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Universal Early Education and Educational Outcomes: The Role of Family Background

Markus Laaninen

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ABSTRACT

Previous research suggests that early childhood education and care (ECEC) participation is positively associated with educational outcomes of especially disadvantaged children in both targeted and universal ECEC systems. ECEC has also been found to reduce early learning disparities between children with immigrant and non-immigrant backgrounds, which is linked to its potential to support early language acquisition. Consequently, ECEC has been regarded as a way for promoting equality of opportunity and has become an integral part of family policy in Western societies. As ECEC has become embedded in family policy, it is important to move beyond mere participation rates and examine how different features of ECEC, such as starting age and intensity, are linked to educational outcomes for children from diverse backgrounds. Interestingly, in contrast to international findings, Finnish research has not found evidence that ECEC can compensate for the educational outcomes of disadvantaged children.

Comparing results across countries is challenging due to significant differences in their ECEC systems. For instance, although the Nordic countries are often grouped under the same Nordic welfare model, the institutions that guide families' childcare choices vary between these countries. Finland stands out from the other Nordic countries particularly in its childcare policy following parental leave. Compared to its Nordic peers, Finland provides relatively extensive support for home care of young children through the home care allowance (HCA) cash benefit, which has resulted in considerably lower ECEC participation rates. Therefore, the relationship between ECEC and children's outcomes should be examined both within and across countries.

In this dissertation, I examine the relationship between ECEC and children's educational outcomes in Finland and the Nordic countries. As the theoretical framework of the study, I draw on the mechanisms of accumulation, compensation, and multiplication, which enable an examination of how ECEC is connected to children's educational outcomes among children from different backgrounds. Dissertation is built upon three sub-studies. The first study examines how the age at which children begin ECEC is associated with their literacy test scores at age 15 in the Nordic countries. The study utilizes PISA data from the years 2015 and 2018 and applies multilevel linear regression analysis. Based on the results, it is possible to

compare literacy scores among children who started ECEC at different ages, across various family backgrounds, and in different countries.

The second study investigates how the duration of the HCA period is associated with children's literacy grades at age 16. The study utilizes comprehensive Finnish population register data and applies sibling fixed-effect regression analysis. The results allow for an examination of how the length of the HCA period relates to children's literacy skills across groups defined by parental education level and ethnic origin.

The third study examines how the intensity of ECEC is associated with the speech production of 4-year-old children. The study utilizes data from the 2018 Child Health, Wellbeing and Services survey, collected during child health clinic visits. Logistic regression analyses are used to examine the association between children's average weekly hours in ECEC and their speech production, with results presented separately by parental education level. This enables an investigation into whether ECEC intensity is linked to children's educational outcomes across different family backgrounds.

In line with previous international research, this thesis finds that universal ECEC has the potential to compensate for educational outcomes among children from low-SES and immigrant backgrounds (Articles II and III). Thus, ECEC may promote equality of opportunity even in countries with universal ECEC systems. These findings support the European Commission’s goals to further increase ECEC participation across Europe. Therefore, while expanding access to ECEC can promote gender equality by enhancing mothers’ labor market participation, it also holds promise for reducing disparities in educational outcomes among children from diverse backgrounds. However, the findings from Article I did not indicate a compensatory effect; rather, the associations appeared additive or, in Norway, even more beneficial for children from high-SES families. Thus, further research is needed.

KEYWORDS: child home care; compensation; early childhood education and care; family background; intergenerational inequality; literacy; speech production

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TIIVISTELMÄ

Tutkimukset ovat osoittaneet, että varhaiskasvatukseen osallistuminen on myönteisesti yhteydessä erityisesti heikommassa asemassa olevien lasten koulutuksellisiin lopputulemiin sekä kohdennetuissa että universaaleissa varhaiskasvatusjärjestelmissä. Varhaiskasvatuksen on myös havaittu vähentävän oppimiseroja maahanmuuttajataustaisten ja ei-maahanmuuttajataustaisten lasten välillä, mikä liittyy sen potentiaaliin tukea varhaista kielen omaksumista. Tämän vuoksi varhaiskasvatusta on pidetty keinona edistää mahdollisuuksien tasa-arvoa, ja siitä on tullut olennainen osa perhepolitiikkaa länsimaisissa. Koska varhaiskasvatus on vakiintunut osaksi perhepolitiikkaa, on tärkeää tarkastella pelkkien osallistumisasteiden sijaan sitä, miten varhaiskasvatuksen eri piirteet, kuten aloitusikä ja intensiteetti, liittyvät lasten koulutuksellisiin lopputulemiin eri taustoista tulevien lasten kohdalla. Kiinnostavaa on, että kansainvälisistä tutkimustuloksista poiketen suomalainen tutkimus ei ole löytänyt näyttöä siitä, että varhaiskasvatus voisi kompensoida heikommassa asemassa olevien lasten koulutuksellisia lopputulemia.

Tulosten vertailu eri maiden välillä on haastavaa, koska maiden varhaiskasvatusjärjestelmät eroavat merkittävästi toisistaan. Esimerkiksi vaikka Pohjoismaat ryhmitellään usein saman pohjoismaisen hyvinvointimallin alle, perheiden lastenhoitovalintoja ohjaavat instituutiot vaihtelevat maiden välillä. Suomi erottuu muista Pohjoismaista erityisesti vanhempainvapaan jälkeisessä lastenhoitopolitiikassa. Suomessa pienten lasten kotihoitoa tuetaan kotihoidontuen avulla huomattavan laajasti verrattuna muihin Pohjoismaihin, mikä on osaltaan johtanut varhaiskasvatukseen osallistumisen selvästi vähäisempään määrään. Siten varhaiskasvatuksen yhteyttä lasten koulutuksellisiin lopputulemiin tulisi tarkastella sekä maiden sisällä että niiden välillä.

Tässä väitöskirjassa tarkastelen varhaiskasvatukseen osallistumisen yhteyttä lasten koulutuksellisiin lopputulemiin Suomessa ja Pohjoismaissa. Tutkimuksen teoreettisena viitekehyksenä hyödynnän kasaantumisen, kompensaation ja moninkertaistumisen mekanismeja, joiden avulla voidaan tarkastella, miten varhaiskasvatus kytkeytyy lasten oppimistuloksiin eri taustoista tulevilla lapsilla. Väitöskirja rakentuu kolmen osatutkimuksen varaan. Ensimmäisessä osatutkimuksessa tutkitaan, miten varhaiskasvatuksen aloitusikä on yhteydessä 15-vuotiaiden lasten lukutaidon testituloksiin Pohjoismaissa. Tutkimuksessa hyödynnetään PISA-

aineistoa vuosilta 2015 ja 2018 sekä käytetään lineaarista monitasoregressioanalyysiä. Tulosten perusteella voidaan vertailla lukutaidon testituloksia sen mukaan, minkä ikäisenä lapset ovat aloittaneet varhaiskasvatuksen, millaisista perhetaustoista he tulevat sekä missä maassa he asuvat.

Toisessa osatutkimuksessa tarkastellaan, miten kotihoidon kesto on yhteydessä lasten äidinkielen arvosanoihin 16 vuoden iässä. Tutkimuksessa hyödynnetään suomalaista koko väestön kattavaa rekisteriaineistoa ja sovelletaan sisarusten kiinteiden vaikutusten regressioanalyysiä. Tulosten avulla voidaan tarkastella, miten kotihoidon kesto on yhteydessä lasten äidinkielen arvosanoihin vanhempien koulutustason ja lasten etnisen taustan mukaan määritellyissä ryhmissä.

Kolmannessa osatutkimuksessa tarkastellaan, miten varhaiskasvatuksen intensiteetti on yhteydessä 4-vuotiaiden lasten puheen tuottamiseen. Tutkimuksessa hyödynnetään vuoden 2018 Lasten terveys, hyvinvointi ja palvelut -kyselyaineistoa, joka on kerätty lastenneuvolakäyntien yhteydessä. Logistisen regressioanalyysin avulla tutkitaan, miten lasten keskimääräinen viikoittainen varhaiskasvatukseen osallistumisaika on yhteydessä puheen tuottamiseen. Tulokset esitetään erikseen vanhempien koulutustason mukaan.

Yhteneväisesti aiemman kansainvälisen tutkimuksen kanssa tämä väitöskirja antaa osviittaa siitä, että universaali varhaiskasvatus voi tukea koulutuksellisia lopputulemia matalan sosioekonomisen aseman ja maahanmuuttajataustaisten lasten kohdalla (artikkelit II ja III). Näin ollen varhaiskasvatus voi edistää mahdollisuuksien tasa-arvoa myös maissa, joissa varhaiskasvatusjärjestelmä on universaali. Tulokset tukevat Euroopan komission tavoitteita lisätä varhaiskasvatukseen osallistumista eri puolilla Eurooppaa. Siten varhaiskasvatuksen saatavuuden laajentaminen voi edistää sukupuolten tasa-arvoa parantamalla äitien työmarkkinaosallistumista, mutta sillä on myös potentiaalia vähentää koulutuksellisia eroja eri taustoista tulevien lasten välillä. Artikkelin I tulokset eivät kuitenkaan viitanneet kompensoivaan yhteyteen, vaan yhteydet näyttäytyivät pikemminkin additiivisina tai, Norjan suhteen, jopa hyödyllisempinä korkean sosioekonomisen taustan lapsille. Peräänkuulutankin siis myös tarpeita jatkotutkimukselle.

ASIASANAT: kotihoidontuki; kompensaatio; varhaiskasvatus; koulutuslopputulemat; perhetausta; ylisukupolvinen eriarvoisuus; lukutaito; puheen kehitys

Acknowledgements

In the movie Fury (2014) a crew of M4A2E8 Sherman tank (Easy Eight) repeat the same mantra: “Best job I’ve ever had”. Although the working conditions of a WWII tank and a 2020s department of social sciences might differ just slightly, I still feel cohesion with the tank crew. Working as a researcher at the INVEST Research Flagship Centre at the University of Turku has been the best job I’ve ever had. Fortunately, doing research is not a lonely task in a dusty, oily, and dark corner of a tank cabin. Therefore, I would like to thank the many people who have helped me on my march.

Traditionally, I guess, this would be the moment to reflect on the struggle, the journey, the battles fought, and to speak about how I’ve grown as a researcher and as a person, culminating in a sense of liberation at reaching this milestone. But the truth is, I’ve simply done what I like and enjoyed every single day of this work. So let’s set aside the grand narratives of paths, journeys, and struggles, and get straight to what truly matters, my warmest thanks.

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Thank you Mikko. From Mikko I’ve seen that beneath a carefree exterior burns a genuine and passionate interest in the subjective wellbeing (not his own). I am very grateful that you took me to work as a research assistant in your TITA project and pushed me to a path of a researcher (not sure if I am actually that grateful from the latter one). You have also offered me interesting reading from your book shelf, and especially your passionate and dedicated interest towards Max Weber’s writings has pushed me forward. Danke, liebe Bürokratie! Mikko also taught me that the acknowledgements section is the only part of this book anyone will ever read. So, naturally, I made this section unnecessarily long.

Aleksi Karhula, when I first saw you, you were teaching statistics in a bachelor's course in 2015, and I wondered: who is this guy laughing from the depths of a mountain (the lonely mountain from the Hobbit) while talking about the distribution of variables. When I saw you last, that same deep laughter continued. Ah, those funny variables. From Aleksi, I've learned that raising small children and writing a dissertation can indeed be done at the same time. I've also realized that the boundary between a geographer and a sociologist is rather blurry. Hopefully that says more about sociology. Thank you, Aleksi, for your guidance and for helping me with funding applications.

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Aki Koivula, you are one of my closest friends at the university. At first, I couldn't think of what to write here. So, I asked an AI (just as you would): 'I like this person, but I can't put into words why and I don't just want to write in my acknowledgements how I like to drink beer and eat kebab with him. How should I write about him?' I received three great answers, which I'll include below. These responses capture my thoughts perfectly.

- I am deeply grateful to Aki Koivula, whose presence and support have meant a great deal to me throughout this journey.
- Thank you to Aki Koivula for being such a positive and supportive colleague—it has always been a pleasure to work with you.
- I truly appreciate Aki Koivula for making this experience more enjoyable and meaningful.

