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LUND PAPERS IN ECONOMIC DEMOGRAPHY 2025:2

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https://www.lusem.lu.se/organisation/research-centres/centre-economic-demography/publications-affiliated-ced/lund-papers-economic-demography

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Abstract

This paper studies if attendance to one of the first types of formal childcare establishments in early twentieth century Sweden helped children escape adverse socioeconomic circumstances in the short and long term. It uses individual longitudinal data from a middle-sized Swedish industrial town, linked to individual data on attendance to the local pre-school (for children in ages 2-7), and follows individuals from childhood until early adulthood. Children from the most disadvantaged families dominated among pre-school attenders. To address endogeneity in pre-school attendance, an instrumental variables methodology is applied with distance between the home and pre-school as an instrument. Results show that pre-school attendance increased the income of a child's family in the immediate term and reduced primary school absence rates in later childhood. In the longer term, pre-school attenders experienced higher occupational attainment. Increased parental labour supply and family income appear as mechanisms. The study contributes to the existing literature on long-term economic effects from childhood circumstances by showing that the first pre-schools, despite providing limited educational elements, still enabled economically disadvantaged families to improve their socioeconomic circumstances.

Acknowledgements

We are grateful for funding from FORTE (DNR 201700866) and the Jan Wallander and Tom Hedelius and Tore Browaldhs Foundation (W18-0008 and W18-0009). Excellent research assistance was conducted by Sofia Brasjö. We thank Finn Hedefalk for support with the coding of housing blocks. An earlier draft of this paper was presented in a seminar at the Economic History department at Lund University. We thank Erik Bengtsson and Therese Nilsson for their valuable comments and suggestions.

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Introduction

Intergenerational persistence in poverty is well-documented over time and space. Even up until recent times and in well-developed welfare states, children born into poor socioeconomic circumstances are more likely to experience poverty in adulthood than children born into more favourable circumstances (Bavaro et al., 2024; Brea-Martinez et al., 2023; Duncan et al., 2012; Parolin et al., 2024). Human capital theory suggests that the persistence in poverty over the life cycle is partly due to poor childhood circumstances, both in terms of health and socioeconomic factors (Almond & Currie, 2011; Cunha & Heckman, 2007). For young children, parents are the main agents to secure stimulating and nurturing environments through their provision of material resources and their time. Nonetheless, the level of investments that parents can offer their children can be limited by their economic resources, which, as a consequence, creates a human capital gap between different socioeconomic groups already from young ages (Attanasio et al., 2022; Becker, 1993; Becker & Tomes, 1986; Cunha & Heckman, 2007). A growing economic research field has shown that various types of external interventions improving young children's circumstances also foster human capital development in the immediate and long term (Almond et al., 2018; Heckman, 2006; Lazuka, 2020, 2023; Page, 2024). One such intervention is offering economically disadvantaged children the opportunity to receive formal childcare (which we also refer to as pre-school in this paper) at young ages.

There is a substantial literature estimating socioeconomic outcomes over the life cycle from formal childcare by studying high-quality pre-school programs

targeted to economically disadvantaged children in the last 50-60 years in currently high-income countries, especially the USA (Almond & Currie, 2011; Duncan et al., 2023). However, our understanding of less invested programs and if they have similar benefits is more limited. In addition, little research has been done on the effects of formal childcare in settings with few alternative interventions aiding children to escape adverse socioeconomic circumstances and where the counterfactual to receiving formal childcare is potentially worse than in the contexts analysed in existing studies.

The aim of this paper is to fill part of the research gap by examining to which extent formal childcare in the first four decades of the twentieth century in Sweden provided children with improved socioeconomic circumstances in childhood and an opportunity of escaping socioeconomic adversity in the long term. We specifically study individuals living in the middle-sized industrial Southern Swedish town of Landskrona between 1905-59 by using unique, high-quality individual longitudinal population data from the Scanian Economic-Demographic Database, SEDD (Bengtsson et al., 2021). The database has been linked to 1) newly digitized individual-level pre-school attendance records from the town's only pre-school between 1905-36 (see Elwert and Quaranta, 2023), which means we can accurately identify individual attendance, and 2) the local primary schools' diaries and exam catalogues containing individual level information on school attendance, absence and grades (previously used by Cormack, 2025).

In the setting of this study, formal childcare was primarily offered to children in low-income families, whose parents needed to work and could not look after them during the day (Ekstrand, 2000; Elwert & Quaranta, 2023). We address the endogeneity of attending pre-school by applying an instrumental variables

approach using the distance from each individual's home to the pre-school as an instrument. As part of the analysis, we address the assumptions required for the instrumental variables model to return causal estimates and perform several robustness checks.

Early twentieth century pre-schools in Sweden primarily aimed to improve the circumstances and upbringing of children in low-income families where parents needed to work (Ekstrand, 2000; Hatje, 1999). The pre-schools taught reading and bible studies to children in large groups in amphitheatre-like settings, but few children learnt to read, and the pedagogy was later questioned by the kindergarten movement (Ekstrand, 2000). Great emphasis was on teaching children hygiene practices, good behaviour and morals and pre-schools also provided children with simple meals and clothing (Ekstrand, 2000; Lindgren & Söderlind, 2019). The counterfactual to formal childcare for children with working parents during the first decades of the twentieth century was to be looked after by neighbours, other relatives or be left home alone (Holmlund, 1999; Nyberg, 1995).

The town of Landskrona provides a relevant case for studying long-term socioeconomic outcomes from pre-school attendance, such as occupational attainment, because of the opportunities presented in the town in the first half of the twentieth century. With a rapid population growth and an industrial expansion, upward social mobility rose, and among men born between 1920-40, over 80% attained a higher lifetime income than their fathers (Brea-Martinez & Dribe, 2024; Dribe & Svensson, 2024). This implies limited labour market barriers and greater opportunities of higher occupational attainment than what past generations experienced, which is ideal for analysing if early-life circumstances affected later-life socioeconomic outcomes.

Nonetheless, men and women faced different occupational opportunities in the first half of the twentieth century. In 1930-50 Sweden, the female labour force participation was a third of the male labour force participation (Stanfors, 2014). Among married women the labour force participation was less than 10% before 1945 and only rose to 23% in 1960 (Stanfors, 2014).

In the current study we find that formal childcare increased the family income by the time children were seven and led to fewer illness days in the first year of primary school. Further, formal childcare significantly increased the occupational attainment in early adulthood, both for men and women. Our results suggest that even quite an elementary form of formal childcare increased families' immediate living standards by allowing parents to work and by providing additional resources for attending children. Increased family incomes would have opened up for greater (material) parental investments throughout childhood, which plausibly explains long-term effects on occupational attainment. We are, however, unable to rule out potential beneficial health effects completely, due to lack of health data other than mortality in adulthood. We do not find remarkable differences between men and women in any of the studied outcomes.

We contribute to the literature on socioeconomic life cycle effects from formal childcare in three ways. First, by studying a historical setting with a less-invested childcare program than most of the existing research.[1] Second, by using newly digitized and linked data on individual pre-school attendance we can measure the effect of formal childcare in a precise manner. Existing

[1] There is a large literature analysing the effects of the well-invested US based pre-school programs (Head Start, Perry Preschool and Abecedarian) targeting children in low-income families and aiming to improve school readiness and cognitive skills, see e.g. Duncan & Magnuson (2013) for a summary of this literature.

historical studies (Ager & Malein, 2024; Rossin-Slater & Wüst, 2020) have not had access to such detailed data and have instead utilized the opening of pre-schools and distance from the home to the pre-school as measures of attendance and estimated intent-to-treat effects. Third, because of the richness of our data we also contribute by examining potential mechanisms frequently examined in the literature on contemporary, high-quality pre-school programs, but which are less addressed in the historical literature to date, such as the role of parental incomes and school performance.

Previous Research

The literature analysing how formal childcare in the last 50-60 years affects individuals' socioeconomic circumstances over the life cycle points to formal childcare improving children's socioeconomic circumstances in the immediate term by giving parents the opportunity of gainful employment outside the household. That way the whole family can maintain its living standards and children can benefit from increased (material) parental investments (Almond & Currie, 2011; Attanasio et al., 2022). Childcare availability increases maternal labour supply in both contemporary higher-income (Baker et al., 2008; Cascio, 2009; Goux & Maurin, 2010) and lower-income countries (Clark et al., 2019; Hojman & Boo, 2022). By sustaining incomes at a certain level, parents also reduce the risk of financial stress and poor mental health, which can hold back parental investments (Cooper & Stewart, 2021; Duncan et al., 2017). There is some evidence of formal childcare positively influencing parent-child interactions in ways that could foster children's human capital

development, e.g. by spending more time together or reading more together (Gelber & Isen, 2013).

If the formal childcare environment is superior to the home environment, formal childcare can support the advancement of essential cognitive and non-cognitive skills that children would not develop at home (Cunha & Heckman, 2007; Heckman, 2006). Pre-schools can also support children's human capital development by providing health related services such as nutritious meals and medical check-ups, which is the case for e.g. Head Start in the USA (Ludwig & Miller, 2007). Several studies have identified beneficial effects on disadvantaged children's health, school readiness and school performance during and immediately after attending targeted pre-school programs (García, Heckman, Leaf, et al., 2017; Ludwig & Miller, 2007). But there are also studies pointing to negative effects from universal pre-school roll-out (Baker et al., 2008). The heterogeneous effects suggest that different types of pre-schools generate different effects.

Because pre-school attendance occurs in a critical life stage of rapid development, the advantages pre-schools provide in children's health and skill production in the short-term can become permanent and manifest themselves later in the life cycle through improved health and economic productivity (Case et al., 2005; Cunha & Heckman, 2007). There is some evidence of longer-term effects on socioeconomic outcomes in terms of increased educational attainment and earnings (Bailey et al., 2021; Gray-Lobe et al., 2023; Havnes & Mogstad, 2015), as well as reduced risk of problematic behaviours and criminality (Belfield et al., 2006; García, Heckman, Leaf, et al., 2017), but long-term effects are not always present nor entirely consistent across studies in different contexts (Duncan et al., 2023).

Different contexts and programs can also explain why some studies find long-term effect from pre-school attendance to differ by sex while others do not. Studying a US pre-school program targeted to low-income families in the 1970s, García, Heckman, Leaf, et al. (2017) find educational attainment to increase more among females but earnings among males, while Gray-Lobe et al. (2023) study a universal US pre-school program running between 1997-2003 to benefit boys' school outcomes more than girls'. Other studies have not observed any differences between males' and females' outcomes, see e.g. Ludwig and Miller (2007) who study Head Start in 1960s USA. Differences by sex can therefore be due to the type of program and the times it operates in. Further, different parental investments and home environments, both among pre-school attenders and their counterfactual group may explain why one sex would benefit more than another (García, Heckman, & Ziff, 2017).

