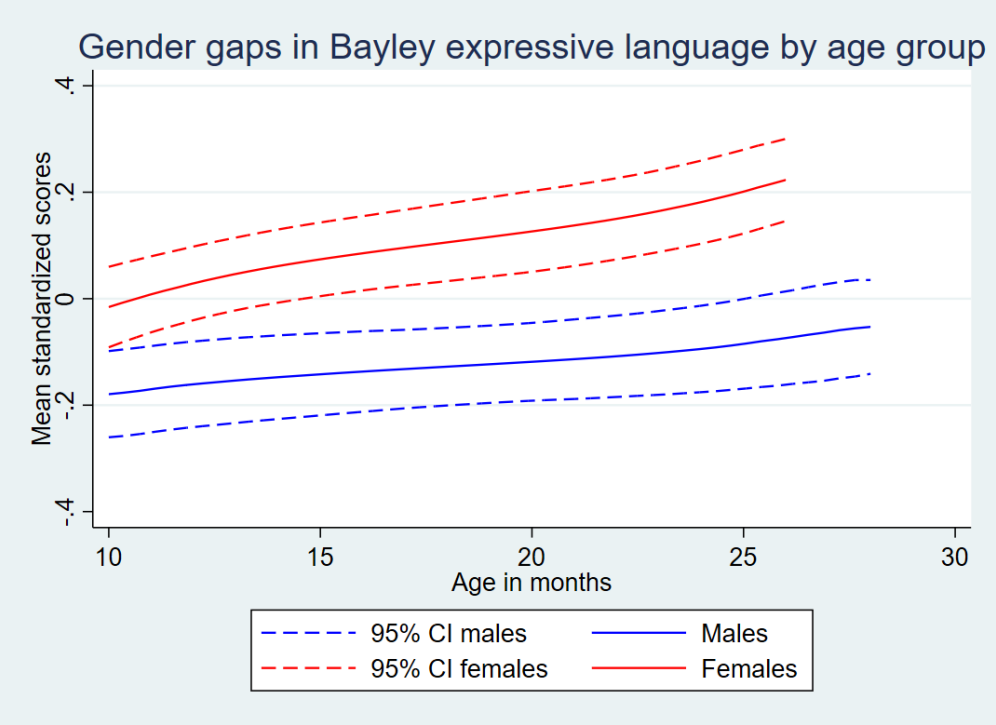

Figure 8: Age distribution of the gender gap in Bayley expressive language score

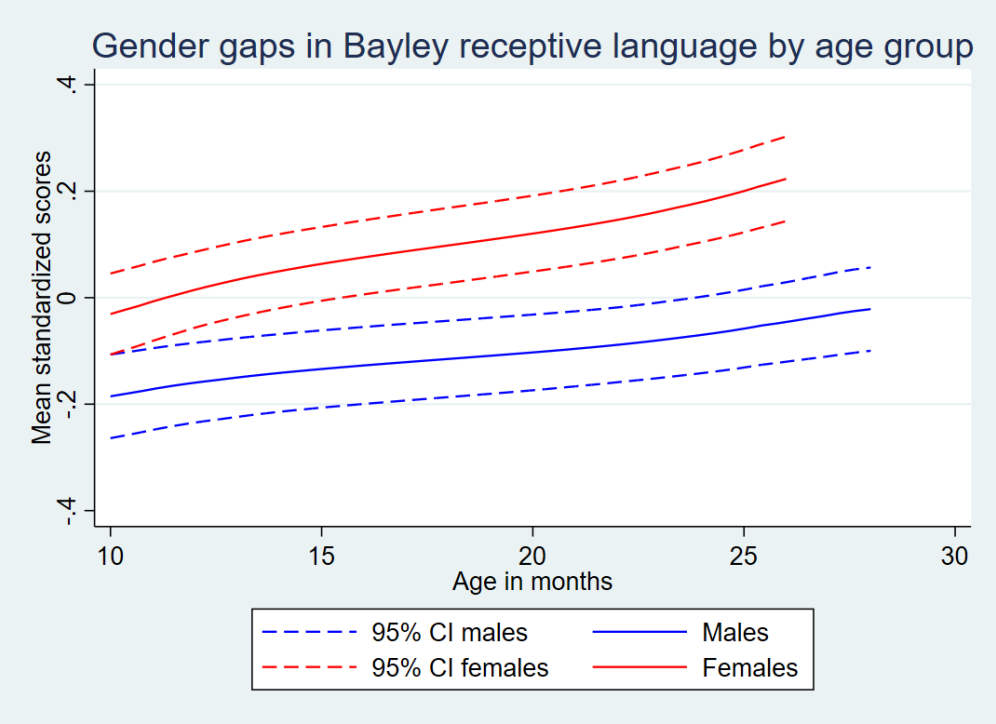

Figure 9: Age distribution of the gender gap in Bayley receptive language score

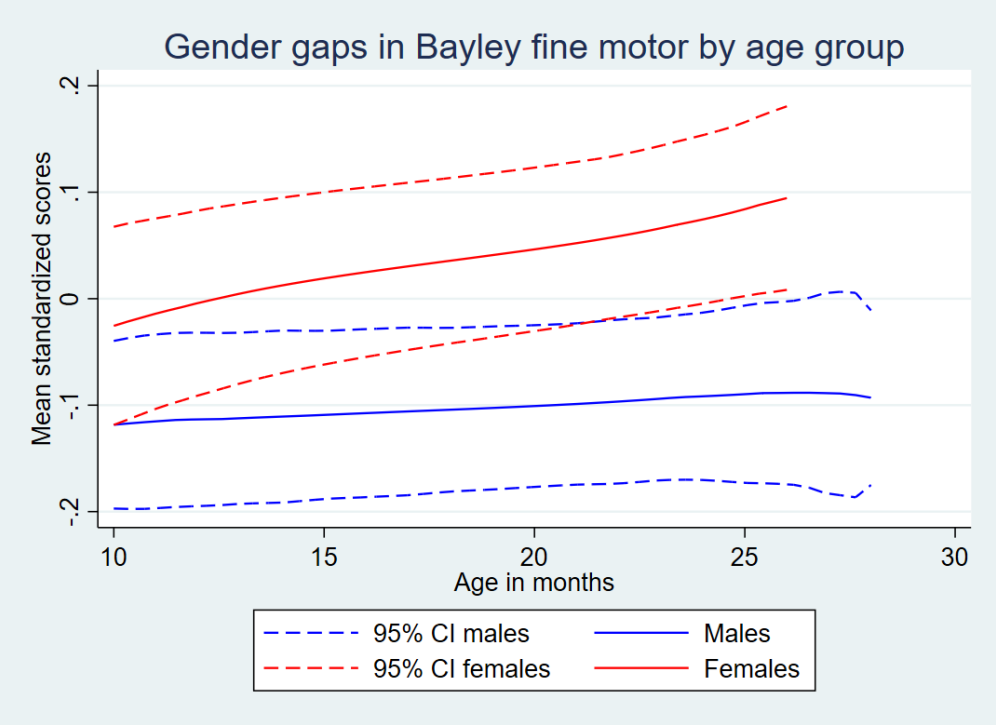

Figure 10: Age distribution of the gender gap in Bayley fine motor score

A.3 Nicaragua