Dear Seppo Vesa-Matti Paasivaara, there have been days when I've cycled to the university in pouring rain just because you asked for company in the lunch WhatsApp group. Anna once described you perfectly: Seppo (nimi muutettu) is someone you'd least want anything bad to happen to. I couldn't agree more. Thank you Vesku for your friendship and for the fast track through HR matters. Anna Grahn, Essi Ahlroth, and Kirsti Sippel, thank you as well for your friendship and peer (and beer) support. With you, I've always been able to be myself (somewhat). I miss our shared lunch breaks with you guys and Seppo in the 3rd-floor coffee room! I also want to thank Jaana Tähti, first, for simply being such a wonderful person, and second, for helping me navigate all sorts of issues related to the university's hundreds (no joke) of support and registration systems, or whatever they are.

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meidät sitten pihalle, kun kyllästyvät. Kiitos Marjo ja Markku kaikesta tuesta. En ole ymmärtänyt pakinaa appivanhemmista, koska te olette niin mukavia ja maanläheisiä ihmisiä.

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Suomen Turussa, Aurajoen varrella (oikeasti istun junassa Karjaalla)
Maaliskuun 30. päivänä Herran vuonna 2026
Markus Antero Juhani Laaninen

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List of original publications

This dissertation is based on the following original publications, which are referred to in the text by their Roman numerals:

I Laaninen, Markus, Kulic, Nevena and Erola, Jani. Age of entry into early childhood education and care, literacy and reduction of educational inequality in Nordic countries. European Societies, 2024; 26(5), 1333-1362. https://doi.org/10.1080/14616696.2024.2310694

II Laaninen, Markus. Duration of Child Home Care Allowance Period and School Success: Differences by Parental Education Level and Ethnic Origins. Research in Social Stratification and Mobility, 2025; 98, 101063. https://doi.org/10.1016/j.rssm.2025.101063

III Laaninen, Markus. Association between speech production and ECEC intensity: differences by family background. European Early Childhood Education Research Journal, 2026; 1-20. https://doi.org/10.1080/1350293X.2025.2578230

1 Introduction

After the Second World War, the primary purpose of early childhood education and care (ECEC) was to support maternal employment by enabling both parents to participate in the workforce in contemporary societies (Kamerman, 2000). Later, ECEC has been integrated into social welfare systems in Western countries. Especially since the turn of the 21st century, increasing emphasis has been placed on equality of opportunity as studies have found that ECEC participation is positively associated with the cognitive development of especially disadvantaged children in both targeted and universal ECEC systems (Burger, 2010; Schmutz, 2024; van Huizen & Plantenga, 2018). Therefore, it is assumed that ECEC can compensate for the generally lower resources available in low socioeconomic status (SES) families in terms of children's educational outcomes (Burger, 2010) and thus ECEC makes it possible to invest in the accumulation of human capital (Heckman, 2000). ECEC has also been found to reduce early learning disparities between children with immigrant and non-immigrant backgrounds, which is linked to its potential to support early language acquisition (Drange & Telle, 2017; Votruba-Drzal et al., 2015).

There are SES gaps in children's cognitive abilities even before the start of comprehensive school (Fernald et al., 2013; Skopek & Passaretta, 2021) which highlights the importance of early educational investments in disadvantaged children (Heckman, 2006). Therefore, it is not surprising that child care policies in contemporary societies emphasize the importance of early childhood investments in terms of ECEC. For instance, World Bank (2024), the European Union (European Commission, 2023) and the Organisation for Economic Co-operation and Development (OECD) (OECD, 2025) are in favour of participating in ECEC and increasing ECEC participation rates.

As ECEC has become an integral part of family policy in Western societies, it is important to go beyond mere participation rates and examine how different features of ECEC are linked to educational outcomes for children from diverse backgrounds. It has been suggested that ECEC participation can be viewed as a dosage (Loeb et al., 2007). Research examining the link between ECEC starting age and children's educational outcomes has generally shown that longer exposure, typically resulting from an earlier start, is associated with improved academic performance (Melhuish

et al., 2015). However, divergent findings have also been reported (Kuehnle & Oberfichtner, 2020), and the benefits of ECEC have in some cases been considered less long-lasting (Cornelissen & Dustmann, 2019). Moreover, the link between ECEC intensity and children's educational outcomes across different family backgrounds remains poorly understood. However, it has been suggested that higher intensity, such as full-day versus half-day care, may be more beneficial for children's educational outcomes (Lee et al., 2006; Zvoch et al., 2008), particularly for those from low SES backgrounds (Loeb et al., 2007). Nevertheless, the link between ECEC features and children's educational outcomes across different family backgrounds still calls for further research.

The relationship between ECEC and children's educational outcomes has been widely studied over the past decades. While the majority of research has focused on North America, European studies on universal ECEC systems have become increasingly common. Cross-country comparisons are important, as ECEC institutions can vary significantly between countries, making country-specific findings difficult to generalize (Kulic et al., 2019). There is considerable variation between countries in both the extent of ECEC participation and its social distribution (Kulic et al., 2017; Pavolini & Van Lancker, 2018). It is therefore important to examine the association between ECEC and children's educational outcomes both within countries and in cross-national comparisons.

In this dissertation I am interested in both comparing the association between ECEC and educational outcomes across Nordic countries and examining specifically Finland. This approach is particularly relevant given that the Nordic countries are often grouped under the social-democratic welfare model and referred to as the golden standard in family policy which can then be compared to, for example, the Anglo-Saxon or Southern European models (Esping-Andersen, 1999; Thévenon, 2011). However, a closer look reveals that Finland's family policy differs significantly from its Nordic peers, particularly in terms of ECEC participation and support for child home care (Eydal et al., 2018), which may be reflected in children's educational outcomes.

In the Nordic countries, the focus of family policy has shifted from transfer-based policies to service-based policies during the 2000s (Hakovirta & Nygård, 2021) and for this reason, ECEC is playing an increasingly central role in Nordic family policy. In other Nordic countries, ECEC participation has long been significantly higher than in Finland. The main reason for this is Finland's national-level child home care allowance (HCA) cash benefit that has been a popular form of support since its introduction in 1985 (Duvander & Ellingsæter, 2016). Although ECEC has been promoted from investment, gender egalitarian and children's rights perspectives, HCA enjoys both political and citizen popularity in Finland (Hiilamo & Kangas, 2009). Only a small proportion of parents place their children in ECEC

immediately after the end of parental leave. Therefore, most families use HCA at least for a while. The HCA scheme encourages especially lower educated and lower income parents to take care of their small children at home (Karila et al., 2017; Österbacka & Räsänen, 2022). In addition, immigrant families in particular care for children under the age of three more often at home (Tervola, 2015). This appears contradictory, as children from immigrant backgrounds and low SES are among those who may benefit the most from ECEC, especially with regard to educational outcomes.

Further, as mentioned before, international studies have consistently found that ECEC tends to especially benefit children from immigrant and low-educated families (Burger, 2010; Melhuish et al., 2015). This has also been observed, for example, in Norway (Dearing et al., 2018; Drange & Havnes, 2018; Havnes & Mogstad, 2015). However, previous Finnish findings suggest that the associations between ECEC and children's educational outcomes do not vary across family background, at least when examining educational attainment (Karhula et al., 2017), cognitive development (Kosonen & Huttunen, 2018) or school grades (Hiilamo et al., 2018). It is therefore important to obtain further research from Finland in order to better understand cross-country differences in the relationship between ECEC and children's educational outcomes.

As the theoretical framework of the thesis, I draw on the mechanisms of accumulation, compensation, and multiplication (Erola & Kilpi-Jakonen, 2017), which enable an examination of how ECEC is connected to children's educational outcomes among children from different backgrounds. I examine the associations between ECEC and children's educational outcomes from the perspectives of ECEC starting age, the duration of home care, ECEC intensity, and family background. In the three studies of the dissertation, I aks:

1. How starting age in ECEC is associated with literacy test scores at the age of 15 by family background in the Nordic countries? (Article I)

2. How duration of the home care allowance period is associated with literacy grades at the end of lower secondary school by parental education and ethnic origins in Finland? (Article II)

3. How ECEC intensity is associated with speech production of four-year-old children by parental education in Finland? (Article III)

Educational outcomes, such as school performance often determine children's educational opportunities. It is therefore important to examine whether ECEC can support both early and later educational outcomes and thereby promote equality of opportunity. In Finland, for example, the ECEC curriculum has in recent years increasingly emphasized pedagogical content. This dissertation focuses on literacy

test scores at age 15 and literacy grades at age 16. In addition, it examines an earlier outcome, speech production at age 4. This allows for an analysis of the relationship between ECEC and educational outcomes both in the short and long term.

The dissertation utilizes high-quality register and survey data. Programme for International Student Assessment (PISA) data enables a comparison between Nordic countries using harmonized measures, allowing for a detailed examination of the Nordic welfare model (Article I). The Finnish register data, in turn, is a full-population dataset, which substantially enhances the generalizability of the results. Register data also enables the examination of smaller population groups, such as second-generation immigrants (Article II). Furthermore, the Child Health, Wellbeing and Services survey from 2018, used in the third article (Article III), includes information on children and parents from 17% of the target population, which is a substantial share compared to traditional social science survey datasets. The features related to families' choice of care for children are considered in statistical analyses with family fixed-effect and covariate adjusted regression models.

This dissertation contributes to the existing research literature in three main ways. First, the findings shed light on cross-country differences in the association between ECEC participation and children's educational outcomes by comparing countries that follow a social-democratic universalistic welfare state model, namely the Nordic countries. The aim is to examine whether ECEC can compensate for childhood family resources in children's educational outcomes also in Finland. Second, the results demonstrate how ECEC intensity and starting age are linked to educational outcomes among children from different family backgrounds. Third, the dissertation examines the relationship between ECEC and educational outcomes among children with immigrant backgrounds. This perspective has received relatively little attention in previous ECEC research, despite the growing importance of labor migration in many European countries facing declining fertility.

From policy perspective, this dissertation contributes to the Finnish policy discussion in two ways. First, the findings offer a more nuanced understanding of ECEC’s role in promoting equity and long-term educational success by examining how ECEC starting age and intensity relate to children's educational outcomes across social strata. In particular, the results highlight that these associations vary depending on children's family background, suggesting that policy discussion should move beyond the binary 'either-or' framing and begin to address the holistic needs of children and families. Second, the dissertation also brings attention to the growing relevance of labor migration in many European countries facing declining birth rates, underlining the importance of inclusive and responsive ECEC systems.

The structure of the dissertation is as follows. Chapter 2 presents the theoretical framework, including a discussion on the roles of the home learning environment

and ECEC, as well as the social mechanisms through which family resources may moderate the relationship between ECEC participation and children's educational outcomes. Chapter 3 reviews the relevant prior research literature. Chapter 4 introduces the Finnish child care and education system. Chapter 5 outlines the research design, including the research questions, data, and methods. Chapter 6 summarizes the key findings of the articles. Finally, Chapter 7 discusses the findings in relation to previous research and policy debates, while also addressing the study's limitations and outlining directions for future research.

2 Theoretical framework

In this chapter, I describe those mechanisms by which ECEC is linked to educational outcomes of children from different family backgrounds. Social mechanisms form the cornerstone of modern analytical sociology. They are classified as mid-range theories, which are empirically testable generalizations of social phenomena (Merton 1968). Appropriate explanations should detail how the phenomenon being explained actually works (Hedström & Ylikoski, 2010). Peter Hedstrom (2005) argues that even if the mechanism is well-founded, we may not see the outcome it suggests. Social phenomena are made up of several simultaneous processes, and these processes can influence each other or cancel each other out. Because of this, social mechanisms should be understood as proposals from a certain point of view of the causal entity, but not necessarily as a dominant view. (Hedstrom, 2005, pp. 31–32)

Before delving into the mechanisms linking ECEC participation and children's educational outcomes, I will first lay the groundwork by discussing equality of opportunity and children's educational outcomes, as well as the connections between the home and ECEC environments in relation to the educational outcomes of children from different family backgrounds.