When they exist, long-lasting effects identified from formal childcare studies set in the last 50-60 years are frequently explained by formal childcare building non-cognitive skills (e.g. academic motivation and emotional self-regulation), which are favoured in the labour market and reduce the risk of antisocial behaviours (Bailey et al., 2017; Belfield et al., 2006; Cunha & Heckman, 2007). Cognitive development as a potential mediator is frequently ruled out in the literature, referring to studies finding no influence on test scores in school ages, e.g. Havnes and Mogstad (2015).

There are only a couple of studies analysing long-term outcomes from formal childcare for children in low-income families in the first half of the twentieth century. These studies find that formal childcare with a clear pedagogical focus in the first half of the 1900s led to intent-to-treat effects increasing the length of schooling by 0.1 years in the USA and Denmark (Ager & Malein, 2024;

Rossin-Slater & Wüst, 2020), decreasing the probability of working as a labourer (Ager & Malein, 2024) and increasing earnings in ages 30-60 by 1.7% (Rossin-Slater & Wüst, 2020). Formal childcare without a pedagogical focus did not generate any effects in the USA (Ager & Malein, 2024). These two studies do not analyse family income as a potential mechanism but explain the effects with the pedagogical quality of the pre-schools. Ager and Malein (2024) additionally identify the largest effects on adulthood occupational attainment among children from newly immigrating families to the USA, whose language skills improved because of pre-school attendance and argue that pre-schools contributed to the integration of children. Although it has been suggested that the counterfactual to attending pre-school was worse for school outcomes historically (Duncan & Magnuson, 2013), the just-mentioned effects are still in line with the more recent American pre-school programs (see discussion in Rossin-Slater & Wüst, 2020).

Background

Formal childcare in Sweden 1830s-1950s

Formal childcare has origins in early nineteenth century England and France. The first formal childcare in Sweden emerged in the 1830s, and three different forms existed until the mid-1900s: infant schools (*småbarnsskolor*), cribs (*krubbor*) and kindergartens (*barnträdgårdar*). The infant schools and cribs were mainly present in the 1800s and into the first few decades of the 1900s, after which kindergartens opened. The three types of pre-schools differed in their emphasis on education, pedagogy and social caretaking, but were all

privately and locally run by charities (often by middle- and upper-class women). Some municipal financial support was provided from the 1860s (Ekstrand, 2000). From the 1940s, the state contributed with additional funding, but it was not until the 1960s that pre-schools were primarily financed by state subsidies in Sweden (Hatje, 2013).

The first pre-schools in Sweden, and which this study focuses on, were the infant schools. The infant schools were created to provide children in low-income families with what was considered (at the time) to be improved care and living conditions as well as some schooling while parents were working during the day. They emerged in the main industrializing towns where not only fathers, but also mothers were most likely to participate in the paid labour force outside of the home out of economic necessity, and the demand for formal caretaking of children was greatest.

The infant schools focused on teaching good morals, health and hygiene practices, and they assisted families by donating clothes and providing simple meals to the children (Ekstrand, 2000; Lindgren & Söderlind, 2019). Initially, they taught bible and nature studies, reading and writing, in large classes with up to 100 children at a time. The emphasis then lay in memorizing facts and learning by heart, but according to infant school reports only a fraction of the children actually learnt to read (Ekstrand, 2000). By the turn of the twentieth century, the infant schools reduced their scholastic focus. Influenced by the kindergarten movement, they introduced more play and social activities, and the environment started to resemble a home more than a school (Lindgren & Söderlind, 2019; Westberg, 2019). Between the early nineteenth to early twentieth century, children attending the infant schools were mainly from low-income households. Infant schools were open to children in ages two to seven

from early morning until late evening, and children to lone mothers were overrepresented compared to the general population (Ekstrand, 2000; Elwert & Quaranta, 2023).

Up until the mid- and late twentieth century, the supply of formal childcare was limited in Sweden. From the 1830s to the 1880s, only 30-40 infant schools have been documented across the country (Ekstrand, 2000). Despite several pre-school institutions in Stockholm in 1900, their collective capacity was restricted to less than 1% of all children in the capital (Nyberg, 1995). In 1949, there were almost 29,000 available spots for children to have some kind of day activity in all of Sweden (Hirdman, 1992). Historical national population counts show that in 1950 there were approximately 609,000 children aged 0-4, meaning that the available spots would have covered approximately 4.7% of these children (Statistics Sweden, 1969).[2] In the 1960s and 1970s, the supply of formal childcare started expanding to the masses and pre-schools developed into the modern institutions we know of today, in conjunction with married women's labour force participation accelerating (Hatje, 2013; Stanfors, 2014).

The limited supply of formal childcare has had different consequences over time. Before the turn of the twentieth century, children to lone mothers were commonly sent to foster care because mothers were not seen as capable of taking care of their children. Nyberg (1995) reports that this was the case for as many as two thirds of the children born to unmarried mothers. Although foster care became a less common phenomenon with time, because of new childcare and poor care legislation in the first decades of the twentieth century, the supply of formal childcare remained low for a long time and among

[2] A more detailed age ranges do not exist in the source so the exact coverage of children aged 2-6 cannot be estimated.

children to unmarried mothers, only 10% attended some sort of pre-school institution at the turn of the 1900s (Nyberg, 1995). During the first part of the twentieth century, the period we study, the most common alternative care solution was for the grandmother (and sometimes other relatives) to look after the children, but some children also joined their mothers at work or were left alone (Holmlund, 1999; Nyberg, 1995).

Formal childcare in Landskrona

The first pre-school institution in Landskrona, *Landskrona barnasyl*, opened in 1862 and was an infant school. Similar to other Swedish infant schools, it was run by the local women's association with the aim to provide *"Christian care and upbringing"* (p. 84) and to reduce the negative effects of poverty among children (Ekstrand, 2000). The local women's association's statutes specify that the pre-school should provide care, some food, activities and education for children whose parents cannot look after them because of their necessity to hold a gainful employment outside the home (Jönsson, 1995).

At the end of the nineteenth century, the pre-school was mainly a place to keep children while parents were away working during the day. Jönsson (1995) explains that many of the mothers of children attending the pre-school worked at the sugar factory in Landskrona, but despite working, families still lived in poor circumstances. The generous opening hours of the pre-school (from six in the morning until eight in the evening) enabled parents to work long hours, which they may not have done without the pre-school.

Throughout the period of study (1905-36), the pre-school in Landskrona had limited financial resources. It was funded by the poor relief organization and the church, as well as through additional donations and gifts, but did not charge

attendance fees until 1936. Yet, in line with focus shifting towards more play and pedagogy rather than traditional teaching, as observed in infant schools in the rest of the country, the infant school in Landskrona invested in a playground and additional pedagogical materials in 1909 (Ekstrand, 2000).

Nonetheless, the Landskrona pre-school stood out compared to the rest of the country by continuing to operate with large groups of children (80-100) into the twentieth century, when most other infant schools reduced the class sizes (Ekstrand, 2000). Consulting the Landskrona pre-school's annual accounts book in the city archive, we find that from the start of our study period until 1926, children were supervised by one head teacher and two-three additional staff each year (Landskrona pre-school expenses, 1905-26). The same source also reveals that the pre-school had expenses for children's clothing, confirming that they offered clothes to children in need. In fact, the pre-school's board protocols reveal that children who arrived with insufficient or wet clothing were provided with new clothes at the preschool (Pre-school board protocols, 1927-36). The pre-school's account books also include costs for meals between at least 1905-26. In sum, the child-teacher ratio was high with today's measures, but children were supervised and provided with both additional food and clothing.

Studying the determinants of attending the infant school specifically in Landskrona between 1905-36, Elwert and Quaranta (2023) find that children from the most disadvantaged families were most likely to attend. They identify several socioeconomic and demographic factors that were overrepresented among attenders: the mother's marital status (unmarried), mother's occupation (maid), the socioeconomic status of the family (low status), the number of children in the family (many children) and the (lack of) adult females in the

family in addition to the mother. They conclude that although there were differences between the childcare provided in Landskrona compared to the rest of the country, Landskrona can be seen as comparable to other Swedish towns when it comes to which families sent their children to the childcare institution, i.e. primarily lower-income households.

Data and variables

Data sources and linking

We use historical longitudinal data from the Scanian Economic-Demographic Database, SEDD, version 7.2 (Bengtsson et al., 2021) to study if formal childcare provided improved socioeconomic circumstances over the life cycle in Sweden at the start of the twentieth century. The SEDD is a population database that includes demographic and socioeconomic data on individuals residing in a southern Swedish region including five rural parishes and a medium-sized industrial town (Landskrona) between 1905-67.[3]

The SEDD also includes residential information (neighbourhood and housing blocks) for most families in Landskrona, which can be used for geospatial analyses, such as neighbourhood and housing blocks (Hedefalk & de Souza Maia, 2023). Demographic and socioeconomic developments in Landskrona correspond to those of other medium-sized towns in Sweden in the first half of

3 SEDD is part of the SwedPop national research infrastructure (www.swedpop.se). See Bengtsson and Dribe (2021) for an overview of research using SEDD and Dribe and Quaranta (2020) for how it was constructed.

the twentieth century (Dribe et al., 2024; Dribe & Svensson, 2024), making the findings of this work potentially generalizable to other areas in Sweden.

In this study, additional individual data on pre-school attendance in Landskrona, which has been linked to SEDD, is utilized. Elwert and Quaranta (2023) gathered and digitized attendance records for the period 1905-36 from the only pre-school in Landskrona at the time and linked them to the SEDD with a 98% linkage rate. To accurately identify and compare individuals ever attending and never attending pre-school to one another, we have restricted the sample in the current study to individuals present in Landskrona at age two and who remained living in the town until they were at least seven years old and for whom all control variables of interest are available (N=6,486). Throughout the study we refer to this sample as the base sample. Because individuals in- or out-migrating between ages two and seven are excluded, the identification of pre-school attendants is considered accurate and children not attending pre-school were most likely either taken care of by relatives, neighbours or friends, or were left alone if both their parents were working all day (see Nyberg, 1995). In SEDD, 69% of individuals identified between ages two and seven are followed until early adulthood, specifically ages 25-29 (N=4,501), out of which we have individual occupation for 90% (N=4,159). Individuals not linked had died or moved out of Landskrona before they reached adulthood. The linking and creation of samples are shown in Figure 1.

