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*Daniela Del Boca, Enrica Maria Martino,
Daniela Piazzalunga*

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Daniela Del Boca, Enrica Maria Martino
and Daniela Piazzalunga

Investments in Early Education and Child Outcomes: The Short and the Long Run

INTRODUCTION

In the last few years a growing number of economists and psychologists have focused on the ways parents care for their younger children. In households where both parents work in particular, the care of children has to be at least partially delegated to the care of other members of the family or to formal childcare. Given the importance of early investments in children's development, an intense debate has focused on the availability and quality of alternative childcare modalities as substitutes for maternal time.

With the growing number of women working, the use of non-maternal childcare has increased in the last two decades, with children cared for within the extended family (mostly by grandparents) or in formal care centers. In countries like Norway, Sweden and France, where formal childcare is widely available and there is generous parental and maternity pay and support for mothers who stay at home, grandparents play a more limited role in providing childcare. In Italy, Spain and the United Kingdom, where there is little formal childcare, grandparents often care for their grandchildren (Jappens and van Bavel 2012). Figure 1 shows a negative link between public expenditure on formal childcare and the use of informal childcare in different countries.

Figure 2 shows the formal childcare enrolment rates for children aged 0–2 and children aged 3–5 in sev-

eral countries. The enrolment rate in formal childcare is much lower for children under the age of 3 and varies considerably across countries. Government spending in this area is highest in the Nordic countries and France, and much lower in Mediterranean countries, both as a percentage of GDP and per child.

Research on the effect of formal childcare on child development has been growing in the last two decades and produced several important results.

The international comparison of children's cognitive outcomes provided by PISA (test scores in mathematics and reading performance) shows a potential link between early investments in education and student performance. In Northern European countries, where larger early investments in children are made, cognitive test scores are higher, while in Mediterranean countries, where investments are lower, children perform worse (OECD 2014).

In this article we report recent findings from the literature focusing on the impact of parental and non-parental investments on child outcomes, with attention to cognitive and non-cognitive outcomes as well as short-run and long-run effects.

THE ECONOMIC APPROACH TO CHILDCARE

In order to analyze the link between early investments and child outcomes, economists have used a production function framework (Todd and Wolpin 2003). The first years of life are especially important, as child development is described as a dynamic and cumulative process, where early investments have the highest rate of return (Cunha and Heckman 2008). The outcome is determined by parental inputs (money and time), school inputs, and endowments; cognitive and non-cognitive outcomes are largely determined in early stages. The neuroscience literature shows that children's skills are most malleable at an early age, making early investments most relevant for future life outcomes, while interventions when children are teenagers or young adults are more expensive and often less effective. Thus, early interventions are more efficient than later interventions. In this framework, cognitive and non-cognitive skills are equally important in explaining several short-term and long-term outcomes, as there is a strong link between skills such as motivation, attention and self-confidence, and performance in school (Cunha and Heckman 2008).

While child development has traditionally been a field of study for development psychologists and neuroscientists, economists have contributed to this area in a significant and original way over the past two



Daniela Del Boca
University of Turin, IZA
and CHILD-Collegio Carlo
Alberto.



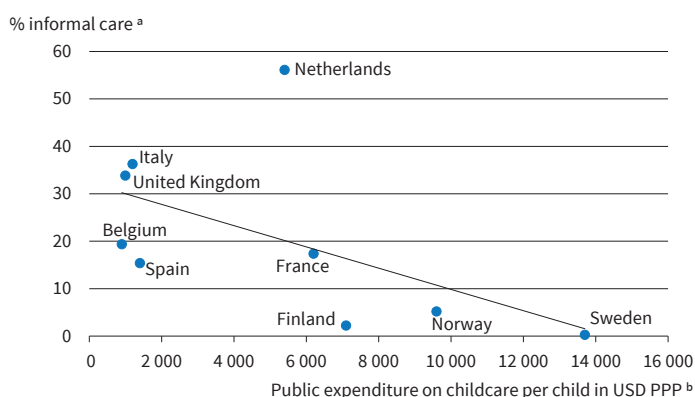
Enrica Maria Martino
University of Turin and
CHILD-Collegio Carlo
Alberto.



Daniela Piazzalunga
FBK-IRVAPP, IZA, and
CHILD-Collegio Carlo
Alberto.

Figure 1

Public expenditure on childcare and use of informal care
Children aged 0–2



^a Proportion of children using informal childcare arrangements during a typical week.
^b 2013 and latest available.

Source: OECD Family Database.

