

Non-cognitive Skills and the Quality of Early Education - Four Essays in Applied Microeconomics

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Dedicated to Hedwig

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Erklärung zu Ko-Autorenschaften

Diese Dissertation besteht aus vier (Arbeits-)Papieren, von denen drei in Zusammenarbeit mit Koautoren entstanden sind:

- Georg F. Camehl, Kurt Hahlweg und C. Katharina Spiess:
“The Effects of a Parenting Program on Maternal Well-being: Evidence from a Randomized Controlled Trial”
- Georg F. Camehl, Pia S. Schober und C. Katharina Spiess:
“Information Asymmetries between Parents and Educators in German Childcare Institutions”
- Georg F. Camehl:
“The Effects of Early Childhood Education and Care Quality on Children’s Non-cognitive Skills”
- Silke Anger, Georg F. Camehl und Frauke Peter:
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Liste der Vorveröffentlichungen

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Rechtliche Erklärung

Erklärung gem. §4 Abs. 2 (Promotionsordnung)

Hiermit erkläre ich, dass ich mich noch keinem Promotionsverfahren unterzogen oder um Zulassung zu einem solchen beworben habe, und die Dissertation in der gleichen oder einer anderen Fassung bzw. Überarbeitung einer anderen Fakultät, einem Prüfungsausschuss oder einem Fachvertreter an einer anderen Hochschule nicht bereits zur Überprüfung vorgelegen hat.

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Erklärung gem. §10 Abs. 3 (Promotionsordnung)

Hiermit erkläre ich, dass ich für die Dissertation folgende Hilfsmittel und Hilfen verwendet habe. Auf dieser Grundlage habe ich die Arbeit selbstständig verfasst.

- Software:
 - Stata Versionen 13, 14 und 15
 - Microsoft Office 2013
 - L^AT_EX mit TeXstudio 2.12.2
- Literatur: siehe Literaturverzeichnis

Berlin, Mai 2018
Georg Camehl

Zusammenfassung

Diese Dissertation besteht aus vier voneinander unabhängigen Kapiteln, die sich mit der ökonomischen Analyse von nicht-kognitiven Fähigkeiten sowie der Qualität von Bildung beschäftigen. Diesen Kapiteln vorangestellt ist eine umfassende Einleitung, welche die unterschiedlichen Forschungsfragen motiviert, und darauf hinweist, wie die Kapitel sowohl gemeinsame als auch komplementäre Beiträge zur ökonomischen Literaturen leisten. Auf die vier Hauptkapitel folgt ein Schlussteil, welcher mögliche Beschränkungen der Kapitel diskutiert, weitere Forschungsfragen darlegt und aus den Ergebnissen dieser Dissertation abgeleitete Politikempfehlungen macht.

Kapitel 2 evaluiert wie das *Positive Parenting Program* (Triple P) das Wohlbefinden von Müttern beeinflusst. Triple P zielt darauf ab, die kindliche Entwicklung durch Verbesserung von elterlichen Erziehungsfähigkeiten positiv zu beeinflussen. Das Kapitel untersucht ein randomisiertes Kontrollexperiment (RCT) des Programms. Es analysiert außerdem eine separate Untersuchungsgruppe aus einem grundsätzlich benachteiligten Stadtgebiet, für welche keine Kontrollgruppe rekrutiert wurde. Für diese Gruppe wird im Kapitel eine künstliche Kontrollgruppe mit Daten des Sozio-ökonomischen Panels (SOEP) generiert. Diese Kontrollgruppe wird dann in einem zusätzlichen Schritt mit Hilfe einer Matching-Methode (*entropy balancing*) genutzt, um den Effekt des Programms auf das mütterliche Wohlbefinden zu schätzen. Insgesamt zeigt das Kapitel positive Effekte von Triple P auf das mütterliche Wohlbefinden - wobei sich die größten Effekte drei Jahre nach der Teilnahme zeigen. So zeigt das Kapitel, dass das mütterliche Wohlbefinden ein weiterer Kanal ist, durch welchen Erziehungsprogramme, als ein Beispiel von frühkindlichen Interventionen, Familien zugutekommen können.

Kapitel 3 untersucht empirisch Informationsasymmetrien zwischen Eltern und pädagogischem Personal in deutschen Kindertageseinrichtungen (Kitas). Insbesondere untersucht es Zusammenhänge zwischen elterlichem sozio-ökonomischem Status (SES), Kita-Charakteristiken und Qualitätseinschätzungen von Eltern und pädagogischem Personal von Kitas. Das Kapitel nutzt K²ID-SOEP, eine Erweiterung des SOEP, welche repräsentative Daten von Eltern, deren Kinder Kitas in Deutschland besuchen, bietet. Diese enthält sowohl Daten zur Einschätzung der Kitaqualität durch die Eltern als auch

durch das pädagogische Personal der Kita, die das jeweilige Kind besucht. Mithilfe von deskriptiven und korrelationalen Methoden vergleicht das Kapitel Qualitätseinschätzungen von Eltern und pädagogischem Personal in 734 Kitas. Das Kapitel beschreibt die Entwicklung eines Index für Informationslücken für unterschiedliche Qualitätsmerkmale und nutzt logistische Regressionen, um diese mit Nachfrage- (also elterlichen) und Angebots- (also Kita-) Charakteristiken in Verbindung zu setzen. Das Kapitel zeigt, dass beträchtliche Informationsasymmetrien zwischen Eltern und pädagogischem Personal existieren. Diese unterscheiden sich erheblich zwischen Qualitätsmerkmalen, aber weniger in Bezug auf den sozio-ökonomischen Hintergrund der Eltern oder Kita-Charakteristiken. Beide Gruppen von Eigenschaften tragen in ähnlichem Umfang zur Erklärung der Variation der Informationslücken bei.

Kapitel 4 untersucht die kausalen Effekte von Qualitätsmerkmalen der Kitagruppe, die ein Kind besucht, auf dessen prosoziales Verhalten und Persönlichkeitsmerkmale. Die Analysen basieren auf Daten des Nationalen Bildungspanels (NEPS), einer Panelstudie zu Bildungsverläufen in Deutschland. Das prosoziale Verhalten und die Persönlichkeitsmerkmale von Kindern werden von ihren Eltern eingeschätzt, wenn die Kindern ungefähr fünf Jahre alt sind. Die Analysen nutzen Variation zwischen Gruppen innerhalb von Kitas zur Identifikation von kausalen Effekten der Kitaqualität auf die nicht-kognitiven Fähigkeiten von Kindern. Während Selektivität in verschiedene Kitas ein Problem darstellen könnte, weisen Spezifikationstests darauf hin, dass Unterschiede zwischen den Gruppen als exogen angesehen werden können. Das Kapitel liefert Hinweise für den positiven Einfluss von hoher Kitaqualität auf die nicht-kognitiven Fähigkeiten von Kindern. Insbesondere die Verfügbarkeit von Materialien zum Spielen und Lernen haben einen positiven Effekt auf das prosoziale Verhalten von Kindern. Dieses Ergebnis besteht mehrere Robustheitsprüfungen.

Kapitel 5 analysiert ob und in welchem Umfang Persönlichkeitsmerkmale von Personen in einer Untersuchungsgruppe von Erwerbstätigen über einen Zeitraum von acht Jahren veränderbar sind. Insbesondere untersucht das Kapitel Veränderungen von Persönlichkeitsmerkmalen nach einem einschneidenden Lebensereignis: Arbeitsplatzverlust. Das Kapitel nutzt Daten des SOEP aus den Jahren 2004 bis 2014 - einem Zeitraum in welchem die Persönlichkeitsmerkmale der Teilnehmenden drei mal gemessen wurden. Der Datensatz erlaubt es, detaillierte Informationen über die Erwerbstätigkeit, insbesondere die Gründe für den Arbeitsplatzverlust sowie Zeiträume der Arbeitslosigkeit, zu nutzen. Das Kapitel konzentriert sich auf Arbeitsplatzverluste aufgrund von Firmenschließungen. Die Ergebnisse des Kapitels weisen darauf hin, dass Persönlichkeitsmerkmale zu einem gewissen Grad auch im Erwachsenenalter veränderbar sind. Das Kapitel zeigt einen Anstieg der Dimension Offenheit (also die Bereitschaft zu neuen

Erfahrungen) für den durchschnittlichen Erwerbstätigen. Dieser Anstieg besteht allerdings vor allem für diejenigen mit einem hohen Bildungsgrad sowie für diejenigen, die sofort nach Entlassung wieder einen neuen Arbeitsplatz finden.

Abstract

This dissertation consists of four independent chapters which contribute to the economic analysis of non-cognitive skills and the quality of education. These chapters are preceded by a comprehensive introduction that motivates the individual research questions and indicates common and complementary contributions of the four main chapters. The chapters are followed by a conclusion that discusses potential limitations, points towards open research questions and makes policy recommendations based on the results of this dissertation.

Chapter 2 evaluates how the Positive Parenting Program (Triple P) affects maternal well-being. The program aims at positively influencing child outcomes by improving parenting skills. The chapter evaluates a randomized controlled trial (RCT) of Triple P. Additionally, it analyzes a separate sample of mothers from a deprived neighborhood who received the treatment, but for whom no control group was recruited. For the sample without a control group, an additional control group using survey data from the German Socio-Economic Panel study (SOEP) is generated. This control group is then used to estimate the effect of Triple P on maternal well-being by applying entropy balancing matching. Overall, the chapter shows positive effects of Triple P on maternal well-being - with the largest effects appearing three years after treatment. It illustrates that maternal well-being can be affected through a parenting program as an example of an early childhood intervention that, consequently, benefits families.

Chapter 3 empirically investigates information asymmetries between parents and early childhood education and care (ECEC) professionals in German childcare institutions. It specifically analyzes the relationships between parental socioeconomic status (SES), ECEC institution characteristics, and quality assessments of childcare centers given by parents and educators. The chapter uses K²ID-SOEP, a unique extension of the SOEP providing nationally representative data on quality assessments of parents on the childcare center their children attend. In addition, educators and center managers from these same centers provided quality assessments. Utilizing both descriptive and correlational methods, the chapter compares quality perceptions by parents and by professionals across 734 ECEC centers. The chapter describes the construction of an

index for information gaps for the different quality features and uses logistic regressions to relate these to demand (i.e. parental) and supply (i.e. ECEC center) characteristics. The chapter shows that considerable information asymmetries between parents and educators exist. These differ substantially across quality measures but less so by parental socioeconomic background or center characteristics. Both of these aspects contribute to explaining variations in the information gaps to a similar degree.

Chapter 4 investigates the causal effects of quality features of the ECEC group a child attends on prosocial behavior and personality traits. The analyses are based on the German National Educational Panel Study (NEPS), a large-scale survey dataset focusing on educational trajectories. Prosocial behavior and personality traits of children are assessed at age five by their parents. The analyses use within-center variation in quality of ECEC-groups to identify the causal effect of quality on these specific child non-cognitive skills. While selectivity may be a threat to identification, evidence from specification tests suggests that, in the German context, differences in quality between groups can be considered exogenous to the parents. This chapter provides evidence that the availability of educational and playing materials in the group have a positive effect on prosocial behavior. This result is robust to a number of robustness tests.

Chapter 5 analyzes whether, and to what extent, personality traits are malleable over a time span of eight years for a sample of working individuals. Specifically, it looks at changes in personality traits after a major adverse life event: involuntary job loss. The chapter uses data from the SOEP from 2004 to 2014 - a period over which individuals' personality traits were measured three times. The dataset allows to exploit detailed employment information, particularly reasons for job termination and unemployment spells. The chapter focuses solely on plant closures as a reason for job termination. The results of the chapter suggest that to some extent personality traits are indeed malleable during adulthood. Although personality traits are relatively stable within the population of workers, the chapter finds an increase in openness, that is, the willingness to seek new experiences, for the average displaced worker. This increase, however, is fully driven by individuals with high educational attainment and by those who find a new job immediately after dismissal.

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List of Abbreviations

ATT	Average Treatment Effect on the Treated
CBCL	Child Behavior Checklist
ECEC	Early Childhood Education and Care
ECEC-P	Early Childhood Education and Care Professional
ECERS	Early Childhood Environment Rating Scale
ECERSPQ	Early Childhood Environment Rating Scale Parent Questionnaire
FE	Fixed Effects
FiD	Families in Germany
GDP	Gross Domestic Product
GLS	Generalized Least Squares
HH	Household
HILDA	Household, Income and Labour Dynamics in Australia
IHDP	Infant Health and Development Program
IV	Instrumental Variables
K ² ID	<i>Kinder und Kitas in Deutschland</i>
K ² ID-SOEP	Early childhood education and care quality in the Socio-Economic Panel
N	Number of Observations
NAEYC	National Association for the Education of Young Children
NEPS	National Educational Panel Study
NFP	Nurse Family Partnership
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
RCT	Randomized Controlled Trial
SB	Standardized Bias
SC2	Starting Cohort 2
SD	Standard Deviation
SDQ	Strengths and Difficulties Questionnaire

List of Abbreviations

SES	Socioeconomic Status
SOEP	German Socio-Economic Panel
Triple P	Positive Parenting Program
US	United States
ZF1	Projekt Zukunft Familie 1
ZF2	Projekt Zukunft Familei 2

CHAPTER 1

Introduction and Overview

1.1 Motivation and Conceptual Background

Education is important for both the lives of individuals and society as a whole. Consequently, in 2014 Germany spent 6.6% of its gross domestic product (GDP) on education (Statistisches Bundesamt, 2017).¹ Correspondingly, education as a means to improve an individual's skills features prominently in economics and has done so since the dawn of economics as a scientific field. The idea that the skills of individuals are an important factor underlying an individuals' productivity and thus potential for economic success in life was already included in Adam Smith's "An Inquiry into the nature and causes of the wealth of nations" (Smith, 1776). He describes different components of a nation's capital; among them (p. 282):

"... the acquired and useful abilities of all the inhabitants or members of the society. The acquisition of such talents, by the maintenance of the acquirer during his education, study, or apprenticeship, always cost a real expense, which is the capital fixed and realized, as it were, in his person. Those talents, as they make a part of his fortune, so do they likewise of that of the society to which he belongs. The improved dexterity of a workman may be considered in the same light as a machine or instrument of trade which facilitates and abridges labour, and which, though it costs a certain expense, repays that expense with a profit."

Although these observations come from 1776, the notions raised remain salient. They are essential for the economic analysis of education and responsible for the existence of economics of education subfield. In the quote, Smith describes the abilities of people as a part of a societies' capital stock, foretelling the notion of human capital. This

¹If research and development is included, the corresponding number is 9.2%

term is later popularized in the 20th century through works of Mincer (1958), Schultz (1961), and Becker (1962), among others, and the subsequent literature on the returns to education.² For a long time, the years of education a person acquired was the standard proxy through which human capital was measured. While human capital and its development through education and training are still basic principles in the economics of education today, many improvements have been made, partly refining and extending them, partly replacing them.

This dissertation focuses on four specific areas of progress. First, education is recognized as a multifaceted concept, meaning that a range of different types of education are allowed for. Second, measures of education in terms of certificates or invested time are complemented by measures for educational quality to provide more comprehensive views of educational types. Third, the practice of measuring human capital through educational inputs is also complemented by more direct measures of skills attainment. The seminal work of Heckman and coauthors on the technology of skill formation conceptualized the relationship between skill development and economic inputs (see e.g. Cunha and Heckman, 2007). The main features of the technology of skill formation are that skills are shaped over the life cycle through biological factors, life experiences, and educational inputs.³ Fourth, the economics literature has moved beyond measuring the returns to education in monetary terms and now includes returns in terms of such indicators as health and well-being. The remainder of this introduction provides background on how the following chapters of this dissertation contribute to these four themes and, thus, the current state of the economics of education literature.

A common differentiation of the multifaceted concept of education is into formal, non-formal and informal education. Formal education comprises any type of directed learning activities that take place in a setting geared toward education. Examples are early learning activities in ECEC centers and any type of schooling including higher education. Non-formal educational activities are a more heterogeneous category that comprises learning activities that do not necessarily lead toward a degree or take place in a specific setting but are still directed. Examples are extracurricular activities for children, such as learning a musical instrument, practicing sports, or, in a professional context for adults, professional development courses. Informal education is more comprehensive category that refers to learning that takes place on the go without necessarily aiming for a specific aim. This can refer to the home environment, which is impor-

²At this point it should also be noted that there is a different strand in the literature based on the seminal work of Spence (1973), which regards education merely as a signal of innate abilities rather than a way to improve them.

³While biological factors certainly play an important role in shaping personality, they are, for reasons of scope, mostly excluded from this dissertation.

tant for children to develop basic skills such as language proficiency and social skills, learning from peers, as well as, in a professional context, learning on the job (see, e.g. Werquin, 2010, for definitions of the three concepts by the OECD).

It is widely recognized in the economic literature that not only the quantity of educational inputs matters, but also their *quality*.⁴ A common differentiation from educational science is between structural and process quality features (see e.g. Vandell and Wolfe, 2000). *Structural quality features* refer the environmental setting (for example the group size in ECEC or if outdoor spaces are available). Examples of aspects of educational process quality are the interactions between the person teaching (these could be teachers in a school setting, educators in ECEC, or simply the parents teaching a skill to their children) or the family climate and the availability of learning materials (such as toys or books that are helpful to learn things). An indirect factor operating through the family climate could be maternal well-being: Mothers with a higher degree of well-being may undertake more and higher quality activities with their children (Berger and Spiess, 2011). This is directly related to *process quality features*, which, however, are often difficult to measure. A large literature in educational sciences and psychology attempts to identify the most important of these aspects, such as features of interactions between children and teachers. Large-scale data for these concepts is expensive to generate as experts are typically needed to assess quality.⁵ Therefore, economists are only beginning to incorporate these notions into their models (an important example being Araujo et al., 2016).

Another development in the economics of education literature is the incorporation of concepts from psychology into economic models (see e.g. Almlund et al., 2011).⁶ In combination with better data availability, direct measures of skills can be incorporated into these models. The skills considered by economists are multifaceted as well. Specifically, a common distinction is between cognitive skills and non-cognitive skills (see e.g. Heckman, 2006). Cognitive skills are skills linked to intelligence, such as problem solving abilities, as well as skills linked to certain substantial topics such as language or mathematical abilities. Non-cognitive skills are linked to personality traits, social skills and other behavioral traits.⁷ The skills this dissertation focuses

⁴See, e.g. Behrman and Birdsall (1983). The importance of quality is also recognized by Becker, who states, “(t)here has been persistent interest, if little success, in measuring the differences in quality among high schools and colleges.” (Becker, 1993, p. 250).

⁵As is the case for the Early Childhood Environment Rating Scale, ECERS, Harms et al. (1998)

⁶Methods from psychology are also more generally included in economics. This lead to the large field of behavioral economics, see e.g. Kahneman (2003); Thaler (2016). In this dissertation I focus on the inclusion of psychological concepts within the scope of “traditional” applied microeconomics.

⁷In this dissertation I follow the model described in Almlund et al. (2011), which sees skills as a subset of overall personality along such other dimensions as values and self-concepts. In this view, certain traits are used as measures for non-cognitive skills. Note the distinction between personality as an

on are non-cognitive skills.⁸ There are three main reasons for this. First, previous research shows that for early interventions, the effects on cognitive skills are often not long-lasting. Nevertheless, there are often long-lasting positive life-outcomes (such as health) to these interventions. Studies claim that these beneficial outcomes are due to improvements in non-cognitive skills (Heckman and Kautz, 2012; Heckman et al., 2013). Second, non-cognitive skills are shown to be independently beneficial for later life, including labor market outcomes (see Heineck and Anger, 2010, for an example within the German context). Third, there is comparatively less existing research in economics on non-cognitive skills compared to cognitive skills, especially concerning their development over time. A related relevant question concerning non-cognitive skills is their stability later in life. This is important from two perspectives. On the one hand, it is important to understand skill development in a dynamic fashion to optimally implement policies that improve individuals' skills. On the other hand, researchers interested in the effects of specific skills often have to assume these skills are relatively stable for methodological reasons, an assumption that might not necessarily be warranted.

Furthermore, the incorporation of concepts from psychology into economic models is related to a broader view of the returns to education. Nowadays, economists not only consider monetary returns to education but also non-monetary returns. Examples of these are health and well-being (Elango et al., 2015). Further, skills, as described above, are also used as outcomes in economic analyses of the returns to education. One example is again the study by Araujo et al. (2016), who estimate returns to education in terms of non-cognitive skills.