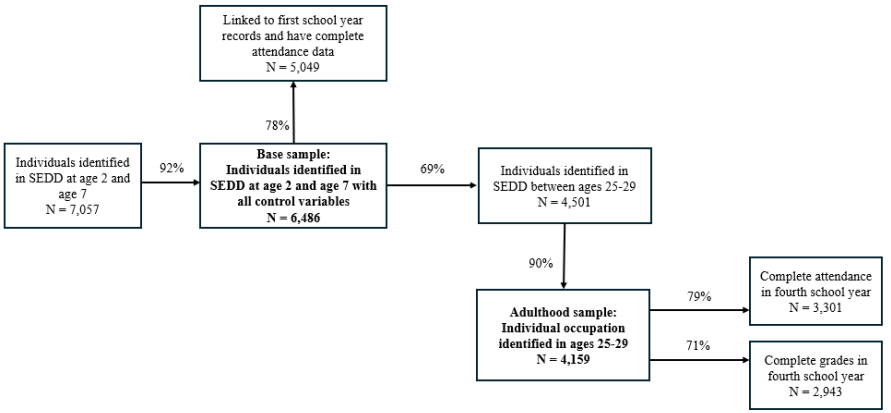

Figure 1. Linking of the sample.
Sources: The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021), linked data on pre-school attendance (Elwert & Quaranta, 2023), school absence and grades (Diaries and Exam Catalogues, Landskrona City Archive).

Further, to examine potential mechanisms between attending pre-school and later-life occupational attainment, we use data on school grades and absence from the Landskrona public primary schools' diaries with exam catalogues (Diaries and Exam Catalogues, 1911-48). Specifically for this study, we collected and digitized school data covering the first and fourth school years between 1911-32 from the Landskrona city archive. School data covering the fourth school year between 1933-48 had already been collected, digitized and linked to the SEDD. 98% of the individuals present in the school records in Landskrona are linked to the SEDD in the period we study. The same type of data have previously been used in studies covering the effects of welfare reforms on children's school performance, both in Landskrona (Cormack, 2025) and other parts of Sweden (Bhalotra et al., 2022; Cattan et al., 2023).

Absence data was available in the archive for the full period of study, but the school grade data for the first school year was only available for birth cohorts 1915-29 and for the fourth school year for birth cohorts 1907-29. The exam

catalogues for earlier birth cohorts were missing in the archive. School absence and presence were recorded in the school diaries for each individual in each year by the class teacher. Schooling was compulsory during the study period and absence from school was mainly due to illness (93% in the first year and 84% in the fourth year).

In our base sample of children observed between ages two and seven (N=6,486), 78% have been linked to the school records with complete data on attendance in the first school year (see Figure 1). In the adulthood analysis, we also explore school absence and grades in the fourth school year as mechanisms between pre-school attendance and adulthood occupational attainment. 79% of the individuals followed until adulthood were linked to the school records with complete attendance data and 71% with complete grade data in the fourth school year.

Individuals not linked to the school data had either died, moved out of Landskrona or did not attend the town's public primary schools. We identify that 2.6% of the individuals had died or moved out of Landskrona before the end of the first school year and 5.7% before the end of the fourth school year. Most of the remaining unlinked individuals must have attended other schools than the local public primary schools. In Swedish towns between 1910-50, 70-80% of children in ages 7-14 attended public primary schools, and the remaining 20-30% received other types of education from e.g. private schools or home tutoring (Statistics Sweden, 2023), which corresponds to the unlinked individuals in our sample.

The sample of individuals we can follow until adulthood differs from the base sample in two main aspects. Individuals born outside of Landskrona and in families with higher socioeconomic status are more likely to move out of the

town before reaching age 25 and are therefore lost in the analysis of adulthood outcomes. Pre-school attenders were from lower status and lower income households, so it is primarily our control group which is affected by the higher socioeconomic groups' attrition. The addition of several control variables in all models should account for potential differences in socioeconomic circumstances and family situation affecting the results. Complete comparisons between the base sample and the sample followed until adulthood, as well as the linked school samples are shown in Table A1 in the appendix. In all samples, the attrition is explained by higher status individuals.

Outcome variables

We start by analysing the immediate effects of formal childcare on families' income, as well as children's school performance in the first school year. We estimate the effect of formal childcare on the family's income in the base sample when children were seven years old and would have completed pre-school had they attended (N=6,486). In the period of study and up until 1947, a family's total labour income was registered in the income tax registers (and in SEDD) under the father's name if parents were married and under the mother's name if she was unmarried, widowed or divorced (Helgertz et al., 2020). Annual labour incomes below 500 SEK were exempt from taxation between 1903-20 and below 600 SEK between 1920-67, meaning that we are unable to know from the registers if individuals with no taxed labour income did not work or if their income was below the minimum taxable level (Helgertz et al., 2020). In the analysis we use the exact nominal value of the registered income and perform a robustness analysis where we treat all nominal incomes below these two thresholds (500 SEK and 600 SEK) as zero incomes, which

returns the same results (see Table A2 in the appendix). Incomes have been adjusted for inflation in all analyses.

In the current version of the SEDD (version 7.2), family incomes before 1947 were only registered every three to five years. Incomes have been imputed in the missing years based on the family head's incomes in surrounding years, occupation, age and sex by Debiasi et al. (2024) and Brea-Martinez and Dribe (2024). To assess if pre-school attendance changed economic circumstances in families, three measures of income are examined: the probability of having a taxable family income, the absolute (real) income and the relative income compared to the rest of the sample. The latter is done by ranking family incomes at ages two, seven and ten into percentiles (pooled sample for all ages). Ranked incomes reveal if families with children attending pre-school became better off, even in samples with large income variance and a significant share of zero-earners (or individuals below the taxable threshold), which is the case in our sample. Table A3 in the appendix presents summary statistics of family incomes.

We study two school outcomes: absence and grades. School absence reflects the percentage of all school days each individual was absent in each school year due to illness by considering the total number of school days in each year and class. School grades were absolute and based on individuals' acquired knowledge during the full year up until and including the school year 1939/40, when teachers were highly encouraged to implement a normal distribution of school grades in each class (SOU, 1942:11). We study school grades among birth cohorts 1907-29 at ages 7-8 and 10-11, meaning that all school grades are based on the absolute performance of each individual and no one in the sample was affected by the new grade distribution.

School grades were set on a seven-step scale, which in this study have been translated into grades 1-7 and standardized with z-scores for easier interpretation and comparability to other studies, as per Bhalotra et al. (2022) and Cormack (2025). School grades in three theoretical subjects (*mathematics, reading, christianity*) in the first school year and four theoretical subjects (*mathematics, reading, writing, christianity*) in the fourth school year are used.[4] The average grade in these subjects is used in the analysis. Figures A1 and A2 in the appendix show the distribution of the school variables.

We then analyse the highest occupational attainment in early adulthood (ages 25-29) using HISCAM (Lambert et al., 2013). Occupations in SEDD come from poll-tax and income records and have been coded into HISCO (van Leeuwen et al., 2002), a standardized historical occupational structure, which makes it straightforward to transform each occupation into the HISCAM scale. HISCAM is a continuous scale of occupations ranked by prestige in an occupational hierarchy ranging from 39.9 to 99, where a higher number reflects a higher occupational attainment. HISCAM differs from other occupational hierarchies because it defines the occupational prestige by considering the vicinity in occupations based on intergenerational relationships identified in historical marriage certificates (Lambert et al., 2013). We specifically use the universal HISCAM classification for males because it is based on a larger sample than the Swedish version. The HISCAM scale had a mean of 50 and a standard deviation of 10 in the original population that the scale was created from. In our main sample following individuals from pre-school ages into early

4 Writing grades were only sporadically recorded in the school diaries with exam catalogues in the first school year and are therefore not considered in the analysis.

adulthood, the mean is 56 and the standard deviation is 10, which is similar to the original scale.

Individual occupational attainment is measured between ages 25-29 because 1) most individuals likely had entered the labour force and were registered with an occupation in any of the ages 25-29, and 2) less than a third of the women married before this age range.[5] During the period of study, most women stopped working upon marriage and would no longer have a registered occupation in the records (Stanfors, 2014). With our choice of age interval, we reduce the risk of losing female observations due to marriage as long as women worked one year in the age interval 25-29. Occupational information does not exist for every year and every person in SEDD, and in our analysis we do not use occupational information older than two years.

We explore four potential mechanisms explaining occupational attainment in early adulthood: children's school absence and grades in the fourth school year, probability of attending non-public schools and family income at age ten.

Empirical strategy

Sending a child to pre-school is an individual decision taken within the family. Specific family characteristics and circumstances can affect this decision and therefore introduce bias in regressions of pre-school attendance on individual outcome variables. To understand the presence of bias in our analysis, we perform a descriptive comparison of pre-school attenders to non-attenders in

[5] 26% of women we follow until adulthood are never married and 74% are ever married between ages 25-29: 9% for one year, 10% for two years, 11% for three years, 15% for four years and 29% for all five years.

the base sample of individuals observed between ages two and seven in Table 1.

Table 1 shows that children attending pre-school were negatively selected in terms of socioeconomic status and family income, in line with the findings of Elwert and Quaranta (2023) who studied socioeconomic and demographic determinants of pre-school attendance in the same setting. For instance, children attending pre-school commonly came from larger households (6.22 versus 5.24 members), had more siblings (82% compared to 67% had older siblings and 28% compared to 16% had younger siblings), and their mothers were less likely to be married (80% versus 89%). Moreover, the distribution of children ever attending pre-school was skewed towards households of unskilled workers or workers with unknown occupations (51% compared to 30%) and, in contrast, children never attending pre-school were more likely to come from households of white-collar workers than attenders (19% compared to 4%).

To identify the causal effect of pre-school attendance on later-life outcomes and to reduce the risk of selection bias in our analysis, we take an instrumental-variables approach. We use physical distance from each individual's home (specifically their housing block) to the Landskrona pre-school as an instrument for attending the pre-school. Physical distance has effectively been used in numerous studies on returns to education (Card, 1993, 2001; Carneiro et al., 2011; Doyle & Skinner, 2016) because distance is a good measure of "costs" affecting the probability of attending educational institutions (Imbens, 2014). The time spent from the home to an educational institution and back each day is an example of a cost. In our case, individuals living a short distance from the pre-school have a lower cost of attending pre-school than individuals

living farther away. Landskrona was a sizable city which stretched across nine square kilometres, so it is reasonable to expect that families' costs of pre-school attendance would decrease with proximity, and proximity would therefore make pre-school a more attractive choice.

Table 1. Descriptive statistics of original sample.