2.1 Equality of opportunity and children's educational outcomes

Social inequalities occur in all societies e. g. as social stratification of power, rights or other resources between individuals and groups. These patterns of stratification shape individuals' and families' access to opportunities and life outcomes. According to equality of opportunities, individual's socioeconomic status and educational achievement should be determined based on their own abilities, and not merely inherited through the family one is born into (Roemer, 1998). Therefore, when looked from behind the veil of ignorance (Rawls, 1973), the "accident of birth" should be irrelevant for individual's outcomes (Cunha & Heckman, 2007, p. 37). It is known, however, that realized equality and social inheritance go hand in hand. There are differences in the equality of opportunities between different societies, and for example educational mobility is stronger in social-democratic welfare states

compared to e. g. liberal or conservative ones (Grätz et al., 2021; Hertel & Groh-Samberg, 2019; Pfeffer, 2008).

Equality of opportunity is also reflected in children's educational outcomes as children whose family background is more favorable do on average better in school and have higher education than children with a lower family background (Breen & Jonsson, 2005; Chmielewski, 2019; Volante et al., 2019). High family background refers to better resources of the family which may consist, for instance, of economic, cultural and social capital of the family (Bourdieu, 1986). Through these resources, children are provided with a basis for a success through parental investments and endowments (Becker & Tomes, 1976; Coleman, 1988; Musick & Mare, 2006). Investments are noticeable resources that can be harnessed for the future of children. Investments include, for example, income or time spent with children. The higher the income parents have, the more opportunities they have to invest in their children. Endowments, in turn, are intangible resources that are passed from parent to child. These can be, for example, information, genes or social resources. (Musick & Mare, 2006) The research literature utilizes parents' education, professional status and income as an indicator of family resources, because it is difficult to distinguish between investments and endowments when measuring the phenomena empirically (Erola & Kilpi-Jakonen, 2017).

The role of immigrant background is a critical dimension in discussions concerning family context and should not be overlooked. The educational attainment of immigrants' lags behind the native population in Western European countries (Heath et al., 2008) and in Finland, where differences in grades (Kilpi-Jakonen, 2012) and education (Kilpi-Jakonen, 2011, 2017) between immigrants and natives are mostly explained by family resources. There may also be cultural differences between immigrant groups, meaning that other immigrant families invest more in the education of their children than others, regardless of the education of the parents (Coleman, 1988, p. 111). In addition, immigrants experience discrimination, for example on the job market, due to their origin (Heath et al., 2008).

Education is emphasized as an important tool in promoting the integration of immigrants. In this context, I refer by integration to the process by which individuals become accepted as part of society (Garcés-Mascareñas & Penninx, 2016). For example, the European Commission has recommended for immigrants to be integrated into the education system at the earliest possible stage, to seek to avoid underachieving immigrant children at school, to prevent social exclusion and to encourage multicultural interaction (Lulle & King, 2016).

2.2 The role of home learning environment and early childhood education and care for children's educational outcomes

Internationally, genetic factors seem to account for less than half of children's educational outcomes (Silventoinen et al., 2020), which suggest that environmental influences play a crucial role in children's lives. Therefore, research has underscored the importance of the early home environment and early education for children (Cunha & Heckman, 2007; Heckman, 2000, 2006). Additionally, there are gaps in children's cognitive abilities along the social strata even before the start of comprehensive school (Fernald et al., 2013; Skopek & Passaretta, 2021). Therefore, it's no wonder that the importance of early investment in children has been highlighted.

The link between ECEC and children's later educational outcomes has been approached in the research literature mainly from the perspective of human capital accumulation. Human capital refers to an individual's skills and knowledge which are acquired through education and they serve as a source of profit (Becker, 1962; Schultz, 1961). Therefore, education serves as an investment for individuals. According to Heckman (2006), early investments, especially in disadvantaged children, are the most impactful, because the returns from these investments accumulate over time. Therefore, ECEC could limit the inequality-generating process of cumulative advantage, which has been central to the sociology of education (DiPrete & Eirich, 2006). I will discuss more on this later in chapter 2.3.

According to Esping-Andersen (2009) the standard model of origins – education – destination, introduced by Blau & Duncan (1967) to explain intergenerational mobility, remains incomplete without addressing the role of conditions and stimuli during early development. Young children are typically cared for at home and / or in ECEC. Both of these are therefore of great importance to children's development and learning. Furthermore, firstly, how home learning environment (HLE) and ECEC are chosen as a form of care and secondly, how HLE and ECEC affect children's development and learning are both socially stratified.

2.2.1 Social stratification in child care choices

The choices families make regarding childcare can be approached from various perspectives. In addition to educational choices (Breen & Goldthorpe, 1997), the selection of childcare arrangements has also been examined as a rational investment in the accumulation of human capital by both parents and children. According to Steinberg & Kleinert (2022), ECEC decision-making is shaped by three key factors: (1) parents have the opportunity to choose between different forms of childcare, (2)

these choices are guided by calculations of perceived costs and benefits, and (3) there are systematic differences in how these costs and benefits are assessed across social status groups. Unlike educational choices, decisions regarding childcare affect not only children but also parents (Steinberg & Kleinert, 2022), significantly influencing, for example, mothers' employment. Further, family norms and preferences concerning parenting and childcare influence the selection of childcare choices. For example, in the Netherlands, it was found that mothers' attitudes and opinions strongly influenced whether families made use of ECEC services (Van Gameren & Ooms, 2009).

Participation in ECEC is socially divided. Across Europe, disadvantaged children are less likely to use ECEC than their more advantaged peers, which is considered to be due to structural factors related to ECEC provision, rather than cultural norms related to parenting (Pavolini & Van Lancker, 2018). For example, social stratification in ECEC enrolment is less pronounced in the Nordic countries compared to many Central European nations (Pavolini and Van Lancker 2018). Furthermore, social stratification in ECEC is greater in Finland than in Sweden (Krapf, 2014), which is linked to the countries' differing child care policies. In Finland, home care has a strong historical role and has been supported by political measures through HCA (Hiilamo and Kangas 2009).As a result, child home care is more common in low SES families. For instance, in Sweden, HCA has been discontinued since 2016, and family policy encourages universal participation in ECEC after the parental leave period (Eydal et al., 2018). Additionally, children from high SES families may participate in higher quality ECEC on average (Kulic et al., 2019). For example, in Norway, childcare is segregated in such a way that children from high SES families participate in higher quality ECEC (Drange & Telle, 2020).

Furthermore, children from immigrant backgrounds participate in ECEC less and at older ages compared to the native children, both across Europe (Van Lancker & Pavolini, 2023) and in Finland (Tervola 2015). This difference in childcare use is not fully explained by differences in the resources of native and immigrant families. Instead, staying longer and obtaining citizenship in the host country are associated with greater childcare use, while adherence to traditional norms from the origin region has the opposite effect. (Van Lancker & Pavolini, 2023). In addition, perceptions of ECEC among immigrants, such as views on its quality, may vary based on institutional experiences from their countries of origin.

2.2.2 Learning environment and children's educational outcomes

Home learning environment

The family investment and family stress perspectives suggest that the HLE varies according to the family's socioeconomic status, and thus the family's resources reflect on children's development and learning. Therefore, families with better resources generally provide a better learning environment for their children.

According to the family investment perspective, families where parents have more resources, such as social, economic, and cultural resources, can invest more in the quality of the HLE (Conger & Donnellan, 2007). The most fundamental of these investments are investments based on parental resources and behavior (Longo et al., 2017). This is reflected, for instance, in better learning materials and better nutrition (Conger & Donnellan, 2007) as well as higher quality parental skills (Ermisch, 2008) e. g. better parent-child relationships and emotional support.

The family stress model is closely connected to the investment model and it suggests that in families where income levels and employment prospects are poor (such as in sociologists' families) the stress brought on by financial uncertainty negatively impacts children's development and learning (Conger & Donnellan, 2007). In such cases, the emotional support provided by parents is less, as parents may not have the resources to adequately attend to their children's needs.

Early childhood education and care

High-quality ECEC functions as a learning-friendly environment, which is positively connected to children's educational outcomes, and thus supports the transition to school (Burchinal et al., 2002; Howes et al., 2008; Mashburn et al., 2008). When discussing the quality of ECEC, two components are highlighted, the first of which is *structural quality* (Howes et al., 2008; Layzer & Goodson, 2006; Slot et al., 2018). This refers to the structural features such as ECEC curriculum, teacher training, group size, and staff-child ratio (Howes et al., 2008; Wysłowska & Slot, 2020). These structural features form the basis for the second aspect of ECEC quality, *process quality*, which refers to children's experiences in ECEC and relates to the functional characteristics of ECEC, such as children's interactions with peers and staff (Wysłowska & Slot, 2020). The characteristics and content of structural and process quality as well as their association with children's outcomes are presented in Figure 1. Higher structural quality is associated with better process quality (Burchinal et al., 2002), especially thru higher teacher qualification (Slot et al., 2015). Correspondingly, the process quality of ECEC is highly significant for

children's educational outcomes (Mashburn et al., 2008). The basis for learning is created in ECEC through social skills as well as cognitive play (Heckman & Masterov, 2007) and this happens in the area of process quality, in the sphere of play and interaction.

In terms of process quality, important aspects include activities that support language development or interactions between parents and staff, which can involve daily brief communication and sharing information (M. A. Barnett et al., 2020). Interaction between parents and ECEC staff is important because it supports, for example, children's prosocial skills (Cohen & Anders, 2020). Involving parents in ECEC activities increase parents' participation in home learning activities, which strengthens children's academic readiness (Barnett et al. 2020) and promotes quality of HLE. Further, parents and ECEC caregivers can together identify and address, for example, learning difficulties at an early stage. According to Barnett and colleagues (2020), the interaction between ECEC staff and parents can be a key mechanism through which the benefits of ECEC are transmitted to children.

In addition to ECEC staff, children can benefit from ECEC because they interact with their peers (Ghirardi et al., 2023). ECEC can be very beneficial, especially for the development and educational outcomes of children with an immigrant background (Drange & Telle, 2017; Votruba-Drzal et al., 2015) because in ECEC they get early exposure to the native language in collaboration with other children and ECEC staff.

The connections between ECEC and educational outcomes are not only tied to whether children participate in ECEC or not, but also to the question of how much. ECEC can be viewed as a dosage (Loeb et al., 2007), and can therefore be examined through factors such as starting age or intensity, which can be understood as indicators of early investments.

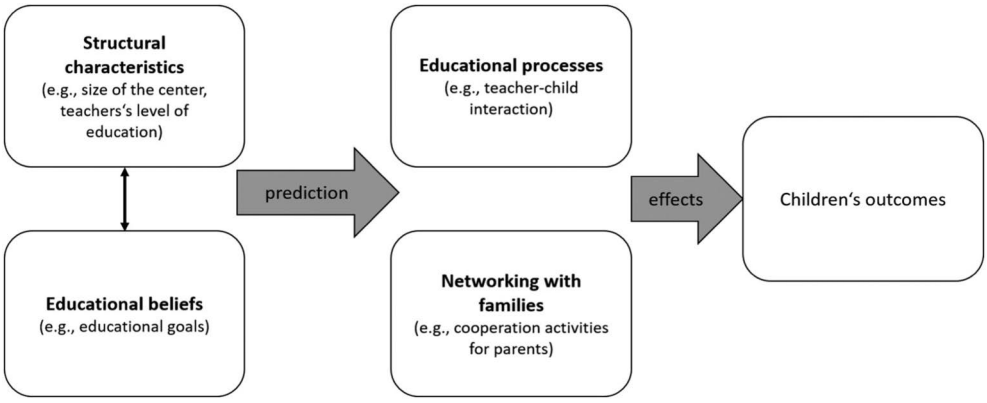

Figure 1. Conceptual model of educational quality: structure-process model of quality (Kluczniok & Roßbach, 2014).

