



## Long-run benefits from universal high-quality preschooling



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### ABSTRACT

This paper investigates the role of preschool quality for children's school performance at the end of primary school. We construct five structural quality indicators based on unique Danish administrative register data. 30,444 children finishing primary school's 9th grade in 2008 and who attended a formal preschool institution in 1998 are used in the analyses. OLS analyses show that three out of five quality indicators, a higher staff-per-child ratio, a higher share of male staff, and a higher share of staff with formal preschool teacher training are associated with significant improvements in children's test results in Danish. Boys benefit more from preschool quality than girls. Ethnic minority children benefit from higher staff stability.

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### Introduction

Social science research is increasingly acknowledging the importance of early childhood development for long-term outcomes (high-school enrollment, crime rates, health, early pregnancies, labor-market career, and life expectancy) (Heckman, Stixrud, & Urzua, 2006). As early childhood is considered a sensitive period for brain development and language acquisition, early learning is crucial for later learning (Heckman, Krueger, & Friedman, 2002; Knudsen, Heckman, Cameron, & Shonkoff, 2006), and early investments may lead to high private and social returns (Cunha, Heckman, Lochner, & Masterov, 2006). Esping-Andersen (2006, 2008) argues that the assurance of high-quality child care could be the single most effective policy for reducing inequalities in education and income.

While a number of evaluation studies document short-term effects of early childhood care (Datta Gupta & Simonsen, 2010; Jensen, 2009), only few studies of long-term effects of child care exist. Moreover, most previous studies either analyze the effects of child care per se or compare different types of child care (e.g. locally run preschool versus private child care). More knowledge of how the quality of child care affects child outcomes, especially for disadvantaged children, is needed. This study analyzes whether variation in the quality of preschools is related to long-term child

outcomes. Our approach is inspired by recent advances in the literature on the economics of education, which focus on how individual schools and teachers contribute to cognitive and intellectual development (Heckman, 2008; Kramarz, Machin, & Ouazad, 2009; Rivkin, Hanushek, & Kain, 2005). Like Havnes and Mogstad (2010) and Datta Gupta and Simonsen (2010), we examine a universal child care system in the Scandinavian tradition. To investigate the equalization potential of preschool attendance, we study the heterogeneity of quality effects across several subgroups of vulnerable children.

Using an extensive administrative register data set with information on child outcomes, children's preschool affiliation, and the staff in each preschool institution, we generate five different indicators of structural quality in the preschool: (1) the staff-per-child ratio, (2) the proportion of male staff, (3) the proportion of trained preschool teacher staff, (4) the proportion of ethnic minority staff, and (5) the stability of the staff (inverse staff turnover). As previous research has shown that test scores are strong predictors for future educational and labor market outcomes (Connolly, Micklewright, & Nickell, 1992; Currie & Thomas, 2001), we measure child outcomes by grades in written Danish obtained from the 9th grade final exam at the end of primary school. Primary school in Denmark is K-9. As kindergarten starts at age 6, 9th graders are aged 15–16 when they finish primary school. Using ordinary least squares (OLS) analyses, we ask the following policy-relevant question: Are individual 9th grade test results correlated with the (structural) quality of children's preschools? Our study focuses on the effect of variation in structural preschool quality for children who attended preschool,

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and our main contribution lies in establishing modest but long-term effects of preschool quality. Thus we extend the literature on preschool arrangements by examining whether variation in various quality aspects can explain some of the variation in later child outcomes. As the Scandinavian countries have been the forerunners in universal early child care, results for Denmark are likely to have wider applicability throughout the Western world for countries striving toward such universal provisions.

When studying long-term effects of quality variation in child care offerings, researchers often find inspiration in the literature on developmental psychology. This literature generally distinguishes between structural quality and process quality (e.g., Vandell & Wolfe, 2000). Structural quality is measured by institution characteristics such as teacher qualifications, location of program, length of program and adult-child ratio (Howes et al., 2008), but also the composition of teachers, for example, the hitherto less addressed shares of male and minority staff. Process quality, on the other hand, relates to interactions between children and teachers and the instructional content within classrooms, including content of teaching materials, and characteristics of effective teaching (e.g. positive social and emotional classroom climate, and teacher-child relationships) (Burchinal, Vandergrift, Pianta, & Mashburn, 2010; Mashburn et al., 2008; Pianta, Barnett, Burchinal, & Thornburg, 2009; Sylva et al., 2006).