	All			Ever attended preschool			Never attended preschool		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
Ever attended pre-school	6486	0.13	0.34	843	1.00	0.00	5643	0.00	0.00
Birth year	6486	1916	7.47	843	1916	7.90	5643	1916	7.41
Female	6486	0.50	0.50	843	0.51	0.50	5643	0.50	0.50
Born in Landskrona	6486	0.92	0.27	843	0.92	0.27	5643	0.92	0.28
Mother age at birth	6486	29.71	6.23	843	29.77	6.27	5643	29.71	6.23
Mother born in Landskrona	6486	0.32	0.46	843	0.29	0.45	5643	0.32	0.47
At age 2:									
Real family income (in 1914 SEK)	6486	874	1490	843	636	733	5643	909	1569
Family income above min. tax threshold	6486	0.71	0.45	843	0.65	0.48	5643	0.72	0.45
Family income percentile rank	6486	0.45	0.30	843	0.40	0.28	5643	0.46	0.30
Older siblings present	6486	0.69	0.46	843	0.82	0.38	5643	0.67	0.47
Younger siblings present	6486	0.18	0.38	843	0.28	0.45	5643	0.16	0.37
Mother married	6486	0.88	0.33	843	0.80	0.40	5643	0.89	0.31
Mother never married	6486	0.10	0.30	843	0.15	0.36	5643	0.09	0.29
Mother previously married	6486	0.02	0.14	843	0.05	0.22	5643	0.02	0.13
Household size	6486	5.37	2.18	843	6.22	2.30	5643	5.24	2.13
Household head's socioeconomic status									
White-collar worker	6486	0.17		843	0.04		5643	0.19	
Medium skilled worker	6486	0.27		843	0.20		5643	0.29	
Lower skilled worker	6486	0.23		843	0.25		5643	0.23	
Unskilled worker & unknown	6486	0.32		843	0.51		5643	0.30	

Notes: The table reflects characteristics of the original sample of individuals identified in ages two and seven. Sources: The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021) and linked data on pre-school attendance (Elwert & Quaranta, 2023).

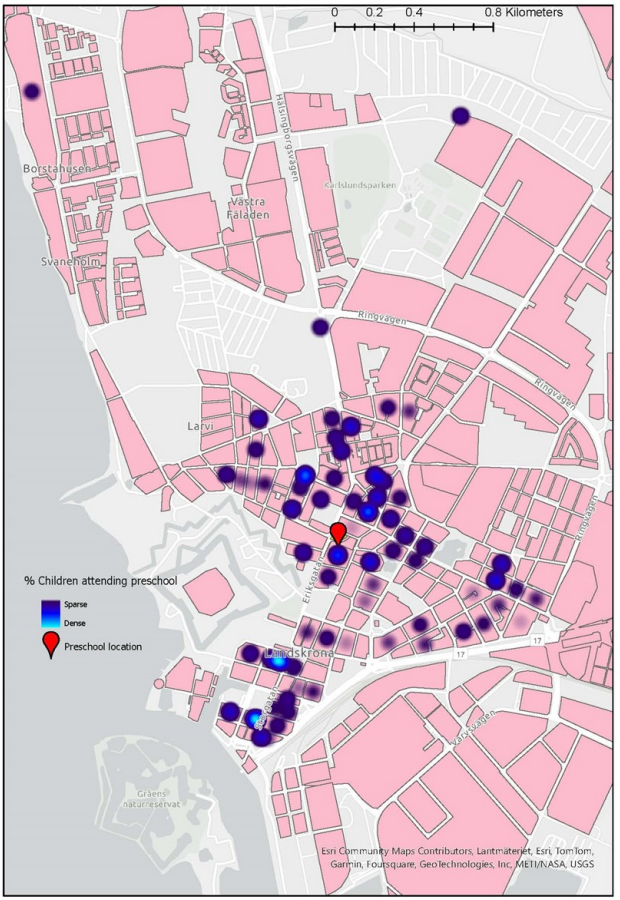

Figure 2. Pre-school attendance by housing block (children observed at age two) in Landskrona 1916-31.
Source: Authors' own calculations based on The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021) and linked data on pre-school attendance (Elwert & Quaranta, 2023).

In Figure 2, we present the distribution of children attending pre-school in our base sample (N=6,486) across housing blocks (residential units similar to address) in Landskrona. Data on housing blocks have been added to the SEDD through linking of maps for Landskrona to individual addresses and creating consistent geographical units across time (Hedefalk & de Souza

Maia, 2023). In the period of study, the city was divided into 116 housing blocks, most of which were situated within a 1.5-kilometer radius from the city centre, where the pre-school was also located. The proportion of children attending pre-school varied significantly across blocks. A few outliers existed, where children living quite far from the centre still attended pre-school. However, in general, attendance was larger among children living in blocks closer to the town's centre where the pre-school was located.

We use a two-stage least squares (2SLS) estimator to estimate the effects of pre-school attendance. We estimate the first stage (1) and second stage (2) equations as per below.

$$p_i = \gamma + \beta d_i + \theta \boldsymbol{X}_i + u_i \quad (1)$$

$$y_i = \alpha + \delta \widehat{p_i} + \varphi \boldsymbol{X}_i + \varepsilon_i \quad (2)$$

where p_i denotes pre-school attendance, d_i is the nearest distance between the housing block where each individual lives at age two and the pre-school, and $\boldsymbol{X}_i$ includes a vector of pre-treatment individual-level controls. y_i reflects each of the outcome variables: occupational attainment, family income, school absence and grades. Equation (2) incorporates the predicted pre-school attendance from Equation (1), $\widehat{p_i}$, making distance an excluded variable.

Robust standard errors, calculated using the Huber-White variance-covariance matrix, are reported for all estimates. Additionally, for informational purposes, we provide results from ordinary least squares (OLS) regressions based on two models: one on pre-school attendance with a set of individual-level controls (controlling-for-observables equation), and one on distance with the same set of individual-level controls (a reduced-form equation). Given the negative selection into pre-school attendance that we identify in Table 1, we expect the

OLS estimates to be systematically smaller than the IV estimates or even in the opposite direction.

Identifying assumptions

The instrumental variables approach using physical distance as an instrument for pre-school attendance will provide causal effects from pre-school attendance under four assumptions. If the assumptions hold, the IV approach estimates local average treatment effects (LATE) reflecting the average effects among individuals affected by the instrument, also called compliers (Angrist et al., 1996). In our case, it means that we identify the average effects of pre-school attendance among children who only attend pre-school because of their proximity to the pre-school and who would not have attended if they had lived farther away.

As a first assumption, distance must be strongly correlated with pre-school attendance. In Figure 3, we plot the fitted values from the OLS regression (first stage) of pre-school attendance on distance at age two in the base sample (N=6,486) and in the sample following individuals until adulthood (N=4,501). The relationship is negative, and proximity to pre-school increases the probability of attending, consistent with findings in Figure 2. The estimates show that moving 100 meters away from the pre-school reduces the probability of attending by 0.0079, an economically large effect (almost a tenth of the mean, as shown in Table 1). F-statistics of the first-stage instrument equals to 149.47 in the base sample (N=6,486) and 107.49 in the adult sample (N=4,501) and therefore exceeds the modern standard threshold of a strong instrument of 104.7 (Keane & Neal, 2023; Lee et al., 2022). We conclude that we have a high

correlation between pre-school attendance and proximity, that our 2SLS t-tests have sufficient power, and that the first assumption holds.

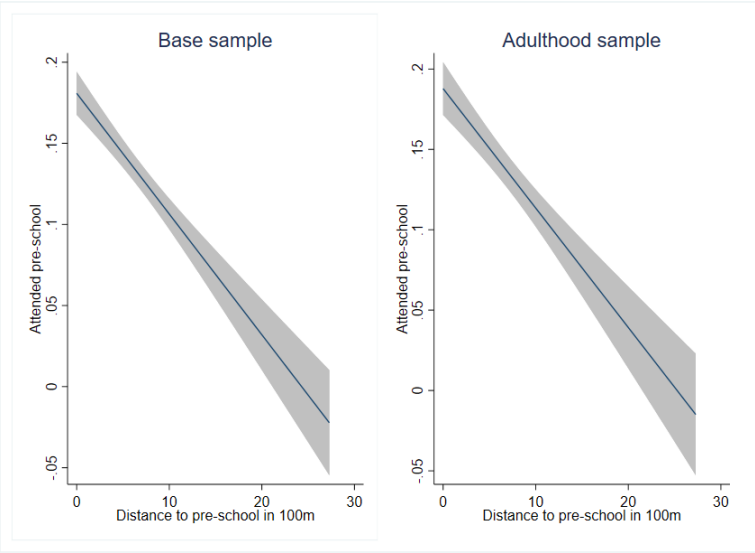

Figure 3. First-stage plots: Relationship between distance to pre-school and ever attending pre-school in the base sample and the sub-sample of individuals followed until adulthood.
Note: The figures reflect fitted values with 95% confidence intervals. Source: Authors' own calculations based on The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021) and linked data on pre-school attendance (Elwert & Quaranta, 2023).

As a second assumption, individuals' home locations must be random within subgroups. Individuals likely choose their residence because of different potential outcomes: for instance, low-income families or lone mothers could move closer to the pre-school to have an opportunity to work, so we randomize the distance variable by introducing control variables in all models. We control for time-invariant demographic variables (year of birth, sex, whether child is born in Landskrona, whether mother is born in Landskrona, and mother's age at birth) and for socioeconomic and demographic variables captured at age two (presence of older siblings, presence of younger siblings, presence of more than one female adult in household, mother's marital status, the household size,

mother's occupation, the family head's income and the family head's socioeconomic status).

As a third assumption, we enforce an exclusion restriction. It implies that the distance to the pre-school should have no direct effect on individuals' outcomes, except through its influence on pre-school attendance. A common concern in the literature using distance as an instrument is that proximity may correlate with access to other institutions, and which could lead to similar outcomes as the pre-school, as discussed by Imbens (2014).

In our case, with a centrally located pre-school, we can anticipate three potential scenarios when the exclusion restriction would not hold. Firstly, individuals living centrally and therefore close to the pre-school could have greater access to better healthcare if healthcare centres were located in the middle of the town. Throughout the study period, the town's hospital was located in the Eastern parts of the centre. In 1927, a public infant health centre *(Mjölkdroppen)* opened in Landskrona where mothers could get consulted on infant feeding, have their child measured, weighted and examined for illnesses. In 1931, it expanded into a child health centre where older children could be checked by medical staff (van Dijk et al., 2024). Some of the later-born cohorts in this study may have used this additional service, which could have benefitted their health and potentially also later-life outcomes. We therefore perform robustness tests verifying if distance to the health care centre, but also the hospital, affected children's health status in the analysis.

Secondly, living in the town centre could increase the probability of gaining a better education if better primary schools were located centrally. At the time of our study, Landskrona had four public primary schools, out of which three were evenly distributed across the town, but one was north of the city centre.

The centrally located schools were of the same school form, but the school outside of town was smaller and, in some classes, combined children from different school years into one class.[6] To reduce the influence of individual schools, we add school fixed effects in all analyses examining primary school grades.

Lastly, neighbourhood effects may also provide a potential threat to the exclusion restriction if the town centre had a higher proportion of white-collar workers living there than elsewhere. This type of social neighbourhood segregation could have benefited children from lower-income households living in the centre by providing them role-models and influences from better-off households and contributed to their improved later-life outcomes (Chetty & Hendren, 2018). Yet, it should not be a concern in our study because socioeconomic segregation was limited in Landskrona up until the 1950s, and individuals from all socioeconomic groups lived in the centre of the town (Brea-Martinez et al., 2024).