1.2 Summary and Overview

The home environment is one of the most important aspects of education in the early years. This is especially the case for very young children as they are influenced only by few other settings.⁹ Thus, improvements to the home environment can have large benefits for child development both directly and indirectly through parental benefits.

overarching concept and personality *traits* as a subgroup of these. Most of these concepts come from personality psychology. In the current economic literature, this terminology is not used consistently. On the one hand, scales that were specifically developed for skills measurement are used. On the other hand, measures describing certain behavior patterns are used as proxies for underlying skills as well.

⁸Common concepts that are grouped as non-cognitive skills are the personality trait conscientiousness from the Big 5 McCrae and Costa (1999), grit Duckworth et al. (2007), and social skills Deming (2017)

⁹ECEC being one of the most important examples, which is analyzed more in detail in the following chapters below

Chapter 2 of this dissertation evaluates how a non-formal educational program, namely the Positive Parenting Program (Triple P), affects maternal well-being and, thus, the home environment. Triple P is a non-formal educational program since it is offered in many different modes but still has structured educational content. The program aims at positively influencing child outcomes by improving parenting skills. The chapter contributes to the literature by analyzing a program that is rarely been into consideration in the economics literature and by focusing on parental outcomes directly and child outcomes indirectly.

The chapter evaluates a randomized controlled trial (RCT) of Triple P. Additionally, it analyzes a separate sample of mothers from a deprived neighborhood who received the treatment but for whom no control group was recruited. For the sample without a control group, an additional control group using survey data from the German Socio-Economic Panel study (SOEP, see Wagner et al., 2007) is generated. This control group is then used to estimate the effect of Triple P on maternal well-being by applying entropy balancing matching. The chapter also assesses the overall validity of this procedure by redoing this analysis with the treatment group from the RCT.

Overall, the chapter shows positive effects of Triple P on maternal well-being - with the largest effects appearing three years after treatment. It illustrates that maternal well-being can be affected through a parenting program as an example of an early childhood intervention that, consequently benefits families. The chapter also shows direct effects of the program on children's behavior as an indicator for their non-cognitive skills.¹⁰ This can plausibly be seen as a channel through which the program affects maternal well-being, as the child behavior effects appear earlier than the well-being effects. From a policy perspective, non-formal educational programs such as Triple P can be considered as a relatively low-cost way to improve the lives of children and families. In addition, cost-benefit analyses of such educational programs should also take into account their effects on parents. In the case of Triple P, only factoring in short term child outcomes would underestimate the benefits of the program.

Apart from the quality of the home environment, the quality of ECEC is important for child development. In the case of ECEC, parents are buyers of educational services on behalf of their children. However, if buyers of educational services are not well informed about the quality of their options, but sellers can observe the level of quality, economic theory predicts market failure due to information asymmetries. In turn, market failure can result in lower overall quality as there is no incentive for buyers to pay for high quality goods. Indeed, research shows that the overall level of quality of ECEC services is mediocre by professional standards, one reason for this could be

¹⁰The chapter uses the Child Behavior Checklist, CBCL, Achenbach and Rescorla (2000).

information asymmetries between parents and ECEC-providers.

Chapter 3 empirically investigates information asymmetries between parents and ECEC professionals in German ECEC institutions. It specifically analyzes the relationships between information asymmetries, parental socioeconomic status (SES) and ECEC institution characteristics. The specific contributions of this chapter are, first, that it constitutes the first study with German data that compares quality assessments of ECEC institutions given by parents and by educators. Second, it also provides descriptive evidence on the availability of information of different quality measures. Third, it is also among the few studies investigating educational quality assessments by different parties from an economic perspective.

The chapter makes use of K²ID-SOEP which is a unique extension of the Socio-Economic Panel Study (SOEP) providing nationally representative data on quality assessments of parents on the ECEC institution their children attend. In addition, educators and center managers from these same centers provided quality assessments. The parents also take part in the main survey of the SOEP, which why the data contains detailed background information on them. Designed with the specific research question in mind, the survey includes quality assessment questions that are identical for parents and educators. Utilizing both descriptive and correlational methods, the chapter compares quality perceptions by parents and by professionals across 734 ECEC centers. The chapter describes the construction of an index for information gaps for the different quality features and uses logistic regressions to relate these to demand (i.e. parental) and supply (ECEC center) characteristics.

The chapter shows that there are considerable information asymmetries between parents and educators. These differ substantially across quality measures, but less so by parental socio-economic background or center characteristics. Both of these aspects contribute to explaining variations in the information gaps to a similar degree. The chapter concludes with the observation that information is not readily available to parents. This is an issue that should be addressed by policy-makers by, example, setting more binding quality standards. Making these nationally comprehensive would contribute to balance opportunities with respect to ECEC. It would also make providing information about quality standards and levels easier. Thus, quality rating systems such as the ones existent in the US could help parents making more informed choices.

Besides improvements in cognitive skills, one of the main benefits of ECEC lies in fostering children's social and emotional development. However, the empirical evidence on this is not conclusive. Considering universal programs, studies from North America demonstrate detrimental effects while studies from Europe show neutral to positive effects Camehl (2016). A possible reason for these divergent findings is the quality of the

services. Additionally, in many countries a majority of children attends ECEC before entering primary school. So the question of the effects of ECEC versus alternatives, such as home care, is partly supplanted by the question of how different types of ECEC affect children and how children's skills can best be fostered.

Chapter 4 directly investigates the causal effects of ECEC quality on children's skills. Specifically, the chapter analyses the effects of quality features of the ECEC group a child attends on their prosocial behavior and personality traits. It contributes to the economic literature by being one of the first studies to elucidate the causal effects of ECEC quality features on children's non-cognitive skills.

The analyses are based on the German National Educational Panel Study (NEPS, see Blossfeld et al., 2011), a large-scale survey dataset focusing on educational trajectories. Pro-social behavior and personality traits are assessed at age five by their parents. The analyses use within-center variation in quality of ECEC-groups to identify the causal effect of quality on these specific child non-cognitive skills. While selectivity may be a threat to identification, evidence from specification tests suggests that, in the German context, differences in quality between groups can be considered exogenous to the parents.

This chapter provides evidence of a beneficial effect of high ECEC-quality on children's non-cognitive skills. Specifically, the availability of educational and playing materials in the group have a positive effect on prosocial behavior, as measured by the Strengths and Difficulties Questionnaire (SDQ, Goodman, 1997). This result is robust to a number of robustness tests. The result is of considerable interest to policy makers in light of the discussion about education quality as structural features are relatively easy to improve compared to other aspects of quality.

Economists typically consider non-cognitive skills to be stable, especially throughout adulthood. Nevertheless, in addition to educational investments, the technology of skill formation postulates that skills can also be changed by incisive life events. In the case of personality traits, empirical evidence from psychological studies suggests that the stability assumption may not always be valid, as they can respond to certain life events. The question of stability is also relevant with respect to research on the effects of non-cognitive skills. If these are malleable throughout adulthood, this could lead to biased results of studies that need stability to identify causal effects.

Chapter 5 analyzes whether, and to what extent, personality traits are malleable over a time span of eight years for a sample of working individuals. Specifically, it looks at changes in personality traits after a major adverse life event: involuntary job loss. Thus, it complements the literature on stability of personality traits by analyzing the effects of a plausibly exogenous event.

The chapter uses data from the German Socio-Economic Panel Study (SOEP) from 2004 to 2014 - a period over which individuals' Big Five personality inventory was measured three times. The dataset allows to exploit detailed employment information, particularly reasons for job termination and unemployment spells. The chapter focuses solely on plant closures as a reason for job termination. Job loss due to plant closure is widely used as a relatively exogenous event to identify causal effects.

The results of the chapter suggest that, to some extent, personality traits are indeed malleable during adulthood. Although the Big Five measures are relatively stable within the population of workers, the chapter finds an increase in openness, that is, the willingness to seek new experiences, for the average displaced worker. This increase, however, is fully driven by individuals with high educational attainment and by those who find a new job immediately after dismissal. The other dimensions of the Big Five personality inventory remain nearly unchanged after an involuntary job loss. This is of interest to policy makers in that policies designed to alleviate the effects of job loss should also take into account effects on psychological measures.

As a graphical summary, figure 1.1 displays the different research areas covered in this dissertation and how they are connected by the individual chapters. On the left, four boxes symbolize the three categories of education that this dissertation considers with a focus on early childhood; formal education is split into parents and educators perspectives to allow for the research question of chapter 3. On the right, another block symbolizes life experiences that are incorporated as a factor in later life. Arrows between the different blocks indicate which chapter investigates the relationship between the different categories.¹¹

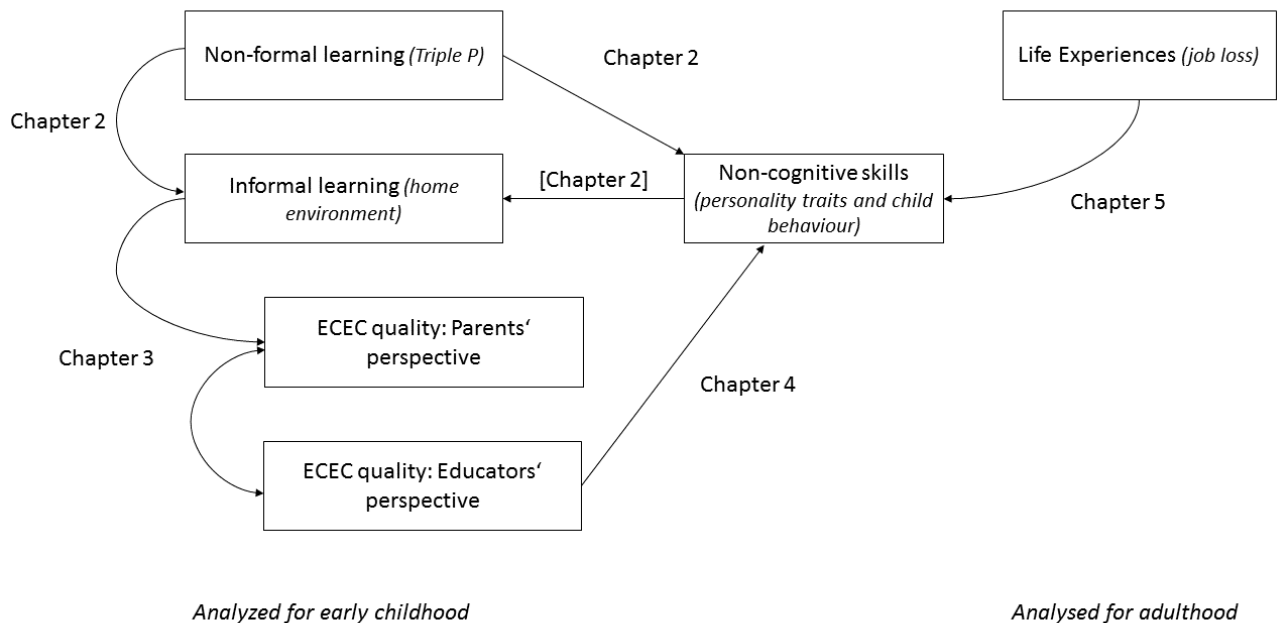
These four chapters are followed by a conclusion. After a recap, the conclusion includes a subsection discussing potential limitations of the research chapters with respect to the common contributions of this dissertation. Furthermore, the conclusion points toward open open research questions and ends with overall policy recommendations that can be drawn from this dissertation.

1.3 Common Themes and Complementary Contributions

As shown above, each of the four chapters of this dissertation individually contributes to the economic literature. However, there are themes that are common between several or all chapters of the dissertation. Furthermore, several of the chapters complement each other. Table 1.1 provides an overview of the contributions of this dissertation,

¹¹The connection between informal learning and non-cognitive skills is in parentheses because although it is not the main focus of the chapter, this relationship is alluded to in chapter 2.

Figure 1.1: Overview of the connections between different chapters



both with respect to the main common themes laid out above as well as the additional substantial and methodological contributions. The following section describes each of these contributions, going through the rows of table 1.1.

Main Contributions

First, with respect to types of education the dissertation covers formal, informal, and non-formal education. In chapter 2, I consider the relationship between the home environment and a non-formal educational program. Chapters 3 and 4 focus on ECEC and, thus, the most important form of formal education in early childhood. As mentioned above, in chapter 3 I focus on the relationship between ECEC and the home environment and, thus, a part of informal education. In this way, the dissertation adds to the analyses of all three areas of education and gives a broad overview on the relationships between different areas of education and their effects. Complementary to education, the dissertation adds experiences later in life as a potential reason for skills changes in chapter 5.

Second, several chapters of this dissertation contribute to the literature by focusing on quality aspects of education, thus going beyond measuring education by certificates or the time invested.¹² With respect to both topics, chapter 2 is concerned with the re-

¹²Measuring educational quality is often challenging since it is a multidimensional concept. Measurement using expert ratings are expensive to implement, especially in large-scale studies. There is a

relationship between quality of the home environment and, thus, informal education and how it can be improved through an intervention. Chapters 3 and 4 focus on quality in the context of formal early childhood education and care. In chapter 4, I estimate the causal effects of ECEC quality on children's prosocial behavior and personality traits. The other most important factor for child development is the home environment. In chapter 3, I analyze information asymmetries between parents and educators with respect to ECEC quality.

Third, this dissertation contributes to the literature on the inclusion of concepts from psychological science into economics. Three of the four chapters in this dissertation directly add to this research direction. In chapter 2, I use a field experiment conducted by psychologists to analyze its effect on the home environment, which is an educational input. Furthermore, I directly include measures from personality psychology in chapters 4 and 5. In chapter 4, I analyze effects of education on prosocial behavior and personality traits. Chapter 5 analyses the effects of life experiences on personality traits.

All these contributions that build on the inclusion of aspects from psychology into economics, can also be seen as evidence regarding non-monetary returns to education. Therefore, and, fourth, this dissertation contributes to analyzing non-monetary returns to education. In chapter 2, I analyze the effects of a non-formal educational program on an important aspect of life, well-being. Apart from being of interest as an outcome itself, well-being is also shown to positively influence other outcomes. Examples include improved labor productivity (Oswald et al., 2015) and, in the case of mothers, improved development of their children (Berger and Spiess, 2011). Chapter 4 estimates causal effects of educational quality on non-cognitive skills directly while chapter 5 gives evidence on heterogenous effects of job loss (as an example of an important life experience) by education of the affected person, also with respect to non-cognitive skills. In this way, the chapter provides evidence on how the *stability* of non-cognitive skills is related to education.¹³

Additional Substantial Contributions

With respect to the age group for which education is analyzed in this dissertation, it focuses on early childhood education and care (ECEC). From an economic perspective, early educational gains are especially important as children can benefit from them for

large literature that measures school teachers' quality by the gain in achievements of their students through value-added models (see e.g. Hanushek and Rivkin, 2010). However, typically this literature makes no claims about which characteristics actually make good teachers.

¹³While chapter 3 does not estimate returns to education, it gives evidence on the correlation between the education of parents and information gaps between them and pedagogical staff of ECEC institutions. Information is an important prerequisite for functional markets (see, e.g. Akerlof, 1970).

a particularly long time (Heckman et al., 2006, see, e.g.). The first three chapters of this dissertation focus on education in early childhood. Chapter 5 complements this by adding the perspective of potential development of personality traits as a special case of skill development in adulthood. Childhood is considered crucial for personality trait development. However, there are different theories about their behavior later in life. On the one hand, there is the hypothesis that personality traits are "set like plaster" (McCrae and Costa, 1994) and do not change apart from aging effects once a certain age is reached. On the other hand, there is the hypothesis that personality traits may be malleable later in life and, thus, can be changed by life events (Srivastava et al., 2003). However, these life events must be quite severe in order to make an impact. Chapter 5 adds to the analyses of skill development in the previous chapters by considering involuntary job loss as one of the most influential economic life events that can occur to working-age adults.

In addition, all chapters provide evidence on differential effects by the socioeconomic status (SES) of the involved individuals. Chapter 2 analyzes the effects of Triple P both for a sample from an average area in a medium-sized city in Germany as well as from a comparatively disadvantaged area. Chapter 3 looks directly at the relationship between SES of parents and information asymmetries between them and ECEC professionals. Chapter 4 investigates the effects of ECEC quality differentially by a number of household characteristics to elucidate if ECEC can act as a substitute or as a complement to informal education at home. To do so, it uses both characteristics that are traditionally analyzed by economists, such as household income, and characteristics that are more frequently used in the educational literature, such as a measure for activities at home. Lastly, chapter 5 reports heterogeneous effects of job loss with respect to the individuals prior education.

Next, with respect to education, all chapters contribute to the literature by analyzing the respective research questions for Germany in the context of universal education programs, while much of the literature comes from the US and is based on comparatively small scale programs (see, e.g. Barnett, 2011). Universal ECEC programs in Germany are comparatively strictly regulated, albeit not in a homogeneous manner across states and municipalities. In addition, compared to other countries, ECEC is relatively inexpensive in Germany as it is heavily subsidized.¹⁴

Additional Methodological Contributions

From a methodological perspective, the dissertation covers a broad selection of quantitative methods ranging from descriptive to correlational, control variable approach, quasi-experimental and experimental. Thus, it showcases how different research ques-

¹⁴For overviews of the German ECEC system see, e.g. Schober (2014); Spiess (1998).

tions justify different methods. In chapter 3, I use both descriptive methods to describe the prevalence and nature of information asymmetries in the market for ECEC. Furthermore, I use correlational methods to show how these are related to characteristics of both the parents and the professionals in the ECEC institutions. In chapters 2 and 5, I use control variable strategies, namely matching to get as close as possible toward causal effects. Similarly, in chapters 4 and 5 I use fixed effects methods and to some degree quasi-experimental methods. In both cases, I argue that a treatment is as-good-as-random for the involved individuals. In chapter 4 this is the within-center variation in quality in ECEC-centers, in chapter 5 involuntary job loss due to plant closure. Lastly, I also use experimental methods. In chapter 2, I analyze a field experiment in which the treatment was randomly assigned to mothers whose children attend an ECEC institution. Additionally, a control group was recruited so that differences between treatment and control group can be regarded as causal effects. As an additional contribution, I compare the results from control-variable strategy I use in this chapter on a separate sample to the results obtained from the experimental data.

Another common theme of this dissertation is that all chapters are based on, or use, large-scale survey data sets and feature quantitative methods to answer research questions in applied microeconomics. With respect to survey data, I use the German Socio-Economic Panel Study (SOEP) which is the largest and longest running longitudinal household study in Germany, in chapters 2, 3, and 5. In addition, I use data from the National Educational Panel Study (NEPS), which is a relatively new and large-scale longitudinal study focusing on educational trajectories in chapter 4.

Lastly, while I mentioned above that all chapters are at least partly based on large scale survey data, another contribution of this dissertation is that it also uses data that are collected in a variety of circumstances. In addition to survey data collected for general scientific use (i.e. secondary data), I also use primary data that was collected with a specific research question in mind. First, chapter 3 is based on data that was collected as part of a study to analyze ECEC quality choices in Germany, the K²ID-SOEP-study. Analyzing information asymmetries was an integral part of this study (see Schober et al., 2017, for more information on the study). Second, I use data that was collected as part of a randomized controlled trial that was specifically planned to elucidate the effects of the parenting program under study. Furthermore, I use administrative data that is publicly available, such as data from the German census 2011 (in chapter 2). Merging this data to the other types of data sets described and illustrating the resulting methodological possibilities is an additional contribution of this dissertation.

Table 1.1: Common and complementary contributions of the individual chapters

	Chapter 2: <i>The effects of a parenting program on maternal well-being: Evidence from a randomized controlled trial</i>	Chapter 3: <i>Information asymmetries between parents and educators in German childcare institutions</i>	Chapter 4: <i>The effects of early childhood education and care quality on children's non-cognitive skills</i>	Chapter 5: <i>Involuntary job loss and changes in personality traits</i>
Main contributions				
- <i>Considering different types of education</i>	Non-formal and informal	Formal and informal	Formal	<i>Not applicable</i>
- <i>Analyzing educational quality</i>	Quality of the home environment	ECEC quality	ECEC quality	<i>Not applicable</i>
- <i>Including concepts from psychology</i>	Analysis of a psychological program, child behaviour	<i>Not applicable</i>	Measures for child skills and personality traits	Measures for personality traits
- <i>Regarding non-monetary returns to education</i>	Maternal well-being	<i>Not applicable</i>	Non-cognitive skills	Stability of personality traits
Additional substantial contributions				
- <i>Age of analyzed groups</i>	Children and adults	<i>Not applicable</i>	Children	Adults
- <i>Relationships with SES</i>	Two different SES samples	Correlations with SES	Heterogeneous effects	Heterogeneous effects
- <i>Focus on Germany</i>	Yes	Yes	Yes	Yes
Additional methodological contributions				
- <i>Quantitative methods used</i>	RCT, matching methods	Descriptive and correlational methods	Quasi-experimental method	Quasi-experimental and matching methods
- <i>Data used</i>	Primary, secondary and administrative data	Primary and secondary data	Secondary data	Secondary data

Source: Own composition.