2.3 Social mechanisms of the triad of educational outcomes, family background and ECEC

Erola & Kilpi-Jakonen (2017) discuss the mechanisms through which we can understand how family resources moderate the association between child outcomes and additional resources. Additional resources can be understood, for example, as kinship relations or societal investments, and in this dissertation, I consider additional resources provided by ECEC. The role of these additional resources on children can vary depending on the resources that families already have. Thus, for example, ECEC can enable access to resources that compensates for other resources of the family, such as parents' human or social capital. Erola & Kilpi-Jakonen (2017) write that if we want to examine the effects of various welfare state institutions on intergenerational inequality, we should look at the groups that these institutions' compensations target. In the context of ECEC, we should therefore compare families with high and low resources.

The mechanisms of accumulation, compensation and multiplication (see also Burger, 2010) are shown in Figure 2 which shows child outcome on the y-axis, additional resource (ECEC) on the x-axis and their associations by family background. Accumulation (Column A in Figure 2) refers to a situation where participation or intensity in ECEC would have the same effect for children with low and high family resources. In other words, panel A illustrates a situation where the effects of family background and ECEC on children's educational outcomes are independent of each other. However, most research suggests that ECEC benefits children from families with low resources (see Burger, 2010; Melhuish et al., 2015 for reviews). This points to the mechanism of compensation (column B in Figure 2). Compensation suggests that involvement in ECEC can even out opportunities for children from more disadvantaged backgrounds. The compensatory mechanism of ECEC has been highlighted in the research literature, especially since it is known that social stratification in children's skills is already visible before school age (Fernald et al., 2013; Skopek & Passaretta, 2021).

Children from disadvantaged families could benefit more from ECEC because the benefits of ECEC are similar to those learned by the well-off already at home (Ghirardi et al., 2023). Therefore, ECEC can particularly support children from low-SES families if they do not otherwise have the same opportunities to engage in educational play at home. Following the social learning theory (Bandura & Walters, 1977), low SES children can benefit from ECEC because they get to learn social skills with children who have higher HLE. Additionally, teacher-child interaction can be beneficial for children from low-SES families if it compensates for their parents' parental skills. ECEC also involves parents and can increase the participation of low-SES parents in home learning activities, which can strengthen children's academic readiness (Barnett et al., 2020). For immigrants, ECEC can

compensate for both their on average weaker economic, cultural and social resources and their weaker language skills.

The opposite mechanism for compensation is the multiplication mechanism (column C in Figure 2) whereby ECEC benefits children with an advantageous social background (see also cumulative advantage, DiPrete and Eirich 2006). Multiplication is often referred to as the Matthew effect (Merton, 1968), meaning that high parental resources and ECEC feed each other, leading to better outcomes for advantaged children. The Matthew effect can manifest, for example, because high-SES children have the opportunity to attend higher-quality ECEC (Drange & Telle, 2020). It may be that high SES children have a double advantage for academic achievement compared to their low SES peers, because they both have better HLE and are more likely to participate in high quality ECEC (Ghirardi et al., 2023).

In the next chapter I will discuss how these proposed mechanisms of intergenerational social inequality at the individual level reflect to the results of empirical research on ECEC and children's educational outcomes.

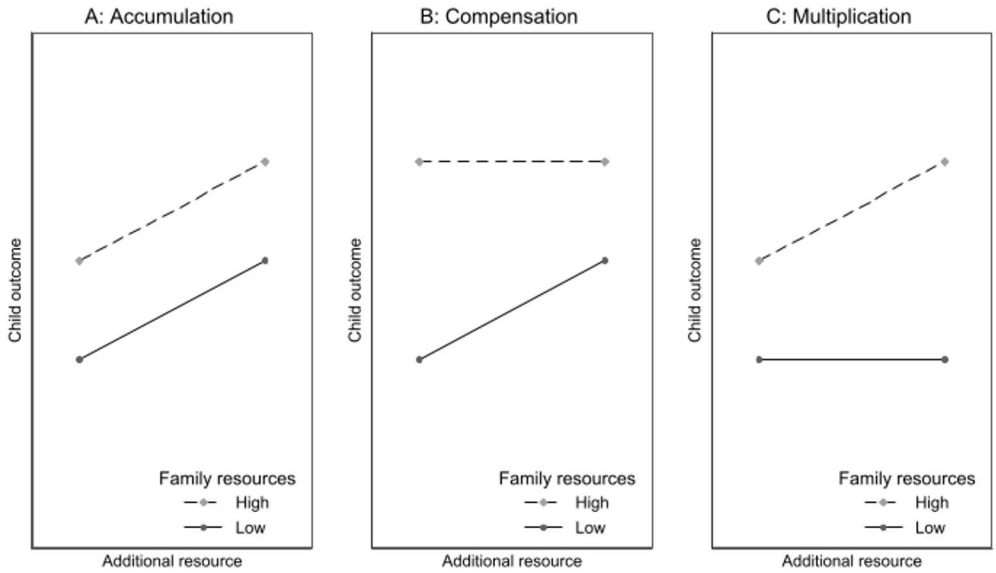

Figure 2. Accumulation, compensation and multiplication effects of additional and family resources for children's outcomes (Erola & Kilpi-Jakonen, 2017).

3 Previous research

In this chapter, I review research on how ECEC is associated to children's educational outcomes, focusing on academic achievement. ECEC research has its roots in the United States where studies investigated how early education could affect children's outcomes, with the main interest being disadvantaged children. These studies were based on early education programs such as Head Start and Perry Preschool Project which offered a possibility for randomized control trial and quasi-experimental research designs (see Melhuish et al., 2015). In general, these studies found that ECEC can improve the educational outcomes of disadvantageous children (Barnett, 1995, 2011; Burger, 2010).

However, no direct conclusions can be drawn from these studies for countries where ECEC services are mostly universal (Kulic et al., 2017, 2019). For example, the previously mentioned Perry program was targeted only at disadvantaged and low-income African American children and the intensive intervention program lasted two years. However, a meta-analysis of studies utilizing quasi-experimental research designs showed that in studies of publicly funded European ECEC systems, the effects of ECEC to children's cognitive abilities and later education were generally positive and ECEC benefited most children with disadvantageous backgrounds (van Huizen & Plantenga, 2018). Thus, ECEC would appear to have a positive association with children's later outcomes even in universal ECEC.

3.1 ECEC, family background and educational outcomes in universal European ECEC settings

Most of the research on European universal ECEC has been conducted in Norway, Germany and Denmark, and these studies have been based on quasi-experimental research designs, which are based on changes in the provision of ECEC. Most of the studies find that the association between ECEC and educational outcomes is heterogeneous in terms of family background, as ECEC seems to be particularly beneficial for educational outcomes of disadvantaged children. The effects of ECEC on children's educational outcomes would thus flow through a compensation mechanism (Chapter 2.3).

A Norwegian study looked at how ECEC started at the age of 1-2 affects language and math skills at the age of seven (Drange & Havnes, 2018). The study considered children born in Oslo 2004-2006. During that time, more children applied for ECEC than places were available. As a result, some ECEC spots were drawn in the lottery, causing random variation in the time to start ECEC. The results showed that children who got a place in the lottery and thus participated in ECEC earlier did better in both language and math tests than those who participated ECEC later. Further the study found that the effects were heterogeneous according to parental education and earlier participation in ECEC benefited children of lower educated parents, but the differences in children of high educated parents were not statistically significant. ECEC thus had a compensatory effect for educational outcomes of children with disadvantageous family background. Further, according to another Norwegian study of cohorts born in 2002-2006, participation in the universal ECEC at the age of three improved the language skills of children from low-income families (Dearing et al., 2018).

Third Norwegian study looked at how participation in ECEC for children aged 3–6 years affected children's adult income, later education, and cognitive test scores (Havnes & Mogstad, 2015). The research design was based on the 1975 reform to increase participation in ECEC, which resulted in large municipality variations in ECEC. The reform had a positive effect on the adult income of children from low- and middle-income families, but a negative effect on the adult income of children from high-income families. In addition, the reform had a positive effect on the education of children from low-income families, but no effect on the education of children from high-income families. The reform was not found to have an effect on the cognitive test scores of the boys measured in the military.

On the other hand, in a study using German panel data (Kuehnle & Oberfichtner, 2020), no differences were found between earlier and later ECEC initiators in cognitive tests measured at 5 and 15 years of age. In addition, the results were homogeneous according to gender, parental education, and immigration background. This study looked at a cohorts born in 1994–1996 and included a regression discontinuity design based on the fact that participation in ECEC is linked to children's year of birth rather than absolute age.

Research on Finland shows that child home care, as a contrafactual for ECEC attendance, has mainly negative, albeit weak, association with cognitive abilities and educational attainment. Further, the results speak in favor of ECEC having a family-independent association to children's educational outcomes. The association would thus proceed according to the accumulation mechanism (Chapter 2.3). A study utilizing a register data and differences in municipality HCA supplement found that HCA had a negative short-term effect on cognitive development of 4-year-old children, but not on later education or primary school grade point average. This study

found no differences in children's developmental outcomes by maternal education. (Kosonen & Huttunen, 2018) Another study utilizing register data found that transitioning directly from home care to pre-primary education starting at the age of 6 had a negative association with primary school grade point average, but not with later educational attainment. These association did not differ by maternal education. (Hiilamo et al., 2018) Unlike previous studies, in one Finnish study, early ECEC attendance was found to have a positive association with later educational attainment, but this association was mainly explained by family resources (Karhula et al., 2017). According to test results measuring proficiency in mother tongue and mathematics conducted at the beginning of the first grade of primary school the various forms of child care did not have an unambiguous association with the children's primary school entry level (Ukkola et al., 2020).

At this point, it is perhaps relevant to highlight that several studies have found ECEC participation to be associated with externalizing behavior problems, such as aggression, defiance, and disruptive behavior towards others. For example, the introduction of universal, highly subsidized childcare in Quebec, Canada, led to an increase in children's behavior problems, such as increase in aggressive behavior (Baker et al., 2008). Further, in the US, childcare attendance was associated with behavioral problems in several studies (Belsky et al., 2007; Loeb et al., 2007; K. A. Magnuson et al., 2007; McCartney et al., 2010). This association between childcare attendance and an increase in behavioral problems has also been found in Europe: in Norway an early entry to childcare predicted aggression at the age of two, although these effects faded away as children got older (Dearing et al., 2015). Another Norwegian study found only small differences in behavior problems between children in parental care and children who were in childcare 40 hours per week (Zachrisson et al., 2013). However, a Finnish study did not find differences in externalizing behavior problems between 2-year-old children in home care and day care centers (Tervahartiala et al., 2024). Dearing & Zachrisson (2017) have also argued that the evidence that quantity of childcare increases behavioral problems is rather weak.

3.2 The importance of starting age and intensity of early childhood education and care for children's educational outcomes

As mentioned in section 2.2, ECEC can be seen as a dosage effect, and therefore it can be assumed that, for example, the connections between ECEC and children's educational outcomes depend on the starting age or intensity of ECEC.

Starting age

Studies on the relationship between ECEC starting age and children's educational outcomes have generally found that a longer duration, in practice, an earlier starting age, is associated with better educational outcomes (Melhuish et al., 2015).

In a study that utilized comparative data from 28 countries in the 2011 Progress in International Reading Literacy Study (PIRLS), it was found that the longer children spent in ECEC, that is, the earlier they started ECEC, the better their results were in fourth-grade reading literacy tests. This result was especially evident among children of low-educated parents (Cebolla-Boado et al., 2016). In a U.S.-based study, it was found that children who started ECEC at the age of 2–3 years experienced the greatest academic benefit from participating in ECEC. However, the differences between income groups in this context were small. (Loeb et al., 2007) In Norway, a younger starting age in ECEC particularly supported the language and math skills as well as the educational attainment of children from low-income and low-educated families (Dearing et al., 2018; Drange & Havnes, 2018; Havnes & Mogstad, 2011, 2015). Similar results have also been found in Denmark and France (Datta Gupta & Simonsen, 2016; Dumas & Lefranc, 2012). Furthermore, in Finland, starting ECEC at around the age of 2 leads to better educational attainment, however these associations are similar regardless of family background (Karhula et al., 2017).

In contrast, a study from Germany found that children who began ECEC three months earlier showed no significant differences in cognitive test outcomes compared to those who started later, regardless of their family background (Kuehnle & Oberfichtner, 2020). Meanwhile, in England, starting pre-school before the age of five led to higher test scores at ages five and seven, but these gains had disappeared by age eleven (Cornelissen & Dustmann, 2019).