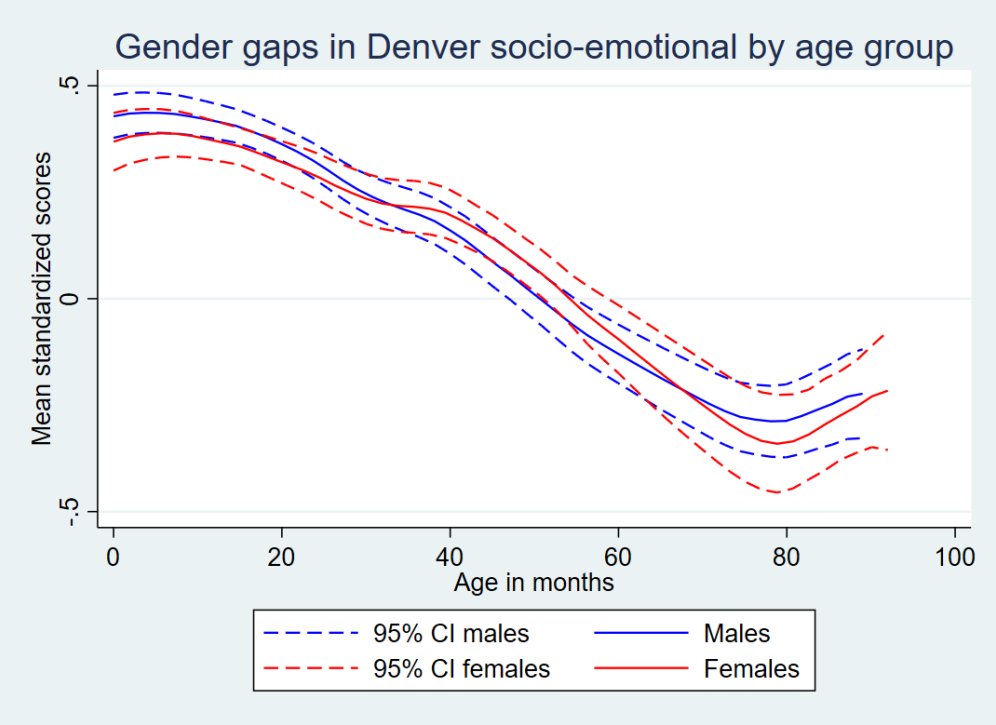

Figure 11: Age distribution of the gender gap in Denver socio-emotional score

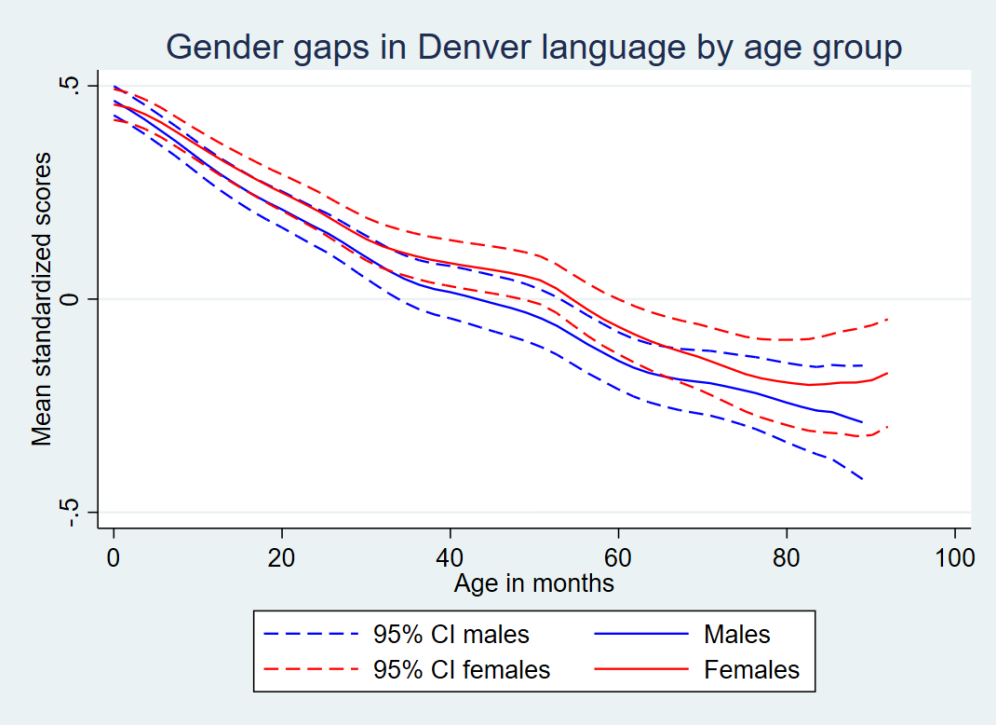

Figure 12: Age distribution of the gender gap in Denver language score

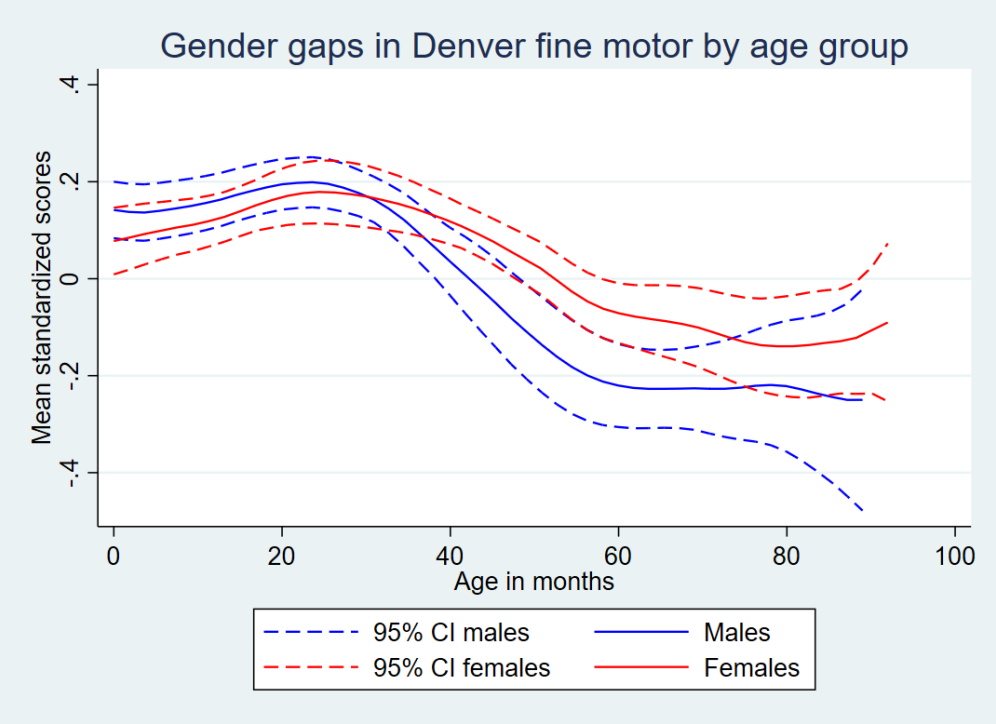

Figure 13: Age distribution of the gender gap in Denver fine motor score

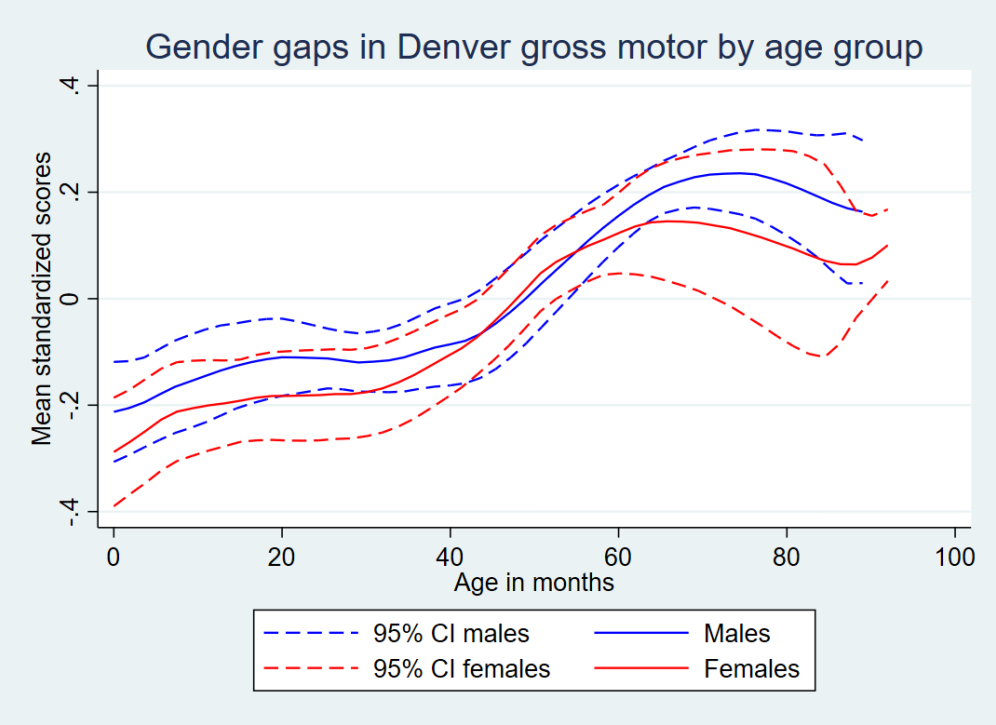