CHAPTER 2

The Effects of a Parenting Program on Maternal Well-being: Evidence from a Randomized Controlled Trial¹

2.1 Introduction

Early childhood intervention programs can have both short and long-term impacts on child development. Economists extensively evaluate programs that focus directly on fostering cognitive skills or socio-emotional behavior of children. This literature covers the evaluation of targeted programs, such as the Perry Program or Head Start, as well as the effects of universal programs (see for example Barnett, 2011; Heckman et al., 2010b; Havnes and Mogstad, 2011; Peter et al., 2016).

However, many successful early intervention programs do not just address children but also work with parents - in particular mothers - to improve parenting skills. Some of these programs focus exclusively on parents while others combine this with components directly addressing the children. Comparatively less research exists on the effects of this program components on child development (for a summary of the few studies, see e.g. Heckman and Mosso, 2014). This is particularly true for programs focusing solely on parents (that is parenting programs), albeit with the goal of improving child development.

Overall, there is little evidence how any of these programs affect parental well-being, in particular maternal subjective well-being. This is surprising, as maternal well-being is an outcome of interest for economists for several reasons: Well-being (seen by many researchers as a quantification of utility) and how it can be improved is of inherent interest as a core question in economics. It is also a central priority for policy makers

¹This chapter is joint work with Kurt Hahlweg (Technical University of Braunschweig, Institute for Psychology) and C. Katharina Spieß. The authors thank Wolfgang Schulz, Marie LeMouel, Jan Marcus, and Sophia Schmitz for their valuable comments on previous versions of this paper. Moreover, we thank participants of the 3rd workshop on Education Economics in Leuven, Belgium, for helpful comments. We also thank Adam Lederer for very helpful editorial assistance.

in several countries (see for example Helliwell et al., 2016; OECD, 2017). Moreover, maternal well-being is of interest as it is not only shown to improve child development (Berger and Spiess, 2011; Dahlen, 2016), but it also influences decisions on maternal labor supply and fertility (e.g Sandner, 2015). More broadly, well-being is associated with positive health outcomes (e.g. Diener and Chan, 2011) and labor productivity (Oswald et al., 2015, e.g.).

This paper analyzes the effects of an early childhood intervention on maternal well-being using data from both a randomized controlled trial (RCT) and an offering of the program free of charge to a group of more disadvantaged mothers for which no control group was recruited. More specifically, we evaluate how one particular parenting program - namely Triple P (Positive Parenting Program) - affects maternal well-being. Triple P is a "multilevel parenting and family support strategy designed to reduce the prevalence of behavioral and emotional problems in preadolescent children."² Thus, by providing parents with information on how to improve interactions with their children, it targets parents. From an economic perspective, it aims at an increase in parental investments. The provision of such information might even lead to a reduction in developmental inequalities, as information about the benefits of investments in early childhood are an important mechanism leading to inequality in child development by the socioeconomic background of parents (Caucutt et al., 2017). While the program's ultimate goal is to improve child outcomes, we argue that potential improvements in maternal well-being could be an additional benefit improving the cost-efficiency of the program.

We use the RCT data, the data from an additional offering of Triple P in a deprived neighborhood, and representative survey data. We apply a wide range of econometric techniques to analyze the effects of the program on maternal well-being. Specifically, we use instrumental variables regression (IV) with the data from the RCT to take into account selection out of the treatment (for those randomly assigned to the treatment group), thus improving over simple mean comparisons. Further, employing entropy balancing (Hainmueller, 2012), we use data from the German Socio-Economic Panel Study (SOEP) to generate a control group for the case where we only have a treated group ('non-experimental group'). This group is then used to evaluate the effect of taking part in Triple P for mothers living in a relatively deprived neighborhood to whom the program was offered free of charge.³

Our main contribution is the analysis of a substantial early childhood and family intervention that is not previously considered in the economics literature. This

²Sanders (1999), p. 71; for more information also see Sanders (2012).

³The program was also offered free of charge to the treatment group of the experimental group.

intervention addresses parents of young children in order to improve child outcomes, something rarely examined in the economics literature (see Heckman and Mosso, 2014). In particular, we focus on maternal well-being, which is an important outcome for the mother, the child, the family, and the economy as a whole. We do this by focusing on subjective satisfaction as a measure for well-being, an approach widely used in the economic literature. Furthermore, we contribute to the literature by demonstrating that a parenting program has positive well-being effects for mothers in Germany, a country without a long tradition of parental programs. Germany provides a considerably different context from other countries where parenting programs exist and are analyzed more frequently, such as the US. Finally, we contribute to the body of research on methodology of program evaluation inspired by LaLonde (1986) by combining data from a small scale trial of the program with survey data to generate a control group. Subsequently, we validate this approach by showing that it yields similar results when applying it to the treatment group from the RCT.

The remainder of the paper proceeds as follows. Section 2 summarizes previous research on early childhood interventions and parental well-being with a focus on parenting programs. Section 3 presents a conceptual framework through which we analyze the effects of a parenting program on parental well-being. Section 4 presents the data, section 5 the methodology, and section 6 our main results. Section 7 provides additional evidence of the effects of a parenting program for the more disadvantaged group using an artificial control strategy. Section 8 concludes.

2.2 Previous Research on Early Childhood Interventions Focusing on Maternal Well-being

The economic literature on parental and, in particular, maternal well-being as an outcome of early childhood interventions is relatively small.⁴ On the one hand, there are studies on the effects of center based child care programs on maternal well-being. For instance, Baker et al. (2008) show that a reform in Quebec, Canada, which led to an expansion of child care provision, adversely affected various child and family well-being outcomes, including parental life-satisfaction, paternal self-reported health, maternal depression, and work-family conflicts. For similar evidence see Brodeur and Connolly (2013); Kottelenberg and Lehrer (2014); Herbst and Tekin (2010). Based on Australian data, Yamauchi (2010) shows a slightly positive correlation of local day care availability with maternal life-satisfaction. For Germany, studies by Schober and Stahl (2016);

⁴If parental outcomes are included in studies outside economics, these most often refer to parenting practices or specific mental health aspects (Brooks-Gunn et al., 2000, give an overview of earlier research on the topic)

Schober and Schmitt (2017) similarly point to a modest positive association between childcare provision and maternal well-being.⁵ Using a quasi-experimental approach, Schmitz (2017) shows that an expansion of child care provision for children aged three or older significantly increased maternal life-satisfaction in Germany.

In addition, other studies analyze day care programs with a parental component. Examples of these include evaluations of the Incredible Years Program (Webster-Stratton et al., 2004), Early Head Start (Love et al., 2005; Barnett, 1995, provides an overview of earlier research), the parental and home components of the Perry Preschool Program (Belfield et al., 2006; Heckman et al., 2010b), and the Abecedarian Program (Masse and Barnett, 2007). Using data from the Head Start Impact Study, Ansari et al. (2016) and Ansari and Gershoff (2016) examine whether one year of Head Start differentially benefited parents as a function of their initial parenting behaviors. The outcomes they consider include maternal depressive symptoms, which only showed improvements among parents most at risk. The Perry Preschool Program had home visits once a week on average. The Abecedarian program did not have home visits, but interacted with parents at the Abecedarian day care center. The evidence generally supports positive (complementary) responses of parents to interventions. However, these evaluation studies concentrate on parental behavior and attitudes as outcome or changes in the home quality only and do not take maternal well-being explicitly into account.⁶

On the other hand, there is a strand of literature on the effects of home visitation programs and exclusive parenting programs. Notable examples of home visitation programs include the Infant Health and Development Program (IHDP; Brooks-Gunn et al., 1994; Klebanov et al., 2001) and the Nurse Family Partnership (NFP; Olds, 2006). The IHDP offers home visitations and focuses on health outcomes. Klebanov et al. (2001) analyze a randomized controlled trial of the IHDP with respect to maternal well-being. They provide an overall measure for well-being that includes aspects of mental health as well as general life satisfaction. Using data from an RCT in the United States, they find that overall the program improved maternal well-being, especially for those mothers without a high school degree. The NFP program provided home visits to first time teenage mothers, advising them on proper nutrition and care of young children, including the importance of cognitive stimulation. The evaluation by Olds (2006), using a randomized controlled trial, finds improvements for mothers through reduced

⁵The studies of Schober and coauthors apply fixed effect models and make use of the regional variation in day care attendance in Germany.

⁶The Incredible Years Program (Webster-Stratton et al., 2004) focuses on positive parenting for parents of children younger than eight. It aims to reduce parent-child violence. Therefore, it is not a program that exclusively aims to improve child outcomes by providing information to parents.

dependence on public assistance. However, he does not analyze well-being measures explicitly. Lindsay et al. (2011) evaluate implementations of three parenting programs (Incredible Years, Triple P, and "Strengthening families, strengthening communities") in the United Kingdom with respect to well-being. In their measure for well-being, they include maternal life satisfaction, but they do not separately report the effects of the program on this measure. Their measure for well-being mixes life satisfaction with mental health components. Furthermore, their study is not a randomized controlled trial, rather it compares the different parenting programs. Their analyses show large improvements in their well-being measure from before to after participation in both Triple P and Incredible Years (0.81 and 0.88 of a standard deviation, respectively), but without comparisons to a control group. Sandner (2015) evaluates a German home-visitation program for disadvantaged mothers that was modelled after the NFP. Using a randomized controlled trial and administrative data, his study finds evidence of both improved maternal well-being and decreased labor market participation for treated mothers. In the economics literature, this study is closest to our own, as it also analyzes the effects of a parenting program on maternal well-being in the German context.

The parental program we analyze is the Triple P program, which focuses on providing information that improves parenting skills with respect to handling child behavior and reducing parental stress. In this sense, it directly aims at improving parental well-being. Existing psychological studies analyze the effects of Triple P. Meta-analyses by Nowak and Heinrichs (2008) and Sanders et al. (2014) report positive effects of Triple P on outcomes such as parenting style, parenting efficacy and satisfaction, as well as parental adjustment and relationships. However, no study explicitly focuses on parental satisfaction.

2.3 Conceptual Framework

To provide an economic perspective on the effects of the parental program on maternal well-being, we consider a simple framework of household production.⁷The underlying assumption of this framework is that well-being can be regarded as a suitable quantification of utility. A person's utility function is given by $U(C, L)$, where C is the amount of goods and services consumed and L is leisure time. Individuals have an endowment of time (L_0) that they can use either for work (where LB is time used on the labor

⁷For general models of household production see Cahuc et al. (2014). There is also an economic literature on parenting style as an investment in child development (del Boca et al., 2014) and (Cobb-Clark et al., 2016). However, parenting skill is a distinct concept from parenting style and more related to actual parenting practices; see Darling and Steinberg (1993). Therefore, we argue that we can model the effects of parenting skills more precisely than the previous literature on parenting style.

market, LH time used for home production) or for leisure:

$$L = L_0 - L_B - L_H$$

Components of C can be either bought (C_B) or produced within the household (C_H) and their size is measured in terms of monetary value:

$$C = C_B + C_H$$

The amount of goods that can be bought (C_B) will typically depend on the wage rate of the person. The component of home-produced goods and services (C_H) most relevant here is child care.⁸ A production function for C_H can be given by:

$$C_H = q(p)L_H$$

We assume that the size of C_H can be influenced both by the amount of goods and services provided (for example the number of hours of child care) but also its quality (for example the quality of interactions with children to develop skills). Thus p is a measure for parenting skills and $q(\cdot)$ is a function determining the amount and quality of the produced services and, thus, its value. In effect, if the persons' parenting skills are higher, they get a higher amount of C_H per invested time unit. We make no further statement about the form of $q(\cdot)$ but note that it may cover situations where certain aspects of home production are independent of parenting skills while others are not. To sum up, in this simple model of labor supply including home production, an improvement in parenting skills has effects analogous to an increase in the wage rate for work on the labor market and, thus, theoretically increases - *ceteris paribus* - individuals' utility from assigning their time to different activities.⁹

Additionally, children could also affect their parents' utility directly when L includes a component indicating the quality of the time parents spend with their children. If the children behave in a way that is agreeable to the parents, this may increase their valuation of the time spent together.¹⁰ We make no further claim about the allocation of time to different activities. However, the model serves as an illustration of the

⁸Child care, in a broad sense, is the most relevant aspect of home production but other aspects could also be influenced by parenting skills or child behavior.

⁹By regarding parenting skills as a measure of the productivity at home, the model could make predictions about time allocation within the household as well. As Browning and Gørtz (2012) show, in this case increased productivity could lead to further specialization of the mother towards childcare. This could explain the reduced maternal labour market participation after participating in the program analyzed by Sandner (2015).

¹⁰This could also be an explanation for the negative employment effects of the home visitation program analyzed by Sandner (2015): Mothers who participated reported higher well-being but, at the same

different channels through which improved parenting skills, due to participation in a parenting program, can lead to an increase in parental well-being in the framework of an economic model. This is because there is a direct channel through increased home productivity and an indirect channel through improved child behavior that leads to a higher valuation of leisure time.

2.4 Data and Descriptive Statistics

Datasets. We use data from a unique intervention study (the so-called *Projekt Zukunft Familie 1 - ZF1*,¹¹ Heinrichs et al., 2006) of Triple P in Germany. In this study, a randomized control trial (RCT) was carried out in one German city in 2001 - the medium sized city of Braunschweig in the state of Lower Saxony.

Triple P can be administered in five different intensities, referred to as levels. The first two levels consist of broadly spreading information through videos and leaflets. Level three includes group training, but with only a narrow focus on parenting skills, whereas level four broadens the focus to include general improvements to the home environment. Level five is an intensive family intervention resembling and going beyond the aforementioned home-visitation programs.

In the setting we analyze, parents participated in level four of Triple P. The participants were recruited from day care centers in a middle class neighborhood.¹² The parent training took place in a group setting with an average of six parents, with telephone follow-ups. The Triple P training includes video lectures as well as role-playing to learn how to handle difficult situations under the supervision of a trained member of the project team. The treatment consisted of four sessions, each lasting two hours that were conducted in the rooms of the day care center that the child of the parents attended at that time and four optional telephone follow-ups. The data includes 280 families of children between 2.6 and 6 years of age. All children attend day care centers and all parents speak German. The field experiment was conducted with 186 families in the treatment and 94 families in the control group (ZF1 from here on). Single mothers are excluded from the analyses, as differential effects of parenting programs are expected for them Heinrichs et al. (2006) and because the sample size of single mothers alone is too small for a separate analysis. Panel attrition of the remaining sample was low: of 219 mothers who participated in the study, still 206 answered the questionnaire three years later; an attrition rate of 6%. All subsequent analyses use

time, reduced employment. This could be due to a higher valuation of leisure time with their children.

¹¹This study was funded by the German Science Foundation (DFG).

¹²Attendance of day care was 78.2% in the relevant age range in 2001 in Germany (Statistisches Bundesamt, 2002, , own calculations).

the sample of mothers for whom information is available for the whole time period.

Outcomes. We use the satisfaction of the mother with her family life as our measure for maternal well-being.¹³ More specifically, we analyze the differences between pre-treatment satisfaction with family life and measurements of it at four different points in time after the treatment. We use this satisfaction variable for two reasons: First, Triple P aims at improving parent-child-interactions and, thus, changes in family life satisfaction are reasonable. Second, this measure of satisfaction is also available in a representative survey dataset that we use for additional analyses.¹⁴ Furthermore, Schober and Stahl (2016) show that satisfaction with family life is the well-being measure that is most affected by early childhood programs compared to satisfaction measures related to other areas of life. We follow the practice in the well-being literature and assume the satisfaction variable to be on a cardinal scale.¹⁵ We use standardized measures of the well-being measure: Differences of well-being were Z-standardized for each point in time such that coefficients of regression models correspond to differences in terms of standard deviations.

In order to obtain a more comprehensive view of the influence of Triple P on maternal well-being and in line with the theoretical model presented above, we analyze two additional outcome measures: First, we consider a variable that measures parenting skills (see Arnold et al., 1993). The ZF1 study measures parenting skills as strategies and actions concerning the upbringing of children.¹⁶ Second, we consider a child related outcome measure, the Child Behavior Checklist (CBCL, Achenbach and Rescorla, 2000; Döpfner et al., 2014). The CBCL is a widely used and validated scale that measures child behavior. Parents answer items on noticeable behavioral and emotional problems, indicating how frequently these occur. The CBCL can be grouped into two subscales, one on internalizing behavior (for example displayed through depressive symptoms) and one on externalizing behavior (for example aggressive behavior toward others). We use this scale as another outcome measure to learn more about a potential

¹³For more information on the scale, see Henrich and Herschbach (2000).

¹⁴See section 7 below.

¹⁵Although life satisfaction is principally a latent variable, in many surveys respondents are asked to grade it on an ordinal scale (see Schröder and Yitzhaki, 2017, for a discussion). Researchers then usually treat these answers as cardinal variables, which assumes that all respondents interpret the question in a similar way (that is, the distances between items in terms of the latent underlying variable are equal).

¹⁶The German version (Naumann et al., 2010) of the parenting scale (for the English version, see Arnold et al., 1993) is administered to assess parenting skills. The scale is a 35-item questionnaire that measures dysfunctional discipline styles in parents. It yields a total score based on three factors: *laxness* (permissive discipline), *over-reactivity* (authoritarian discipline, displays of anger, meanness, and irritability) and *verbosity* (overly long reprimands or reliance on talking). Higher scores indicate dysfunctional parenting behavior. The total score has adequate internal consistency, good test-retest reliability ($r = 0.84$), and reliably discriminates between parents of clinic and non-clinic children.

indirect channel of parenting via child behavior on maternal well-being.

Covariates. Our estimations control for various covariates. Table 2.1 includes pre-treatment descriptive statistics. Children are an average of four years old, the gender ratio is roughly balanced, and children have an average of one sibling. Households with net income above 1,500€ are considered as high income households.¹⁷ Additionally, more participants in the ZF1 study have earned a university entry degree ('Abitur').

2.5 General Empirical Strategy for Evaluation of the RCT (ZF1)

Since the ZF1 data come from a RCT study, identification of causal effects is straightforward. The randomized assignment of individuals to either treatment- or control-group provides exogenous variation that makes it possible to interpret mean differences as causal. If randomization works perfectly, there is no systematic unobserved heterogeneity between the individuals in the treatment and control group. Therefore, additional econometric techniques are not necessary. However, we know from the implementation of the RCT that some mothers choose not to take part in the treatment even though they were assigned to the treatment group. If this selection is related to any characteristics that also influences the outcome, exogeneity of the treatment is violated and estimates of causal effects are likely to be biased. To learn more about control and treatment group differences, we verify that covariates are balanced between treatment and control group. We also do this comparison for those actually treated and for those not treated. Naturally, this only works for observable characteristics. Table 2.2 shows the mean differences of observable characteristics between groups after randomization and between those who subsequently took up the treatment and the remaining control group. The table shows that there are two variables for which the randomization did not seem to result in similar means for the treatment and control group: Mothers in the treatment group are statistically significantly more likely to have a college degree and less likely to only have a vocational degree. If we consider the actual treated and the actual control group, mothers in the treatment group are still less likely to have vocational training, but also more likely to not have a tertiary degree. This indicates that there was likely no significant selection into actual treatment participation based on observable characteristics apart from a higher likelihood of mothers without a tertiary degree to opt out of the treatment.

Nevertheless, this does not rule out selection into or out of the actual treatment based on unobservable characteristics. In other words, if mothers who choose not to

¹⁷The study includes income on an ordinal scale with seven steps of around 500€. However, data alignment to make additional analyses feasible (presented below) required us to generate a binary variable on income to have sufficient overlap with other groups.

take part in the treatment have other, unobserved, characteristics that also affect their well-being, mean differences between the treatment and control groups are biased estimates of the causal effect of the treatment. This problem can be mitigated using an instrumental variable (IV) approach. The assignment to the treatment group constitutes a valid instrument, as it is uncorrelated with unobserved characteristics of the mothers via the randomization. Therefore the exogeneity assumption likely holds for this instrument. At the same time, it is highly correlated with taking up the treatment and, thus, also a relevant instrument. Moreover, we use covariates in our estimations to further increase the precision of our estimates.