Intensity of care

Studies on the relationship between ECEC intensity and children's educational outcomes have been somewhat inconsistent. Some studies have not found that higher ECEC intensity is linked to improvement in children's cognitive outcomes in the U.S. (Howes et al., 2008; NICHD, 2000). On the other hand, it has also been observed that children who participated in full-day ECEC performed better than those in part-time ECEC in vocabulary and math tests in the U.S. (Robin et al., 2007). The type of ECEC examined in U.S. studies varies across research due to the diversity of ECEC systems in the country. However, research on kindergarten participation in the year before primary school in the US consistently shows that children in full-day programs outperform those in half-day programs in literacy and math (V. E. Lee et al., 2006; Yan & Lin, 2005; Zvoch et al., 2008). However, these academic advantages tend to diminish over time (Cooper et al., 2010; Votruba-Drzal et al., 2008). A similar result

was found in the UK, where the intensity of group care between the ages of 0–51 months was positively associated with cognitive ability scores (Barnes & Melhuish, 2017). Moreover, in several Asian countries, ECEC intensity was positively linked to children's cognitive and language development (Rao et al., 2019).

An Australian study found that although increased ECEC intensity was positively associated with tests measuring nonverbal and fluid intelligence, these associations did not differ according to children's SES (Coley et al., 2015). Additionally, this study did not find that ECEC intensity was linked to children's academic or vocabulary skills. However, in a U.S. study by Loeb et al. (2007), it was found that, unlike their high-income peers, low-income children benefited from attending ECEC for more than 30 hours per week. Still, studies examining the interaction between ECEC intensity and family background in relation to children's educational outcomes have been relatively limited.

3.3 ECEC and educational outcomes for children of immigrants

Children with immigrant backgrounds typically speak their parents' native language at home, and therefore early exposure to the host country's language in ECEC may benefit their educational outcomes (Drange & Telle, 2017; Votruba-Drzal et al., 2015). Especially children whose home language differs from the language used in ECEC appear to benefit from ECEC participation (Gormley, 2008; R. Lee, 2016; Votruba-Drzal et al., 2015). European studies have found that ECEC participation supports the school success (Drange & Telle, 2017), language skills (Felfe & Lalive, 2018), and school readiness (Cornelissen et al., 2018) of children with immigrant backgrounds. U.S. studies have also found that ECEC participation benefits the literacy and math skills of children with immigrant backgrounds (Gormley, 2008; Lee, 2016; Magnuson et al., 2006).

Studies comparing the benefits of ECEC for native-born and immigrant-background children have yielded somewhat mixed results. In studies conducted in Germany (Cornelissen et al., 2018) and the U.S. (Votruba-Drzal et al., 2015), it was found that children with immigrant backgrounds benefited more from ECEC participation than non-immigrant children. However, another U.S.-based study did not find differences in the benefits of ECEC between these groups (Magnuson et al., 2006).

Nonetheless, the educational outcomes of children with immigrant backgrounds have been studied relatively little, which is unfortunate, as early interventions may be particularly meaningful for this group. Furthermore, to my knowledge, there are no studies indicating that ECEC is more beneficial for native children than for immigrant children. ECEC thus presents an opportunity to support the integration of immigrant children and their families.

4 Child care and educational system in Finland

4.1 Child care arrangements

The data for this dissertation were collected before the 2022 parental leave reform. At that time, parents, most often mothers, received parental allowance until the child was roughly ten months old. After this period, they could either enroll the child in ECEC or care for the child at home, in which case they were eligible for HCA. In addition, it was possible to apply for flexible or partial care allowance, which combines work and childcare, as well as private care allowance if parents wished to arrange childcare independently. Parental allowance, HCA, flexible and partial care allowance, and private care allowance are all applied for through the Social Insurance Institution of Finland (Kela).

ECEC services are largely provided by municipalities. These services consist of municipality day care, municipality family day care, and service voucher and private care allowance that can be used for private day care costs. I will discuss the development of the shares of these different ECEC services later in Figure 4.

4.1.1 Home care allowance

Most families take care of a child with HCA for at least some time. Only about 0.7 percent of children under 12 months of age were in ECEC in 2023 (Statistics Finland, 2024). HCA is paid until the child turns three if the child is not in ECEC provided by municipality. It is possible to receive HCA for the care of older siblings under six years of age if there are children under three years of age in the family who are being cared for with HCA. Municipalities sometimes add a separate supplement to the HCA, and this amount varies from one municipality to another. The municipal supplement for HCA is paid especially in large municipalities where there is a shortage of ECEC spots (Lahtinen & Svartsjö, 2018; Miettunen, 2008). The municipal supplement to HCA has also been seen as a way for municipalities to save on organizing ECEC services, as ECEC is a large expenditure in the municipal economy and the tax benefit of parental work cannot fully compensate for short-term costs (Haataja, 2012). Mothers spend on average 2–5 months more

at home with their children in municipalities that provide a municipal supplement to the home care allowance (Kosonen, 2014; Österbacka & Räsänen, 2022), which can be considered problematic as it weakens mothers' attachment to the labor market.

ECEC fees are subsidized and free for the lowest-income families. However, it may be more financially beneficial for low-income families to rely on HCA, since the municipal supplement to the HCA can be received simultaneously with unemployment benefits. Therefore, using HCA may be the only sensible option for, for example, families with many children. It is not surprising, then, that immigrants, lower-educated individuals, and the most disadvantaged families are more likely to care for their children at home (Karila et al., 2017; Kekkonen, 2014; Tervola, 2015). Indeed, the HCA has received considerable criticism, particularly in relation to women's employment and gender equality issues. For example, HCA may weaken women's attachment to the labour market (Kosonen, 2014).

4.1.2 Early childhood education and care

Internationally, efforts are being made to promote participation in ECEC, and the European Union, for example, set an objective for its member states to increase the participation rate of aged 3 or over in ECEC to 96 percent by 2030 (European Commission, 2023). The enrolment rate in ECEC is high in the Nordic countries. In Denmark, Iceland, Norway and Sweden over 95 percent of children aged 3 or over have participated in ECEC since 2017. In Finland, this proportion has been notably lower, only exceeding 80 percent in 2016 (Figure 3). The lower ECEC participation rate in Finland results from the Finnish HCA scheme, which has contributed to the establishment of a strong culture of caring for young children at home (Haataja, 2016; Karila et al., 2017; Miettinen & Rotkirch, 2017; Valaste, 2016). In Norway, HCA is also available for the care of children under the age of two, whereas Sweden abolished its HCA scheme in 2016 and Iceland and Denmark have never implemented comparable national-level CFC programs (Duvander and Ellingsæter 2016; Eydal, Rostgaard, and Hiilamo 2018). In Norway and Sweden, however, HCA has not influenced the popularity of home care for young children as strongly as it has in Finland. Further, for example in Sweden, parents also have better opportunities for part-time work, making it easier to reconcile work and childcare. (Krapf, 2014) In Finland, the proportion of children participating in part-time early childhood education is small (Säkkinen & Kuoppala, 2016) and families often have to choose between working and childcare.

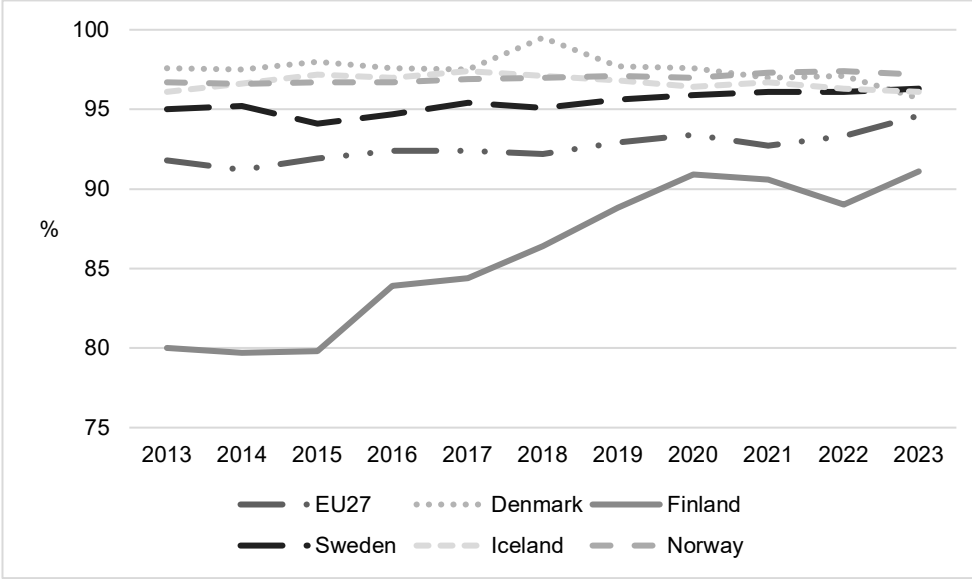

Figure 3. Participation in ECEC of children aged 3 and over in the Nordic counties and EU27 average (Eurostat, 2025).

The development of the ECEC in Finland is linked to the post-World War II period, when the welfare state was formed. Rapid industrialization, rural-to-urban migration, and the employment of women created the need for day care for children, especially in cities. (Alila et al., 2014; Karila et al., 2017) While in Sweden day care was framed from a gender egalitarian perspective on women's right to work, in Finland the perspective was for families to choose between day care and home care. In Finland, the costs of social policy have played a key role in the Finnish political debate: home care is cheaper than ECEC. (Hiilamo & Kangas, 2009) The social debate emphasizes the labor, social and family policy tasks of ECEC, while education and equality policy tasks have received less attention (Alila et al., 2014).

In recent years, however, the educational policy tasks of ECEC have received more attention and ECEC has moved from the Ministry of Social Affairs to the Ministry of Culture and Education. According to the law, ECEC refers to the planned and purposeful whole of a child's upbringing, teaching and care, with a special emphasis on pedagogy (Act on Early Childhood Education and Care, 2018). Academic competence is not the main goal of ECEC, although mathematical and linguistic competence are considered in the basics of the early childhood education plan (Opetushallitus, 2022). Further, the evaluation of ECEC is not primarily based on children's learning outcomes (Ukkola et al., 2020).

In Finland, municipalities must arrange ECEC for all children who need it. However, it is up to the municipalities to decide how ECEC is organized, which is

why there are differences between municipalities in the organization of ECEC services. According to municipal politicians and ECEC officials, emphasis is placed on saving money and the employment of parents in rural areas, while in cities, emphasis is placed on children's learning which may be linked to regional inequalities in the provision of ECEC services (Karila et al., 2017).

The use of various ECEC services in Finland from 1985 to 2023 is described in Figure 4, which shows that from the 1980s to the 2010s, the number of children attending center-based day care increased from about 55% to about 80%. Correspondingly, the number of children in family day care decreased from about 45% to about 4%. The private care allowance has been reported since 1997 and the service voucher since 2015, and in 2023, about 15% of children in ECEC participated in private ECEC services. The statistics do not take into account open early education, in which children in home care can participate. Open early education is a part-time club activity, which can be organized, for example, by the municipality or communities.

