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Gender-specific effects of early childhood intervention: Evidence from a randomized controlled trial☆

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ABSTRACT

This paper investigates the effects of an early childhood intervention in Germany that begins prenatally and continues until the child's second birthday. The intervention consists of home visits and targets socially disadvantaged first-time mothers to improve child development. The effects on child development were assessed via developmental tests in a randomized controlled trial. Home visits significantly improved girls' cognitive development during the first 24 months after birth. In contrast, the intervention had no effect on boys. These gender-specific outcomes can be explained by greater increases in parental investment (e.g. reading to the child) for girls than for boys. Our results demonstrate that early childhood interventions have an effect on early cognitive child development, although concentrated on girls, in a country where a wide range of additional support services are available for disadvantaged mothers with young children.

1. Introduction

This paper evaluates the effects of an early childhood intervention (ECI) on children's cognitive development and language proficiency in a randomized controlled trial. In particular, we examine the *Pro Kind* project, a German home visiting program for socially disadvantaged first-time mothers, which starts prenatally and continues until the child's second birthday. Home visits are conducted by professional midwifes or nurses who interact with the parents to promote maternal health behaviour during pregnancy and to stimulate parenting practices in order to improve child development. The *Pro Kind* research deploys the Bayley Scales of Infant Development (BSID) at the ages of 6, 12, and 24 months and a language test at the age of 24 months to assess children's cognitive development and language proficiency.

In investigating the effects of the *Pro Kind* home visiting program, this paper makes distinct contributions to the empirical literature on the evaluation of ECIs. First, although some evidence exists about the effectiveness and efficiency of ECIs that begin in preschool (e.g. Heckman et al., 2013, 2010a; Deming, 2009; see Almond and Currie, 2011, for a literature overview), few studies have examined the impact of interventions that start prenatally. However, a large body of literature in psychology and more recently also in economics argues that determinants of a child's success in life are formed already during infancy or even in utero (Figlio et al., 2014; Almond and Currie, 2011). Therefore, interventions that increase maternal health and parental investments at the fetal and infant stages can be highly efficient because they prevent the dynamic accumulation of developmental delays as early as possible.

Second, the few studies on early childhood interventions, which start prenatally or in infancy, are located in developing countries (Attanasio et al., 2015, 2014) or the U.S. (Olds et al., 2002), where the interventions successfully stimulated early cognitive development. However, evidence is missing for the effectiveness in European countries. Here, outcomes could be different due to a higher degree of health insurance coverage, higher welfare payments, and a more expanded system of mandatory doctor visits and health insurance paid midwife visits during pregnancy and after birth compared to the U.S., and especially to developing countries. The study closest to ours is Doyle et al. (2013), who evaluate a prenatally starting home visiting program in Ireland. They find positive effects on parental behaviour, but only small effects on children's cognitive development. However, the results of Doyle et al. (2013) are based on a small sample and they employ maternal self-evaluations of child development, which may be subject to a number of sources of bias, e.g. social desirability (Seifer et al., 2004; Najman et al., 2001).

Third, while gender reevaluations of preschool programs show

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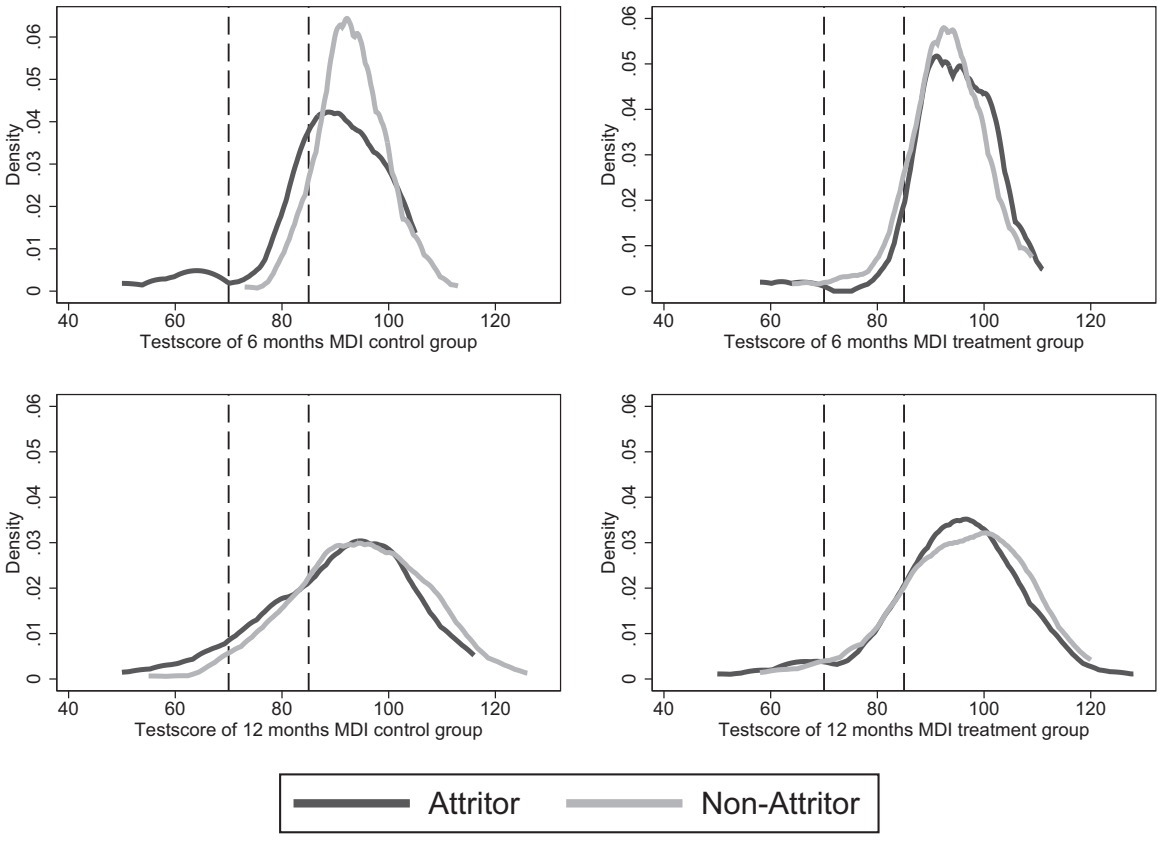