In addition to looking at the effects of Triple P on maternal well-being at different points in time, we follow the procedure laid out by Anderson (2008) and also consider a summation index of the outcome over all four points in time when the well-being was measured as a robustness check. The summation index is a weighted average generated with predictions from a generalized least squares (GLS) model including only a constant. In this way, the weights are set according to the covariance of the outcomes per individual in order to maximize the amount of information. The summation index has an advantage for interpretation as it gives an indication of overall effectiveness of the parenting program. This procedure reduces the number of tests concerning the overall effectiveness of the treatment to one, making the analyses additionally robust to overtesting.

2.6 Results

2.6.1 Main Results

Table 2.3 shows the treatment effect of Triple P participation on maternal well-being. In principle, there are four different outcomes, each given by the difference between the well-being measurement at a given point in time and the pre-treatment measurement. First, we present the OLS results based on actual program participation for ZF1. We regress on the pre-post difference in the well-being including only the pre-treatment value of well-being (column 1) to control for potential level effects and, in a second step, all covariates (column 2). These estimations show medium sized effects (Cohen, 1988), which are only statistically significant for the second and third year following treatment (column 2). The effect of the treatment on the summation index is also significant. As explained above, these estimates may be biased because of non-random take-up of the treatment. Using the instrumental variable approach (IV, again with control variables) for ZF1, standard errors increase, but effect sizes are not significantly

different from the OLS results (column 3).¹⁸ The increasing standard errors are not surprising as IV only partly uses the variation between treatment and control groups to estimate the difference. The slightly decreasing effect sizes could be explained by the selection into the treatment: Likely explanations are heterogeneous treatment effects and selection based on these (some mothers who would have been less affected by the treatment could have chosen to not participate, thus biasing the difference in means upwards) or unobserved heterogeneity in their characteristics (something that makes them less likely to participate in the training and makes them unhappier at the same time). The positive effect of the treatment seems to become most apparent after a few years instead of directly after the treatment.

Overall, the increases in well-being of between 20 and 30% of a standard deviation are quite sizeable when compared results in the literature. For example, Yamauchi (2010) finds an increase of satisfaction with free time by 16% of a standard deviation when day care is available in the area but no increase in satisfaction with family life. Schmitz (2017) finds an increase of general life satisfaction of 30% of a standard deviation if the child attends day care. However, day care is comparatively more costly than the Triple P intervention. Sandner (2015) finds a 15% increase of general life satisfaction after participating in the Pro-Kind program, a slightly lower effect.¹⁹

2.6.2 Robustness

In the main specifications above, we use changes in the well-being measures as outcomes in a linear model. Since the original measures come from a five-point ordinal scale it is *a priori* unclear if this is a valid approach. Thus, we also estimate ordered logit models as a robustness check.²⁰ For this to be feasible, groups must be collapsed because large changes are rare in absolute terms: While, in principle, the maximum change in well-being is four points, the majority of observations have changes of -1, 0, or 1, with only a few changes of larger magnitude. Given these limitations and some loss in statistical power, we find that our results are not sensitive to our choice of using well-being as a metric variable (table 2.4). The effects on the probability of positive and negative

¹⁸T-tests for equality of the effects between the OLS results without covariates and the IV-model yielded p-values with a minimum value of 0.3701 for the effect on the difference after three years. Note that this corresponds to the most conservative way to test for differences between effects as all other differences are smaller.

¹⁹To put these results into perspective, these effects are similar in size to the effects of involuntary job loss, which is considered to be one of the most detrimental shocks with respect to well-being. Kassenboehmer and Haisken-DeNew (2009) report effects of between -0.230 and -0.531 points on an 11-point Likert-scale for women in Germany, which translate into effect sizes of -13% to -31% of their reported standard deviations. The effects for men in this study are between .0702 and -0.724 (-41% to -42%).

²⁰The downside of a more complex model is, of course, a loss of statistical power, so given that both models provide similar estimates we prefer the simpler model.

changes are very similar in magnitude, thus providing evidence of a linear relationship between the treatment and the outcome measure.

2.6.3 Channels

As described above, we analyze two potential channels for the change in maternal well-being. Table 2.5 gives the results of the IV-regressions on parenting skills and child behavior. Outcomes are recoded such that higher values correspond to better parenting skills and less problematic behavior by the child, respectively. Column 1 shows a strong effect of the treatment on parenting skills. This change in the home environment induced by changing parental skills seem to be permanent. Positive effects for child behavior are smaller and driven by the CBCL internalizing behavior subscale (columns 3). These are most pronounced and strongly statistically significant in the two-year follow-up. For the other points in time, effects on the internalizing subscale are smaller, but still significant in two out of three measurement points. Our results show that both improved parenting skills and less problematic child behavior could be channels through which the interventions improves maternal well-being; these are in line with our theoretical model of utility and home production. However, in this case, the improvements in parenting skill seem to be the more important factor.

2.7 Additional Analyses for the Non-experimental Group of More Disadvantaged Families

2.7.1 Background and Data

In addition to the randomized controlled trial evaluated above, Triple P was independently offered to mothers in a deprived neighborhood of Braunschweig. This is part of another intervention study, the so-called *Projekt Zukunft Familie 2 - ZF2* Heinrichs and Jensen-Doss (2010).²¹ The analysis of this sample shows how the intervention affects potentially disadvantaged mothers. This group is of particular interest with respect to avoiding inequalities in parental behavior early on. This intervention study includes an additional 197 treated families. However, no control group exists for this study. In order to evaluate the effect of the treatment for the participants in ZF2, we use survey data from the German Socio-Economic Panel Study (SOEP) to generate a control group.²² Thus, analyzing this sample is relevant from a methodological perspective as well.

²¹This study is funded by the Jacobs Foundation.

²²Additional information on how this is provided in the empirical strategy section.

The SOEP is the largest household panel study in Germany (Wagner et al., 2007). We use SOEP waves from 2010 through 2014, as these are the first to include a question on family life satisfaction that is identical to that in the ZF2 data.²³ Overall, 2,548 individuals with children under the age of six answered the personal questionnaire for all four waves in the SOEP. Furthermore, we restrict the sample to mothers whose child is between 2.6 and 6 years old and attended a day care center at the time of the interview. This reduces the sample size to 2,120 observations.²⁴ In addition, we make use of data on the regional level, provided by the *Federal Statistical Office and Statistics Braunschweig* (see section 7.2 for details).

An advantage of creating a control group using SOEP data is that in addition to the well-being measure we analyze, it includes a rich set of regional, socioeconomic, and sociodemographic characteristics. One challenge of the dataset is that the outcome is measured on slightly different scales in the various samples we use. While the ZF2 study uses a five point Likert-type scale, SOEP uses an eleven-point scale. Thus, we transform the eleven-point scale into a five point scale. Another challenge of the dataset is that the well-being information is measured ten years later than in the SOEP. This question might be crucial with respect to the outcome variable. Additionally, there might be differential trends stemming from unobservable shocks to one of the datasets. In general, we assume that the trajectory of satisfaction with family life in our control group is a good proxy for that in the treatment group given all observables. For evidence on the validity of this assumption and further discussion of both mentioned issues, see appendix 2.B.

Pre-treatment satisfaction with family life is lower in the ZF2 study compared to the SOEP. (see table 2.6). With respect to covariates, a large difference between the ZF2 data and the other two datasets emerges: Less than a quarter of families fall into the high income group compared to around 60 percent for the two other subsamples. We expect this because the sampling of ZF2 families focuses on relatively deprived neighborhoods. The education variables also show a similar picture: participants of the ZF2 study have, on average, lower school degrees, with a smaller share of mothers having earned a college degree.

2.7.2 Method: Matching with a Generated Control Group

All individuals in the ZF2 subsample were treated. To estimate the treatment effect with this data, additional data are needed. Therefore, we create a control group using SOEP data. We then use this control group to estimate the effects of the treatment

²³This is also the same measure as in the ZF1 data.

²⁴Sufficient knowledge of German was an additional prerequisite for taking part in ZF2, but there are no SOEP observations that had to be excluded due to insufficient knowledge of German.

via entropy balancing (Hainmueller, 2012). Entropy balancing is a weighting method to preprocess the data such that the means and potentially higher moments of the generated control group matches the treatment data. It can be regarded as a matching method and, thus, the conditional independence assumption (selection on observables) is necessary for identification of causal effects.²⁵ The corresponding balancing graphs are shown in appendix 2.C. To further control for differences between the treatment and the generated control group, we add regional administrative data. In principle, we would like to use all the background information that is available to us to generate a control group. However, this can make the optimization algorithm used for entropy balancing infeasible for two reasons (Hainmueller, 2012): (1) Too many covariates compared to the number of observations, and (2) too large differences between the moments of the two groups for specific characteristics. To solve these problems, we conduct the following additional procedure: Based on the regional information, we generate subgroups of the control group: Each subgroup covers a certain share of SOEP individuals. Which individuals are in each subgroup depends on a measure of similarity between the individuals' home municipality and Braunschweig. Given the set of regional characteristics for Braunschweig, we calculate a similarity index for the regions where the SOEP observations come from. As a measure of similarity, we calculate the Mahalanobis distance based on regional indicators. For each region, the measure is given by

$$d_i(x, y) = \sqrt{\sum_{j=1}^k \left(\frac{x_j - y_{ij}}{sd(y_j)} \right)^2}$$

where i is the indicator for the region and j denotes the different characteristics, as shown in the data section. Observations are then ordered according to this similarity measure.²⁶

The regional information is on the county (*Kreise* in German) or the municipality level (*Gemeinde* in German).²⁷ However, the two sample areas of the ZF2 data set are lower regional levels than a county or municipality. For this lower level, *Statistics Braunschweig* provides us with the same information given on the upper levels. The selected indicators are the following: The unemployment rate, the percentage of families on welfare, the percentage of foreigners, and the average living space per dwelling in square meters. In addition, we include the socioeconomic background of families. Table

²⁵For a discussion of the differences of regression and matching estimators with special regard to entropy balancing, see the empirical strategy section of Anger et al. (2017).

²⁶The Mahalanobis distance is a generalization of the Euclidean distance including a z-standardization (subtracting the mean and dividing by the standard deviation) of the distance for each characteristic.

²⁷We used data from the most recent German census (2011), accessed from <https://ergebnisse.zensus2011.de/> (accessed November 2017).

2.7 shows these regional indicators. Overall, means of the participants in ZF1 are relatively similar to those in our SOEP sample. By definition, regional characteristics for ZF2 show a comparatively disadvantaged background.

As previously noted, each observations is assigned a similarity measure based on regional characteristics. We then create different control groups based on the quantiles in which an observation lies on the similarity distribution. We define ten cutoffs, starting with the first decile of the distribution, continuing in ten-percentage-point steps. In the main specification, we take the 20% cutoff (for the reason of this see next paragraph). Results for other specifications are presented in appendix 2.C.

A way to validate this entire procedure is to apply it to the ZF1 sample. Thus, we create another artificial control group with the same procedure as described above. When we rerun the models using the ZF1 treatment group and the new artificial control group we find that the specification that comes closest to the original estimation is the one using the 20% cutoff, providing the reason for choosing the 20% cutoff for our main specification with the ZF2 treatment group. Results for other cutoffs are presented in appendix 2.C.

2.7.3 Results

Table 2.8 first shows the comparison of the experimental group (ZF1) and the generated control group (column 2). It also repeats the main results from section 6 as a reference (column 1). As mentioned above, we calculate effects using the experimental group in order to validate our control group creation approach.²⁸ Effects using the generated control group are, in general, somewhat smaller than those from the evaluation of the RCT, except for one case, the measurements after one year. However, they show a similar pattern with the largest effects emerging after three years. Next, we consider the effect of the treatment in a relatively disadvantaged neighborhood (ZF2) using the generated control group (column 3). We also find positive effects of the treatment for people from the disadvantaged neighborhood.

We check the assumption necessary to treat well-being as a metric variable and test for a linear relationship between treatment and outcome as a robustness check. The test indicates that linearity seems to hold.²⁹

²⁸In appendix 2.C, the full results for different subgroups of the artificial control groups are shown. Here we include only the 20% subset to show that, in this case, the results of this approach come closest to the results derived from the analyses of the RCT.

²⁹This is analogous to the robustness check in section 6.2. The table of results is included in appendix 2.D.

2.8 Conclusion

This study analyzes the effect of a parenting program on maternal well-being using both experimental and non-experimental methods. In general, there is little literature on the effects of interventions aimed at improving child outcomes on parental well-being. The economic literature on the evaluation of parenting programs almost exclusively focuses on child outcomes. To our knowledge, this is the first paper evaluating the Triple P program with respect to maternal well-being in general and the first paper on Triple P from an economic perspective. Unlike most parenting program evaluations, this paper uses data from a context, namely Germany, with a universal day care system and an underdeveloped infrastructure of parenting programs.

Using two different implementations of the program, as well as additional administrative and survey data, we find that the program has a positive medium- to long-run effect on maternal well-being. We measure a small effect one year after the treatment that could be attributed to changes in parenting style. This is in line with empirical evidence for this channel in the literature on the effects of parenting programs on parental skills. In the long-run, effects on maternal well-being are larger and increasing. A potential mechanism for this is the improvement in child outcomes, which takes time to materialize. We find the improvement of maternal well-being noteworthy as Triple P is a low cost intervention yielding comparatively large effects on maternal well-being. Moreover, our analysis shows that evaluations of parenting programs that only take child outcomes into account may underestimate the benefits of the program. Improved maternal well-being has positive consequences for both the family and society. For policy makers who are interested in increasing the well-being of mothers with young children, early childhood interventions addressing parents are an effective tool.

Appendix

2.A Tables

Table 2.1: Descriptive statistics (pretreatment)

	ZF1
Child age (in years)	4.06 (1.02)
Child female (%)	48.57 (50.07)
Number of siblings	1.09 (0.94)
Mother single (%)	10.50 (30.73)
HH income above 1500€ (%)	65.00 (47.78)
Mother's age (in years)	35.23 (4.95)
Mother German (%)	96.43 (18.59)
Mother low school degree (%)	11.07 (31.43)
Mother medium school degree (%)	34.64 (47.67)
Mother high school degree (%)	54.29 (49.91)
Mother no tertiary degree (%)	12.86 (33.53)
Mother vocational training (%)	53.57 (49.96)
Mother college degree (%)	33.57 (47.31)
Mother working (%)	76.79 (42.30)
Pre-treatment satisfaction with family life (5-point scale)	4.21 (0.81)
N	280

Standard deviations in parentheses.
Source: Projekt Zukunft Familie 1.

Table 2.2: Observable characteristics for ZF1 treatment and control groups as assigned through randomization (columns one to three) and for ZF1 participants who were eventually treated or not treated (columns four to five)

	Control group (1)	Treatment group (2)	Difference (1) - (2) (3)	Not Treated (4)	Treated (5)	Difference (4) - (5) (6)
Child age (in years)	4.11 (0.98)	3.97 (0.97)	0.14	4.03 (1.04)	4.00 (0.93)	0.03
Child female (%)	43.55 (49.99)	47.13 (50.08)	-3.59	45.56 (50.08)	46.51 (50.07)	-0.96
Number of siblings	1.15 (0.96)	1.08 (0.79)	0.07	1.08 (0.91)	1.11 (0.78)	-0.03
Income above median (%)	74.19 (44.11)	79.62 (40.41)	-5.42	77.78 (41.81)	78.29 (41.38)	-0.52
Mother's age (in years)	36.00 (4.79)	35.47 (4.43)	0.53	35.41 (5.19)	35.77 (4.02)	-0.36
Mother German (%)	98.39 (12.70)	96.82 (17.62)	1.57	97.78 (14.82)	96.90 (17.40)	0.88
Mother low school degree (%)	9.68 (29.81)	6.37 (24.50)	3.31	7.78 (26.93)	6.98 (25.57)	0.80
Mother medium school degree (%)	27.42 (44.97)	36.94 (48.42)	-9.52	32.22 (46.99)	35.66 (48.09)	-3.44
Mother high school degree (%)	62.90 (48.70)	56.69 (49.71)	6.22	60.00 (49.26)	57.36 (49.65)	2.64
Mother no tertiary degree (%)	12.90 (33.80)	7.01 (25.61)	5.90	14.44 (35.35)	4.65 (21.14)	9.79**
Mother vocational training (%)	38.71 (49.11)	59.87 (49.17)	-21.16***	42.22 (49.67)	62.02 (48.72)	-19.79***
Mother college degree (%)	48.39 (50.38)	33.12 (47.22)	15.27**	43.33 (49.83)	33.33 (47.32)	10.00
Mother working (%)	80.65 (39.83)	76.43 (42.58)	4.21	75.56 (43.22)	79.07 (40.84)	-3.51
Pre-treatment satisfaction with family life (5-point scale)	4.28 (0.66)	4.25 (0.79)	0.03	4.30 (0.71)	4.23 (0.79)	0.08
N			219			219

Notes: The table can be read as follows: Column one shows means of characteristics for mothers who were assigned to the control group, column two those who were assigned to the treatment group. Column three shows differences between means. Column four shows means of characteristics of mothers who did not receive the treatment (regardless of the outcome of the randomization), column five those of mothers who were treated. Column six again shows differences in means between the last two groups. Calculations exclude single mothers. Significance levels: ** $p \leq 0.05$, *** $p \leq 0.01$ of a t-test between groups.

Source: Projekt Zukunft Familie 1.

Table 2.3: Effects of Triple P on difference in maternal well-being from pre-treatment to later measurements of well-being (ZF1)

Difference in well-being between pre- treatment and measurement...	OLS (without covariates)	OLS (controlling for baseline well-being)	OLS (including covariates)	IV
	(1)	(2)	(3)	(4)
...directly after the treatment	0.23* (0.14)	0.21 (0.13)	0.18 (0.14)	0.14 (0.18)
...after 1 year	0.12 (0.12)	0.10 (0.12)	0.06 (0.12)	0.05 (0.16)
...after 2 years	0.32** (0.14)	0.29** (0.12)	0.22* (0.12)	0.19 (0.16)
...after 3 years	0.33** (0.14)	0.31** (0.12)	0.30** (0.13)	0.28* (0.17)
Summation index	0.30** (0.13)	0.27** (0.11)	0.23** (0.11)	0.20 (0.15)
N	206	206	206	206

Notes: Each cell shows effect sizes from one model including covariates as described in the data section above. Robust standard errors in parentheses. Significance levels: * $p \leq 0.1$, ** $p \leq 0.05$.

Source: Projekt Zukunft Familie 1.

Table 2.4: Changes in well-being on ordinal scale - Predicted probabilities for change from ordinal logit model

Difference in well-being between pre- treatment and measurement...	OLS		
	Change: -1	No change	Change: +1
...directly after the treatment	-0.07 (0.05)	-0.00 (0.01)	0.07 (0.05)
...after 1 year	-0.03 (0.04)	0.00 (0.00)	0.03 (0.04)
...after 2 years	-0.06 (0.04)	0.00 (0.01)	0.06 (0.04)
...after 3 years	-0.11** (0.05)	0.02 (0.01)	0.10** (0.04)
Summation index	-0.10** (0.04)	0.01 (0.01)	0.08** (0.04)
N	206	206	206

Notes: Each cell shows the probability for a discrete change from the pretreatment level of well-being. Groups are collapsed to three as described in section 6.2. Robust standard errors in parentheses. Significance level: ** $p \leq 0.05$. Source: Projekt Zukunft Familie 1.

Table 2.5: Effects of Triple P on parenting skills and child behavior

Difference in well-being between pre- treatment and measurement...	Parenting skills	Child behavior (CBCL)	Internalizing behavior (CBCL)	Externalizing behavior (CBCL)
	(1)	(2)	(3)	(4)
...directly after the treatment	0.53*** (0.10)	0.19 (0.16)	0.26* (0.16)	0.18 (0.18)
...after 1 year	0.35*** (0.10)	0.32* (0.17)	0.44*** (0.17)	0.20 (0.18)
...after 2 years	0.51*** (0.11)	0.24 (0.17)	0.24 (0.17)	0.10 (0.17)
...after 3 years	0.36*** (0.11)	0.24 (0.17)	0.30* (0.16)	0.18 (0.18)
Summation index	0.67*** (0.16)	0.27* (0.16)	0.36** (0.16)	0.18 (0.18)
N	259	250	250	250

Notes: Each cell shows effect sizes from one IV-regression model including covariates on pre-treatment socio-economic characteristics as described in the data section; robust standard errors in parentheses. Significance levels: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$. Source: Projekt Zukunft Familie 1.