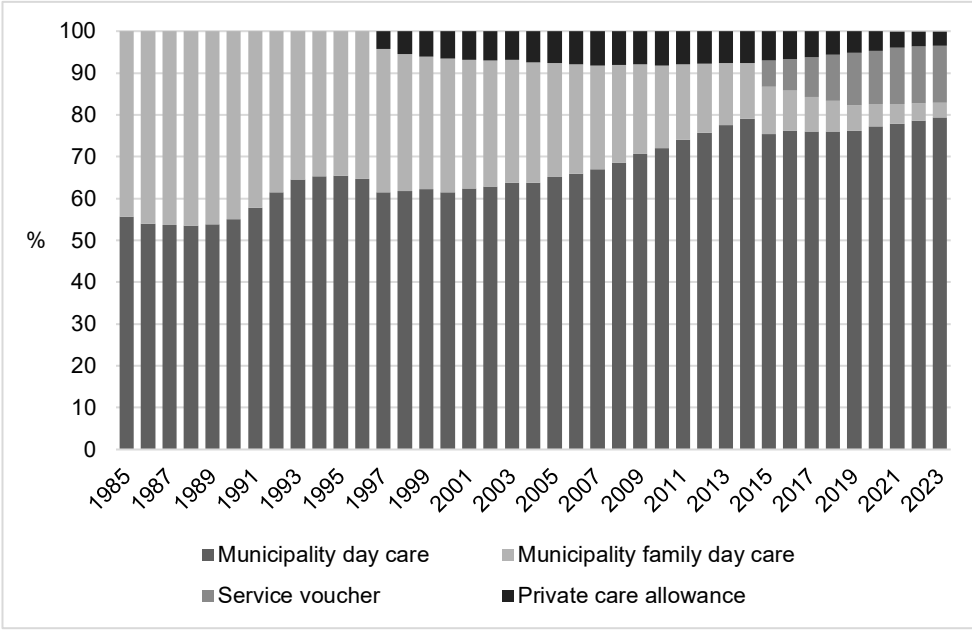

Figure 4. Use of ECEC services in Finland 1985 – 2023 (Statistics Finland, 2024).

4.2 Finnish education system

The Finnish school system is one of the most equal in the world. The school is free at all levels of education and there are no dead ends in the system. Preschool, which is compulsory, begins the year the child turns six. After preschool, children start

primary school in the year the child turns seven. Primary school lasts for nine years, ending in the year the child turns 16.

It is noteworthy that in Finland, educational choices are made relatively late. The first choice is made not until the end of primary school. In this case, children choose between academic or vocational track, which are the two forms of secondary education. The choice to an academic track is based on grade point average (GPA) of the compulsory school diploma. After secondary school, children can continue to universities, and polytechnic schools. As there are no dead ends in the school system, students can also apply to the university from a vocational track of the secondary schools, although it is really rare (Kilpi-Jakonen et al., 2016).

Table 1 below illustrates the key features of the Finnish child care and education system, along with the timing of outcome measurements of this thesis, up to the age of 17.

Table 1. Key features of the Finnish child care and educational system in relation to the outcomes examined in the thesis (adapted from Article II).

Child's Age	Parental Leave	HCA	ECEC	Pre-school Starts	Comprehensive School	Secondary school starts	LENE test measured	PISA test Measured	Literacy Grade Measured
0	x	x(a)	x (a)						
1		x	x						
2		x	x						
3		x (b)	x						
4		x (b)	x				x		
5		x (b)	x						
6		x (b)	x (c)	x					
7					x				
8					x				
9					x				
10					x				
11					x				
12					x				
13					x				
14					x				
15					x			x	
16					x	x			x (d)
17									

a = Eligibility at the age of 10 months
b = with sibling increase
c = Preschool is included in ECEC
d = Measured in the year the individual applied for upper secondary education

5 Research setting

5.1 Objectives of the study

In my dissertation, I examine the links between ECEC and children's educational outcomes among children from different family backgrounds, focusing on ECEC starting age and intensity, as well as the duration of HCA. These associations are reflected against the mechanisms of accumulation, compensation and multiplication presented in Section 2.3. This dissertation focuses on literacy test scores at age 15 and literacy grades at age 16. In addition, it examines an earlier outcome, speech production at age 4. This allows for an analysis of the relationship between ECEC and educational outcomes both in the short and long term. The investigation of these characteristics of childcare stems from gaps identified in previous literature. First, in Finland, international research findings suggesting that ECEC participation is linked to children's educational outcomes in different ways depending on their background have not been observed, even though such findings have been reported in other Nordic countries. Second, the connections between ECEC and the educational outcomes of children with immigrant backgrounds have been scarcely studied, despite the potential of ECEC to support their academic skills, particularly in terms of language acquisition. As Finland will increasingly rely on immigration in the future, this is a socially and politically significant area of research. Third, the characteristics of ECEC are closely tied to how ECEC relates to children's educational outcomes. However, previous research on the relationship between ECEC intensity, measured in this study as weekly hours, and the educational outcomes of children from different backgrounds is limited. Therefore, in the three studies of the dissertation, I examine:

1. How starting age in ECEC is associated with literacy test scores at the age of 15 by family background in the Nordic countries? (Article I)
2. How duration of the home care allowance period is associated with literacy grades at the end of lower secondary school by parental education level and ethnic origins in Finland? (Article II)

3. How ECEC intensity is associated with speech production of four-year-old children by parental education level in Finland? (Article III)

The main features of the sub-studies are presented in Table 2. The first study examines how the age at which children begin ECEC is associated with their literacy test scores at age 15 in the Nordic countries. The study utilizes PISA data from the years 2015 and 2018, and applies multilevel linear regression analysis (students nested into schools). Based on the results, it is possible to compare literacy scores among children who started ECEC at different ages, across different family backgrounds, and in different countries. This allows for a comparison of the mechanisms presented in Section 2.3 across the Nordic countries using a harmonized dataset. This approach is especially relevant as the Nordic countries are often seen as representatives of the social-democratic welfare model and considered the gold standard in family policy. However, a closer examination shows that Finland's family policy diverges notably from its Nordic counterparts, particularly in ECEC participation and support for HCA, differences that may influence children's educational outcomes.

The second study investigates how the duration of the HCA period is associated with children's literacy grades at approximately age 16. The study utilizes comprehensive Finnish population register data and applies sibling fixed-effect regression analysis. Based on the results, it is possible to examine how the duration of the HCA period relates to children's literacy skills across groups defined by parental education level and children's ethnic origin.

The third study examines how the intensity of ECEC is associated with the speech production of 4-year-old children. The study utilizes data from the 2018 Child health, wellbeing and services survey, collected during child health clinic visits. The logistic regression analyses examine the association between children's average weekly hours in ECEC and their speech production, with results presented separately by parental education level. This enables an examination of whether ECEC intensity is associated with children's educational outcomes across different family backgrounds.

Table 2. Overview of the research papers.

	Study I	Study II	Study III
Research question	How starting age in ECEC is associated with literacy test scores at the age of 15 by family background in the Nordic countries?	How duration of the home care allowance period is associated with literacy grades at the end of lower secondary school by parental education level and ethnic origins in Finland?	How ECEC intensity is associated with speech production of four-year-old children by parental education level in Finland?
Data	PISA data from 2015 and 2018	Register data from Statistics Finland	Child health, wellbeing and services 2018 survey data
Methods	Multi-level linear regression models	Family fixed effects linear regression models	Logistic regression models
Outcome variable	Literacy test scores at the age of 15	Literacy grade at the age of 16	LENE test scores measuring speech production at the age of 4
Main independent variables	Starting age in ECEC, Economic, social, and cultural status (ESCS) index	Use of home care allowance for children aged 0-6, mother's education level.	Weekly hours in ECEC, parental education level.

5.2 Data and measures

The dissertation makes use of three distinct datasets. This use of complementary evidence enables the examination of different aspects of ECEC and educational outcomes. In turn, the complementary nature of the data also allows for a more robust assessment of the results.

5.2.1 PISA 2015 and 2018 survey data

The first article utilizes cross-sectional PISA data from the years 2015 and 2018, covering Denmark, Finland, Iceland, Norway, and Sweden. In the PISA study, 15-year-old students complete a two-hour test assessing their skills in literacy, mathematics, and science. PISA datasets can be downloaded from here: https://www.oecd.org/en/about/programmes/pisa/pisa-data.html Additionally, students fill out a background questionnaire that includes information about their family and home environment. The article focuses on students who started primary school at the age of 5 to 7, which is the usual starting age range in the Nordic countries. Only students with no missing values in the variables used in the analyses were included.

The dependent variable in the study is the literacy test score. For the analyses, literacy scores were standardized by country and year so that the mean was 0 and the standard deviation was 1. In the PISA datasets, literacy test scores are provided in

ten different variables due to the complex survey design of PISA. In the analyses of this study, only the first literacy score variable, the first plausible value, was used. However, in the additional analyses, all literacy plausible values were also utilized (see Chapter 5.3). The key independent variable is the age at which the student started ECEC, based on self-reported responses. Family background was measured using the Economic, social, and cultural status (ESCS) index, which is constructed using principal component analysis based on parental education and occupational status, as well as indicators of household resources. The index was categorized into five groups by country and year. Additional control variables include gender, age in months, home language, and immigrant status.

5.2.2 Register data

The second study utilizes full-population Finnish register data, more specifically, FOLK-longitudinal data modules on personal data (FOLK) (Statistics Finland, 2025) and child care allowance payments data (Kela, 2025). The sample consists of biological siblings born in Finland between 1998 and 2003. These years were selected because information on the duration of the HCA has been available since 1998, and grades in literacy were accessible up to 2019. The sample was further restricted to children born in Finland to ensure equal eligibility for HCA among siblings. The final sample included 140,649 individuals from 66,070 families.

The dependent variable in this study is the literacy grade from the comprehensive school leaving certificate, typically awarded at around age 16. These grades are based on teacher assessments, and literacy was chosen as the outcome variable due to its importance for overall learning. This is particularly relevant for children with immigrant backgrounds, for whom literacy grades are closely linked to proficiency in the majority language.

The key independent variable is the number of months the child received HCA. This information is based on the number of months the basic component of HCA was paid for the child while being cared for by parents or relatives. Parental education level was measured in 2010 to ensure consistency across siblings. Education was categorized into three levels: (1) basic education, (2) secondary education, and (3) tertiary education. Both maternal and paternal education levels were included in the analyses.

Ethnic origin was defined based on the parents' countries of birth and categorized into six groups: (1) mother or father born in Finland; (2) mother and father born in Iraq; (3) mother and father born in Somalia; (4) mother and father born in the former Soviet Union; (5) mother and father born in the former Yugoslavia; and (6) mother and father born elsewhere. These categories were selected to ensure a minimum of 200 cases per group for statistical testing.

Additional control variables included whether the parents lived together when the child was three years old, sibling order, age difference to the next child in the family, whether the child was the last born, number of children in the family, mother's employment status when the child was under one year old, number of unemployment months for both parents when the child was aged 0–6, and gender. These characteristics help account for differences between siblings in the duration of HCA period.

5.2.3 Child health, wellbeing and services 2018 survey data

The third study utilizes cross-sectional data from the Child health, wellbeing and services 2018 survey data collected by the Finnish Institute for Health and Welfare in 2018 (Finnish institute for health and welfare, 2025). The survey targeted children and their families who participated in the four-year health check-up at child health clinics between February and October 2018. In addition, child health care nurses provided responses to questions concerning the child. Data were collected from 290 municipalities across mainland Finland, representing 98% of all municipalities. The dataset includes information on 17,099 children, with parental survey responses available for 8,720 of them. The analytical sample for this study includes children who participated in ECEC and whose parent(s) responded to the parental questionnaire. After accounting for missing responses, the final analytical sample consisted of 6,218 children, representing 17% of all 4-year-olds who participated in the comprehensive health check during the data collection period (Finnish institute for health and welfare, 2023).

The dependent variable in this study is performance in a speech production task that is part of the LENE (Neurological Development of Preschool-Aged Children) test battery. Individual tasks in the LENE assessment were scored as follows: 0 = normal performance, 1 = slightly atypical or uncertain, 2 = clearly atypical, and K = refusal to participate. For the analysis, responses were recoded into a binary variable (0 = not at all, 1 = a little or a lot); thus, any concern, regardless of severity, was interpreted as a deviation in speech production.

The variable describing ECEC intensity is based on parental responses regarding the number of weekly hours in ECEC. This variable was categorized into five groups: 1–10, 10.5–20, 20.5–30, 30.5–40, and 40.5 or more hours per week. Categorization was used to account for potential non-linear associations between ECEC intensity and speech production. Parental education level was measured using a binary variable: (1) less than tertiary education and (2) tertiary education. This categorization was chosen due to the low number of parents with only basic education in the dataset.

Additional control variables included the child's gender, physical health, age-appropriate development, family upbringing practices, information on whether an ECEC staff assessment of the child's functioning and well-being in ECEC was available during the health check-up, and type of ECEC. These factors help account for variation in both language development and ECEC intensity.