As in the other Scandinavian countries, preschools in Denmark are designed to meet children's needs for early education, socialization, as well as care, but are less inclined to stress having a formal curriculum. The programs are generally considered to be of very high quality compared to other OECD countries (Kamerman, 2000) when measuring quality on primarily structural measures. Danish child care programs stress the importance of learning through play, creativity, social inclusion, outdoor activities, cooperation with the parent group, language assessment, nutrition, and physical exercise. Each Danish child care institution has, since 2004, been expected to develop its own pedagogical learning plan, establishing how the institution intends to work pedagogically with its goals. Unfortunately, the evidence on the effectiveness of process quality measures in Danish child care is limited. One exception is a systematic research review by Larsen et al. (2013) mentioning a few Scandinavian (including Danish) recent studies of quality. Moreover, a recent study analyzes a randomized controlled trial in Danish preschools (Jensen, Holm, & Bremberg, 2013), identifying causal effects on children from improved process quality. Generally, different measures of quality are interrelated (Mooney, 2007), and a path from structural features of child care quality through process features to child outcomes has been established (Early Child Care Research Network, 2002; Pianta et al., 2005). Structural quality measures like child-to-teacher ratio, teacher education, and turnover may hence provide the foundation for high-quality child care experiences (Zaslow, 2010). Thus acknowledging the importance of devoting more effort to studies of process quality, our study focuses on structural quality, as there is no information on process quality in our data. Structural quality may be easier regulated than process quality, and thus requires intensified research efforts.

Despite the high-average structural quality of preschools in Denmark, considerable variation exists in the resources spent on preschools across, as well as within, municipalities. A number of structural aspects are important for assessing the quality of preschool; these include type of care, staff qualifications, group size, physical facilities, quality of management, easy accessibility, peer group composition, the educational approach, the proportion of male teachers, teacher turnover, and parental involvement (Gørtz & Andersson, 2013; Marshall, 2004). Pianta et al. (2005) show that structural quality (e.g. teacher qualifications – whether the teacher has education at BA-level and the teacher's experience with teaching younger children) is positively associated with process quality

measured on the ECERS-R scale and observations of the emotional climate in the classroom. Moreover, Neidell and Waldfogel (2010) find evidence that peer enrollment in preschool affects children's outcomes in kindergarten, and Justice, Petscher, Schatschneider, and Mashburn (2011) find strong peer effects in children's language skills.

From the administrative register data, we generate a set of structural quality characteristics for preschools in 1998. For each preschool, we calculate five indicators of quality that we expect to have positive impacts on child outcomes: (1) the staff-per-child ratio, (2) the proportion of male staff, (3) the proportion of trained preschool teachers among the staff, (4) the proportion of ethnic minority staff, and (5) the stability of staff per institution compared to the previous year.

There is now considerable evidence in favor of positive long-term effects of organized high-quality child care. Behrman and Birdsall (1983), however, stress that looking solely at the quantity of schooling is misleading because the variation in quality is substantial, and the same risk applies to preschools. Previous studies generally find lasting effects of child care (Barnett, 2008; Barnett & Ackerman, 2006; Campbell et al., 2008; Schweinhart & Weikart, 1981). However, the gains from preschool may eventually fade. This may either happen if continual and sufficient support for children at risk is not assured (Esping-Andersen et al., 2012; Reynolds, 1993, 2000), or if public schools compensate for children who enter school already lagging behind (Barnett, 2011). A number of evaluations of the U.S. Head Start program find positive effects of the program, especially for disadvantaged children (Currie, 2000; Deming, 2009; Kisker, Paulsell, Love, & Raikes, 2002; Ludwig & Miller, 2007; Paulsell, Kisker, Love, & Raikes, 2000; Pianta et al., 2009). Similar results appear in a number of European evaluations (Dumas & Lefranc, 2010; Felfe & Lalive, 2012; Havnes & Mogstad, 2010, 2011). However, Baker, Gruber, and Milligan (2008) find negative effects of introducing large-scale subsidized child care in Canada on behavioral and motor-social skills.

A few studies compare differences between types of care (e.g. formal center-based care vs. informal private care and care at home) (Bernal & Keane, 2006; Datta Gupta & Simonsen, 2010; Esping-Andersen et al., 2012; Gregg et al., 2003; Waldfogel, Han, & Brooks-Gunn, 2002). A number of studies argue in favor of universal high-quality preschool (Gregg, Washbrook, Propper, & Burgess, 2005; Lasser & Fite, 2011). Blau (1999), however, suggests that child care characteristics have little association with child development. Considerable heterogeneity in child outcomes exists already in early childhood. Much of it is attributable to environmental factors such as family background and parental preference, emphasizing the potential to reach disadvantaged children through targeted high-quality child care programs (Currie, 1998; Duncan & Brooks-Gunn, 2000; Heckman, 2008; Mayer, 1997). Therefore, as previously mentioned, the goal of our study is to investigate how variations in child care quality affect children in the longer run, and which structural quality measures have the largest influence on child outcomes. As effects differ across different types of care, we focus solely on one type of care, child care provided by formal preschool institutions, which is the dominant type of child care for 3–6 year-olds in Denmark.

#### *Structural preschool quality indicators*

In this section, we present and further discuss the rationales for our five structural quality indicators: (1) the staff-per-child ratio, (2) the proportion of male staff, (3) the proportion of trained preschool teachers among the staff, (4) the proportion of ethnic minority staff, and (5) the stability of staff per institution compared to the previous year. These structural measures of quality will be related to child outcomes in the empirical analysis.

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