Table 2.6: Descriptive statistics (pre-treatment)

	ZF2	SOEP
Child age (in years)	4.42 (1.03)	4.39 (1.06)
Child female (%)	44.16 (49.78)	49.01 (50.00)
Number of siblings	0.94 (0.90)	1.27 (0.98)
Mother single (%)	12.30 (32.97)	10.09 (30.13)
HH income above 1500€ (%)	22.84 (42.09)	60.08 (48.98)
Mother's age (in years)	33.49 (5.54)	34.55 (5.59)
Mother German (%)	85.79 (35.01)	90.19 (29.75)
Mother low school degree (%)	31.98 (46.76)	17.85 (38.30)
Mother medium school degree (%)	45.69 (49.94)	45.81 (49.83)
Mother high school degree (%)	22.34 (41.76)	36.34 (48.11)
Mother no tertiary degree (%)	20.81 (40.70)	20.17 (40.13)
Mother vocational training (%)	68.53 (46.56)	56.21 (49.62)
Mother college degree (%)	10.66 (30.94)	23.62 (42.48)
Mother working (%)	65.99 (47.50)	63.45 (48.17)
Pre-treatment satisfaction with family life (5-point scale)	3.99 (0.94)	4.30 (0.74)
N	197	2375

Source: Projekt Zukunft Familie 2, SOEP v31, German Census and Statistics Braunschweig.

Table 2.7: Descriptive statistics of regional characteristics (one observation equals one regional unit)

	ZF1	ZF2	SOEP control group
	(1)	(2)	(3)
Share of foreigners (%)	7.30 (0.00)	11.98 (0.00)	7.30 (5.45)
Living space (m ² per person)	43.80 (0.00)	37.96 (0.00)	43.24 (3.89)
Population density (people per km ²)	1262.20 (0.00)	3464.61 (0.00)	937.70 (1052.10)
Mean age (in years)	43.00 (0.00)	44.43 (0.00)	43.27 (1.98)
Strain ((young + old) / working age population)	55.80 (0.00)	74.42 (0.00)	59.12 (6.10)
Share of Catholics (%)	14.00 (0.00)	13.66 (0.00)	29.75 (24.21)
Share of Protestants (%)	39.60 (0.00)	42.12 (0.00)	28.33 (16.86)
Share receiving welfare (%)	18.70 (0.00)	39.31 (0.00)	15.74 (8.68)
Migration background (%)	21.40 (0.00)	49.95 (0.00)	18.49 (9.88)
Share with high school degree (%)	53.70 (0.00)	n.a. n.a.	42.24 (12.44)
Unemployment rate (%)	6.10 (0.00)	9.41 (0.00)	4.87 (2.08)
Share of women in employment (%)	74.10 (0.00)	69.51 (0.00)	75.01 (3.63)
N	1	1	874

Notes: Numbers on *Kreis*- or *Gemeinde*-level (county or municipality) depending on characteristics.
Sources: Projekt Zukunft Familie 1 & 2, SOEP v31, German Census and Statistics Braunschweig.

Table 2.8: Effects of Triple P on maternal well-being using the SOEP based control group

Difference in well-being between pre-treatment and measurement...	ZF1: IV (using experimental control group)	ZF1: Entropy balancing with SOEP control group	ZF2: Entropy balancing with SOEP control group
...directly after the treatment	0.14 (0.18)	0.10 (0.14)	0.22** (0.11)
...after 1 year	0.05 (0.16)	0.10 (0.12)	0.06 (0.11)
...after 2 years	0.19 (0.16)	0.14 (0.11)	0.12 (0.13)
...after 3 years	0.28* (0.17)	0.20* (0.11)	0.21* (0.11)
Summation index	0.20 (0.15)	0.17* (0.10)	0.19* (0.10)
N	206	320	316

Notes: Each cell shows effect sizes from one IV-regression model including covariates on pre-treatment socio-economic characteristics as described in the data section; robust standard errors in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$.

Sources: Projekt Zukunft Familie 2, SOEP v31, German Census and Statistics Braunschweig.

2.B Data Alignment of Well-being Measures between Different Data Sources

Maternal well-being measures. Both the ZF1- and ZF2-studies included a five-point scale on satisfaction with family life. The categories of the scale were *unsatisfied - rather unsatisfied - rather satisfied - fairly satisfied to very satisfied*. The SOEP uses an eleven-point scale is used (with only two labels at the extreme points: *completely unsatisfied* and *completely satisfied*). A transformation is needed in order to compare scores. Multiplying the SOEP scores by 0.4 and adding 1 results in a linear transformation. We assume that the scales represent the underlying latent variable accurately enough to use these models. Any measurement error in the scores from the ZF1- and ZF2-studies due to the reduced amount of information of the scale will be captured by the error term in the regression. Table 2.9 shows the relations between the well-being scales from the SOEP and the ZF1- and ZF2-studies as well as the transformed scale.

Due to data availability, SOEP data are from different years than the data from ZF1 and ZF2. This could bias estimates if systematic differences affect study participants differentially between the two studies. Figure 2.1 shows trajectories of general life satisfaction (as a substitute for satisfaction with family life) for the two time periods using SOEP data. This cannot be shown with our satisfaction variable, which is not available for all years. The solid line shows the trajectory for the years 2001 to 2005. This corresponds to the years in which ZF1 and ZF2 were implemented. The dashed line shows the trajectory for the years 2010 to 2014, this corresponds to the years from which the generated SOEP control group was drawn. The lines run in parallel, indicating that well-being evolves similarly over time in both time periods. As we include pre-treatment measures of the outcome variable in our models, we take the different levels into account.

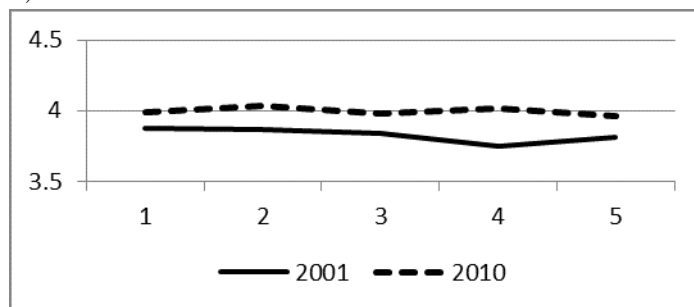
Additionally, we check if trends for satisfaction with family life are similar in the ZF1 control group and the SOEP generated control group. Figure 2.2 shows that there is a decrease in satisfaction with family life for the ZF1 control group. This trend is slightly smaller for the SOEP control group. Apparently, satisfaction with family life decreased more over time for families in Braunschweig in 2001 than it did in Germany as a whole nine years later. Using the SOEP data without further adjustment likely leads to biased estimates of the effect of program participation. As our main results show, it is possible to recover effects of the program using the SOEP generated control group when using data from regions that are similar in terms of our distance measure to the ones where the original study was conducted. Thus, we can at least partly control for factors leading to the different trajectories in figure 2.2. While not

completely establishing external validity of the study for the whole of Germany, our results indicate that Triple P can be shown to have a similar effects other populations in Germany when taking into account the variables we did.

Table 2.9: Relations between the different maternal well-being scales

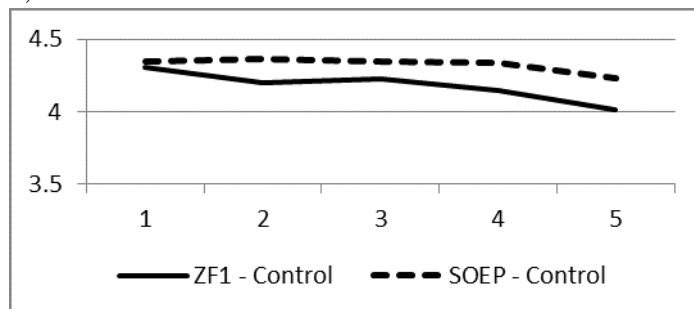
SOEP	Transformed scale	ZF1 and ZF2
0	1	1
1	1.4	
2	1.8	
-	-	2
3	2.2	
4	2.6	
5	3	3
6	3.4	
7	3.8	
-	-	4
8	4.2	
9	4.6	
10	5	5

Figure 2.1: Five-year trajectories of satisfaction with life starting in 2001 and in 2010 (SOEP)



Source: SOEP v31.

Figure 2.2: Five-year trajectories of satisfaction with life starting in 2001 and in 2010 (SOEP)



Sources: Projekt Zukunft Familie 2, SOEP v31.

2.C Entropy Balancing and Selection of Observations Based on Regional Data

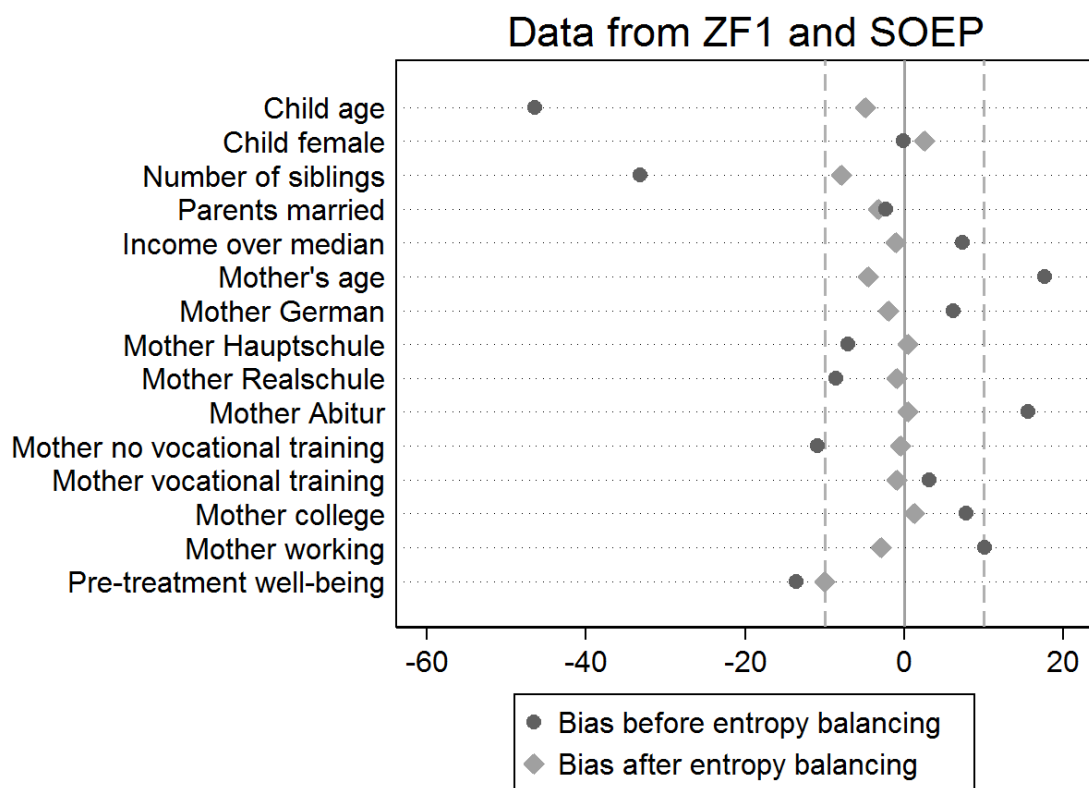
Table 2.10: Using ZF1 and SOEP, including different percentiles of SOEP participants depending on distance measure

Difference in well-being between pre-treatment and measurement...	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
...directly after the treatment	0.03 (0.12)	0.10 (0.14)	0.07 (0.13)	0.04 (0.11)	0.01 (0.10)	0.08 (0.10)	0.07 (0.10)	0.06 (0.10)	0.08 (0.10)	0.08 (0.09)
...after 1 year	0.20 (0.17)	0.10 (0.12)	0.07 (0.11)	0.08 (0.11)	0.04 (0.10)	0.07 (0.10)	0.08 (0.10)	0.05 (0.10)	0.04 (0.10)	0.03 (0.09)
...after 2 years	0.11 (0.13)	0.14 (0.11)	0.10 (0.10)	0.07 (0.10)	0.06 (0.09)	0.04 (0.09)	0.05 (0.09)	0.07 (0.09)	0.07 (0.09)	0.08 (0.09)
...after 3 years	0.24* (0.13)	0.20* (0.11)	0.14 (0.10)	0.12 (0.10)	0.13 (0.10)	0.11 (0.10)	0.12 (0.09)	0.13 (0.09)	0.14 (0.09)	0.12 (0.09)
Summation index	0.18 (0.12)	0.17* (0.10)	0.12 (0.09)	0.10 (0.09)	0.07 (0.09)	0.09 (0.09)	0.10 (0.09)	0.10 (0.09)	0.10 (0.09)	0.09 (0.08)
N	222	320	419	517	614	714	810	908	1006	1103

Notes: Each cell shows effect sizes from one model including covariates as described in the data section. Robust standard errors in parentheses. Significance level: * $p \leq 0.1$.

Sources: Projekt Zukunft Familie 1, SOEP v31, German Census and Statistics Braunschweig.

Figure 2.3: Covariate balances before and after entropy balancing - ZF1 (using 20% of SOEP observations)



Sources: Projekt Zukunft Familie 1, SOEP v31, German Census and Statistics Braunschweig.

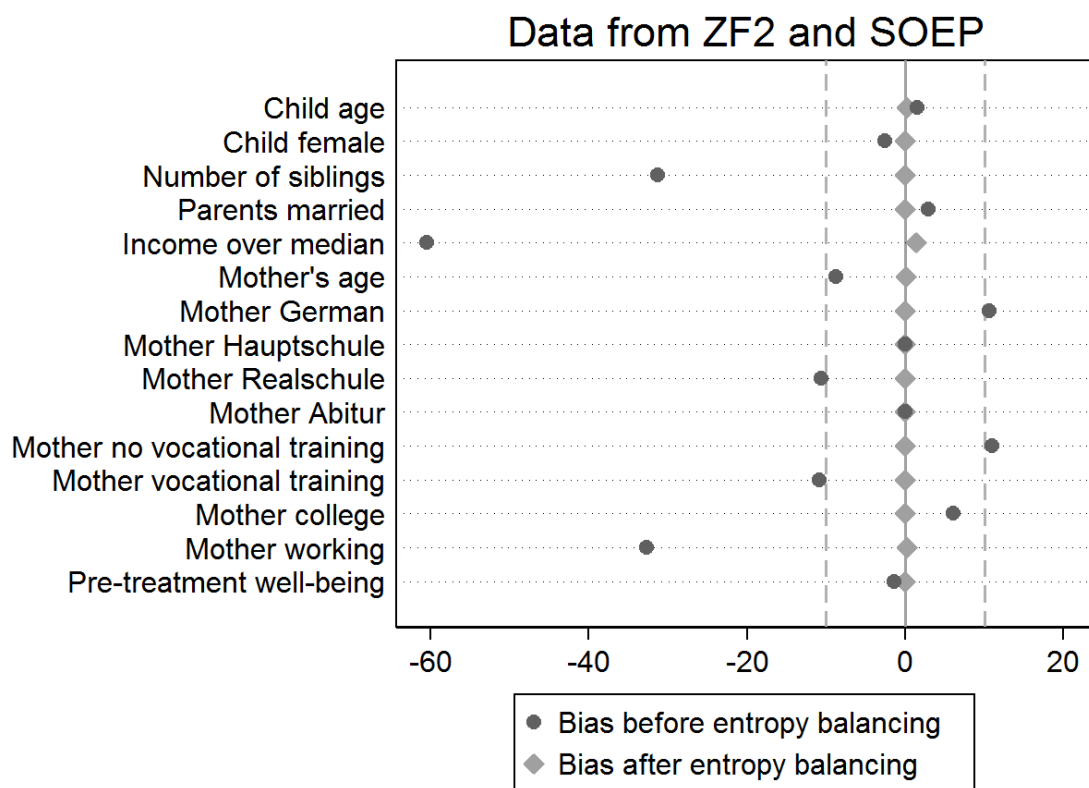
Table 2.11: Using ZF2 and SOEP, including different percentiles of SOEP participants, depending on distance measure

Difference in well-being between pre-treatment and measurement...	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
...directly after the treatment	0.12 (0.12)	0.22** (0.11)	0.20* (0.11)	0.20* (0.11)	0.22** (0.10)	0.20** (0.10)	0.19* (0.10)	0.20** (0.09)	0.21** (0.09)	0.19** (0.09)
...after 1 year	-0.02 (0.12)	0.06 (0.11)	0.04 (0.10)	0.01 (0.10)	0.03 (0.10)	0.01 (0.10)	0.03 (0.10)	0.06 (0.10)	0.06 (0.10)	0.04 (0.09)
...after 2 years	0.40** (0.17)	0.12 (0.13)	0.16 (0.12)	0.09 (0.11)	0.07 (0.11)	0.05 (0.11)	0.07 (0.11)	0.04 (0.11)	0.05 (0.10)	0.03 (0.10)
...after 3 years	0.11 (0.12)	0.21* (0.11)	0.21* (0.11)	0.17* (0.10)	0.13 (0.10)	0.12 (0.10)	0.14 (0.10)	0.12 (0.10)	0.11 (0.10)	0.10 (0.09)
Summation index	0.19 (0.12)	0.19* (0.10)	0.18* (0.10)	0.14 (0.09)	0.14 (0.09)	0.12 (0.09)	0.13 (0.09)	0.13 (0.09)	0.13 (0.09)	0.11 (0.09)
N	218	316	414	513	627	707	806	906	1002	1099

Notes: Each cell shows effect sizes from one model including covariates as described in the data section. Robust standard errors in parentheses. Significance levels: * $p \leq 0.1$, ** $p \leq 0.05$.

Sources: Projekt Zukunft Familie 2, SOEP v31, German Census and Statistics Braunschweig.

Figure 2.4: Using ZF2 and SOEP, including different percentiles of SOEP participants, depending on distance measure



Sources: Projekt Zukunft Familie 2, SOEP v31, German Census and Statistics Braunschweig.

2.D Additional Table

Table 2.12: Predicted probabilities for changes in well-being from ordered logit estimations

Difference in well-being between pre-treatment and measurement...	ZF2: Entropy balancing with SOEP control group		
	Change: -1	No change	Change: +1
...directly after the treatment	-0.07*** (0.03)	-0.04* (0.02)	0.11** (0.04)
...after 1 year	-0.02 (0.03)	-0.00 (0.01)	0.02 (0.03)
...after 2 years	-0.03 (0.03)	-0.01 (0.01)	0.04 (0.04)
...after 3 years	-0.08** (0.03)	-0.00 (0.01)	0.08** (0.03)
Summation index	-0.05 (0.03)	-0.00 (0.00)	0.05 (0.03)
N	316	316	316

Notes: Each cell shows the probability for a discrete change from the pretreatment level of well-being. Groups are collapsed to three, as described in section 6.2. Robust standard errors in parentheses. Significance levels: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Sources: Projekt Zukunft Familie 2, SOEP v31, German Census and Statistics Braunschweig.

CHAPTER 3

Information Asymmetries between Parents and Educators in German Childcare Institutions¹

3.1 Introduction

In recent years, shares of children attending early childhood education and care (ECEC) institutions have been growing across many industrialized countries. Studies on the impact of ECEC attendance point to positive effects on child development, especially in the domain of cognitive competencies, including verbal and numeric skills (for literature reviews, see e.g. Burger, 2010; Gormley Jr. et al., 2008; Auger et al., 2014; Camilli et al., 2010; Montie et al., 2008; Barnett, 2011; Ruhm and Waldfogel, 2012; Waldfogel, 2015). More generally, ECEC programs can improve school readiness, especially for disadvantaged children. Hence, such programs can decrease inequalities with respect to education and income (e.g. Havnes and Mogstad, 2011, 2015; Heckman and Raut, 2016).

However, an increasing body of research indicates that the effects of ECEC attendance depend on the quality of the interactions and the learning environment in these institutions (see e.g. Araujo et al., 2016; Bauchmüller et al., 2014; Walters, 2015; Anders et al., 2012; Dearing et al., 2009; Keys et al., 2013; Elango et al., 2015). Barnett (2011), for instance, summarizes that the effects of participating in high-quality programs on cognitive outcomes of children are much larger than for programs of average quality.