5.3 Methods

In the first study, multilevel OLS regression analysis was applied to account for the clustering of students within schools. Analyses were conducted separately for each country. First, we estimated the association between age of ECEC entry and literacy scores within each country. Next, we examined whether this association varied by family background by including an interaction term between age of entry and family background in the model. In practice, the OLS models compared mean literacy scores between children who started ECEC at different ages, while controlling for other relevant covariates included in the study.

Approximately 25% of students reported that they did not remember the age at which they started ECEC. To address this, we used Stata program's multiple imputation tool to impute the missing values. The imputation model included the following predictors: ESCS index, gender, immigration background, and home language. After the imputation, we estimated our regression models using the ten imputed datasets, generating ten separate coefficient estimates and standard errors, which were then pooled into one set of final statistics. In these analyses, we applied the final student weight provided in the PISA data. For the robustness checks, we replicated our results using the Repest package in Stata, which accounts for the hierarchical structure and sampling design of the data (Avvisati & Keslair, 2014). Repest allows analyses with student weights, replicate weights and all plausible values, as required for complex survey data such as PISA but unfortunately the package does not support the use of imputed values. These additional analyses revealed the same findings as the main analyses.

In the second sub-study, fixed-effects OLS regression models were used to estimate the association between HCA duration and literacy grades among biological siblings. The models were run within groups defined by ethnic origin and maternal education level. Our estimates of HCA duration reflect the change in literacy grade, measured on a z-standardized scale, with each additional month of HCA. The fixed-effects models aim to control for shared sibling characteristics, thereby reducing unobserved confounding in the analyses.

In the third sub-study, logistic regression analysis was used to estimate the likelihood of atypical performance in the speech production test. Likelihoods were compared across groups defined by ECEC intensity and parental education level.

The regression models also included control variables for the child's gender, physical health, age-appropriate development, family upbringing practices, and type of ECEC. Results were reported as odds ratios (ORs). In addition, predicted probabilities of atypical performance were reported by ECEC intensity and parental education, allowing group differences to be illustrated in terms of percentage point differences.

5.4 Research ethics

The dissertation was conducted in accordance with good scientific practice (Tutkimuseettinen neuvottelukunta, 2023). The respondents in the datasets are anonymous and cannot be identified. Two datasets used in the dissertation, register data and child health clinic survey data, were accessed via a remote service, with statistical authorities responsible for the appropriate storage and handling of the data.

In preparing the revised version of the dissertation and its third article, Microsoft Copilot, an AI based on the GPT-4 architecture, was used to support fluent academic writing. All content generated with the assistance of this tool was carefully reviewed.

6 Results

The sub-studies revealed evidence of accumulative (Article I), compensatory (Article II, III) and multiplicative (Article I) mechanisms (as discussed in Section 2.3). The main findings of the sub-studies are summarized in Table 3. Consistent with earlier international findings, this dissertation finds that universal ECEC can help bridge gaps in educational outcomes for children from low SES and immigrant backgrounds (Articles II and III). However, Article I reveals results pointing partly in the opposite direction, suggesting that ECEC may particularly benefit the outcomes of children from high-SES backgrounds

In the first sub-study, although children who started ECEC earlier performed better in literacy tests, the association was similar across socioeconomic groups. An exception was Norway, where earlier ECEC entry appeared to benefit children from high SES backgrounds more strongly. In the second sub-study, the duration of the HCA period was negatively associated with literacy grades among children whose parents had low levels of education and among second-generation immigrant children. In the third sub-study, ECEC intensity was positively associated with children's speech production, particularly among children whose parents had low educational attainment. These latter findings align with international research suggesting that participation in ECEC may compensate for educational disadvantages among children from low-educated families and those with immigrant backgrounds.

Table 3. Main results of the sub-studies.

Study	Mechanism observed	Main results
I	Accumulation (Denmark, Iceland, Finland, Sweden); Multiplication (Norway)	Best outcomes for children starting ECEC at ages 2–3. No compensatory effect for low-SES children. In Norway, high-SES children benefitted the most.
II	Compensation (Low SES, immigrants)	Longer HCA duration linked to lower literacy grades among children of low-educated mothers and second-generation immigrant children.
III	Compensation (Low SES)	As the intensity of ECEC increased, the disparity in language development between children from low- and high-educated families diminished.

6.1 Article I: Starting age in early childhood education and care and literacy scores at the age of 15

Universal ECEC is widely expected to benefit children's educational outcomes, especially for those from disadvantaged backgrounds. However, cross-country comparisons are challenging due to varying definitions of ECEC. Theoretically, earlier ECEC start yields greater benefits, aligning with Heckman's (2006) human capital accumulation hypothesis. This study examines the link between ECEC starting age and literacy outcomes across five countries with universal, high-quality childcare systems. By comparing differences in access, cost, and quality, we assess how ECEC timing relates to educational outcomes of children. Using PISA scores, we also explore whether early ECEC can help close literacy gaps for low-SES children.

We found that children who started ECEC between the ages of 1 and 4 generally performed best in literacy tests at age 15, compared to those who started before age 1 or after age 4. Thus, starting ECEC earlier, after the age of 1, was associated with better outcomes. The most favourable age for starting ECEC, in terms of literacy outcomes, appeared to be between 2 and 3 years. The greatest benefits of early ECEC entry were observed in Sweden, while the smallest were found in Norway. However, overall differences between countries were modest. For example, in Sweden, the difference in literacy scores between children who started ECEC at age 2-3 and those who started at age 5 or older was 0.19 standard deviations.

Contrary to previous international research, we did not find evidence that early ECEC entry compensates for the educational outcomes of children from low SES backgrounds in any of the Nordic countries. Instead, in Norway, we observed signs of a Matthew effect or multiplication mechanism, as children from high SES backgrounds appeared to benefit more from early ECEC entry than their low SES peers. This finding contradicts earlier literature, which has consistently found that early start in ECEC tends to benefit disadvantaged children the most. Norwegian results may suggest that parents with high SES tend to choose higher-quality ECEC environments, potentially accounting for the greater benefits observed among children from high-SES families. Further, this finding may stem from the narrower range of variables used in Article I, which limited the capacity to fully capture the link between ECEC and children's educational outcomes.

6.2 Article II: Duration of the home care allowance period and literacy grades at the end of comprehensive school

While earlier studies highlight the positive impact of ECEC participation for children from less educated families, Finnish research on the duration of the HCA period

shows little variation based on parental education. Further, research on immigrant children has largely focused on targeted programs in the U.S., with limited attention to universal ECEC systems. This study seeks how the duration of the HCA period is associated with children's literacy grades by parental education level and ethnic origins.

Results show that the duration of the HCA period was negatively associated with literacy grades at the end of comprehensive school among children whose mothers had low levels of education. On average, children from less educated families who remained in home care for four years achieved literacy grades that were 0.09 standard deviations lower than those who entered ECEC directly after parental leave.

Additionally, the duration of the HCA period was negatively associated with literacy grades among second-generation immigrant children. In contrast, among non-immigrant children, HCA duration was not associated with literacy outcomes. Again, when comparing children of immigrants who entered ECEC directly after parental leave with those who remained in home care for four years, the latter group had literacy grades that were 0.25 standard deviations lower.

In the interaction analysis by parental country of birth, the strongest negative association between HCA duration and literacy grades was observed among children whose parents were of former Yugoslavian origin. A negative association was also found in the 'Other' group, which includes children from mixed parental backgrounds. However, no significant associations were found among children of Somali, Iraqi, or former Soviet Union origin.

Since in Finland, participation in ECEC and receipt of HCA are mutually exclusive, these findings may suggest that ECEC may help compensate for the generally lower social, economic, and cultural resources available in low-SES families in relation to children's educational outcomes. This result strongly reflects findings from the international research literature.

6.3 Article III: Weekly hours in early childhood education and care and speech production at the age of 4

Children may spend long hours in non-parental care, especially when both parents work full-time. However, findings on how ECEC intensity affects educational outcomes are mixed. Some research shows positive effects, while others find no clear link. It's also unclear how these effects vary by family background. High-quality ECEC can help offset the typically less supportive home learning environments of disadvantaged children, improving their educational outcomes. The amount of time spent in ECEC may also matter, children attending more hours per week often show

greater benefits, suggesting that ECEC intensity can matter for educational outcomes.

According to the results, ECEC intensity was not generally associated with speech production among 4-year-old children. However, atypical performance in speech production tests decreased with increasing ECEC hours among children of less educated parents, while the likelihood of atypical performance among children of highly educated parents remained stable. Therefore, the gap in speech production between children of low- and high-educated parents narrowed as ECEC intensity increased.

For example, among children of low-educated parents, the probability of atypical performance in speech production was 16% for those attending ECEC 11–20 hours per week, compared to 10% for those attending 41 or more hours per week, a difference of approximately six percentage points. Interestingly, the lowest rate of speech production concerns (9%) was observed among children of highly educated parents who attended ECEC for the fewest hours.

Thus, in line with international literature and the findings of Article II, Article III suggests that ECEC may have a compensatory association on the educational outcomes of children from less advantaged backgrounds.

7 Discussion

7.1 Interpretation of the results

This dissertation contributes to the existing research literature in three main ways. First, the findings shed light on cross-country differences in the association between ECEC participation and children's educational outcomes by comparing countries that follow a social-democratic universalistic welfare state model, namely the Nordic countries. Further, the aim was to examine whether ECEC can compensate for childhood family resources in children's literacy and language proficiency also in Finland. Second, it explored how both the intensity and starting age of ECEC are associated with children's educational outcomes across different family backgrounds. Third, the dissertation investigates the relationship between ECEC participation and educational outcomes among children with immigrant backgrounds.

The Article I found that earlier participation in ECEC was associated with better literacy test scores at age 15 across all Nordic countries. The most beneficial starting age appeared to be between two and three years, which aligns with the findings of Loeb et al. (2007) and supports Heckman's (2006) human capital accumulation hypothesis, emphasizing the importance of early investments. However, ECEC participation did not appear to compensate for the lower family resources of children from low-SES backgrounds in terms of literacy skills. Instead, the benefits of ECEC were cumulative. Surprisingly, in the case of Norway, early ECEC participation was particularly beneficial for children from high-SES families. Therefore, rather than a compensatory effect, the findings regarding Norway suggest a multiplication mechanism. These results contrast with previous research on universal ECEC systems, which has suggested that early ECEC participation can compensate for family resource disparities in children's skill development (Datta Gupta & Simonsen, 2016; Dearing et al., 2018; Drange & Havnes, 2018; Felfe et al., 2015). In Article I, we discuss the possibility that the benefits of ECEC may diminish over time and may no longer be clearly visible by age 15. It is also possible that early ECEC enrollment is similarly selected across family backgrounds, meaning that parents who enroll their children early are generally able to support their learning regardless of SES, as suggested by the accumulation mechanism in chapter 2.3. The Norwegian findings

may indicate that high-SES parents are more likely to select higher-quality ECEC settings (Drange & Telle, 2020), which could explain why children from high-SES families appear to benefit the most from ECEC.

The second article found that the duration of the HCA period was negatively associated with literacy grades among children of low-educated parents and those with immigrant backgrounds. This suggests that, as a contractual for HCA use, ECEC may help compensate for the lower family resources of these children in terms of literacy proficiency. For children with immigrant backgrounds, ECEC may support early language acquisition, which could translate into long-term benefits. These findings align with previous research indicating that universal ECEC can help level the playing field for children from different SES backgrounds (Burger, 2010; Schmutz, 2024; van Huizen & Plantenga, 2018) and for children with immigrant backgrounds (Drange & Telle, 2017; Votruba-Drzal et al., 2015), who often face lower childhood resources. Therefore, following investment and family stress theories (Chapter 2.2.2), ECEC participation may help mitigate parental stress or limited resources that affect children's learning. Interestingly, the study found that children with ancestry from the former Yugoslavia and those with mixed backgrounds appeared to benefit ECEC the most. In contrast, children with Somali or Iraqi backgrounds did not show similar advantages from early ECEC participation.