A fourth assumption in the instrumental variables method is monotonicity, meaning that proximity is a reason for individuals to attend pre-school by (strictly) making it the most appealing option. This assumption could be violated if parents who lived closer to the pre-school actively chose to not send their children to pre-school, while they would have sent their children to pre-school had they lived farther away (so-called defiers). However, it appears to

[6] Schools in Sweden were classified into different school forms depending on e.g. if they mixed different ages children into classes or not (which was more common in smaller, rural schools). The centrally located schools in Landskrona were all "form A" schools and the one outside was a "form B" school.

be an implausible scenario as we observe in Figure 2 that attendance was high among individuals living nearby.

Results

Main results

In presenting the results, we report the IV-estimates together with coefficients from the first stage and reduced-form equations, and OLS estimates. The reduced-form estimates reflect the effect of distance to the pre-school, independently of attending, on each outcome variable. The reduced-form estimates do not require the exclusion restriction to hold when interpreted on their own. OLS estimates provide a reference to the IV-estimates which deal with the negative selection of families into pre-school attendance.

We start by examining the immediate outcomes of attending pre-school on family income in Table 2. We observe that pre-school attendance leads to a greater probability of the family earning an income above the threshold for taxable incomes (31 percentage points or 39% of the mean), higher absolute incomes (508 SEK or 52% of the mean) and higher relative incomes (29.6 percentile points or 58% of the mean) when the child is seven years old. The result suggests that parents could work and earn a higher income because their children attended pre-school. The pre-school's long opening hours likely meant parents could spend the full day working compared to if, for instance, others had taken care of the children or if the children were left alone at home.

Table 2. Immediate effects of formal childcare on family income.

Dependent variables:	Family income above min. tax threshold at age seven		Absolute family income at age seven		Family income percentile rank at age seven	
	OLS	IV	OLS	IV	OLS	IV
Attended pre-school	-0.0435***	0.375***	-82.23***	508.0*	-0.0387***	0.296***
	(0.0155)	(0.127)	(24.25)	(290.7)	(0.00905)	(0.0773)
First stage instrument		-0.0078***		-0.0078***		-0.0078***
		(0.0006)		(0.0006)		(0.0006)
F statistic first stage		148.55		148.55		148.55
Reduced form		-0.0029***		-3.965*		-0.0023***
		(0.00095)		(2.244)		(0.0006)
Mean dep. var.	0.806		975.05		0.507	
Stand. dev. dep. var.	0.395		1570.25		0.285	
Observations	6,486	6,486	6,486	6,486	6,486	6,486

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Notes: First stage instrument is the distance to pre-school from the home in 100 meters. The reduced form reflects the effect of distance to the pre-school from the home on each dependent variable. The OLS regression and the IV-model account for child's demographic factors characteristics from birth (birthyear, born in Landskrona and sex), at age two (number of siblings, household size, presence of older siblings, presence of younger siblings), maternal demographics (mother's age at child's birth, born in Landskrona, marital status when child is age 2), family economic characteristics when the child is aged two: the occupation of the mother (maid, occupation other than maid, unspecified/no occupation), the family head's income, the family head's SES and the presence of more than one adult female in the household. Sources: The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021), linked data on pre-school attendance (Elwert & Quaranta, 2023), school absence and grades (Diaries and Exam Catalogues, Landskrona City Archive).

In Table 3, we examine school absence due to illness, a measure of children's health after pre-school, in a smaller sample of individuals who have been linked to school records in the first school year. We find that pre-school attendance reduces school absence due to illness by 3.7 percentage points, which is the equivalent of eight days and of similar magnitude as the mean in the full sample (3.4%).

Table 3. Immediate effects of formal childcare on school absence and performance in the first school year.

Dependent variables:	School absence due to illness		Average school grades (birth cohorts 1915-29)	
	OLS	IV	OLS	IV
Attended pre-school	-0.0052**	-0.0374**	-0.317***	0.120
	(0.0019)	(0.0190)	(0.0627)	(0.381)
First stage instrument		-0.0109***		-0.0140***
		(0.0013)		(0.0022)
F statistic first stage		75.79		41.98
Reduced form		0.0004**		-0.0017
		(0.0002)		(0.0053)
Mean dep. var.	0.034		0.000	
Stand. dev. dep. var.	0.055		1.000	
Observations	5,049	5,049	2,814	2,814

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Notes: First stage instrument is the distance to pre-school from the home in 100 meters. The reduced form reflects the effect of distance to the pre-school from the home on each dependent variable. The OLS regression and the IV-model account for child's demographic factors characteristics from birth (birthyear, born in Landskrona and sex), at age two (number of siblings, household size, presence of older siblings, presence of younger siblings), maternal demographics (mother's age at child's birth, born in Landskrona, marital status when child is age 2), family economic characteristics when the child is aged two: the occupation of the mother (maid, occupation other than maid, unspecified/no occupation), the family head's income, the family head's SES and the presence of more than one adult female in the household. The school grade models additionally include school fixed effects. Sources: The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021), linked data on pre-school attendance (Elwert & Quaranta, 2023), school absence and grades (Diaries and Exam Catalogues, Landskrona City Archive).

We also analyse where in the distribution the effects are largest and observe that pre-school reduces the probability of belonging to the top third and increases the probability of belonging to the bottom third in the distribution of school absence days, which likely explains why the effects are so large (see appendix Table A4). Because the pre-school provided daily meals and clothing, children could have improved their general health if the free daily meals and clothing were an improvement compared to what their parents could afford and/or what they would have been given were they left on their own or in informal care settings. Additionally, children attending pre-school may have been exposed to some common childhood diseases and developed an immunity

to them, while non-attenders were only exposed to the same diseases once they started school (van den Berg & Siflinger, 2020).

We also analyse the effect of formal childcare on school grades in the first school year in Table 3. The analysis is based on birth cohorts 1915-29 because the school records did not contain grades for earlier cohorts. We do not find formal childcare to increase grades in the first school year significantly, which can be explained by the pre-school not providing efficient educational or pedagogical elements. In the appendix we present evidence of these results not being driven by differences between earlier versus later born cohorts; we analyse the effect of formal childcare on family income and school absence for cohorts 1903-14 and 1915-29 separately and find similar results in both cohorts (Table A5).

Next, we examine to which extent formal childcare has long-term effects on occupational attainment in adulthood in Table 4. We have information on individual occupational attainment in ages 25-29 for 4,159 individuals who lived in the town of Landskrona in pre-school ages. We find that formal childcare improves occupational attainment by 7.38 points on the HISCAM scale (13% of the mean or 0.7 standard deviations). For comparison, Ager and Malein (2024) found pre-school attendance in NYC at the start of the twentieth century to increase later-life occupational attainment to a similar extent (10%).

In the base sample, an upward movement of this magnitude corresponds to a change from the mean HISCAM score of 55.9 to a HISCAM score of 63.3. Transforming the HISCAM scores back to HISCO and consulting van Leeuwen et al. (2002), we observe that typical occupations with a HISCAM score around 55.9 are: textile worker, metal worker, shipyard worker and painter. Typical occupations with a HISCAM score around 63.3 are factory

workers involved in electronics, wholesale and retail workers (higher level) and builders.

The OLS estimates in all performed analyses confirm the negative selection into pre-school attendance that we observed in Table 1. The IV-methodology has allowed us to reduce the selection bias and has generated estimates which show that formal childcare leads to greater occupational attainment in adulthood.

Table 4. Long-term effect of formal childcare on occupational attainment in ages 25-29.

Dependent variable:	Individual HISCAM	
	OLS	IV
Attended pre-school	-1.690***	7.384**
	(0.339)	(3.284)
First stage instrument		-0.0075***
		(0.0007)
F statistic first stage		107.49
Reduced form		-0.0553**
		(0.0238)
Mean dep. var.	55.91	
Stand. dev. dep. var.	10.28	
Observations	4,159	4,159

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Notes: HISCAM ranges from 39.9 to 99. White-collar occupation defined as HISCLASS 1-5. First stage instrument is the distance to pre-school from the home in 100 meters. The reduced form reflects the effect of distance to the pre-school from the home on each dependent variable. The OLS regression and the IV-model account for child's demographic factors characteristics from birth (birthyear, born in Landskrona and sex), at age two (number of siblings, household size, presence of older siblings, presence of younger siblings), maternal demographics (mother's age at child's birth, born in Landskrona, marital status when child is age 2), family economic characteristics when the child is aged two: the occupation of the mother (maid, occupation other than maid, unspecified/no occupation), the family head's income, the family head's SES and the presence of more than one adult female in the household. Sources: The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021), linked data on pre-school attendance (Elwert & Quaranta, 2023), school absence and grades (Diaries and Exam Catalogues, Landskrona City Archive).

Table 5. Heterogeneities by sex.

Dependent variable:	Family income at age seven, percentile rank (original sample)		School absence due to illness (first school year)		Individual HISCAM (adulthood sample)	
	OLS	IV	OLS	IV	OLS	IV
Female:						
Attended pre-school	-0.0396***	0.220**	-0.0033	-0.0303	-2.236***	7.387*
	(0.0128)	(0.0923)	(0.0029)	(0.0248)	(0.504)	(3.951)
First stage instrument		-0.0090***		-0.0132***		-0.0086***
		(0.0009)		(0.0020)		(0.0011)
F statistic first stage		92.87		46.23		62.64
Reduced form		-0.0020**		0.0004		-0.0631*
		(0.0008)		(0.0003)		(0.0325)
Mean dep. var.	0.5009		0.0343		54.27	
Stand. dev. dep. var.	0.2834		0.0530		9.05	
Observations	3,262	3,262	2,486	2,486	1,918	1,918
Male:						
Attended pre-school	-0.0376***	0.382***	-0.0068***	-0.0520*	-1.360***	8.631
	(0.0128)	(0.134)	(0.0026)	(0.0289)	(0.469)	(5.587)
First stage instrument		-0.0067***		-0.0093***		-0.0065***
		(0.0009)		(0.0016)		(0.0010)
F statistic first stage		56.17		32.15		44.56
Reduced form		-0.0026***		0.0005*		-0.0560
		(0.0008)		(0.0003)		(0.0353)
Mean dep. var.	0.5132		0.0345		57.31	
Stand. dev. dep. var.	0.2834		0.0577		11.03	
Observations	3,224	3,224	2,563	2,563	2,241	2,241

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Notes: HISCAM ranges from 39.9 to 99. Family income rank is the same outcome as presented in Table 2, absence the same outcome as presented in Table 3 and HISCAM the same outcome as presented in Table 4. Sources: The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021), linked data on pre-school attendance (Elwert & Quaranta, 2023), school absence and grades (Diaries and Exam Catalogues, Landskrona City Archive).