¹This chapter is joint work with Pia S. Schober (University of Tübingen, Department of Sociology) and C. Katharina Spieß. The chapter is forthcoming in the journal *Education Economics*, <https://doi.org/10.1080/09645292.2018.1463358>. The authors thank the Jacobs Foundation for supporting this research as part of the “Early Childhood Education and Care Quality in the Socio-Economic Panel (K²ID-SOEP, Project number 2013-1063)” project. The authors thank Colin Green and two anonymous referees of the journal *Education Economics*, participants of the BIEN-Jahrestagung 2016, the LERN-Jahrestagung 2016, the ESPE-2016 Conference and the SOEP-User Conference 2016 for helpful comments on earlier versions of this paper. We also thank Adam Lederer for very helpful editorial assistance.

Therefore it is important that children attend high-quality ECEC centers. With respect to ECEC quality, educational scientists mostly distinguish between structural, process and orientation quality (e.g. Kluczniok and Roßbach, 2014). These quality dimensions work together in affecting child development.

Parents usually choose which ECEC center they would like their children to attend. To choose high-quality ECEC, parents need to be able to assess and monitor the quality of these services. As parents can visit their children's ECEC centers on a daily basis, they are assumedly able to monitor quality and take action if they are not satisfied. Parents are expected to act as advocates of their children, ensuring that their early care and education experiences are adequate. ECEC professionals, including the center director and pedagogic staff, provide another perspective on ECEC center quality. Their assessments are important in enabling continuous internal monitoring of quality. Yet, parental assessments of the quality of a given classroom may well diverge from evaluations by the ECEC professionals. In general, differences in assessments between buyers and sellers of human services - in this case early childhood education and care - can be conceptualized as information asymmetries. Such asymmetries are likely to arise because these services are not experience goods and parents as consumers must trust the ECEC professionals to some extent, as they cannot entirely assess quality (e.g. Mocan, 2007).

From an economic point of view, information asymmetries may lead to low quality of service provision in a market. If parents cannot distinguish between high- and low-quality centers, they are less likely to be willing to pay higher fees (e.g. Herbst, 2016). Under this scenario, high quality centers will exit the market, average quality will fall, and eventually the market will be filled primarily with mediocre quality centers (Akerlof, 1970; Mocan, 2007; Artz and Welsch, 2014; Herbst, 2016). In Germany, as childcare fees are usually fixed (e.g. Schmitz et al., 2017), the theoretical argument is slightly different: High quality childcare is more costly for the providers and requires more effort from staff at a given resource level. If parents do not observe and enforce high quality, there is no apparent reason to increase quality above minimum standards. Moreover, enforcement of minimum quality standards may be imperfect. So even in a highly regulated market, information asymmetries can be a reason for low quality.

As mentioned above, attendance in a low-quality ECEC center is likely less beneficial for child outcomes than attendance in a high-quality center. In extreme cases, low ECEC quality may even have negative effects on child development (see e.g. Baker et al., 2008). Thus, if certain groups of parents vary in their abilities or resources to evaluate ECEC quality, this might exacerbate inequalities. If, for instance, more educated parents are better informed, their children are less likely to attend low-quality

ECEC services.² This is especially important as research shows that disadvantaged children from low educated or poor families particularly benefit from high ECEC quality. If their parents are less informed and they therefore attend ECEC centers of lower quality, education or income gaps might increase, not only in the short but also in the long run.³

In addition to leading to market failure, information asymmetries between parents and providers may be problematic per se, as they reflect a lack of communication and interaction of pedagogic staff and parents. Several previous studies provide evidence of the benefits of regular interaction between parents and centers for children's wellbeing, e.g. through more supportive parenting styles (Ansari and Gershoff, 2016), greater opportunities for physical activities (Froehlich Chow and Humbert, 2014), and lower levels of corporal punishment in such centers (Khoury-Kassabri et al., 2014). High levels of ECEC quality therefore require regular and substantial interaction of ECEC professionals with parents, which could reduce the information deficit. Thus, significant information gaps between quality assessments of parents and ECEC professionals might affect children's well-being negatively.

Only a small number of empirical papers examine information asymmetries in the market for childcare.⁴ The existing studies often focus on the US market, including an economic study by Mocan (2007) and several studies by education scientists (Cryer and Burchinal, 1997; Cryer et al., 2002; Torquati et al., 2011; Bassok et al., 2017, see the last two for an overview). These studies focus on differences in the quality ratings of parents and experts. Only a few studies (see below) have taken the quality rating of ECEC professionals into account explicitly. Their ratings seem highly relevant, as they are the most important actors for providing parents with information about quality. Moreover, it is plausible to assume that ECEC professionals are better informed about the level of quality of their services than parents. We therefore focus on information asymmetries between parents and ECEC professionals. Given the particularly high benefits of high levels of ECEC quality for children from disadvantaged backgrounds, we further investigate whether the information gaps differ by parental background.

Our findings for the highly regulated German ECEC market point to considerable information asymmetries concerning three groups of quality measures: (1) structural features; (2) educational and play activities; and (3) pedagogical focuses. In comparison to the judgments of the ECEC professionals, parents underestimate quality more

²Less educated parents who provide a lower-quality home learning environment may also assess the quality of the ECEC environment better, as it might compare favorably relative to their home environment (see Mocan, 2007).

³See e.g. Stahl et al. (2017), for an empirical study which shows that disadvantaged children receive lower-quality ECEC in Germany.

⁴For summaries, see e.g. Blau (2001), Helburn and Bergmann (2002) and Fenge and Wrede (2015).

often than they overestimate it. We derive our results from a unique data set, which allows us to compare quality assessments from parents and ECEC professionals of the same centers. We measure the information gap by comparing answers of parents with those of ECEC professionals with respect to exactly the same questions. Additionally, we introduce a theoretical observability rating of the quality measures used and verify the categorization based on our data. Indeed, the results suggest that the information gap is larger for less observable quality measures on average. Moreover, we analyze how the incidence of information gaps relates to parent and provider characteristics. We find only a few significant correlations between characteristics of parents or ECEC providers and information asymmetries. However, subgroup analyses show that lower levels of income and educational attainment are associated with higher incidences of information gaps.

3.2 The German ECEC System

In Germany, ECEC centers are heavily state-subsidized and usually charge income-dependent fees which are relatively low compared to most OECD countries (for a brief overview of the German ECEC system, see: Schober, 2014; Spiess, 1998). The OECD reports net costs of child care for a two-year-old child of a couple as 11% of average wages in Germany, while the EU average is 15% (OECD, 2015).⁵ Schröder et al. (2015) show that financial contributions by families vary somewhat due to regional variation in subsidies and fee regulations. Around 18% of families with children who attend ECEC are completely exempt from fees. In many states, fees are regulated by the state - typically determined by family income and the number of children in care (e.g. Spiess, 2008). In comparison to the US market, the German childcare market is not very competitive (e.g. Artz and Welsch, 2014), the share of for-profit providers is low at about 1% (Statistisches Bundesamt, 2016) - with most ECEC institutions operated by non-profit organizations or municipalities.

Since 1996 children aged three years and older are legally entitled to a slot in an ECEC center in Germany (e.g. Spiess, 2008). Thus, from age three onward almost all children attend formal ECEC services. The attendance rates for younger children are lower, but have been increasing from 16% in 2007 to 33% in 2015 (Statistisches Bundesamt, 2016).⁶ In the past, there were not enough places for children under three

⁵The OECD calculates this for a couple where the first earner earns 100% and the second earner earns 67% of the national average wage. The calculations use data from the year 2012 and assume full-time center-based care.

⁶However, there are considerable social disparities for this group: Children under the age of three with migration background or from low income families are significantly less likely to attend childcare (see Schober and Spiess, 2013).

years of age: demand far exceeded supply, especially in Western Germany (Wrohlich, 2008). However, two federal laws in 2005 and 2008 provided extra funding, granted prioritized access for children with parents in employment or education, and stipulated a legal right to a place in an ECEC institution for all children aged one year or older from August 2013. As a result, parents are no longer as restricted in their choice of ECEC institutions: 91% of the parents in our data report that they had a choice between at least two centers.

In Germany, each state has its own regulation for minimum standards of quality. Child-teacher ratio is one of the few indicators that are precisely, albeit differently, regulated in all states. There is significant variation across states with respect to the level of regulation in terms of other quality indicators, such as opening hours, parental fees, building requirements and maintenance and group size (e.g. Bock-Famulla et al., 2015). Moreover, all German states have implemented pedagogical guidelines (*Bildungspläne* Diskowski, 2009). However, these plans vary by state and are not mandatory in most states. Therefore, ECEC quality varies across regions and centers.

Despite a relatively high overall degree of regulation, an empirical study of ECEC quality in Germany shows that out of 188 evaluated ECEC centers for children below the age of three, the majority offers quality that can be classified as sufficient but no more. 10% of the centers were assessed as good and another 10% as insufficient (Tietze et al., 2012).⁷ Furthermore, 44% expressed concerns about the quality of ECEC centers.⁸

In Germany fees are not usually a signal of quality, given the relatively strict fee regulations in many states. There is also no overall national accreditation system like that administered by the National Association for the Education of Young Children (NAEYC) in the United States (e.g. Xiao, 2010), which consumers may use as a source of information. Furthermore, there are no Quality Rating and Improvement Systems as found in many US states (e.g. Herbst, 2016).

3.3 Previous Studies and Differences in Information Asymmetries

Most studies on information asymmetries in childcare markets focus on differences in quality ratings between parents and experts. Among the very few studies which analyze differences between parents and ECEC professionals, most look at differences in

⁷Surprisingly, several studies show that overall parents report a relatively high level of satisfaction with ECEC although this varies by quality aspects and is related to actual levels of quality as assessed by parents (Camehl et al., 2015).

⁸Own calculations based on the 2013 wave of the “Familien in Deutschland” (FiD-data), see below.

ideas and perceptions about ECEC quality (e.g. European Child Care and Education - Study Group, 1997; Pierrehumbert et al., 2002; Weaven and Grace, 2010; Harris and Tinning, 2012). To our knowledge, there is only one study which focuses on reported quality levels and also considers the ECEC professionals' assessments. The study by Barros and Leal (2015) is based on a Portuguese sample and shows that parents and ECEC professionals overestimate quality in comparison to experts but that there is a higher correlation between professionals' and experts' ratings than between parents' and professionals' ratings. Thus, they find information asymmetries but do not analyze them more in-depth. Their results imply that differences are lower for aspects which are relatively fixed such as the space available for adults in the center. They further state that parents' and ECEC professionals' ratings may be more based on what they would quality like to be than on actual observations and that parents may lack suitable reference points for assessing high quality, that is, some experience of high quality centers.

The majority of studies which investigate information asymmetries between parents and experts show that parental and experts' assessments of various dimensions of the classroom operation correlate, but that there are information asymmetries. Mocan (2007) demonstrates the existence of such information asymmetries in the US child-care market, which provide an explanation for low average quality. As in most studies of this type, the process quality of the ECEC services is rated by experts using the Early Childhood Environment Rating Scale (ECERS). An earlier study by Cryer and Burchinal (1997) for the US arrives at similar results as Mocan (2007). In a more recent study, Cryer et al. (2002) use a sample of parents of preschoolers in the US and compare this with a sample of parents in selected German states. Their findings show that in both countries parents assign substantially higher quality scores to their children's classrooms than trained observers do and that parental quality assessments are influenced by the relative importance they attribute to specific aspects of quality. The representativeness of these results may be limited, as the respective samples only consider children at specific age groups, and are limited to selected regions.⁹ A few other North American studies with similar approaches are summarized in Torquati et al. (2011), Howe et al. (2013), Bassok et al. (2017).

Independent of the ECEC system, information asymmetries of all kinds - those between parents and experts as those between parents and ECEC professionals - might be related to the observability of different ECEC quality aspects and may be more

⁹For similar studies based on Greek data, see Grammatikopoulos et al. (2014) and Rentzou and Sakellariou (2013); for a study based on a Swedish sample, see Kärby and Giota (1995). On a much smaller Canadian sample Lehrer et al. (2015) find some evidence that parents can discriminate childcare quality.

prevalent among specific groups of parents and providers. Firstly, the information gap may differ by the level of observability of different quality aspects. Parents rarely have the opportunity to spend much time in their children's classrooms observing the various quality dimensions of daily care practices. Studies indeed show that parents tend to spend relatively little time at a center - typically limited to when they drop off or pick up their children, or attend parent meetings. Most of the information that parents receive is second-hand, e.g. based on other parents' experiences, reports of their own child, the teaching and administrative staff, as well as through the materials that the child brings home, such as artwork (see Cryer et al., 2002; Artz and Welsch, 2014). Even if they do spend some time at the childcare centers, they might not have sufficient knowledge to rate the quality in ways compared to trained observers. As a result, Mocan (2007) distinguishes between aspects of services that are "easy to observe," such as opening hours, and aspects that are "difficult to observe," such as the quality of teacher-child interaction. His results, and also those by Cryer and Burchinal (1997), confirm that when parents and external experts rate the quality of easy-to-monitor aspects of care, differences in scores between parents and experts are smaller than when they rate aspects that are more difficult to monitor.¹⁰

Secondly, the information gap might differ by demand-side, parental characteristics, such as education, income and employment status. There are several empirical studies showing that there are socio-economic differences in the assessment of quality by parents (e.g. Johansen et al., 1996; Hagy, 1997; Blau and Hagy, 1998). Higher educated parents might have lower costs in searching for the right information, have better search strategies, or have better informed networks (see e.g. Meyers and Jordan, 2006). Parents working longer hours might value quality more as their children use such services longer; however, they might also have more time constraints when searching. Cryer et al. (2002) find that parents with lower educational attainment tend to rate the importance of the ECEC quality characteristics significantly higher than more highly educated respondents in both Germany and the US. Less educated parents tend to rate the quality of their children's classrooms slightly higher on the ECERS Parent Questionnaire (ECERSPQ) than parents with higher levels of education. Similarly, Mocan (2007) shows that parents with (at least some) college education assess quality more accurately than less educated parents. Parents using full-day care are more accurate in their predictions. Artz and Welsch (2014) assume that parents in high income neighborhoods have better resources for evaluating the quality of ECEC services.

¹⁰The study by Cryer et al. (2002) also shows very clearly that the information gap differs between quality measures.

Thirdly, the levels of information asymmetries may vary by the supply side characteristics of the ECEC providers. Parents might use center characteristics as predictors for quality. Centers that are under market pressure may be less able or more willing to communicate effectively with parents. Similarly, the size of the center might matter as institutionalized communication processes might require a certain minimum size of an institution. Mocan (2007) shows that the provider type has an effect on information asymmetry: parents rate the quality of public providers lower. In addition, the proportion of white children at a center is associated with a perception of higher quality, while the proportion of children whose parents receive childcare subsidies relates to lower parental quality ratings.

We analyze these three types of information asymmetries using a unique German data set. The quality aspects we analyze relate to structural features of quality for the most part as well as some aspects related to process quality. Structural features are usually defined as comprising easily observable, quantifiable and regulatable features of the ECEC context, such as group size and child-staff-ratio.

We extend previous studies by measuring the incidence of an information gap regarding various ECEC quality aspects between the buyers and the sellers as well as the size of such asymmetries. Furthermore, we examine whether information asymmetries differ between observable and unobservable aspects as well as how they relate to the socio-economic background of parents and to specific characteristics of ECEC institutions. Such an analysis allows us to investigate the extent to which consumers have difficulties in extracting information from ECEC professionals due to limited observability of quality aspects, due to socio-economic characteristics of the parents, or due to provider characteristics. Any such difficulties may result in education inequalities for the children in care. We perform this analysis for a German sample that is not restricted to particular states and we refer to a market for ECEC services that is, in comparison to the US market, much more regulated and where services for basically all children are subsidized.

3.4 Data and Methods

3.4.1 Data

Our analyses are based on a subsample of the German Socio-Economic Panel (SOEP), the SOEP-extension sample “Families in Germany” (FiD), and a SOEP-supplementary study that includes additional information from both parents and ECEC centers. All studies belong to the SOEP which is the largest and the longest-running multidisciplinary longitudinal study in Germany (Wagner et al., 2007). In 2013, 24,113 adult

members of 14,170 households participated in the study. We use the 2013 SOEP wave in conjunction with the 2013 FiD wave. FiD is a dataset that specifically surveys families with young children and also targets families that are typically under-sampled in general surveys: low income, single parents, and large families. In 2013, a total of 6,853 individuals in 3,923 households participated (Schröder et al., 2013). The structure, content and thus the variables of these two data sets are virtually identical, so they can be analyzed jointly using weighting factors. The 2013 SOEP supplementary K²ID study (see Camehl et al., 2015) includes information on the quality of facilities attended by children who lived in a SOEP or FiD household at that time.¹¹ In a first step of the K²ID project one parent of each child below school age was surveyed in order to gather information on the ECEC center their child or children attend. This includes the address of the center and parent's assessment of a large number of indicators regarding its quality.¹² The second step was to collect indicators of structural, orientation, and process quality directly from the director of each center and from the main group educator of the group attended by the SOEP/FiD-child under study.¹³ In our analysis, we only consider quality measures where information from both the parent and from the ECEC director/group educator is available. In this case, the parents and the ECEC professionals were asked identical questions.¹⁴ Given the design of our study, we thus only compare parents and ECEC centers which are linked via the attendance of the children. Depending on the quality measure, we can compare the information from 346 to 725 parents and the ECEC institution that their child attends. This relatively broad range is related to the fact that the FiD-questionnaire included a larger number of quality-related questions. For a detailed description of the new K²ID-SOEP-study, which was conducted by ourselves together with the SOEP, see Schober et al. (2017).

We compare the quality assessments of parents and ECEC professionals. We argue that none of them has particularly high incentives to inflate their perceptions. Inflated ratings might be due to parents not wanting to report that they have chosen an ECEC institution of low quality for their child. ECEC professionals might not want to report

¹¹For more information on this supplementary study see the project-homepage: www.k2id.de (accessed: September 2017).

¹²The main SOEP and FiD surveys only ask about provider type every four years and include no further information on ECEC centers.

¹³This was accomplished through postal questionnaires and telephone follow-ups and aimed at capturing the quality of the learning environment, the interactions between children and teaching staff, activities, as well as the attitudes of ECEC professionals. If respondents were unable to complete the full questionnaire, they were given the option of answering a compressed questionnaire version and, toward the end of the survey period, we also performed a phone follow-up with an even shorter version. Sample sizes vary, as not all quality aspects were covered in the shorter questionnaires.

¹⁴Appendix 3.D shows the wording of the questions which are relevant for our information gap measures.

low quality, as this implies that their work is insufficient. However, as we designed the study ourselves, we tried to minimize overreporting in both cases. Towards both actor groups, we emphasized that the study does not aim to evaluate quality of particular institutions, but rather seeks to draw general conclusions for policy makers and researchers which might improve the conditions for ECEC professionals and children. Even if overly positive ratings occurred, we would expect that the bias for both groups would go in the same direction. Moreover, we asked for perceptions with respect to many quality measures and find large variations which does not point to stringent and systematic overreporting of quality.

Parents and ECEC institutions in most of our subsamples were surveyed between October 2013 and November 2014. Our total sample includes 1,870 parents and 680 ECEC institutions. For 82% of children, the mother answered the parental questionnaire, for 18% the father did. The response rate for the parental questionnaire is reasonably high at 74%, the response rate of the institution questionnaire is also high for this type of survey at 55%. We use survey as well as non-response weights to account for selective participation in the study. These survey weights are generated using extensive information about non-respondents that is available through the SOEP general survey for all individuals that were sent the additional questionnaire (for more information on this weighting procedure, see Schober et al., 2017).

3.4.2 Definition of Information Gap

We measure the information gap using a binary variable that indicates if there is any gap. Depending on measurement scales, we construct binary gap indicators in two ways: (a) For categorical variables (existence of written pedagogical concept, the educational and play activities and pedagogical focuses), the variable takes the value one if the answers from parents and centers match and zero otherwise (C_{ij} stands for the center information, P_{ij} for the parental information, the index i for children and j for groups):

$$D_{ij} = \begin{cases} 0 & \text{if } C_{ij} \neq P_{ij} \\ 1 & \text{if } C_{ij} = P_{ij} \end{cases}$$

For continuous variables (i.e. most structural features), the gap is defined based on a threshold:

$$D_{ij} = I \left\{ \left| \frac{C_{ij} - P_{ij}}{C_{ij}} \right| \leq 0.1 \right\}$$

The threshold is set at 10% of the information provided by the ECEC center. As part of robustness checks, we also present results for the following other thresholds: exactly matching information and thresholds of 5%, 15% and 20%.