Figure 14: Age distribution of the gender gap in Denver gross motor score

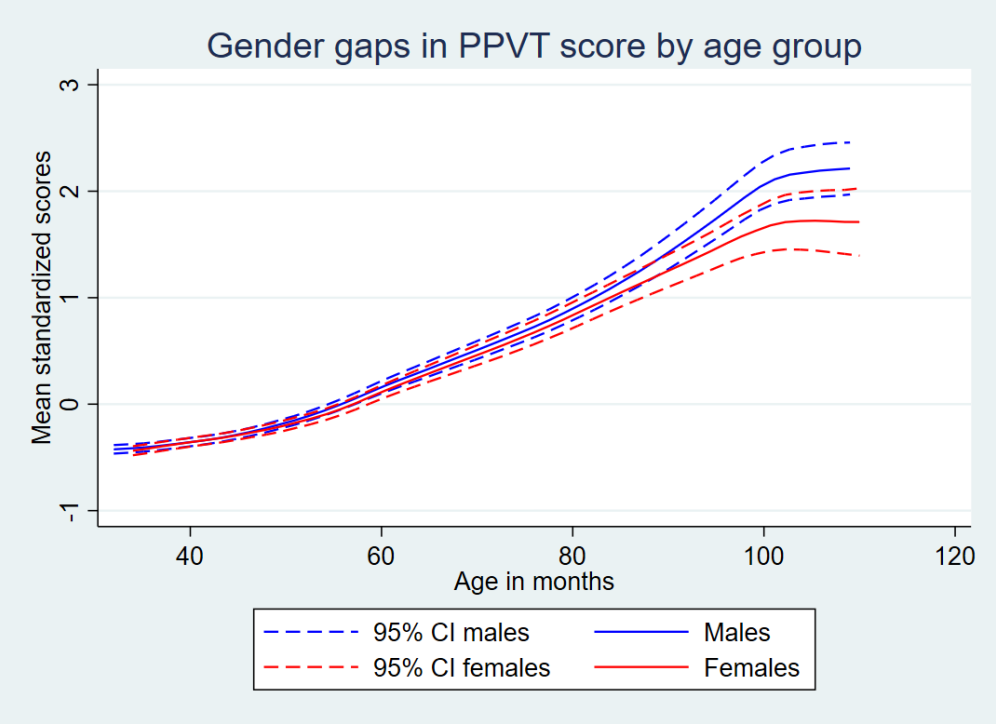

Figure 15: Age distribution of the gender gap in PPVT score

A.3.1 Uruguay

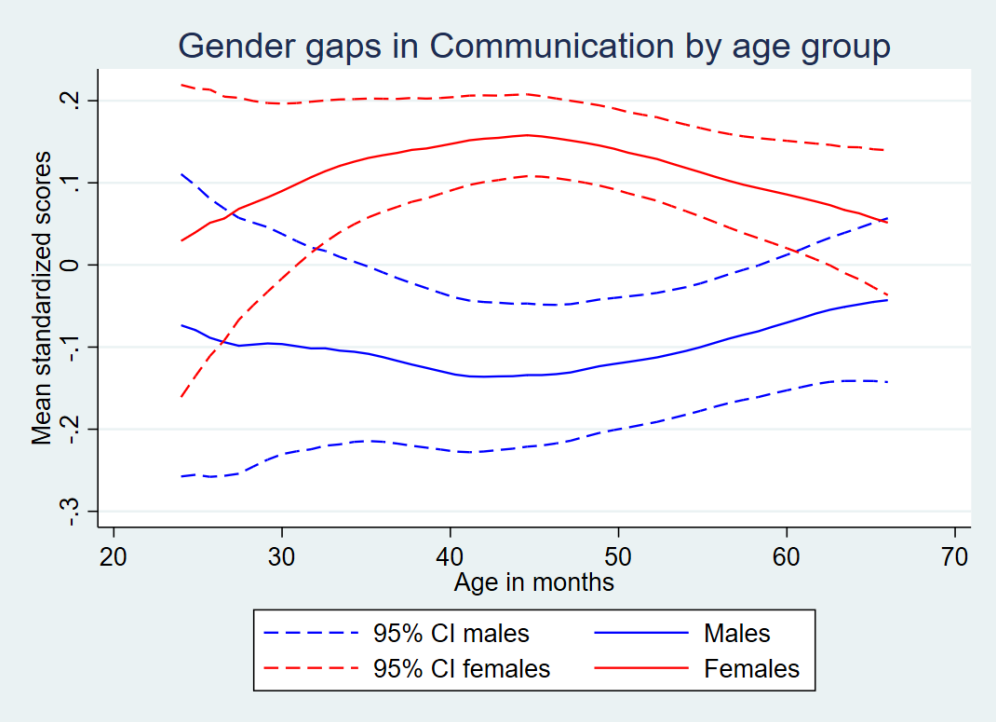

Figure 16: Age distribution of the gender gap in Communication score

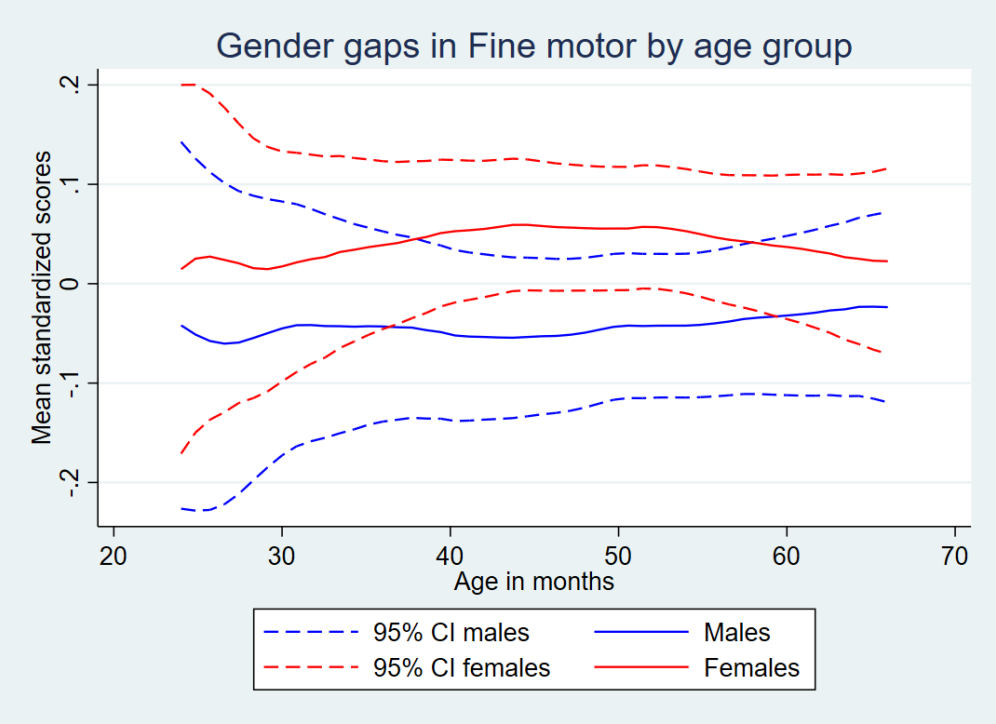