Heterogeneities by sex

Because boys and girls had different occupational opportunities in the period we study, we analyse whether the main effects from pre-school attendance on family income (Table 2), school absence in the first school year (Table 3) and

occupational score in adulthood (Table 4) differ between the sexes. The results are shown in Table 5.

We observe that pre-school attendance rises the relative family income in both boys' and girls' households. The results reflect the necessity for parents to work and therefore send their children to pre-school no matter the sex of the child. Children's absence due to illness in the first school year is measured on a smaller sample which has been linked to school records. Both sexes have a similar reduction in illness days in the first school year. The effect is not statistically significant for girls, which may be due to the reduced sample. The similarities between the sexes in absence and relative income suggest that pre-school attendance affects boys and girls in comparable ways.

We also find similar effects on occupational attainment using HISCAM for men and women. The reduced sample size means the effect for men is not statistically significant, but the magnitude of the estimate is in line with that for women. As an additional robustness check, and because occupational attainment could be expected to increase in higher ages, we compare HISCAM for women never married to women married at least one year in ages 25-29 (Table A6 in the appendix). We find the largest effects among women who never married, which confirms that married women left the workforce and would not be observed up until age 29 or be able to achieve as high occupational attainment as unmarried women. In the same vein, we analyse the effect of pre-school on the family head's HISCAM (the spouse's HISCAM) among women who married between ages 25-29. We find that women who had attended pre-school married men with higher occupations (Table A6 in the appendix).

We conclude that there were no remarkable heterogeneities between males and females in the main variables of interest: family income during the pre-school years, school absence in the first school year and occupational attainment in adulthood.

Plausibility of identifying assumptions

For our main results to be causal, we require four assumptions to hold, out of which the first two were addressed in the empirical strategy chapter. We now address the third and fourth assumptions (exclusion restriction and monotonicity). Exclusion restriction, that proximity to pre-school affects each outcome variable only through actual pre-school attendance, is an untestable assumption. We perform robustness analyses where we use the distance to other centrally located institutions which could affect children's health in the same direction as pre-school attendance (the infant and child health centre and the hospital). These locations are treated as placebo instruments and presented in Table 6. If there is no effect from the placebo instruments, we can be more confident that the exclusion restriction holds and that the results in the main analysis derive from pre-school attendance.

In Table 6 we find that the two placebo instruments which could pose a threat to the study by influencing children's health (distance to the infant/child health centre and the hospital), result in no significant effects on children's school absence in the first school year. We also observe that the instrument becomes weaker compared to the main model, suggesting that these locations and institutions are not good instruments for pre-school attendance and do not explain the reduction in school absences.

The fourth assumption is monotonicity and is also untestable. Monotonicity suggests that there are no defiers in the sample and that proximity to the pre-school should not make individuals less likely to attend pre-school. As discussed previously and as per the map in Figure 2, it is unlikely that individuals living close to the pre-school actively choose to not attend and the monotonicity assumption should hold.

Table 6. Placebo instruments: effect of formal childcare on school absence in the first school year.

Dependent variable:	School absence due to illness first school year			
Instrument:	Distance to infant and child health centre		Distance to hospital	
	OLS	IV	OLS	IV
Attended pre-school	-0.0051***	-0.0877	-0.0049**	-0.0366
	(0.0019)	(0.0724)	(0.0019)	(0.0283)
First stage instrument		-0.0037***		-0.0074***
		(0.0013)		(0.0012)
F statistic first stage		7.62		40.43
Reduced form		0.0003		0.0003
		(0.0002)		(0.0002)
Mean dep. var.	0.034		0.034	
Stand. dev. dep. var.	0.055		0.055	
Observations	5,049	5,049	5,049	5,049

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Notes: The OLS regression and the IV-model account for child's demographic factors characteristics from birth (birthyear, born in Landskrona and sex), at age two (number of siblings, household size, presence of older siblings, presence of younger siblings), maternal demographics (mother's age at child's birth, born in Landskrona, marital status when child is age 2), family economic characteristics when the child is aged two: the occupation of the mother (maid, occupation other than maid, unspecified/no occupation), the family head's income, the family head's SES and the presence of more than one adult female in the household. Sources: The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021), linked data on pre-school attendance (Elwert & Quaranta, 2023), school absence and grades (Diaries and Exam Catalogues, Landskrona City Archive).

Mechanisms

Formal childcare can be linked to greater occupational attainment in later life through several channels in childhood. Table 7 displays the OLS and IV coefficients for each of the potential mechanisms studied in this paper.

As a first channel, formal childcare can increase parents' labour supply and the family income, which increases parents' ability for material investments in their children. We have already observed this pattern in the base sample of children present in Landskrona between ages two and seven. Now we explore if it can be a mechanism towards higher occupational attainment in adulthood by limiting the analysis to the sample that can be followed until ages 25-29. Because lasting income gains suggests greater parental investments, we also analyse whether the income gains are temporary or remain in later childhood by estimating the effect on family income at age ten.

We find that formal childcare leads to a significantly higher family income at age seven among individuals who can be followed until adulthood (32.7 percentile points in income rank). The magnitude is in line with the increase observed in the base sample. Again, this can be explained by the pre-school's generous opening hours likely increasing parents' labour supply. Further, for individuals present at age ten, we observe an even higher and statistically significant effect on family income among compliers (43.9 percentile points). Thus, income did not just increase temporarily during the early childhood years when children could attend pre-school but remained higher several years after as well.

Table 7. Mechanisms: Effect of formal childcare on childhood outcomes among individuals followed until adulthood.

Dependent variable:	Family income at age seven, percentile rank		Family income at age ten, percentile rank–subsample		Attending local public school (ages 10-11)		School absence due to illness (ages 10-11) – subsample		Grades fourth school year (ages 10-11) – subsample	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Attended pre-school	-0.0379***	0.327***	-0.0377***	0.439***	0.0243	-0.0647	-0.0003	0.0002	-0.246***	0.102
	(0.0113)	(0.0953)	(0.0114)	(0.105)	(0.0148)	(0.1193)	(0.0027)	(0.0280)	(0.0488)	(0.452)
First stage instrument		-0.0075***		-0.0071***		-0.0075***		-0.0075***		-0.0111***
		(0.0007)		(0.0008)		(0.0007)		(0.0008)		(0.0020)
F statistic first stage		107.49		89.06		107.49		81.63		29.76
Reduced form		-0.0025***		-0.0031***		0.0005		0.000		-0.0011
		(0.0007)		(0.0007)		(0.0009)		(0.0002)		(0.0050)
Mean dep. var.	0.499		0.544		0.82		0.0324		0.00	
Stand. dev. dep. var.	0.284		0.265		0.38		0.0544		1.00	
Observations	4,159	4,159	3,796	3,796	4,159	4,159	3,301	3,301	2,943	2,943

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Notes: The sub-sample of individuals with grades in the fourth school year only includes individuals born 1907-29 due to lack of grades data for earlier birth cohorts. First stage instrument is the distance to pre-school from the home in 100 meters. The reduced form reflects the effect of distance to the pre-school from the home on each dependent variable. The OLS regression and the IV-model account for child's demographic factors characteristics from birth (birthyear, born in Landskrona and sex), at age two (number of siblings, household size, presence of older siblings, presence of younger siblings), maternal demographics (mother's age at child's birth, born in Landskrona, marital status when child is age 2), family economic characteristics when the child is aged two: the occupation of the mother (maid, occupation other than maid, unspecified/no occupation), the family head's income, the family head's SES and the presence of more than one adult female in the household. The school grade models additionally include school fixed effects. Sources: The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021), linked data on pre-school attendance (Elwert & Quaranta, 2023), school absence and grades (Diaries and Exam Catalogues, Landskrona City Archive).

As a second channel, higher family incomes could increase parents' ability to afford alternative, and potentially superior, primary schooling for their children. In Landskrona there was a private girls' secondary school which also accepted girls in primary school ages. In addition, there were other (private) primary school options in the region that parents could have utilized for both boys and girls (Richardson, 2010; Statistics Sweden, 1922). We therefore examine whether pre-school attendance increases the probability of attending the local, public schools or not. Children who were registered as present in Landskrona, but who were not linked to the local public school records are assumed to have either attended public or private schools elsewhere, or private schools in the town. Although the IV-coefficient suggests children were less likely to attend the local public schools (6 percentage points lower or 8% of the mean), we do not find any significant effects on the probability of attending the local public primary schools and cannot conclude that school type is a mechanism.

As a third channel, pre-schools can promote children's health if they provide better care, nutrition or other health services that children could not have attained had they not attended pre-school. In our case, pre-schools provided clothing and daily meals, and we observe lower school absence in first grade in the base sample, suggesting that pre-school improves children's health in the short term. Childhood health is an important factor of human capital, and which has been found to affect later-life economic and occupational outcomes, see e.g. Almond and Currie (2011) and Almond et al. (2018) for overviews. To understand if pre-school attendance had longer lasting health benefits, which could explain gains in occupational attainment, we examine school absence in the fourth school year for the sample of individuals we follow to adulthood.

We do not find any effects on school absence in the fourth school year among the individuals we can follow until adulthood. All children from low-income households attending the public primary schools in Landskrona during the period of study were provided services similar to those in the pre-school, e.g. clothing donations and free school meals. In addition, the town had a school doctor responsible for monitoring children's growth and general health (Sjövall, 1942). It is therefore plausible that any health advantages from pre-school levelled out with time as everyone received the same additional resources through the school. We also examine if there was any mortality selection in survivors up to age 30, but do not find it to be present (see Table A6 in the appendix), although it should be noted that mortality in this age range was very low. With the current measures and the data we have available, we cannot conclude that long-term health advantages explain greater occupational attainment.

As a fourth channel, a pre-school environment that is superior to the home environment can support the development of children's cognitive skills (Heckman, 2006). Cognitive development as a potential mediator of long-term economic positive influences from pre-school attendance is however frequently ruled out by studies finding no influence on test scores in school ages, e.g. Havnes and Mogstad (2015) and discussion in Heckman and Mosso (2014). In our study we do not find that formal childcare affects grades in the fourth school year. The results are not surprising given that the type of pedagogy and schooling provided by the pre-school was traditionally done with large groups of children and limited teaching staff. Besides, we did not observe any effects on school grades in the first school year either. Thus, we cannot conclude that greater school performance or cognitive skills are mechanisms for occupational attainment gains. Summarizing, the main

observed mechanism explaining the long-term effect on occupational attainment is increased family incomes and improved living standards for children.