Depending on the item, the information is either provided by the director of the center or by the group educator of the child. The center director provides information on opening times and pedagogical focuses, whereas the group educator provides all other information.¹⁵ P_{ij} is the respective rating of the parent. A threshold value of 10% provides a way to deal with random errors in the evaluation from either parents or centers. In case parents indicate that they do not know the response to a specific question, the indicator is set to zero, that is we count this as a mismatch between parent and institution answer regardless of the institution answer. Alternatively, one may want to treat these answers as missing. In robustness checks, we also run our models under this assumption.

3.4.3 Quality Measures

As noted above, our quality measures mainly relate to structural features and, to a smaller degree, to process quality. If we think of a production function of educational attainment all of these measures could be considered as educational inputs, which might affect children differently depending on their parental background and thus the quality of their home learning environment. Table 3.1 lists the three groups of quality measures that we focus on. All of them are aspects of ECEC quality, as defined by education scientists. We grouped them according to other ECEC quality scales and the expertise of ECEC quality experts (see Schober et al., 2017). One grouping aspect is if ECEC policy makers can regulate and monitor the quality aspects. This is relatively easy for structural features. As part of the structural features, we also consider if a written pedagogical concept exists at all. Offers of particular education and play activities are less regulable, and more closely related to the process quality. Structural features however may affect if ECEC centers can offer particular activities. The last group of ECEC quality characteristics covers the pedagogical focus and content dimensions of the pedagogical concept, which also relates to the orientation quality of ECEC centers. For each quality aspect, we assign a degree of observability based on theoretical considerations. This measure combines the narrowly defined observability of the information and the amount of communication necessary for gaining information on a certain aspect. For aspects that are typically not directly observable by parents, we consider how much effort it likely takes for parents to acquire information regarding the respective quality aspect. For instance, information regarding activities is more likely to be regularly volunteered by children and educators than information on educational qualifications of all group educators.

¹⁵For the shortened institutional questionnaires, the institution director was asked about the child's group, thus providing all the information.

Structural features are usually defined as comprising quantifiable and regulable features of the ECEC context. They cover easily observable aspects, such as the opening hours, overall group size, and the existence of a written pedagogical concept, as well as slightly less observable aspects, such as the children-per-educator ratio and the number of educators in the group (categorized as medium observability). Finally, we consider the number of children with non-German family language in the group and the number of educators without a professional degree in ECEC as two structural aspects that can only be observed with some effort (low observability). All of these structural features are relatively easy to regulate and thus easy to address by ECEC policy makers. While for most aspects it is obvious that they may be considered inputs of educational attainment and how they contribute to an increase in ECEC quality, this might not be obvious in respect to opening hours and the number of children with non-German family language.¹⁶ Longer opening hours might support parents in combining work and family. This might contribute to an increase in household income, which might again benefit child development (e.g. Carneiro and Ginja, 2016). This applies in particular to low income households which need the income of two working parents. Moreover, disadvantaged children might benefit from longer opening hours, as this allows them to stay longer in a qualitatively better environment instead of spending more time in a home environment of poorer quality. Furthermore, the so-called dosage effect of ECEC attendance very much depends on the age of the child (e.g. Loeb et al., 2007). Regarding group composition, several studies document that a higher average level of peer abilities in an ECEC center is positively associated with children's cognitive and language skills (e.g. Stahl et al., 2017). A large proportion of children with non-German family language in ECEC centers has been shown to be negatively associated with German language acquisition of children with a non-German family language (e.g. Klein and Becker, 2017).

Another set of education inputs covers *education and play activities*, including music education, language activities, and outdoor activities. These likely differ in terms of observability. On the one hand, foreign language activities as well as painting and arts activities yield direct results that the children can show to their parents. Similarly, day-trips or excursions are usually announced to parents. We therefore categorize them as highly observable. On the other hand, observing math, science, or other daily educational activities, which are routine, is more difficult for parents and, therefore, these are categorized as medium observable.

The third group covers the *pedagogical focus* on subjects such as language, math,

¹⁶Whereas many studies find that lower child-staff ratios and higher or more specific teacher qualifications are associated with higher ECEC quality, findings for other structural characteristics such as group size, are more mixed (for a review, see Kuger et al., 2016).

motor function or health. We consider most of these items as medium observable, as parents are likely to ask about them when making their decisions about where to enroll their child. We make an exception for the foreign language activities as these usually require special training for the educators (or even cooperation with external staff) and label this aspect highly observable.

3.4.4 Parental and ECEC Institution Characteristics

The *demand side variables* capture the socio-economic background of the family, specifically maternal employment status, her educational attainment, the household's net income, as well as an indicator for migration background of the mother.

The *supply side variables* include indicators of the size of the center, whether it is run by a public provider, and the share of children exempt from fees. Furthermore, the models include a scale on the frequency of communication between parents and the institution. This variable is the mean of four items about how often certain types of communication take place, including daily conversations or parent evenings.¹⁷

Moreover, our models control for the length of time the child attends the center with respect to its daily hours and the overall period, as the information gap may decrease as parents learn more about the center's quality. We also control for the child's gender and age, if the child has a chronic disease, the number of children in the household, the gender of the parent answering the survey, the time between parental and institutional interview in days, plus regional indicators for East Germany and urban areas. We also control for the level of the quality measure as reported by the ECEC director. We test for multicollinearity of the variables and include only those that are not multicollinear. For descriptive statistics of additional variables, see table 3.5 in appendix 3.C.

3.4.5 Methods

A main contribution of this paper is the in-depth descriptive analysis of the information gap between parents and ECEC staff. To examine how information gaps relate to demand and supply side characteristics, we use logistic regression models. The existence of an information gap is estimated as follows:

$$D_{ij} = \beta X_{ij} + \gamma Z_{ij} + \delta C_{ij} + \epsilon_{ij}$$

where D_{ij} is the binary variable as specified above, X_{ij} is the vector of socio-economic and center-specific background variables, Z_{ij} is a vector of control variables including a constant term and C_{ij} is the level of quality as reported by the respective person in the

¹⁷The scales of the items range from 1 (lowest) to 6 (highest).

institution.¹⁸ ϵ_{ij} is an idiosyncratic error term, which we cluster at the group level.¹⁹ We furthermore test for nonlinearities in important SES variables and interaction effects between parental SES variables.

3.5 Results

3.5.1 Information Gaps and Observability

Initial bivariate results show that the parental and ECEC professionals' assessments are significantly different for a large share of the quality aspects (table 3.1). We focus on *structural features* first: With respect to opening hours, parents slightly underestimate the actual opening hours; however, the difference is only about 20 minutes. Parents report smaller group sizes, fewer educators for the group, and they report a larger number of non-German speaking children in the group than the ECEC professionals. If we assume that, *ceteris paribus*, quality increases with smaller groups, then in this respect parents report slightly higher levels of quality than ECEC professionals. However, if we further assume that, *ceteris paribus*, fewer educators per group and more children with a foreign family language may relate to a more difficult learning environment, then parents underestimate the quality compared to ECEC professionals (see table 3.1, column 9). Moreover, as expected based on our theoretical observability rating, a large percentage of parents report that they feel unable to provide any information on the number of non-German speaking children and the share of educators without degree, the two aspects of low observability. In addition, 46% of parents also indicate that they do not know if the centers have a written pedagogical concept, which points to information problems, as one of its inherent purposes is to inform parents.

When comparing the empirically measured information gaps with our theoretical grouping by observability, the three aspects with the highest theoretical observability, opening hours, group size and existence of written concept, show, as expected, very high shares of no information gaps (table 3.1, column 5). Of these, the degree of match for the existence of a written pedagogical concept is the lowest and relatively close to those aspects that we labeled as "medium observable." While parents tend to overestimate the quality concerning group size, a highly observable item, they tend to underestimate quality in the cases of aspects with low observability, such as the

¹⁸Controlling for the quality level reported by ECEC professionals can be interpreted as a baseline measure of quality. This is not necessarily correlated with the dependent variable, which measures if there is an information gap or not.

¹⁹In the overall sample, there are 62 groups with more than one child, 53 of which have two children. We therefore use clustered standard errors to obtain correct standard errors. However, more sophisticated models such as fixed effects are not feasible.

number of non-German speaking children in the group and the overall share of educators without a degree. The incidence of no information gap is highest with respect to the opening hours and lowest for the number of non-German speaking children, which seems plausible given that information on opening hours is easy to observe whereas the number of children with a non-German family language is not.

With respect to the *education and play activities*, four out of seven differences are statistically significant; the exceptions being “foreign language activities,” “painting/arts,” and “music education.” It may be that these activities are especially important for the parental ECEC selection processes and, thus, parents gather more information from the ECEC professionals about them. Whenever there is a significant difference, parents tend to report fewer activities than ECEC professionals, implying that they underestimate quality: While 72% of the parents report that the center offers German language support activities, the share is higher among ECEC professionals (91%). The incidence of no information gap is highest for activities such as “trips into the nature” or “painting and art activities”, both easily observable activities, while the share is lowest for less observable activities related to “math and science.” On average, 64% of parents report that math or science activities are offered, while 90% of ECEC professionals report that they offer these activities. Hence our theoretical observability grouping seems to fit reasonably well with the observed information patterns for education and play activities. The overall level of information gaps for education and play activities is lower than for the structural features. In part, this may be explained by the fact that the activities were measured on a binary rather than a continuous scale.

The incidence of no information gap is slightly lower with respect to the *pedagogical focus* than for the shares for education and play activities. One quarter of parents report that there is no pedagogical focus as opposed to only 12% of the ECEC professionals. In line with the observability grouping, the assessment of ECEC professionals and parents is mostly identical with respect to a foreign language focus. Surprisingly, parent and ECEC professional assessments also match well for a math focus. For all other types of activities, we observe between 60% and 80% of cases with no information gap. However, for only three out of eight aspects are the mean differences in the quality assessments statistically significant, as over- and underestimations offset each other for the other aspects.

3.5.2 Parental and ECEC Institution Predictors of Information Gaps

Next we present results of our multivariate analyses, which investigate how the information gaps relate to characteristics of parents and ECEC centers. Table 3.2 reports the results for the *structural features*: With respect to the opening hours the prob-

ability of no information gap is higher for mothers working full-time than for those working part-time. Thus, mothers working longer hours seem to be better informed on this quality measure, which is particularly important for them. The effect of household income is only statistical significant at the 10% level and negative, which means that higher income households have a lower probability of no information gap. Other model specifications point to a non-linear effect of household income. This effect is mainly driven by parents in the third household income quartile, who have an 18 percentage point lower probability of an information match than households in the lowest income quartile.²⁰ One explanation for this might be that for economic reasons households in the lower income quartile may have to perform more market work and thus may care more about opening hours than others. Moreover, full-time employed and non-employed mothers are less informed about the existence of a pedagogical concept than mothers working part-time. Parents with a migration background also appear to be less aware whether the ECEC center has a written pedagogical concept. We observe few statistically significant associations with respect to less observable quality characteristics with one exception: Information gaps with respect to the number of children not speaking German at home are less likely to be found among higher educated mothers. Overall, one can conclude that information asymmetries for highly observable quality measures are more frequently related to parental background than those for less observable characteristics.

We find few coherent significant associations of ECEC center characteristics with information gaps in terms of structural features. The probability of no information gap with respect to two of the most observable quality measures, opening hours and group size, is higher for public than for non-profit providers. The share of children with fee exemptions correlates negatively with the probability of no information gap in respect to the share of educators without a degree. This means that in such cases the information gap is higher. However, there is no clear pattern in terms of center characteristics being more strongly associated with gaps for more or for less observable characteristics.

Concerning other factors, such as the number of hours a child spends in ECEC and the length of tenure at a given center increase, the information gap regarding the ECEC's quality decreases. The latter is plausible as parents had more time to acquire information about quality. Also, the levels of quality reported by the ECEC professionals are significantly related to the probability of no information gap.²¹

²⁰All models were estimated with various specifications for the income variables. The results are available from the authors upon request.

²¹For the written pedagogical concept, which according to the ECEC professionals exists in 92% of the cases, the existence of such a concept is positively related to the probability of no information

Overall, demand and supply side factors appear to be of similar importance with some statistically significant relationships related to the demand and some to the supply side factors, depending from the existence of information gaps. To verify this, we estimate further models: A basic model with the control variables only, and then two further models with either adding the demand or the supply side factors. The shares of variation in the existence of no information gap explained either by demand or by supply side factors (as measured through the pseudo- R^2 of the respective models) are very similar among the models (see table 3.6 in appendix 3.C).²² Thus the group of demand and supply side variables explain about the same share of variance in existence of no information gap; in the case of the children per educator the demand side factors (and the control variables) explain 17% of the variation while the supply side factors explain 18%, in the case of a written pedagogical concept the respective shares are 31% and 25%. For selected quality measures (and respectively information gaps) we also show how the results vary when the threshold for mismatch varies (see table ?? and 3.8 in appendix 3.C). The differences in thresholds only matter for three out of six quality measures, namely the opening hours, the group size and the number of children per educator. Thus table 3.8 only presents the estimation results for the information gap of the first three quality measures. The results show that for smaller thresholds, results become less stable compared to our main specification. Changing the threshold from 10% to 20% hardly affects the results while changing them from 10% to an exact match leads to very different results. Most associations which are strongly statistically significant in our main specification do not change when using larger thresholds. We interpret this as an indicator that the results using very small thresholds are more vulnerable to measurement error.

As another robustness check, we test how the information gaps differ if we treat parents' 'don't know' answers as missing values instead of a mismatch. The results are shown in table 3.9 in appendix 3.C. The size of the information gap only changes notably in the case of the existence of a pedagogical concept, which is due to a particularly high share of parents reporting to not know if a pedagogical concept exists. Moreover, we test if our estimations change due to differences in the share of missing values. Overall, these estimations result in a loss of power and thus are difficult to compare with the main specification.²³ Particularly, the significant association be-

gap. This means that if such a concept exists, the likelihood that parents know about it is high, whereas if it does not exist, many parents still believe it does or answer that they do not know about it. In respect to the other quality levels, the interpretation is less intuitive.

²²In the appendix 3.C, we only present the example for structural features. The picture looks very similar for the group of educational and play activities and the group related to the pedagogical focus.

²³These estimations are available from the authors upon request.

tween migration background and an information gap with respect to the existence of a written pedagogical concept is affected, as many parents with migration background report to not know if a pedagogical concept exists.

Further, we investigate if the associations between SES and information gaps vary across income and education groups. We are particularly interested in exploring whether we observe education or income differences among migrants, as previous studies have shown that migrant children on average attend centers of lower quality (Stahl et al., 2017). We calculate interactions effects as described above. For mothers with a migration background, our results show that a household income below the median correlates negatively with no information gap regarding a written pedagogical concept and the number of educators. This is not the case for parents without a migration background. The interaction between migration background and low educational qualifications is not statistically significant. This might be due to too small sample sizes. Similarly, lower income correlates negatively with no information gap with respect to the share of educators without a degree only for mothers without a migration background. This result is of particular interest, as this quality measure is not easy to observe. Overall we see that lower SES parents (with respect to income and education) are more affected by an information gap - however, this varies by maternal migration background.²⁴

With respect to information gaps related to education and play activities (table 3.3), parental background factors matter for three out of the four highly observable quality measures. In particular, the knowledge of painting activities is highly influenced by demand side factors, such as household income. Parents with higher incomes have a higher probability of no information gap here. Further analyses which test a non-linear income effect show that this is mainly driven by parents in the highest income quartile. They are also better informed about trips to libraries than parents from lower income quartiles. Demand side factors are not significantly related to medium observable quality measures. No clear patterns emerge with respect to supply side factors and their relationships with quality measures of high or medium levels of observability. If the center is smaller, under pressure, or if more frequent communication with parents takes place, the probability of no information gap is greater in several cases (in respect to center size the effect sizes are not substantively significant). Very important as a predictor for information gaps related to these measures is the reported level of quality: If an activity is offered at the center, the probability of no information gap increases for almost all measures. However, as with structural quality features, overall our estimations with solely controls and demand side variables or solely supply side

²⁴This results are available from the authors upon request.

variables show now great differences in the share of variation explained by one group of factors or the other.

The information gap patterns are different with respect to the *pedagogical focus* - independent of the observability of the quality measure, they appear to depend more on demand side factors (table 3.4). Household income correlates positively with no information gap with respect to focuses on “foreign language”, “music”, “health”, and “motor functions”. Further estimations show that in two out of four cases this is driven by parents in the highest income quartile, but this effect is only weakly significant. The pattern is less clear for the others. The employment status of the mother and her education also affect the existence of an information gap. However, the direction of the associations differs by quality measures. Parents with a migration background are more likely to report that their child’s ECEC center lacks a specific focus than the center itself. In respect to the statistical significance the most important supply side predictor of the probability of no information gap is the center size, however the effect sizes are not substantively significant. For all information gaps related to pedagogical focus, we find some statistically significant relationships with parental characteristics. Although five out of eight measures of these information gaps also related to center characteristics, only one characteristic shows consistent patterns across various information gap measures.

In a final step, we test how information gaps relate to the evaluation of the quality measure by the ECEC-professionals. Figure 3.1 shows predicted probabilities of no information gap depending on the quality level reported by the ECEC-professionals for selected outcomes.²⁵ For these estimations, we rerun the multivariate logistic regression models (see table 3.2-3.4). The results can be interpreted as follows: When, for instance, the ECEC-professionals report that no written pedagogical concept exists, less than 10% of the parents give the same answer. Similarly, when the ECEC-professionals report that more educators are responsible for the group or more have no degree, the information gap increases considerably. Similar patterns emerge for some activities and pedagogical focuses. Thus, even if the ECEC professionals report less favorable quality conditions, the parents do not seem to observe them. Possibly they might have a standard ECEC center in mind with a written pedagogical concept, one, professionally trained educator per group and a focus on certain activities.

²⁵Figures for the other quality measures are available from the authors upon request.

3.6 Conclusion

In this paper, we analyze information asymmetries between the parents and ECEC professionals concerning various quality measures in the German ECEC market. We contribute to the literature by investigating information asymmetries in a highly regulated childcare system, by focusing on the perspectives of parents and ECEC professionals and by considering structural quality indicators with varying levels of observability as opposed to focusing on process quality, which is generally hard for parents to assess. The results of this study may be transferable to other universal ECEC markets with low ECEC prices and without any rating systems. We investigate how the probability of information asymmetries relates to three dimensions: (i) theoretical observability of the respective quality aspects; (ii) parental socio-economic background; and (iii) characteristics of the ECEC center. To do so, we exploit a rich data set, with information regarding parents and ECEC professionals, as well as their respective quality assessments based on identical quality measures.

With respect to structural features, information asymmetries are relatively high, ranging between 42%²⁶ and 87% mismatches between the information provided by parents and ECEC professionals. Overall, information asymmetries are lower for the existence of education and play activities than for existence of a pedagogical focus. This indicates that parents are better informed about day-to-day activities than about the relatively abstract concept of a pedagogical focus. Remarkably, we find that for most aspects, where there are significant information asymmetries, ECEC professionals report a higher level of quality than parents. This is in contrast to studies that compare parental assessments with expert ratings, which usually found parents to overestimate quality. To better understand the extent to which quality assessments not only of parents but also of ECEC professionals may be subject to bias and may contribute to inadequate information about ECEC quality for parents, future studies should further examine potential sources of biases in ECEC professionals' quality assessments of their own ECEC institutions.

Our theoretical grouping of observability suits the data reasonably well. In particular with respect to structural features and activities: information asymmetries are more likely to occur for aspects that are difficult to observe or require parental enquiry. Our findings also indicate that the socio-economic background of the parents and the characteristics of the centers matter to some degree; both groups explain a similar share of the variance in information asymmetries. For structural quality features as well as the education and play activities, we find that parental characteristics are more

²⁶Not taking into account 16% for opening times, which are not really a quality aspect from a pedagogic point of view as discussed above.

strongly associated with information gaps regarding highly observable characteristics compared to less observable ones, which seems plausible. Information gaps regarding the pedagogical focus also appear to be influenced by parental background variables even though we considered them as medium observable. Perhaps some, but not necessarily all, information about the pedagogical focus is frequently accessible to parents and some groups of parents, therefore, feel they should know about this. In addition, information gaps with respect to the pedagogical focus are also associated with center characteristics suggesting that some institutions provide more information on this aspect than others.