Figure 17: Age distribution of the gender gap in Fine motor score

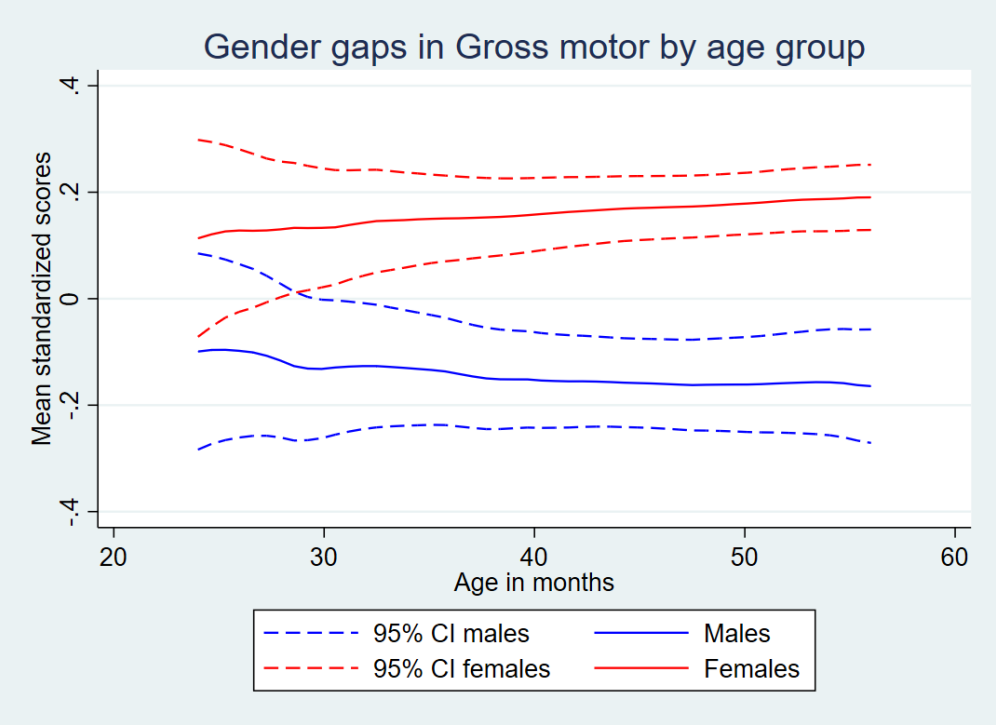

Figure 18: Age distribution of the gender gap in Gross motor score

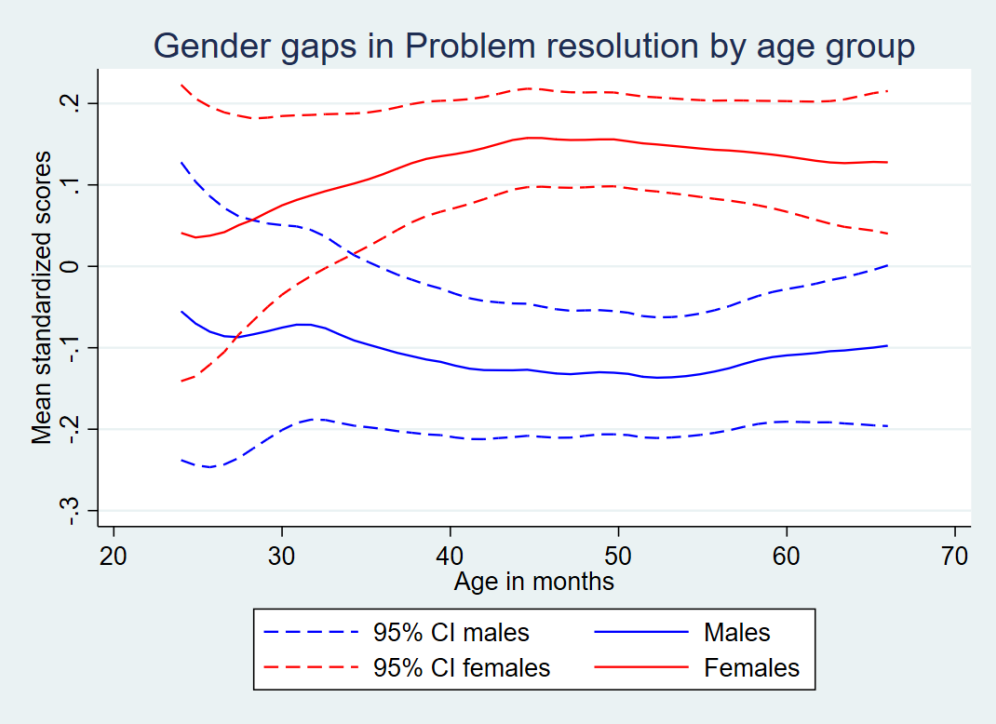

Figure 19: Age distribution of the gender gap in Problem resolution score

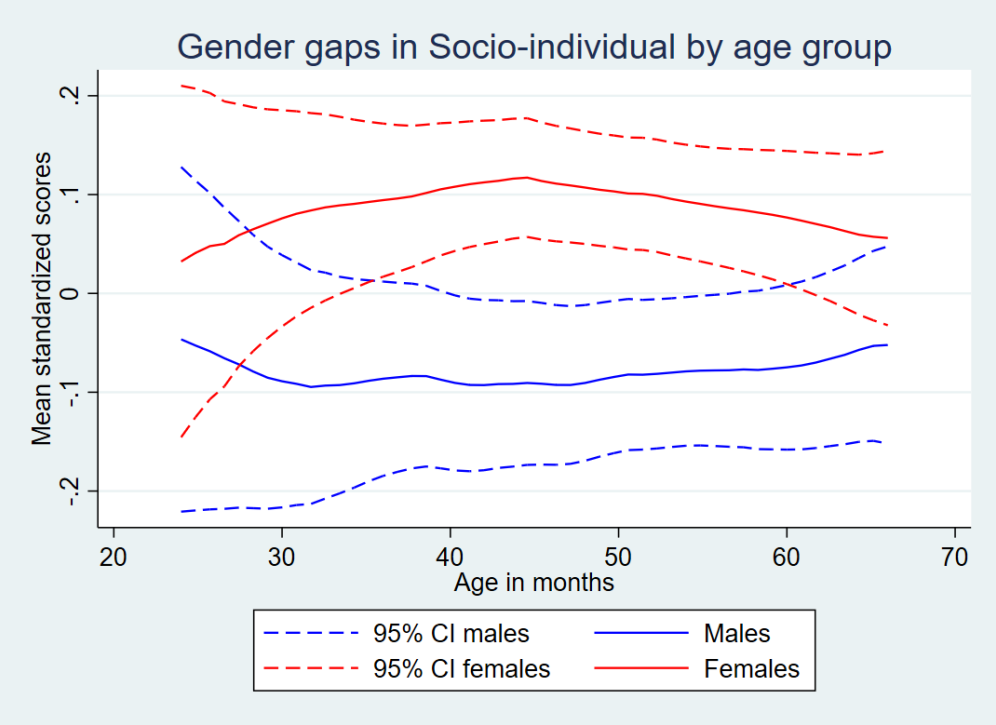

Figure 20: Age distribution of the gender gap in Socio-individual score