Concluding discussion

In this study we show how formal childcare in early twentieth century Sweden helped children from, primarily, low-income households escape adverse socioeconomic circumstances in the short and long term. We employ an IV-approach to reduce the selection into pre-school attendance and show that children attending pre-school solely because of its proximity to their home (compliers) were better off in the immediate and longer term. The results suggest that attending pre-school has two immediate effects on children and their families. Pre-school enables parents to work and increases families' incomes in early childhood as well as leads to children experiencing fewer illness days in school. Both the health-promoting services provided by the pre-school (meals and clothes) and parents' higher incomes can explain the immediate decline in school absences (Cunha & Heckman, 2007). None of these outcomes have previously been studied in the historical formal childcare literature.

In the long term, pre-school attendance leads to higher occupational attainment once individuals reach early adulthood, which is in line with past studies on pre-school attendance in the first half of the twentieth century (Ager & Malein, 2024; Rossin-Slater & Wüst, 2020). The gains are of similar magnitude for men and women. With the data we have available we do not observe lasting effects on health beyond the first school year, so improved health does not

appear to explain the long-term effects on occupational attainment. Any potential initial health advantage from pre-school may have cancelled out during primary school ages because schools provided health care services to all children (Sjövall, 1942).

Parental incomes continue to increase in later childhood though and more likely explain the long-term effect on occupational attainment. Parents could have spent the additional income on material items benefiting children and improving their living conditions in ways that support their human capital development over the life cycle, compared to if parents had not earned as much. We are not able to rule out potential non-cognitive effects that the pre-school may have had on children in the short and long term, due to lack of such data.

Nonetheless, long-term occupational effects can only be present if there are educational or labor market opportunities for individuals to achieve them. In our setting, entrance to secondary school relied on school performance. Girls' opportunities to proceed to secondary school were more limited than boys'. Before 1927, free public secondary schooling was only provided to boys, although a private girls' secondary school also existed in Landskrona. More research is needed to understand if pre-school increases chances of gaining a higher education in the period we study, but there is no straightforward evidence of school grades increasing in the sample of individuals we follow until adulthood, so this appears to be a less likely pathway.

Nonetheless, individuals in this study reached ages 25-29 between 1928-58. Over those thirty years, with an exception during the 1930s financial crisis, occupational opportunities grew in all of Sweden (Schön, 2014) and upward social mobility rose – especially for men – in the area we study (Brea-Martinez

& Dribe, 2024). This setting could have provided pre-school attenders with occupational opportunities that would not have presented themselves in a less mobile environment.

This paper contributes to the broader literature on early-life human capital investments and how these can reduce intergenerational persistence in socioeconomic disadvantages in a setting where other (potentially competing) early childhood interventions are rare. The type of pre-school we study, one with limited resources, provides an additional contribution as most of the studies on formal childcare have focused on well-designed and well-invested programs (Duncan & Magnuson, 2013). By examining the mechanisms in a less-financed pre-school context, we contribute to the wider literature on formal childcare by showing that even lower-funded programs can make a difference for children and their families, and also by showing why.

We specifically contribute to the small historical literature on formal childcare provision to low-income families and its socioeconomic effects on attenders (Ager & Malein, 2024; Rossin-Slater & Wüst, 2020). While the existing studies have mainly estimated intent-to-treat effects due to lack of data on individual pre-school attendance, our study is unique in being able to precisely identify pre-school attendance on an individual level due to newly digitized data on pre-school attendance in the population we study.

Further, in the existing historical literature, very little is known about mechanisms between pre-school attendance and socioeconomic outcomes over the life cycle. Because we study a pre-school with limited resources and little pedagogical focus, we can be quite certain to exclude the educational quality of the pre-school as a potential explanation. By studying formal childcare in a population with little immigration, we can also exclude integration and

language development as potential mechanisms. Our results rather point to the pre-school's additional caretaking and/or gains in material parental investments because parents labour supply and incomes increased.

While our study has several important contributions, it has three main limitations. First, studying pre-school attendance in one town may question the study's representativeness and generalizability. However, this is not a major concern in our case. The socioeconomic and demographic development, as well as the pre-school setting, in Landskrona was comparable to other Swedish middle-sized towns at the start of the twentieth century (Dribe et al., 2024). There are no reasons why similar effects would not be observed in other Swedish towns with a growing industry and need for formal childcare, making our results potentially generalizable to other settings.

Second, while the instrumental variables approach has the benefit of estimating causal effects from pre-school attendance, it comes at the expense of only reflecting individuals who attended pre-school because of their proximity to it (local average treatment effects), which also questions the study's generalizability to all pre-school attenders. It was a conscious decision to use the IV-approach as selection into pre-school attendance was large and population-wide estimates from OLS-regressions would not have been meaningful on their own. Yet, as a consequence, we cannot ascertain that the observed effects are valid among all pre-school attenders, but they reflect compliers. Lastly, although we are able to analyse several mechanisms over the life cycle, the lack of data on non-cognitive skills and socialization factors, which are commonly argued to explain positive adulthood outcomes in the contemporary literature (Bailey et al., 2017; Belfield et al., 2006; Cunha &

Heckman, 2007), cannot be examined in this study. Future studies should explore novel data sources that capture these factors.

Nonetheless, in this study we conclude that formal childcare broke some of the short- and long-term effects of experiencing economic adversity in childhood and supported greater occupational attainment for children in low-income households. There are opportunities for future research to analyse additional mediating factors over the life cycle, such as secondary and technical school attendance or behavioural social factors. Future research can also assess if the observed effects are transmitted to the next generation, as observed in a recent study (García et al., 2023).

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Appendix

Figure A1. Distribution of school absence in first and fourth school year by pre-school attendance.

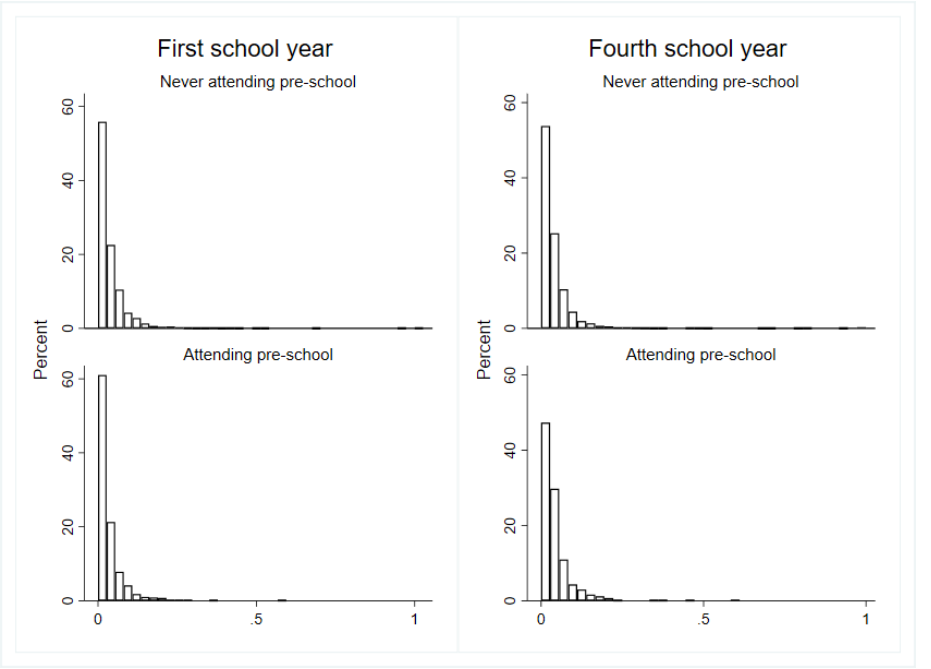

Figure A2. Distribution of school grades in first and fourth school year by pre-school attendance.

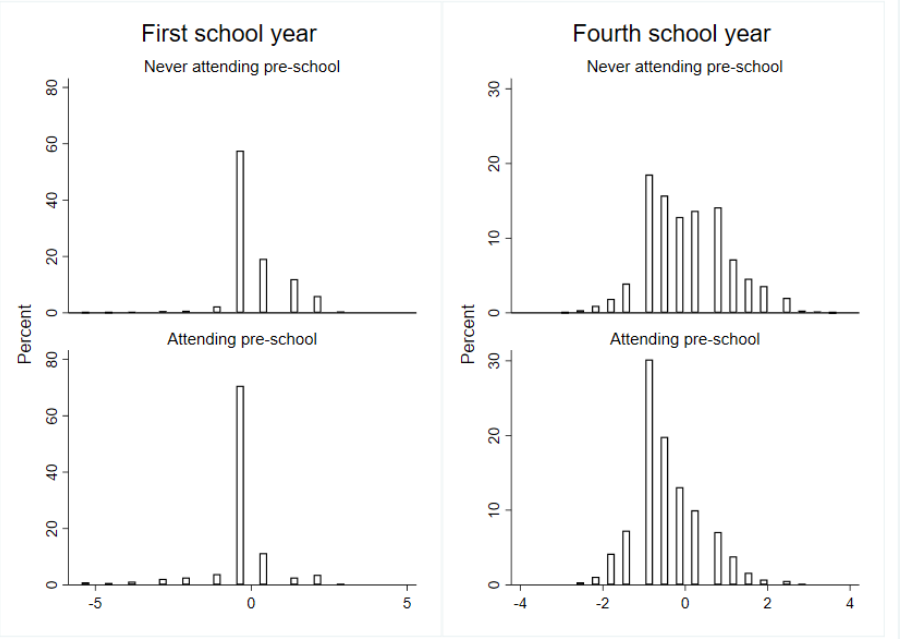

Table A1. Linking of samples.