In the Article II, I reflect on the possibility that these differences may stem from the varying circumstances under which refugee families arrived in Finland. While refugees from Somalia and Iraq who came to Finland may have been better equipped to support their children’s education, others in more disadvantaged situations may have fled to neighboring countries. On the other hand, families from the former Yugoslavia who fled to Finland may have been more socially diverse. Cultural differences may also play a role. For example, families with former Yugoslavian backgrounds may be more receptive to the benefits of ECEC than their Somali or Iraqi counterparts, possibly because ECEC systems were more prevalent in Yugoslavia than in Somalia or Iraq when children’s parents lived in their country of origin.

According to the findings of Article III, ECEC intensity was not generally associated with speech production among 4-year-old children. However, the gap in speech production between children of low- and high-educated parents narrowed as ECEC intensity increased. This was primarily due to a reduction in speech production concerns among children of less educated parents with increasing ECEC hours, while the likelihood of speech production deviations among children of highly educated parents remained stable. In line with international literature and the findings of Article II, the third study suggests that ECEC may play a compensatory role in supporting the educational outcomes of children from less advantaged

backgrounds. This would imply the existence of the compensation mechanism presented in Chapter 3.2. Results from article III may reflect the discussion in Chapter 2.2.2, which suggests that in ECEC settings, children interact with peers, and low-SES children may benefit from learning alongside their more affluent counterparts. Alternatively, it is possible that interactions between parents and ECEC staff particularly support the engagement of low-SES parents in their children's lives, potentially fostering a more enriching HLE (Chapter 2.2.2). However, not all previous studies have found that ECEC intensity can compensate for the educational outcomes of children from low-SES backgrounds (Coley et al., 2015). Therefore, this topic warrants further research.

The effect sizes observed in the articles can be interpreted as small or modest. For example, in Article I, the literacy differences between children who started ECEC at different ages ranged from 5% to 19% of a standard deviation. In turn, Article II found that the differences between those who did not receive HCA and those who stayed at home until age 4 amounted to 9% of a standard deviation among children of low-educated mothers, and 25% of a standard deviation among second-generation immigrant children.

This thesis found indications of all the mechanisms introduced in Chapter 2.3. Article I observed that, in line with the accumulation mechanism, the association between ECEC participation and literacy test scores was similar across family backgrounds in Denmark, Finland, Iceland, and Sweden. In contrast, the article found evidence of the multiplication mechanism in Norway, where ECEC participation appeared to support the outcomes of children from high-SES families in particular. Articles II and III, on the other hand, provided indications of the compensation mechanism: HCA duration was negatively associated with the outcomes of children from low-SES families and second-generation immigrant families. Moreover, Article III found that ECEC intensity was positively associated with the speech production of children from low-SES families, which also points to a compensation mechanism. Thus, this dissertation does not yield a uniform conclusion, something that is also reflected in the policy recommendations discussed in the following chapter.

7.2 Contribution

In line with previous international research, this dissertation found partly that universal ECEC has the potential to compensate for literacy skills among children from low-SES and immigrant backgrounds, as well as support speech production development among low-SES children (Articles II and III). Although it is important to note that Article II found a negative association between HCA duration and literacy scores, this does not in itself imply that the association between ECEC and

literacy outcomes would necessarily be positive. However, the use of HCA serves as a counterfactual for ECEC enrollment in Finland. Therefore, it can be cautiously suggested that ECEC may promote equality of opportunity even in countries with universal ECEC systems. Thus, the findings from articles II and III support the European Commission's goals to further increase ECEC participation across Europe (European Commission, 2023). In addition, the articles did not find any evidence suggesting that ECEC would be detrimental to children's outcomes. While expanding ECEC access can promote gender equality by improving mothers' labor market participation, it also holds promise for reducing disparities in educational outcomes among children from diverse backgrounds.

Article I did not provide evidence of a compensatory mechanism. Rather, the associations appeared to be additive or even more advantageous for children from high-SES families. This observed multiplicative mechanism or Matthew effect highlights an important implication: if ECEC participation in fact amplifies differences between children from different family backgrounds, then policies aimed at simply increasing overall ECEC enrolment may not be advisable from an equality-of-opportunity perspective. In this sense, it is essential to ensure that children from low-SES families have genuine access to high-quality ECEC services. However, it is important to note that the indication of a Matthew effect found in Article I remains relatively unexplored in the existing literature on this topic. For this reason, future comparative studies between universal and non-universal ECEC systems are particularly welcome.

Compared to previous Finnish research (Hiilamo et al., 2018; Karhula et al., 2017; Kosonen & Huttunen, 2018), this dissertation found indications that ECEC may compensate for the educational outcomes of children from low-SES backgrounds (Articles II and III). One possible reason for the differing results is that the article III focused on shorter-term outcome, whereas earlier studies often examined longer-term outcomes. Additionally, in contrast to previous research studying school grades (Hiilamo et al., 2018), this study may have better addressed unobserved confounding by using family fixed effects models in Article II.

Key finding of this dissertation is that the duration of the HCA period was negatively associated with literacy grades, particularly among some children with immigrant backgrounds. This suggests that ECEC, as an alternative to prolonged home care, has the potential to support language development among immigrant children, at least among some second-generation immigrant groups. This is an important contribution, as previous research on immigrants in universal ECEC systems remains limited. Moreover, many European countries are expected to rely increasingly on labor migration in the future, and investing in ECEC could play a vital role in supporting the integration of immigrant families into society. ECEC can benefit both children, by fostering early language acquisition, and adults, by

providing opportunities to interact with other local parents and engage more closely with their communities.

If we want to support children's participation in ECEC, one policy consideration could be whether the Finnish HCA should be limited to children under the age of two, as is the case in Norway. In Article II, I further suggest that Finnish policymakers might consider alternative forms of support for families with children that do not strongly steer childcare arrangements (see Kosonen 2022), such as a means-tested increase in child allowance. The Finnish public debate around home care and ECEC is often polarized, framed in either/or terms that emphasize the benefits of ECEC for mothers and children on one hand, and concerns about children's behavioral problems on the other. Still, it is important to recognize that statistics examine average associations, which may obscure the diverse needs of children and families. Therefore, I emphasize the importance of parental choice in selecting the form of childcare they believe is best for their child before the age of two, as this age appeared to be the most beneficial time to start ECEC according to Article I. This decision could be supported through collaboration with professionals at the child health clinics.

7.3 Limitations

The main limitations of this thesis are linked to constraints in the available data. First, the datasets did not include variables that would allow for the measurement of ECEC quality, HLE quality, or parenting practices, all of which may influence both ECEC participation and children's educational outcomes. In addition, the datasets are cross-sectional, which poses challenges for my research questions that are causal in nature. Therefore, when interpreting the results and the related policy recommendations, it is important to recognize that my research designs are vulnerable to errors arising from unobserved confounding. In the following, I discuss the limitations of each article in more detail.

The main limitation of Article I is that information on ECEC participation is based on retrospective self-reports by children, which makes the results vulnerable to measurement error and may therefore distort the findings. In addition, cross-country comparisons are not entirely straightforward, as ECEC systems differ across countries, which is reflected in the fact that the variables do not fully correspond to one another. For example, in the case of Denmark, it was not possible to distinguish children who had entered ECEC at ages 0, 1, and 2 from one another. Article I also had a more limited set of variables available compared to the other articles, which may have restricted the ability to model the relationship between ECEC participation and children's educational outcomes in a comprehensive manner.

The main limitation of Article II is that HCA duration is not a perfect proxy for the actual length of home care. In families with multiple children, the amount of HCA benefit attributed to an older child may be incorrectly calculated, as the benefit cannot be received simultaneously with parental leave payments. Although this issue was addressed in the statistical analyses of Article II, it is still possible that measurement error is reflected in the regression coefficients. Therefore, the HCA duration period should be understood more as an indicator of exposure to the HCA policy rather than a precise measure of time spent in home care. Consequently, HCA duration may not be a perfect counterfactual for ECEC participation. Another limitation is that the outcome variable, literacy grade, is based on teacher-assigned grades. These may be affected by grading heterogeneity, potentially resulting in measurement error. Because the analyses in Article II focused on siblings born in Finland, first-generation immigrants had to be excluded. The findings therefore cannot be generalized to all immigrant families. Further, Article II attempted to account for unobserved family-level factors using family fixed-effects models, it remains possible that within-family differences, such as learning difficulties, explain part of the observed associations between HCA duration and literacy grades.

The original idea for Article II was also to examine families with Swedish and Estonian ancestry, as it was assumed that ECEC might be less beneficial for them in terms of language learning. Finnish and Estonian are linguistically very similar, which may facilitate school performance for children from Estonian-speaking families, while Swedish-speaking children can attend school in their native language. Unfortunately, the number of children from these linguistic groups was very small in the sibling dataset, and therefore the selection of immigrant groups was ultimately based on sample size rather than theoretical considerations. As a result, interpreting the findings required relying partly on ad hoc explanations, such as discussing the potential role of refugee backgrounds.

The main limitations of Article III relate to selection bias. The results observed in Article III may also stem from the possibility that children with high ECEC intensity are similar to one another in terms of the outcome, regardless of their family background. Thus, instead of parental education, the observed associations may be driven by other background factors that are not measured in the data, for example, dual earnership, which is positively linked to the home learning environment (HLE). Therefore, the results remain vulnerable to bias from unmeasured confounding, and it is possible that the association between ECEC intensity and children's speech production is overestimated. Furthermore, the dataset used in Article III underrepresented low-SES and immigrant families, which may lead to an underestimation of the association between ECEC intensity and speech production if we assume that the results are otherwise not biased by unobserved confounding. In addition, the outcome variable in Article III was constructed as a dummy variable,

which naturally reduces precision. This was done to ensure adequate group sizes for statistical modelling and to allow greater interpretability, but it inevitably results in a loss of information because nuances in the outcome are not captured. With a larger dataset, it would be possible to obtain more precise estimates of the association between ECEC intensity and children's outcomes.

7.4 Directions for future research

Looking ahead, Finland has the opportunity to utilize longitudinal Varda data (Finnish national agency for education, 2025) that includes detailed information on ECEC characteristics, such as type and quality, and allows researchers to follow children over time into their school years. The findings of this dissertation rely largely on the examination of correlations. Future research would therefore benefit from the development of more robust research designs using new datasets, which would help to reduce potential sources of error. Although ECEC in Finland is, on average, of high quality compared with many other countries, the inclusion of quality indicators would further strengthen the analyses by helping to clarify the mechanisms through which ECEC relates to children's educational outcomes.

Future research should also focus more closely on first-generation immigrant families, as ECEC participation may be even more beneficial for them compared to the second-generation immigrant children examined in Article II. Moreover, the number of second-generation immigrant children in Article II was relatively small, and the study could be replicated with a larger sample over time to better understand the relationship between HCA duration and educational outcomes among immigrant children. Another important avenue for future research would be to examine the links between ECEC participation and children's later educational attainment. This would allow researchers to assess the long-term benefits of ECEC, which is particularly relevant for immigrant children. In addition to ECEC quality, future studies should also pay closer attention to features of the HLE. One promising approach could involve combining survey data, which should include information on HLE, with longitudinal Varda data. Such a research design would provide valuable insights into how different aspect of ECEC are connected to educational outcomes among children from diverse backgrounds.

Finally, the results concerning the Nordic countries in Article I call for the development of new comparative datasets that would allow for a more reliable examination of the association between ECEC participation and children's educational outcomes across countries. Such standardized data would be particularly valuable when comparing countries whose ECEC systems differ substantially from one another. This would require harmonized measures of both ECEC and educational outcomes, and possibly the use of longitudinal data.

7.5 Conclusion

The findings of this dissertation indicate that ECEC participation has the potential to reduce disparities in children's educational outcomes across different family backgrounds, even in the Finnish context. Children with immigrant backgrounds could particularly benefit from ECEC participation, especially when examining their later literacy grades. However, this compensatory effect was not observed in all articles, suggesting that the long-term associations between ECEC and children's educational outcomes require further research. There is a particular need for further research, especially in Finland, where the topic has received limited academic attention despite extensive public debate.

Abbreviations

ECEC	Early childhood education and care
HCA	Home care allowance
HLE	Home learning environment
PISA	Programme for International Student Assessment
OECD	Organisation for Economic Co-operation and Development

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