A.3.2 Ecuador

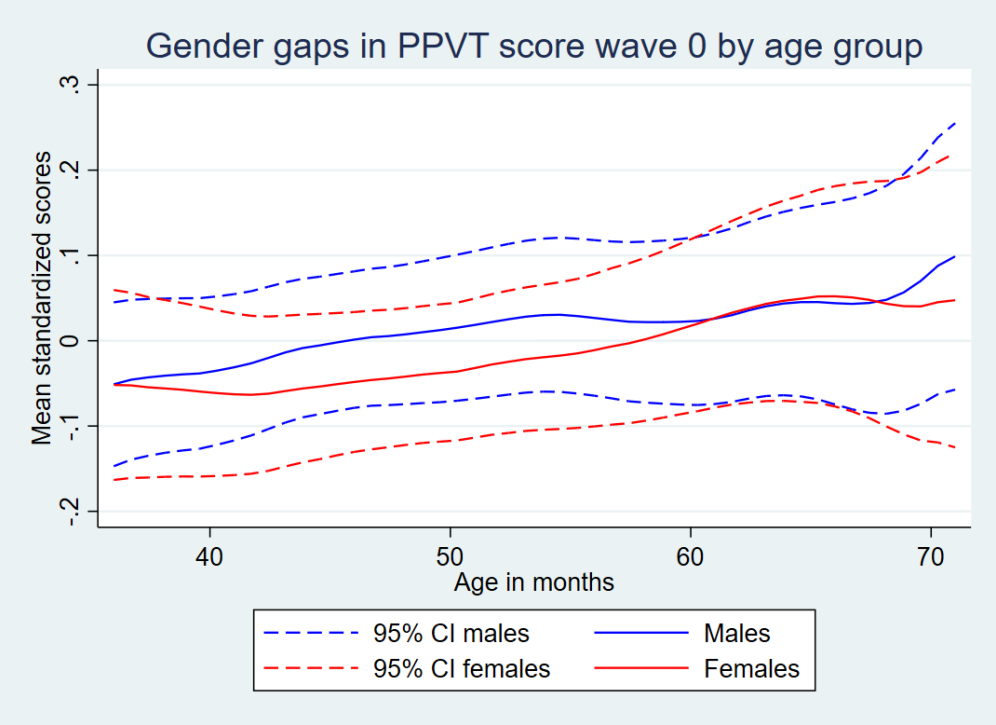

Figure 21: Age distribution of the gender gap in PPVT score (wave 0)

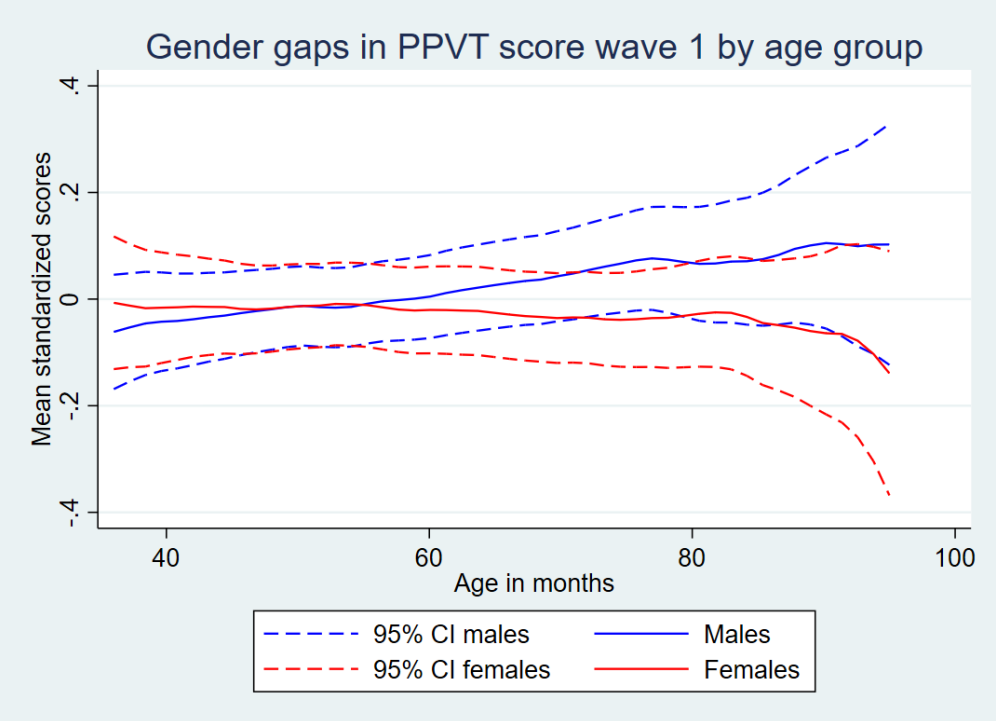

Figure 22: Age distribution of the gender gap in PPVT score (wave 1)

A.4 Chile

A.4.1 First wave (2010)

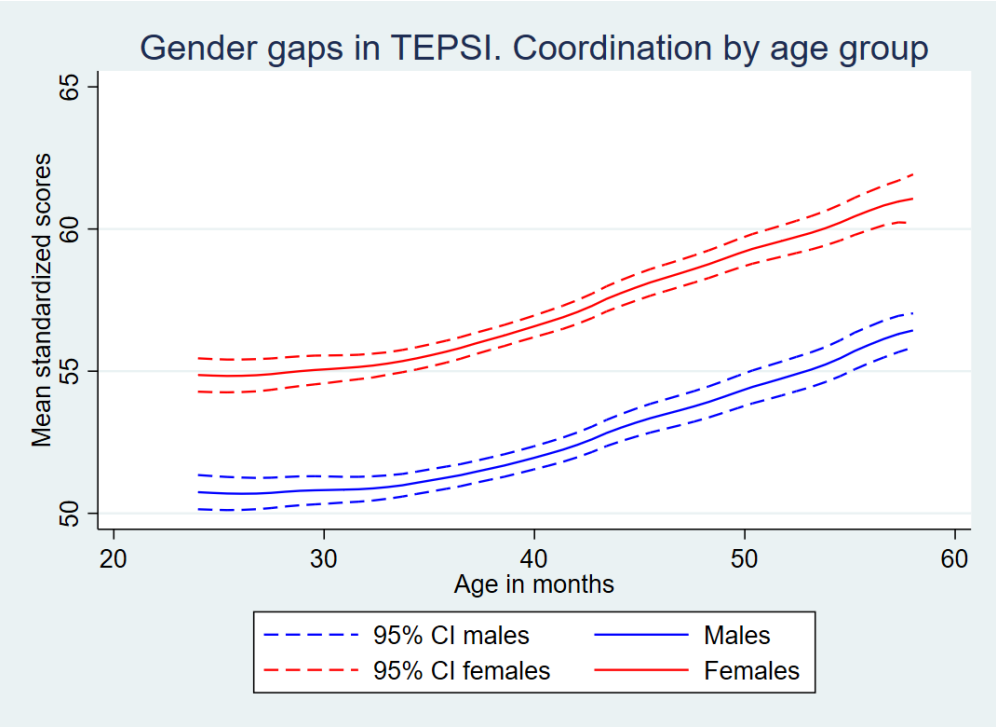

Figure 23: Gender gap in TEPSI Coordination. 2010.