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decades. Economists are interested in understanding both the drivers of economic growth at the macro level, and the drivers of individual productivity and labor market outcomes at the micro level. At the micro level, early contexts affect a person's development over his/her entire lifecycle; affecting the development of skills and abilities, they influence the productivity of individuals and potentially their costs to society (Knudsen et al. 2006). As mothers increasingly join the labor force, reducing time that they spend with their children, concerns are raised over the negative effects that their absence may have on children's development.

Other research in economics focuses on inequality and social mobility. As there exist substantial gaps between advantaged and disadvantaged children, which last and increase over an entire lifetime, investing in the development of disadvantaged children may be especially important to give equal opportunities to children from different backgrounds. These investments would help to close those gaps and reduce inequalities in the long term.

In terms of policy implications, this evidence makes investments in early childcare and the design of parental leave policies particularly relevant for two distinct goals: to encourage and sustain female employment and facilitate the reconciliation of work and family responsibilities; and to improve children's opportunities and reduce inequality at the earliest stages of life.

While theoretical and empirical literature in several disciplines highlights the importance of the first years of life for the cognitive and non-cognitive devel-

opment of children, rigorous evaluations of the impact of different forms of childcare at the pre-kindergarten age are still rare, mainly due to the lack of adequate data, and results are mixed.

Recently, some empirical studies tried to assess the impact of early childcare on child outcomes. The main difficulties stem from the lack of data and from the endogeneity in parental preferences over childcare which, if not adequately taken into account in the identification strategy, prevent any causal interpretation of the results. Another important issue is the alternative childcare option available to the family: failing to control for the true counterfactual scenario could lead to a misleading interpretation of the results, as highlighted by Elango et al. (2015).

Below we discuss the most recent studies on US and European data, which have addressed the hypotheses presented before, dealing with endogeneity in the choice of childcare.

THE ROLE OF THE FAMILY

Several recent studies in different countries have used the theoretical framework described above to explore the impact of family inputs on child outcomes. To analyze this impact, the most accurate measure of family's time investments in children is provided by time diary surveys, which usually contain detailed information about the amount of time parents spend engaged in various activities with their children. Not only is the amount of time spent with children relevant, but also (and most importantly) the quality of this time, and the distinction between active time – i.e., time spent in playing with the children – and passive time – i.e., being in the same room, but doing other activities besides childcare – is crucial.

Mothers' and fathers' care

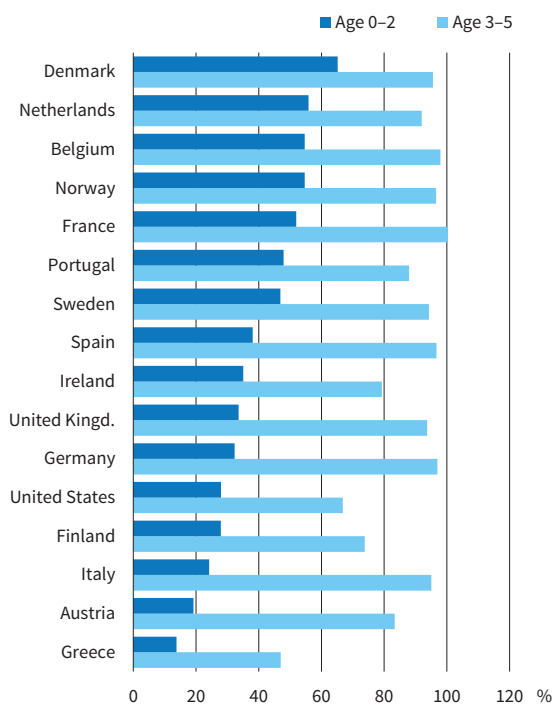
Research exploiting time use data from the Child Development Supplement of the Panel Study of Income Dynamics shows that US mothers who are highly educated can use their time more productively, and are able to squeeze their leisure time to continue to provide similar amounts of quality time to their children when they work as when they do not (Hsin and Felfe 2014).

The size of the impact of mothers' inputs on child cognitive outcomes depends on the childcare substitutes available to the household. As most research shows, mothers' time is the most important input to a child's cognitive development. However, in recent decades, fathers' time with their children has increased markedly, partly offsetting the decline in mothers' time due to increasing employment rates.

Drawing on time use data, Del Boca, Flinn and Wiswall (2014) find that both parents' inputs are important for children's cognitive development. The study finds that parental time inputs, and especially active time, are generally more productive than financial expenditure on "child goods" (such as tutoring, toys

Figure 2

Enrolment rates to early childcare by age and country, 2014



Source: OECD Family Database.

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and games, books and so forth). The study also shows that mothers' time is particularly important for younger children, but fathers' time becomes more important as children grow up. When children grow older their own inputs become more important than mothers' and fathers' inputs, as well as school and peer groups (Del Boca, Monfardini and Nicoletti 2017).