	Original sample			Adulthood vs original sample		First school year vs original sample		Fourth school year vs adulthood sample	
	N	Mean	Std. Dev.						
Ever attended pre-school	6486	0.13	0.34	0.00		0.02	***	0.00	
Birth year	6486	1916	7.47	-0.04		0.51	***	0.40	**
Female	6486	0.50	0.50	-0.02		-0.01		0.02	
Born in Landskrona	6486	0.92	0.27	0.02	***	0.00		0.00	
Mother age at birth	6486	29.71	6.23	0.17		-0.07		0.01	
Mother born in Landskrona	6486	0.32	0.46	0.02	**	0.00		0.01	
At age 2:									
Real family income (in 1914 SEK)	6486	874	1490	-67.48	**	-162.56	***	-94.68	***
Logged family income	6486	5.17	2.90	-0.04		-0.10	*	-0.05	
Family income above min. tax threshold	6486	0.71	0.45	-0.00		-0.01		-0.01	
Family income percentile rank	6486	0.45	0.30	-0.01		-0.02	***	-0.01	
Older siblings present	6486	0.69	0.46	0.01		0.01		0.00	
Younger siblings present	6486	0.18	0.38	0.00		0.00		0.00	
Mother married	6486	0.88	0.33	0.00		-0.01		0.00	
Mother never married	6486	0.10	0.30	0.00		0.01		0.01	
Mother previously married	6486	0.02	0.14	0.00		0.00		0.00	
Household size	6486	5.37	2.18	0.05		0.00		0.00	
Household head's socioeconomic status									
White-collar worker	6486	0.17		-0.03	***	-0.05	***	-0.03	***
Medium skilled worker	6486	0.27		0.01		0.02	*	0.01	
Lower skilled worker	6486	0.23		0.01		0.00		0.01	
Unskilled worker & unknown	6486	0.32		0.02	**	0.03	***	0.01	

Notes: The table reflects characteristics of the original sample of individuals identified in ages two and seven. Sub-sets of this sample are followed until adulthood, until the first and fourth school years. Column (A) reflects how the adulthood sub-sample analyzed in Table 4 differs from the original sample (analyzed in Table 2). N=4,159. Column (B) reflects how the sub-sample linked to the school records in the first year of school and for whom data on school absence is available (Table 3) differs from the original sample. N=5,049. They differ in terms of pre-school attendance, birth year, income levels and socioeconomic status. Column (C) reflects how, among individuals who can be followed until adulthood, individuals linked to the school records in the fourth year of school and with complete school grades (used for analyses of mechanisms in Table 8) differ from the sample of individuals who can be followed until adulthood. This sample is also skewed towards lower socioeconomic status. N=2,943. Sources: The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021), linked data on pre-school attendance (Elwert & Quaranta, 2023), school absence and grades (Diaries and Exam Catalogues, Landskrona City Archive).

Table A2. Effect of attending pre-school on family income at age 7, treating all incomes below taxable thresholds as zero.

Dependent variable:	Family income at age 7	
	OLS	IV
Attended pre-school	-87.14***	549.7*
	(24.86)	(295.1)
First stage instrument		-0.0078***
		(0.0006)
F statistic first stage		148.56
Reduced form		-4.290*
		(2.273)
Mean dep. var.	958.19	
Stand. dev. dep. var.	1579.16	
Observations	6,486	6,486

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. *Notes*: First stage instrument is the distance to pre-school from the home in 100 meters. The reduced form reflects the effect of distance to the pre-school from the home on each dependent variable. The OLS regression and the IV-model account for child's demographic factors characteristics from birth (birthyear, born in Landskrona and sex), at age two (number of siblings, household size, presence of older siblings, presence of younger siblings), maternal demographics (mother's age at child's birth, born in Landskrona, marital status when child is age 2), family economic characteristics when the child is aged two: the occupation of the mother (maid, occupation other than maid, unspecified/no occupation) and the family head's real income, as well as the family head's SES and the presence of more than one adult female in the household. *Sources*: The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021), linked data on pre-school attendance (Elwert & Quaranta, 2023), school absence and grades (Diaries and Exam Catalogues, Landskrona City Archive).

Table A3. Descriptive statistics of family income and its distribution at ages 2, 7 and 10.

	N	Mean	Std. Dev.	Min.	Max.
All:					
Family income (real) at age 2	6,486	873.58	1489.53	0.000	38796.50
Family income rank at age 2	6,486	0.453	0.302	0.0695	1.000
Family income above tax threshold at age 2	6,486	0.71	0.45	0	1
Family income (real) at age 7	6,486	975.05	1570.25	0.000	44224.27
Family income rank at age 7	6,486	0.507	0.285	0.0695	1.000
Family income (real) at age 10	5,911	1079.13	2550.06	0.000	143344.90
Family income rank at age 10	5,911	0.544	0.268	0.0695	1.000
Ever attended pre-school:					
Family income (real) at age 2	843	635.60	733.38	0.000	8424.81
Family income rank at age 2	843	0.398	0.282	0.0695	0.994
Family income above tax threshold at age 2	843	0.65	0.48	0	1
Family income (real) at age 7	843	717.53	595.59	0.000	6668.35
Family income rank at age 7	843	0.451	0.271	0.0695	0.991
Family income (real) at age 10	750	769.01	509.94	0.000	6747.27
Family income rank at age 10	750	0.488	0.249	0.0695	0.992
Never attended pre-school:					
Family income (real) at age 2	5,643	909.13	1568.51	0.000	38796.50
Family income rank at age 2	5,643	0.461	0.304	0.065	1.000
Family income above tax threshold at age 2	5,643	0.72	0.45	0	1
Family income (real) at age 7	5,643	1013.52	1664.27	0.000	44224.27
Family income rank at age 7	5,643	0.515	0.286	0.0695	1.000
Family income (real) at age 10	5,161	1124.20	2719.23	0.000	143344.90
Family income rank at age 10	5,161	0.552	0.269	0.0695	1.000

Source: The Scanian Economic-Demographic Database version 7.2 (Bengtsson et al., 2021)

Table A4. Distributional effects from illness in first school year: IV-coefficients.

Dependent variable:	<33rd percentile	33rd-66th percentile	>67th percentile
Attended pre-school	0.2908*	0.1138	-0.4046**
	(0.1499)	(0.1504)	(0.1631)
Observations	5,049	5,049	5,049

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Notes: First stage instrument is the distance to pre-school from the home in 100 meters. The reduced form reflects the effect of distance to the pre-school from the home on each dependent variable. The OLS regression and the IV-model account for child's demographic factors characteristics from birth (birthyear, born in Landskrona and sex), at age two (number of siblings, household size, presence of older siblings, presence of younger siblings), maternal demographics (mother's age at child's birth, born in Landskrona, marital status when child is age 2), family economic characteristics when the child is aged two: the occupation of the mother (maid, occupation other than maid, unspecified/no occupation) and the family head's real income, as well as the family head's SES and the presence of more than one adult female in the household. Sources: The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021), linked data on pre-school attendance (Elwert & Quaranta, 2023), school absence and grades (Diaries and Exam Catalogues, Landskrona City Archive).

Table A5. Effect of attending pre-school on family's income at age seven and child's absence due to illness in the first school year, by birth cohort.

Dependent variable:	Family income (percentile rank) when child is seven years				School absence due to illness, first school year			
	Birth cohorts 1903-14		Birth cohorts 1915-29		Birth cohorts 1903-14		Birth cohorts 1915-29	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Attended pre-school	-0.0400***	0.342***	-0.0328**	0.281***	-0.0054**	-0.0270	-0.0051*	-0.0426
	(0.0121)	(0.124)	(0.0131)	(0.0994)	(0.0026)	(0.0266)	(0.0028)	(0.0262)
First stage instrument		-0.0065***		-0.0092***		-0.0090***		-0.0133***
		(0.0009)		(0.0009)		(0.0017)		(0.0019)
F statistic first stage		51.54		108.83		28.83		52.12
Reduced form		-0.0022***		-0.0026***		0.0002		0.0006*
		(0.0007)		(0.0009)		(0.0002)		(0.0003)
Observations	2,989	2,989	3,497	3,497	2,179	2,179	2,870	2,870

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Notes: p-value 0.103 for the IV-coefficient -0.0426 for birth cohorts 1915-29. First stage instrument is the distance to pre-school from the home in 100 meters. The reduced form reflects the effect of distance to the pre-school from the home on each dependent variable. The OLS regression and the IV-model account for child's demographic factors characteristics from birth (birthyear, born in Landskrona and sex), at age two (number of siblings, household size, presence of older siblings, presence of younger siblings), maternal demographics (mother's age at child's birth, born in Landskrona, marital status when child is age 2), family economic characteristics when the child is aged two: the occupation of the mother (maid, occupation other than maid, unspecified/no occupation) and the family head's real income, as well as the family head's SES and the presence of more than one adult female in the household. *Sources*: The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021), linked data on pre-school attendance (Elwert & Quaranta, 2023), school absence and grades (Diaries and Exam Catalogues, Landskrona City Archive).

Table A6. Effect of attending pre-school on individual and family head HISCAM for women who never married and were married for at least one year between ages 25-29.

Dependent variable:	Individual HISCAM Never married		Individual HISCAM Married at least one year		Family head HISCAM Married at least one year	
	OLS	IV	OLS	IV	OLS	IV
Attended pre-school	-2.18	37.17	-2.12***	3.03	-1.374**	13.37***
	(1.563)	(30.41)	(0.519)	(2.905)	(0.661)	(4.321)
First stage instrument		-0.0040*		-0.0103***		-0.0102***
		(0.0023)		(0.0013)		(0.00130)
F statistic first stage		3.20		63.21		61.41
Reduced form		-0.1495		-0.0312		-0.137***
		(0.0918)		(0.0296)		(0.0419)
Mean dep. var.	55.62		53.78		57.73	
Stand. dev. dep. var.	11.17		8.10		10.85	
Observations	507	507	1,411	1,411	1,367	1,367

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Notes: 74% of females were married for at least one year between ages 25-29. First stage instrument is the distance to pre-school from the home in 100 meters. The reduced form reflects the effect of distance to the pre-school from the home on each dependent variable. The OLS regression and the IV-model account for child's demographic factors characteristics from birth (birthyear, born in Landskrona and sex), at age two (number of siblings, household size, presence of older siblings, presence of younger siblings), maternal demographics (mother's age at child's birth, born in Landskrona, marital status when child is age 2), family economic characteristics when the child is aged two: the occupation of the mother (maid, occupation other than maid, unspecified/no occupation) and the family head's real income, as well as the family head's SES and the presence of more than one adult female in the household. Sources: The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021), linked data on pre-school attendance (Elwert & Quaranta, 2023), school absence and grades (Diaries and Exam Catalogues, Landskrona City Archive).

Table A7. Effect of attending pre-school on probability of surviving to age 25.

Dependent variable:	Survival to age 25	
	OLS	IV
Attended pre-school	-0.00388	0.00238
	(0.00648)	(0.0460)
First stage instrument		-0.0078***
		(0.0006)
F statistic first stage		148.55
Reduced form		-0.0000
		(0.0004)
Mean dep. var.	0.977	0.977
Stand. dev. dep. var.	0.151	0.151
Observations	6,486	6,486

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Notes: First stage instrument is the distance to pre-school from the home in 100 meters. The reduced form reflects the effect of distance to the pre-school from the home on each dependent variable. The OLS regression and the IV-model account for child's demographic factors characteristics from birth (birthyear, born in Landskrona and sex), at age two (number of siblings, household size, presence of older siblings, presence of younger siblings), maternal demographics (mother's age at child's birth, born in Landskrona, marital status when child is age 2), family economic characteristics when the child is aged two: the occupation of the mother (maid, occupation other than maid, unspecified/no occupation) and the family head's real income, as well as the family head's SES and the presence of more than one adult female in the household. Sources: The Scanian Economic Demographic Database version 7.2 (Bengtsson et al., 2021), linked data on pre-school attendance (Elwert & Quaranta, 2023), school absence and grades (Diaries and Exam Catalogues, Landskrona City Archive).

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