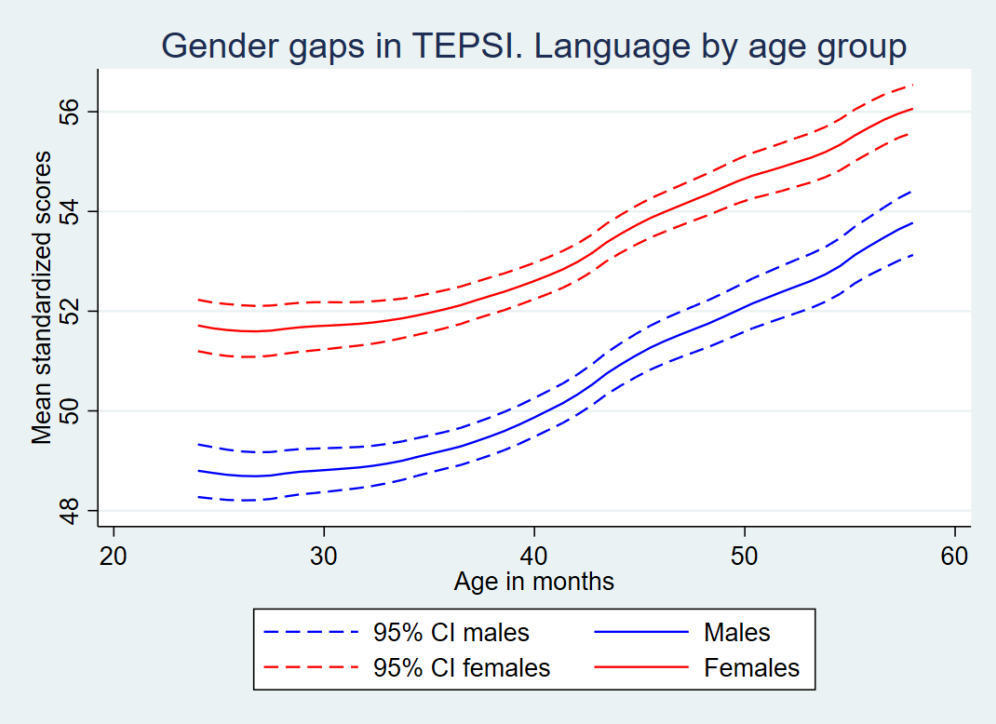

Figure 24: Gender gap in TEPSI Language. 2010.

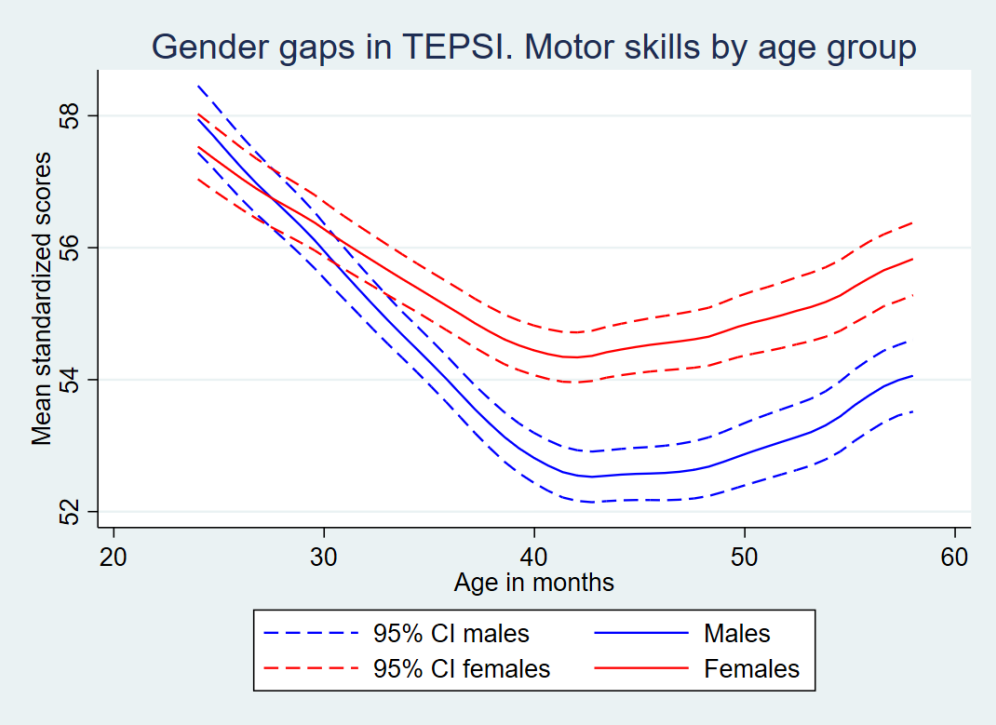

Figure 25: Gender gap in TEPSI Motor skills. 2010.

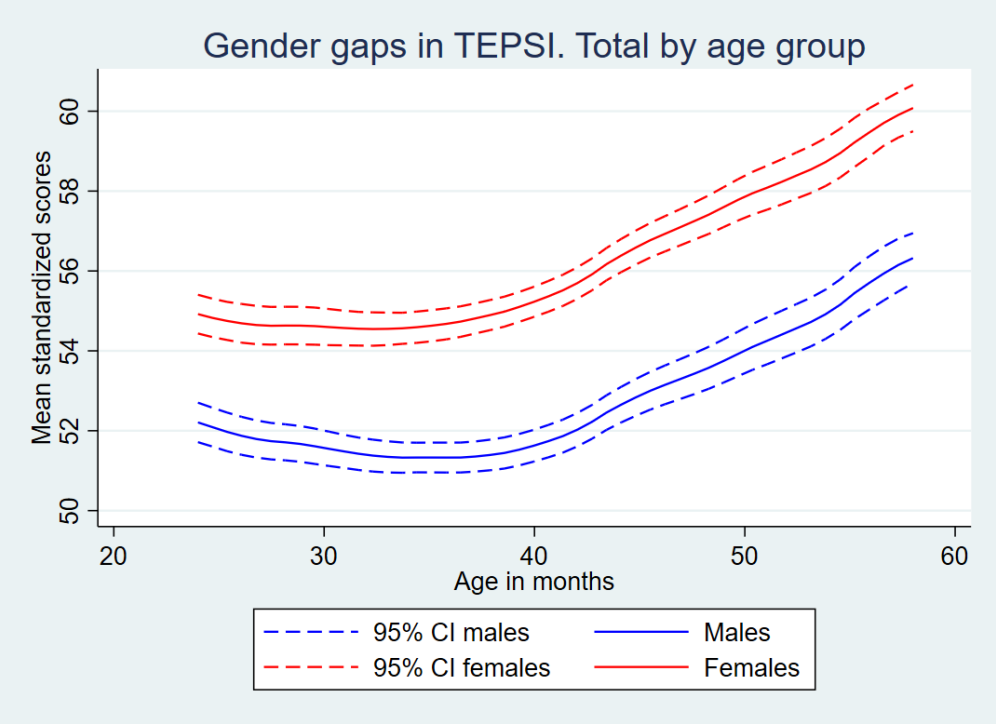

Figure 26: Gender gap in TEPSI Total Score. 2010.