In applied psychology, new parental inputs have been considered besides time and money, including the style of parenting itself, which defines parents' approach in disciplining their children. Baumrind (1966) proposed a typology of three parenting styles, which are distinguished mainly in terms of the relative importance parents attach to control of versus freedom for their children. According to his analysis, children's best cognitive and behavioral developmental outcomes are more often correlated with authoritative parenting (i.e., high levels of both warmth and control). These early results were tested in more recent studies, which find that parenting style is an important determinant of children's outcomes independent from other parental investments (Cobb-Clark, Salamanca and Zhu 2016, Doepke and Zilibotti 2014).

Grandparental care

When both parents work, one of the most important substitutes of their time is informal childcare provided by grandparents. Data from several countries indicate that grandparents play an important role in childcare in most cases (Jappens and van Bavel 2012).

A large proportion of grandparents provide some kind of care for grandchildren, some on a regular basis. This proportion has decreased over time in countries where subsidized universal childcare has become available, while it has remained stable or increased in countries where affordable formal childcare is unavailable.

Recent research results show that grandparents' care can positively affect some measures of cognitive outcomes, while negatively affecting others. Toddlers who received informal care from grandparents did better on vocabulary tests than those who received formal childcare, but were less prepared for school (Hansen and Hawkes 2009; Del Boca, Piazzalunga and Pronzato 2014).

In center-based formal care, better trained staff may provide a more stimulating environment, featuring more interaction with staff and other children, and more educational activities than informal care. One potential explanation of the positive effect of grandparents care on naming vocabulary is that grandparents provide one-on-one care, with children addressed verbally by adults more frequently than in formal care. In addition, grandparents provide a more stable relationship with children, whereas formal care centers are likely to be characterized by staff rotation.

These results differ considerably according to children's socio-economic backgrounds. The positive impact on a child's vocabulary associated with grandparents' care is stronger for children from advantaged backgrounds, while the negative impact on school readiness is stronger for children from disadvantaged

backgrounds. Del Boca, Piazzalunga and Pronzato (2014) also explored longer-term effects and show that the negative effects of grandparental care on cognitive outcomes decline at age 7, but the differences by socio-economic background remain.

THE ROLE OF FORMAL CHILDCARE

Empirical research conducted on US or European countries generally finds that center-based childcare has positive effects on several child outcomes, both among cognitive skills (IQ, language and motor skills, school readiness, achievement tests) and their non-cognitive counterparts (better health, socio-emotional maturity, lower hyperactivity and aggressive behavior). The programs are usually more beneficial for children from disadvantaged backgrounds or from households with low socio-economic status; the channel to explain this heterogeneity in results may refer to the worse and less stimulating home environment available to disadvantaged children, while richer families may have access to high-quality substitutes of center-based childcare; another possible explanation is the lack of information about education and pedagogical methods among parents from low socio-economic status, for whom formal childcare may also play an informative role about best parenting practices (Cuhna, Elo and Culhane 2013, Cuhna 2015).

Empirical evidence on cognitive outcomes

Elango et al. (2015) report and systematize results from several studies evaluating the impact of formal childcare on children's outcomes. The first results come from the evaluation of randomized social experiments targeting disadvantaged children (the Carolina Abecedarian Project in the 1970s, Head Start, begun in 1965, and the Infant Health and Development Program in the 1980s); they find significant positive effects on early measures of IQ. Differences by gender emerge, the effect being stronger – or significant – for boys.

Additional evidence comes from universal programs both in the US and in Europe. Bernal and Keane (2011) find that center-based care has no negative effects on children's cognitive outcomes (measured by standardized vocabulary, reading and math tests) as a substitute for maternal time with children, while informal care does. Evaluating the impact of universal pre-kindergarten in Oklahoma, Gormley (2008) finds increases in cognitive, language, and motor skills, especially for black children and children of immigrant parents. Loeb et al. (2007) find that center-based care has a positive impact on reading and math scores. Brilli, Del Boca and Pronzato (2016) explore the relation between early childcare and children's performance in primary school in Italy, where early childcare supply is highly rationed and heterogeneously distributed; they find a positive effect of childcare availability, the results being stronger for low income households and in areas where childcare availability is lower. Drange and Havnes (2015) use a lottery mechanism applied in Nor-

way to allocate slots in early childcare centers to evaluate the impact on cognitive outcomes: they find that children from low income families who went to early childcare centers perform better in a language and mathematics test at 7, while no significant impact emerges among children from high income families. Felfe and Lalive (2014) use rich German data to study the impact of early center-based care on both cognitive and non-cognitive outcomes (language and motor skills, school readiness, socio-emotional maturity); they find that it is beneficial for children with less educated mothers or foreign parents.