Fig. 1. Comparison of MDI Test Scores between Attritors and Non-Attritors.Note: The figure shows the distribution of the test scores for those children who participated in the 6 months assessment but did not participate in the 12 months assessment (attritor, darker line) and those who participated in the 6 and 12 months assessment (non-attritor, lighter line) for treatment and control group (upper row). The figures in the lower row show the results for the 12 months assessment. The vertical lines indicate test scores of 85 and 70 in the MDI.

greater effects on girls' cognitive and health development (Anderson, 2008; Heckman et al., 2010b; Conti et al., 2015; Campbell et al., 2014; Datta Gupta and Simonsen, 2010), gender-specific effects have thus far received little attention for ECIs that begin earlier. This research gap is surprising, as sex differences in children's cognitive and non-cognitive skills emerge at a very young age (Halpern, 2012; Bertrand and Pan, 2013). Accordingly, Baker and Milligan (2014) find that productive parental investments, like reading and singing, differ by gender before the age of two years. Additionally, more recent research shows that already in preschool age boys suffer more from adverse home environments than girls (Autor et al., 2015, 2016) which might be attributed to lower parental investments into boys. Therefore, an intervention aiming to increase stimulating parental investments may interact with these existing gender-specific behaviors. Due to a relatively large sample size and detailed information about maternal investments, the *Pro Kind* study gives us the opportunity to analyse gender-specific effects on cognitive development and the intervention's effect on investments as well as the interaction of these effects with child gender.

We find that home visiting starting prenatally has an impact on cognitive development for girls with an effect size of 0.30 SDs at 6 and 12 months and of 0.20 SDs at 24 months of age. In line with that, the ratio of girls who are delayed in their cognitive development is reduced by 13 percentage points at 12 months and by 12 percentage points at 24 months. Additionally, girls from home-visited families produce more words and sentences than do their counterparts from control families, with an effect size of 0.25 SDs. In contrast, boys do not benefit from the treatment in any of these outcomes. As a mechanism for the effects, we find that the treatment enhances cognitively stimulating parental investments like reading books to the child or looking at picture books together. The gender-specific effects on child's cognitive development occur because the treatment enhances these investments more for girls than it does for boys, and it reduces passive activities like watching TV in girls but not in boys. Different implementation of the program by gender (boys received 10% less home visits than girls) might explain the gender specific effect on parental investments. Because the mother mainly decides if and how many home visits are conducted, the reduced number of visits might be a proxy of maternal satisfaction with the program. This seems to be lower in mothers of boys.

Our results demonstrate that a prenatally starting intervention has an effect on early cognitive child development, although concentrated on girls, in a European country where support services from many sources are available for mothers with young children. Additionally, the results supplement the literature on gender-specific outcomes previously found in later-starting interventions. This literature shows that girls benefit more from educational interventions around the life cycle, starting in preschool, as described above, continuing in school (Rodríguez-Planas, 2012), and persisting into university (Angrist et al., 2009). Our results show that heterogeneous gender effects also occur for ECIs starting prenatally, indicating that they are not likely to reduce the oft-discussed widening gender gap in test scores and graduation (e.g. Heckman et al., 2010a; Goldin et al., 2006). However, with that knowledge, it may be possible to modify and adapt interventions to the developmental needs of boys (e.g. strengthening stimulating activities with boys).

The rest of the paper is organized as follows: Section 2 provides a description of the *Pro Kind* project, its sample, and the outcome measures. Section 3 describes the estimation strategy. Section 4.3 presents the results on the impact of the home visiting program, the results of sensitivity analyses, and discusses the results. Section 5 presents the conclusions.