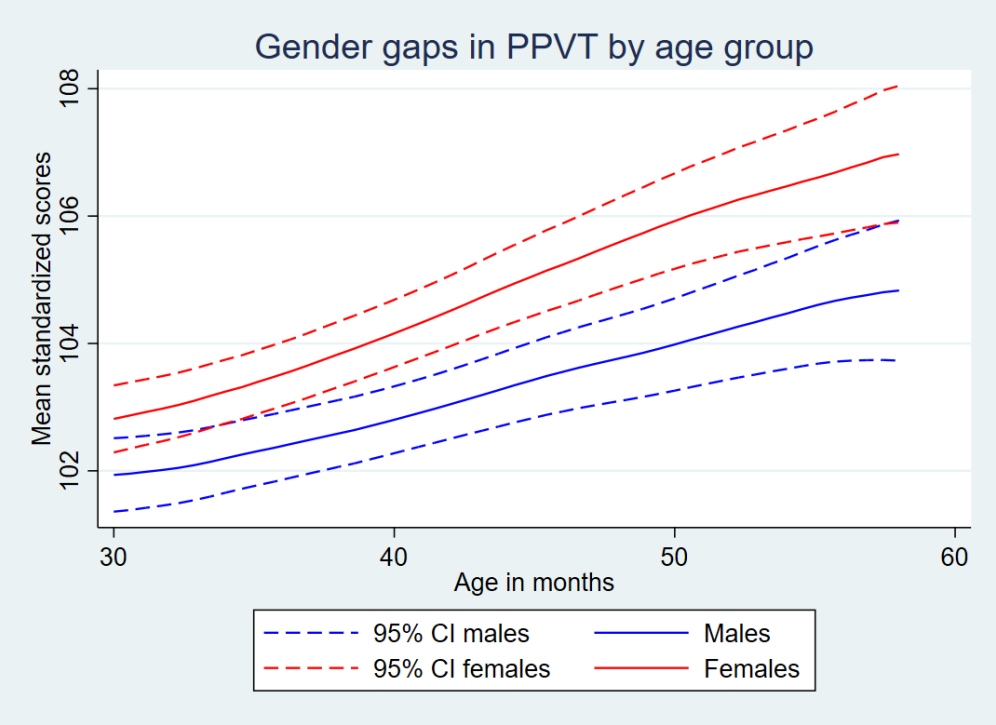

Figure 27: Gender gap in PPVT. 2010.

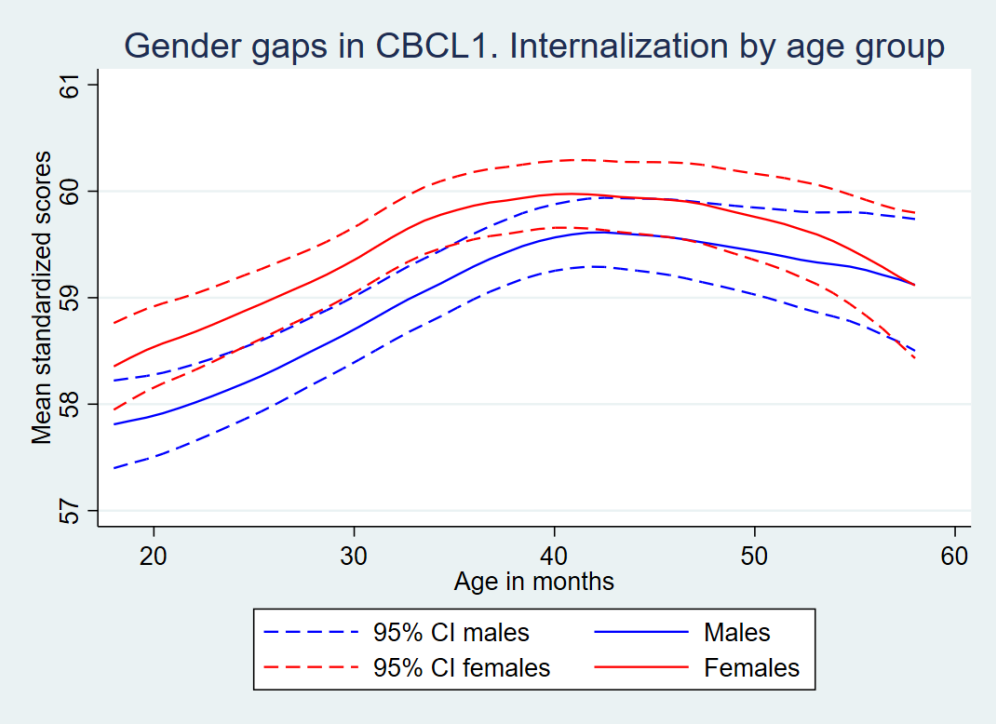

Figure 28: Gender gap in CBCL Internalzing behaviors. 2010.

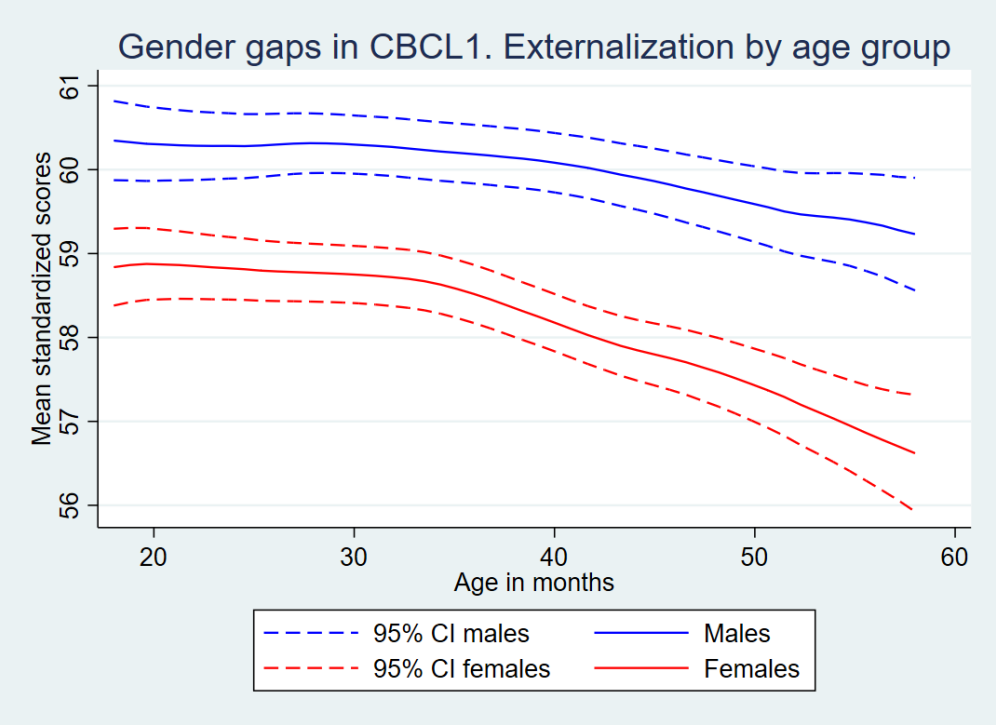

Figure 29: Gender gap in CBCL Externalzing behaviors. 2010.