Empirical evidence on non-cognitive outcomes

Economists usually cluster under “non-cognitive outcomes” a number of different characteristics valued at school and in the labor market, but which are not measured by achievement and IQ tests, such as behavior, personality traits,¹ goals, motivations, preferences, self-control and locus of control. However, most studies to date have focused only on behavior due to data limitations.

Compared to cognitive skills, non-cognitive skills are considered to be more malleable for longer periods of time, even though investments at early ages have larger effects (Felfe and Lalive 2013) and higher returns (Kautz et al. 2014). Moreover, non-cognitive skills also influence cognitive skills (Almlund et al. 2011).

Few studies find an increase in the behavioral problems suffered by children attending early formal care (Magnuson, Ruhm and Waldfogel 2007; Baker, Gruber and Milligan 2008), while others do not find any difference with parental care. According to a study for Denmark by Datta Gupta and Simonsen (2010), being enrolled in formal care at age 3 is as good as parental care in terms of non-cognitive outcomes; while family day care, by contrast, negatively affects children’s behavior. Hansen and Hawkes (2009) find similar results for the UK: they report no effect of formal care at 9 months on the behavior of children at age 3, whereas children cared for by grandparents have more peer problems.

Other researches find instead a reduction in behavioral problems thanks to formal care (Figlio and Roth 2009; Chor, Andresen and Kalil 2016; Felfe and Lalive 2013 for disadvantaged children). After the first evaluation revealed its negative impact on the non-cognitive development of very young children (Baker, Gruber and Milligan 2008), in a later evaluation, Baker, Gruber and Milligan (2015) distinguished positive effects on disadvantaged children in terms of reduction of hyperactivity, anxiety and depression.

Effects in the medium and long run

One of the most important questions for policy purposes is how long the effects of early formal care last, and on which outcomes. Findings are mixed: while

some researchers show that the positive effects of attending formal care on the cognitive abilities of children fade or dissipate within few years, others find a long-lasting effect.

As noted in the review by Elango et al. (2015), a general pattern for IQ and achievement test scores is that they fade after the beginning of primary school and, in some cases, completely vanish by teenage years. Hojman (2015) finds that, for Public Private Partnerships (PPP) and Educational Training Programs (ETP), the gap between treatment and control groups narrows because the control group gains more from schooling. Evaluating a Tennessee program with a randomized control trial, Lipsey, Farran and Hofer (2015) find that attending pre-kindergarten at age 4 has positive effects on cognitive and – to a lesser extent – behavioral outcomes at age 5. However, the cognitive effects disappear by the end of kindergarten (age 6), and at age 8–9 treated children performed worse than the control group, with no differences in terms of behavioral outcomes.

A few papers, by contrast, find significant effects on cognitive outcomes in the long run. Elango et al. (2015) report two studies that find persistent, although weakening, effects on IQ long after school entry, and they both concern pre-kindergarten interventions. Evaluating a Spanish reform, Felfe and Lalive (2014) find that high quality childcare for 3-year-olds improves children’s reading skills at age 15 and reduces grade retention in primary school. In Denmark, Datta Gupta and Simonsen (2016) show that early formal care at age 2 has a positive effect on grades in language at age 16. García et al. (2016) report that a high quality program starting at age 0 and targeting disadvantaged children has a long lasting effect on IQ.

More importantly, most papers find persistent effects on adults’ outcomes more broadly defined: (i) educational attainment (Cascio 2009; Havnes and Mosgtad 2011; Elango et al. 2015), which is related to (ii) better labor market outcomes (Havnes and Mosgtad 2011; Elango et al. 2015); (iii) health behavior and health outcomes (Carneiro and Ginja 2014; Elango et al. 2015; Conti, Heckman and Pinto 2015); and (iv) criminal activity (Cascio 2009; Carneiro and Ginja 2014; Elango et al. 2015).

The first puzzle in child development literature is how to reconcile those studies that also find medium-term effects on IQ, while in most cases they fade out. The second puzzle is how to explain the effects of early childhood on adult outcomes, even when IQ or cognitive gains fade out by the teenage years (see, for example, Duncan and Magnuson 2013).

On the one hand, it is worth noting that long-term effects on achievement tests were found when formal childcare was introduced at early ages (0–3), while these effects dissipate if we consider preschool/kindergarten age only (3–5). This result seems to confirm the findings by Heckman and co-authors: not only is it important to invest in early childhood, but starting earlier drives higher returns. Indeed, some evidence indicates that

¹ Usually the “Big Five”: conscientiousness, openness, agreeability, emotional stability, extraversion.

investments before age 3 are more likely to improve IQ over the long term (Kautz et al. 2014).

On the other hand, even when the effect on cognitive outcomes vanishes, there is a persistent impact on adults' life outcomes. According to Heckman and coauthors, later outcomes on health, crime, and employment are mediated by the positive impact of early childhood education on non-cognitive skills, even if the impact on cognitive skills dissipates early (Heckman, Pinto and Savelyev 2013; Conti, Heckman and Pinto 2015; Elango et al. 2015). Recently, different authors have shown that changes in early non-cognitive skills have an impact on later outcomes, proving that they often have the same predictive power² of cognitive measures (Heckman, Stixrud and Urzua 2006, Almlund et al. 2011, Baker, Gruber and Milligan 2015).

This result highlights the importance of studying child development as a dynamic multi-skill process, as described by Cunha and Heckman (2008), where human capital accumulation results from "self-productivity" – skills developed in earlier stages bolster the development of skills in later stages – as well as from the dynamic complementarity that results when skills acquired prior to a given investment increase the productivity of that investment.

The role of quality

While a lack of adequate data has not allowed investigation of the causal impact of different levels of quality or different pedagogical curricula on child development to date, some pioneering research suggests that they do have a role to play in shaping a bad or good substitute for parental time in terms of its impact on child development. Blau (1997) finds that the effects of group size, staff/child ratio, and provider's human capital on quality are very small. Other variables like teachers' enthusiasm, communicative skills, and dedication are potentially more important, but more difficult to measure. More recent studies find that some objective indicators of the quality of childcare before age three (namely teachers-children ratio, teachers' age and education, working hours, and group size) are of major importance in determining the positive impact on children's school readiness and their socio-emotional maturity at the beginning of primary school (Felfe and Lalive 2013). Li et al. (2012) find that experiencing high-quality childcare in both infant-toddler and preschool care has better consequences on cognitive outcomes at age 2 and 5; the quality of care-giving was assessed by professionals on a standardized scale and outcomes were measured before entering primary school; irrespective of the time of preschool care, high-quality infant toddler care is related to better memory skills. Love et al. (2003), comparing a variety of childcare centers differing in level of regulation and of staff quality, conclude that the quality of available childcare influences children's developmental outcomes and should be taken into account when evaluating childcare policies.

² Among personality traits, conscientiousness is considered to have the largest predictive power (Almlund et al. 2011).

Other studies have linked quality with the influence of certain program curricula and pedagogical philosophies on the teaching strategies employed in classrooms, into the two main categories of "child-centered" and "academic" approaches. According to the first approach, teachers do not impose a specific curriculum, but facilitate the child's learning by planning activities based on the child's interests, and engaging in the activities alongside the child. In an academic approach, instead, the focus is on acquiring notions related to different subject areas. Some descriptive evidence shows that by the end of preschool, children from child-centered programs have acquired greater competence in social, basic math and basic verbal skills than their peers in academically-driven preschool environments (Marcon 2002). This area of research, while interesting and potentially important, has not produced rigorous analysis and the results are quite mixed.

CONCLUSIONS

In this article we have summarized and discussed recent empirical results on the links between family, formal and informal childcare and child outcomes. We have distinguished between cognitive and non-cognitive outcomes and medium- and long-run effects.

Studies find that multiple actors contribute to the child development process: mothers, fathers, grandparents, and schools. While mothers' inputs are clearly crucial in early childhood, fathers are also important, especially as children grow older. Grandparents' inputs have mixed results, improving vocabulary, but reducing other cognitive skills.

Formal childcare appears to be very beneficial on cognitive outcomes and, in most cases, on non-cognitive outcomes, too. The results also show that the positive association between formal childcare and positive child outcomes is stronger for children in more disadvantaged homes. While children in families with higher income and more education already receive substantial early investments within their families, in low-income households they often lack the resources needed to support and stimulate child development.

As for the persistency of these effects, while the positive impact on cognitive outcomes may dissipate over time, the impact on non-cognitive skills and health drives the positive relation between formal and high-quality early childcare and life outcomes in the long run, such as higher educational attainment, lower probability of criminality, better health conditions, and better performances in the labor market.

The empirical evidence reported here suggests that policies encouraging and supporting parents' efforts to spend more time with their children during early stages of development and policies promoting the development of high-quality formal childcare have a positive impact on child outcomes.

These results have important implications for parental leave policies and the provision of affordable, high-quality childcare. Only a few studies have yielded results that are not compatible with the positive impact

of early interventions programs on children from low-income households.

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