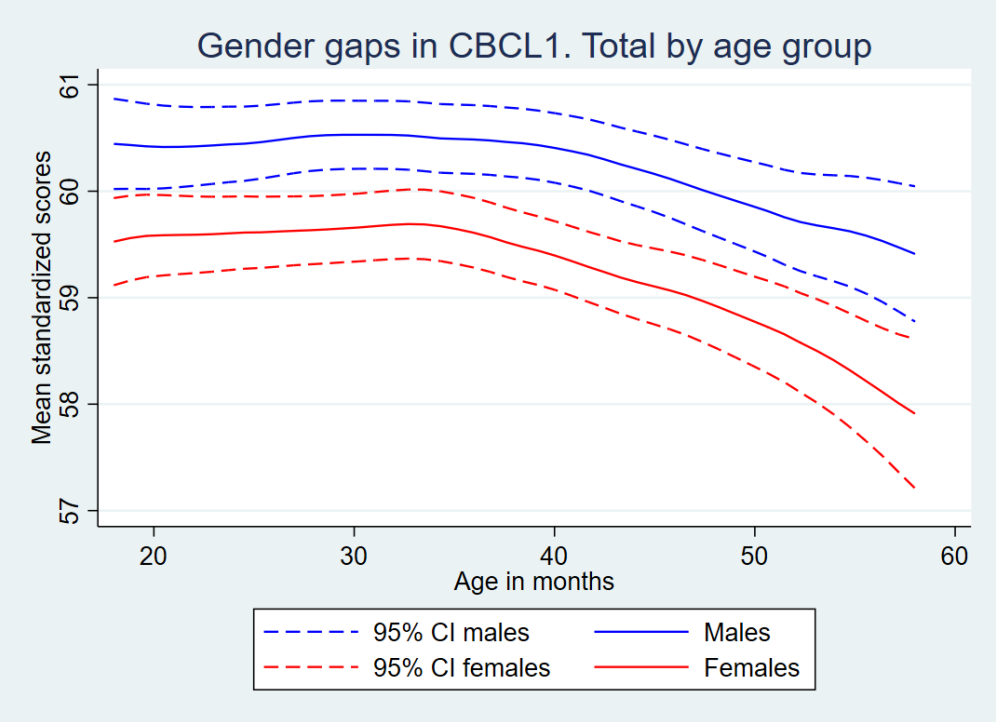

Figure 30: Gender gap in CBCL Total score. 2010.

B The IT-HOME questionnaire[2]

The Infant-Toddler Home Observation for Measurement of the Environment Inventory questionnaire is the recommended one to be administered to children up until 3 years old (the majority of children in our sample). The grouping of the 45 items in the corresponding six sub-scales is gathered in tables 16-21, together with the factor loadings corresponding to the construction of an index using PCA.

[2]The names of the items in English are adapted from Linver et al. (2004).

Table 16: Emotional and verbal responsiveness of the primary caregiver

	Factor loadings
1. Parent permits child to engage in "messy" play	0.0092
2. Parent spontaneously vocalizes to child twice	0.1056
3. Parent responds verbally to child' verbalizations	0.1145
4. Parent tells child name of object/person during visit	0.1742
5. Parent's speech is distinct and audible	0.1429
6. Parent initiates verbal exchanges with visitor	0.1825
7. Parent converses freely and easily	0.1598
8. Parent spontaneously praises child at least twice	0.2050
9. Parent's voice conveys positive feelings toward child	0.1198
10. Parent caresses/kisses/hugs child at least once during visit	0.1640
11. Parent responds positively to praise of child offered by visitor	0.1469

Table 17: Acceptance

	Factor loadings
12. No more than one instance of physical punishment during past week	0.0406
13. Family has a pet	0.0219
14. Parent does not shout at child during visit	0.0194
15. Parent does not express annoyance with or hostility to child	0.0406
16. Parent neither slaps nor spanks child during visit	0.0333
17. Parent does not scold or criticize child during visit	0.0368
18. Parent does not interfere or restrict child more than three times during visit	0.0382
19. At least 10 books are present and visible	0.0898

Table 18: Organisation of the physical and temporal environment

	Factor loadings
20. Substitute care is provided by one of three regular substitutes	0.0008
21. Child is taken to grocery store at least once a week	0.0274
22. Child gets out of house at least four times per week	-0.0704
23. Child is taken regularly to doctor's office or clinic	0.0778
24. Child has special place for toys and treasures	0.2152
25. Child's play environment is safe	0.1822

Table 19: Provision of appropriate play materials

	Factor loadings
26. Muscle activity toys or equipment available	0.2319
27. Push or pull toy activity	0.2391
28. Stroller or walker, kiddie car, scooter, or tricycle available	0.2058
29. Stuff dolls or role toys	0.1975
30. Learning facilitators - mobile table and chairs, high chair, play pen	0.1814
31. Simple eye-hand coordination toys	0.2415
32. Complex eye-hand coordination toys	0.2381
33. Toys for literature and music	0.2416
34. Parent provides children toys to play during the visit	0.1864

Table 20: Parental involvement with the child

	Factor loadings
35. Parent talks to child while doing household work	0.0585
36. Parent consciously encourages developmental advance	0.1365
37. Parent invests maturing toys with value via personal attention	0.2642
38. Parent structures child's play periods	0.1212
39. Parent provides toys that challenge child to develop new skills	0.2701
40. Parent keep child in visual range, looks often	0.0792

Table 21: Opportunities for variety in daily stimulation

	Factor loadings
41. Father provides some care daily	0.0483
42. Parent reads stories to child at least three times weekly	0.0885
43. Child eats at least one meal per way with mother and father	0.0493
44. Family visits with relatives or friends once a month or so	0.0700
45. Child has three or more books of his or her own	0.1310

The score for each sub-scale is constructed by summing up all the items that are true within each sub-scale. Then, the score for each sub-scale is internally standardized and cleaned from tester effects.

The responsiveness sub-scale measures the degree to which parents emotionally and verbally respond and reinforce the child's behavior and communication with the child. The acceptance sub-scale measures parents' acceptance of undesirable behavior and avoidance of restriction/punishment. The organization sub-scale measures of regularity and foreseeing in child activities, the safety of the child's physical environment, and the use of community services. The materials sub-scale captures the appropriateness of the child's toys for her development in several spheres. The involvement sub-scale measures up to what extent parents are actively involved in the child's learning and they

provide her with some stimulation. Last but not least, the variety sub-scale measures if there are other people or situations in the child's daily life that are not regular, but that provide variety without disorganization.
Alternatively, we compute an index for each of the sub-scales using Principal Components Analysis (PCA) and retaining only the first component. We do so on the raw scores, and then we standardize the resulting indices. In the following table, we describe the psychometric properties of each sub-scale and the total HOME scale, namely the Cronbach's alpha and the eigenvalues corresponding to the first component.

Table 22: Psychometric properties of each HOME subs-scales

Sub-scale	Cronbach's alpha	Eigenvalue
Responsiveness	0.70	3.04
Acceptance	0.41	2.40
Organisation	0.23	1.38
Materials	0.73	2.89
Involvement	0.56	2.02
Variety	0.49	1.69
Total	0.76	4.96

We recompute all the sub-scales indices retaining only the items that are specific to the child. In the materials sub-scale, all but the last item are not specific to the child, and for the involvement sub-scale, all the items are specific for the child, so for these two sub-scales, we do not report results separately for the "child-specific items" case. In table 23 we reproduce the gender differences in the different HOME indices computed using PCA. In the second row, we can see that once we remove all the items that are not specific to the child the difference in the HOME index becomes significant at 5% level. There are also significant gender differences in the materials sub-scale (in favor of boys) and in the involvement sub-scale (in favor of girls). These results replicate the ones in the main analysis, but now we have that the gender differences for the acceptance and the variety sub-scales are no longer significant. In the organization sub-scale, girls score significantly higher than boys once we remove the non-child-specific items.

Table 23: Gender differences in HOME indices

	Boys	Girls	Dif	p-value	N
HOME total index	-0.018	0.023	0.019	0.566	2620
HOME total (child specific)	-0.041	0.048	0.07	0.033	2620
HOME responsiveness index	-0.005	0.009	-0.002	0.942	2621
HOME acceptance index	-0.017	0.032	0.051	0.123	2620
HOME organisation index	-0.028	0.035	0.06	0.107	2621
HOME materials index	0.031	-0.028	-0.076	0.036	2621
HOME involvement index	-0.05	0.051	0.084	0.035	2621
HOME variety index	-0.03	0.033	0.058	0.14	2621
HOME responsiveness index (child specific)	-0.006	0.011	0.002	0.944	2621
HOME acceptance index (child specific)	-0.016	0.031	0.05	0.138	2620
HOME organisation index (child specific)	-0.038	0.043	0.078	0.068	2621
HOME variety index (child specific)	-0.023	0.025	0.043	0.286	2621

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