Interestingly the information gap frequently correlates strongly with the level of the respective quality measure. Yet the direction of the relationship varies. If ECEC professionals offer the respective education and play activities, the probability that both parents and ECEC professionals report this increases. However, if ECEC professionals report one or more types of pedagogical focus, the probability of a match between parents' and ECEC professionals' reports decreases.

With respect to information asymmetries of households that are potentially less privileged, the following findings are of particular interest: Parents with a migration background are less likely to accurately know about the existence of a written pedagogical concept and whether the ECEC centers have a pedagogical focus on German language support. These results are important as these quality features relating to language competencies are likely to be especially important for children with a migration background. Thus, one may argue that children in minority households may particularly benefit from government-provided information regarding childcare quality. Although we find no other systematic pattern for parents with lower SES, the results by other studies that they do attend ECEC centers of lower quality underlines the conclusion that they, in particular, may need some support to better assess high levels of quality.

We find considerable information gaps for most quality features. This might be an indication for a less than optimal interaction between parents and ECEC professionals, and thus might influence child well-being. Yet, overall the gaps are only moderately related to parent and center characteristics. One possible explanation may be that parents in Germany rely on ECEC sector regulations and do not feel the need to inform themselves more thoroughly - this might apply to all parents irrespective of their socio-economic background. Indeed, although the quality in the German ECEC market is mediocre according to scientific standards (Tietze et al., 2012), variation is also relatively low. Investing into gaining more information about quality may, therefore, not be optimal for many groups. This is also in line with the fact that prices are

uninformative about quality and there is no external quality rating system. Yet one may assume that more uniform quality assessments may benefit the daily interactions between parents and ECEC professionals, who are not just parties to the exchange of a service good but also actors both interested in the welfare of the children enrolled in ECEC services. In addition, one may argue that parents should advocate for higher quality services if, on average, parents assess the quality lower than the ECEC professionals.

To reduce the information gap on ECEC quality between parents and ECEC professionals and thus to improve the quality of ECEC services and ultimately child well-being, several possibilities may be considered: First, the government may set incentives for ECEC centers to provide more information to parents before they make their ECEC decision and to regularly communicate thereafter. Second, a nationwide accreditation system might help to improve the quality assessment of parents and ECEC professionals, as it helps to establish a common basis of what represents good (minimum) quality. Third, a rating system based upon the nationwide quality accreditation system might further help overcome information asymmetries between parents and ECEC professionals (see e.g. Spiess and Tietze, 2002). However, a rating system should be implemented carefully, as the US experience has shown that it might increase inequalities in the use of high ECEC quality. If these ratings systems raise ECEC costs, this may come at the cost of some children from disadvantaged households who may have to switch to informal care, while their advantaged counterparts are more likely to use ECEC services of higher quality (see e.g. Herbst, 2016). Thus, to promote children's wellbeing across socio-economic groups, it would be important to prevent childcare fees for children from disadvantaged families from rising.

Appendix

3.A Tables

This space is intentionally left blank. Table 3.1 follows on the next page.

Notes to table 3.1:

Labeling of columns:

- (1) Mean (Parent)
- (2) Mean (Provider)
- (3) Difference (1)-(2)
- (4) Standard deviation (3)
- (5) No information gap (in %)
- (6) Information by parents > information by ECEC-P (in %)
- (7) Information by parents < information by ECEC-P (in %)
- (8) Parents “don’t know” (in %)
- (9) Higher quality assessment on average by parents or ECEC-P

Notes: ¹: No clear quality judgment possible. In principle from a parent’s point of view longer hours are preferable as this increases flexibility, while this is not necessarily the case for children.

²: No clear difference between column 2 and 3.

For the following 5 items the parents could choose the answer category “don’t know” (in brackets are the respective percentage of total answers): Children per educator (4.32%), educators responsible for the group (2.22%), existence of learning curricula (30.41%), non-German speaking children (34.60%), share of educators without degree (15.35%). For these items, column (6) and (7) do not add up to the figures in column (5), see also column (8). Significance levels of t-test for equality of means from (1) and (2) in column (3):*10%, **5%, ***1%. Statistics are weighted using sampling and nonresponse weights.

Sources: SOEP v31 and K2ID-SOEP.

Table 3.1: Means of reported quality measures and differences between parental and ECEC professional (ECEC-P) information

Quality Measure	Observability (theoretical)	(1)	(2)	(3)	(4)	(5)	(6) (7) (8)			(9)	N
							Breakdown of (5)				
Structural features											
Opening times (in hours)	High	9.34	9.7	-0.35***	1.05	84.49	1.94	13.57	<i>na</i>	¹	353
Group size (# children)	High	18.8	19.73	-0.93**	7.87	58.5	15.64	25.86	<i>na</i>	Parents	647
Written pedagogical concept (in %)	High	90.43	94.06	-3.63	36.49	46.71	2.64	4.6	46.06	n.s. ²	613
Children per educator	Medium	9.01	9.24	-0.23	4.44	32.78	31.14	29.38	6.7	n.s. ²	629
# of educators responsible for group	Medium	2.99	3.27	-0.28*	1.95	49.64	20.59	26.26	3.51	ECEC-P	725
# of non-German speaking children	Low	5.02	3.8	1.22***	4	12.92	32.6	11.19	43.29	ECEC-P	685
Educators without degree (in %)	Low	20.14	14.86	5.29	33.91	37.89	21.63	16.11	24.37	n.s. ²	593
Educational and play activities (existence of the following activities)											
Painting / arts (in %)	High	93.65	92.38	1.27	35.71	87.25	7.01	5.74	<i>na</i>	n.s. ²	680
Foreign language activities (in %)	High	26.13	24.28	1.85	44.35	80.33	10.76	8.91	<i>na</i>	n.s. ²	632
Trips to libraries etc. (in %)	High	74.35	87.28	-12.93***	45.13	77.99	4.54	17.47	<i>na</i>	ECEC-P	666
Trips into nature (in %)	High	96.98	99.37	-2.39***	18.19	96.64	0.49	2.87	<i>na</i>	ECEC-P	695
Music education (in %)	Medium	73.32	78.71	-5.39	54.75	69.78	12.41	17.81	<i>na</i>	n.s. ²	659
German language activities (in %)	Medium	71.97	91.14	-19.17***	52.53	68.78	6.03	25.2	<i>na</i>	ECEC-P	620
Math / science activities (in %)	Medium	64.31	89.98	-25.67***	55.66	62.48	5.92	31.59	<i>na</i>	ECEC-P	635
Pedagogical focus											
Foreign languages (in %)	High	14.66	3.6	11.06***	36.91	85.19	12.93	1.88	<i>na</i>	Parents	461
Music (in %)	Medium	53.47	52.32	1.15	64.02	59.09	21.03	19.88	<i>na</i>	n.s. ²	461
German language (in %)	Medium	6.82	8.9	-2.07	36.37	86.76	5.59	7.66	<i>na</i>	n.s. ²	461
Math (in %)	Medium	18.43	20.41	-1.98	52.13	72.84	12.59	14.57	<i>na</i>	n.s. ²	461
Science (in %)	Medium	39.22	28.41	10.81**	61.06	61.63	24.59	13.78	<i>na</i>	Parents	461
Motor functions (in %)	Medium	46.31	44.35	1.96	65.51	57.14	22.41	20.45	<i>na</i>	n.s. ²	461
Health (in %)	Medium	22.32	17.66	4.66	49.45	75.39	14.64	9.98	<i>na</i>	n.s. ²	461
No pedagogical focus (in %)	Medium	25.46	11.47	13.99***	51.2	71.88	21.05	7.07	<i>na</i>	ECEC-P	455

Table 3.2: Logistic regression of no information gap between parent and ECEC professional assessments of structural features (1 = no information gap); marginal effects with standard errors in brackets

	Opening hours	Group size	Written peda- gogical concept	Children per edu- cator	Number of edu- cators respon- sible for group	Number of children with non- German mother tongue	Share of educa- tors without degree
Demand side							
Mother works	0.159***	0.000	-0.184**	-0.105	-0.022	-0.019	-0.008
full-time	(0.04)	(0.09)	(0.08)	(0.10)	(0.08)	(0.07)	(0.07)
Mother does	-0.015	-0.024	-0.242***	0.012	-0.016	-0.060	0.018
not work	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)	(0.05)	(0.06)
Mother has	0.101*	-0.086	0.062	0.045	0.025	0.147***	0.052
college degree	(0.06)	(0.07)	(0.07)	(0.07)	(0.06)	(0.05)	(0.06)
Mother has	0.068	-0.159*	-0.115	-0.123	-0.036	0.082	0.003
no degree	(0.08)	(0.09)	(0.10)	(0.09)	(0.08)	(0.08)	(0.08)
Household net	-0.148*	-0.038	-0.049	-0.050	-0.071	-0.034	0.074
income (log)	(0.09)	(0.08)	(0.09)	(0.08)	(0.07)	(0.05)	(0.07)
Migration	-0.095	-0.027	-0.135**	0.038	0.015	-0.054	-0.082
background	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Supply side							
Center	-0.000	0.001	-0.000	0.001	0.001**	-0.000	-0.001**
size	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Share who do	-0.013	-0.030	-0.230	-0.248	0.172	-0.068	-0.400**
not pay fees	(0.16)	(0.19)	(0.17)	(0.16)	(0.18)	(0.16)	(0.20)
Public	0.114**	0.167***	0.079	0.073	0.060	-0.014	0.035
provider	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.04)	(0.06)
Center under	0.006	-0.006	-0.010	-0.045**	-0.020	-0.004	-0.017
pressure	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Contact with	-0.108**	0.070	0.045	0.119**	-0.001	-0.014	-0.037
parents	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)	(0.04)	(0.05)
Control variables							
Attendance in	0.010***	0.004	0.007**	-0.001	-0.001	0.001	0.005
hours per week	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Attendance in	0.005**	0.003	-0.000	0.006**	0.003	0.003	0.002
months	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Level of quality	-0.093	-0.050	0.536***	0.134**	-0.414***	0.036	-0.426***
measure	(0.10)	(0.07)	(0.05)	(0.06)	(0.06)	(0.04)	(0.06)
N	298	474	448	455	529	440	412
Pseudo R^2	0.2862	0.1690	0.3195	0.1997	0.2249	0.1853	0.3054

Notes: Standard errors are clustered on the ECEC group level; Significance levels: *10%, **5%, ***1%; Estimations are weighted using sampling and nonresponse weights; additional control variables: time between parent and institution interview in days, if the mother or the father answered the questionnaire, the number of children in the household, gender and age of the child, if the child has a chronic disease, if the educator has a degree focusing on ECEC, if the educator recently participated in professional development, influence of the federal pedagogical guidelines, if the institution is organized in groups or not and indicators for East Germany and urban areas; for item nonresponse means are imputed and binary indicators added to the models.

Sources: SOEP v31 and K2ID-SOEP.

Table 3.3: Logistic regression of no information gap between parent and ECEC professional assessments of educational and play activities offered in the group (1 = no information gap); marginal effects with standard errors in brackets

	Painting, arts	Foreign lan- guages	Trips to libraries etc.	Trips into nature	Music educa- tion	German lan- guage	Math and science
Demand side							
Mother works full-time	0.022 (0.05)	-0.045 (0.06)	-0.068 (0.07)	-0.023 (0.03)	-0.052 (0.08)	0.057 (0.07)	-0.030 (0.08)
Mother does not work	0.080** (0.03)	0.008 (0.06)	0.065 (0.06)	-0.004 (0.02)	-0.006 (0.06)	-0.046 (0.07)	0.024 (0.07)
Mother has college degree	-0.072** (0.03)	0.026 (0.05)	-0.007 (0.06)	-0.016 (0.02)	-0.104 (0.07)	-0.035 (0.07)	0.078 (0.07)
Mother has no degree	-0.036 (0.03)	-0.166** (0.08)	0.031 (0.07)	0.002 (0.01)	-0.087 (0.08)	-0.003 (0.08)	0.022 (0.09)
Household net income (log)	0.087*** (0.03)	-0.027 (0.07)	0.088 (0.06)	0.031* (0.02)	-0.037 (0.07)	-0.069 (0.06)	-0.066 (0.08)
Migration background	-0.061** (0.03)	0.069 (0.06)	0.013 (0.05)	0.002 (0.02)	0.014 (0.06)	0.045 (0.06)	-0.058 (0.06)
Supply side							
Center size	-0.000 (0.00)	0.001 (0.00)	-0.001* (0.00)	-0.000 (0.00)	-0.000 (0.00)	0.000 (0.00)	-0.001* (0.00)
Share who do not pay fees	-0.039 (0.06)	0.009 (0.13)	0.346** (0.17)	-0.015 (0.03)	-0.261 (0.16)	-0.100 (0.17)	-0.388** (0.16)
Public provider	-0.056* (0.03)	-0.015 (0.05)	-0.004 (0.04)	-0.035 (0.02)	0.003 (0.06)	-0.048 (0.05)	-0.095 (0.06)
Center under pressure	-0.023** (0.01)	-0.001 (0.02)	-0.011 (0.02)	-0.011** (0.00)	-0.013 (0.02)	0.010 (0.02)	-0.036* (0.02)
Contact with parents	0.055* (0.03)	0.046 (0.05)	-0.011 (0.04)	0.027* (0.01)	-0.029 (0.06)	0.038 (0.05)	0.143*** (0.05)
Control variables							
Attendance in hours per week	0.001 (0.00)	-0.002 (0.00)	0.002 (0.00)	0.002 (0.00)	0.006 (0.00)	-0.009*** (0.00)	-0.001 (0.00)
Attendance in months	0.000 (0.00)	-0.002 (0.00)	0.003 (0.00)	0.001 (0.00)	0.002 (0.00)	0.001 (0.00)	-0.002 (0.00)
Level of quality measure	0.861*** (0.04)	-0.174*** (0.06)	0.243*** (0.09)	0.000 (.)	0.390*** (0.07)	0.284*** (0.10)	0.113 (0.10)
N	480	434	478	421	471	445	456
Pseudo R^2	0.5585	0.2028	0.2466	0.4496	0.2354	0.2880	0.2365

Notes: Standard errors are clustered on the ECEC group level; Significance levels: *10%, **5%, ***1%; Estimations are weighted using sampling and nonresponse weights; additional control variables: time between parent and institution interview in days, if the mother or the father answered the questionnaire, the number of children in the household, gender and age of the child, if the child has a chronic disease, if the educator has a degree focusing on ECEC, if the educator recently participated in professional development, influence of the federal pedagogical guidelines, if the institution is organized in groups or not and indicators for East Germany and urban areas; for item nonresponse means are imputed and binary indicators added to the models.

Sources: SOEP v31 and K2ID-SOEP.

Table 3.4: Logistic regression of no information gap between parent and ECEC professional assessments of educational and play activities offered in the group (1 = no information gap); marginal effects with standard errors in brackets.

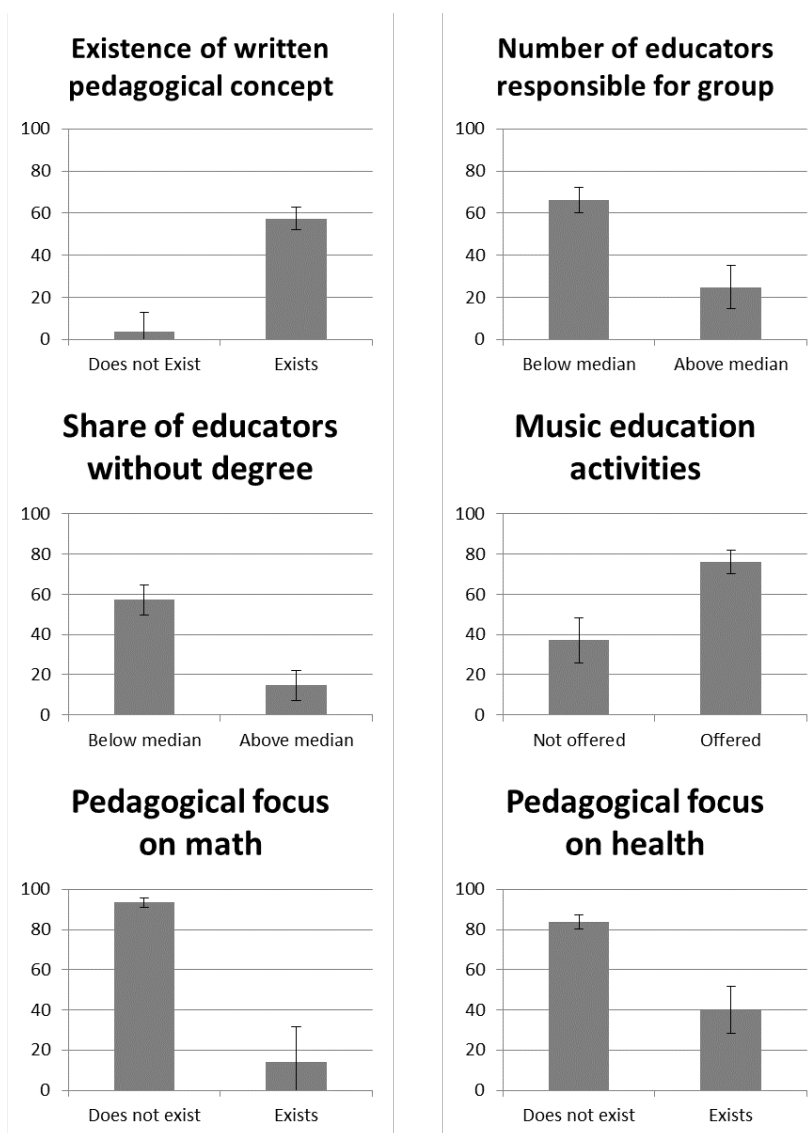
	Foreign lan- guages	Music	German lan- guage	Math	Science	Motor func- tions	Health	No special focus
Demand side								
Mother works full-time	-0.094 (0.09)	0.056 (0.10)	-0.086 (0.10)	-0.227*** (0.07)	-0.055 (0.09)	-0.132 (0.10)	-0.118 (0.09)	-0.060 (0.11)
Mother does not work	0.079 (0.06)	0.239*** (0.06)	-0.002 (0.09)	0.015 (0.03)	-0.058 (0.06)	-0.163** (0.08)	0.065 (0.05)	-0.029 (0.07)
Mother has college degree	0.002 (0.05)	-0.021 (0.07)	0.106 (0.07)	0.031 (0.03)	0.083 (0.06)	0.068 (0.08)	-0.166*** (0.05)	0.056 (0.07)
Mother has no degree	-0.046 (0.06)	-0.080 (0.09)	0.044 (0.12)	0.004 (0.06)	-0.184** (0.07)	0.266*** (0.09)	-0.135* (0.08)	0.075 (0.10)
Household net income (log)	0.212*** (0.08)	0.168** (0.08)	-0.077 (0.09)	0.005 (0.03)	-0.050 (0.06)	0.182** (0.09)	0.140** (0.06)	-0.095 (0.09)
Migration background	-0.068 (0.04)	-0.123 (0.08)	-0.170* (0.10)	0.024 (0.04)	-0.072 (0.06)	-0.126 (0.08)	0.099 (0.06)	-0.186*** (0.07)
Supply side								
Center size	-0.001* (0.00)	-0.001** (0.00)	-0.001 (0.00)	-0.001*** (0.00)	-0.000 (0.00)	0.000 (0.00)	-0.001 (0.00)	0.000 (0.00)
Share who do not pay fees	0.143 (0.14)	0.116 (0.18)	0.406 (0.26)	0.118* (0.07)	0.182 (0.14)	0.047 (0.20)	0.235** (0.10)	0.158 (0.18)
Public provider	-0.108** (0.04)	-0.096 (0.07)	-0.098 (0.07)	0.003 (0.03)	0.032 (0.05)	0.176*** (0.07)	-0.009 (0.04)	0.055 (0.07)
Center under pressure	-0.032* (0.02)	0.012 (0.02)	-0.034 (0.02)	-0.017* (0.01)	-0.001 (0.02)	0.014 (0.03)	0.026* (0.01)	-0.006 (0.02)
Contact with parents	-0.051 (0.05)	-0.161*** (0.06)	-0.038 (0.06)	-0.011 (0.03)	0.006 (0.04)	0.010 (0.06)	0.000 (0.04)	-0.088 (0.05)
Control variables								
Attendance in hours/week	0.008** (0.00)	-0.001 (0.00)	-0.001 (0.00)	-0.002 (0.00)	0.008** (0.00)	0.007 (0.01)	-0.001 (0.00)	-0.001 (0.00)
Attendance in months	-0.002 (0.00)	0.006** (0.00)	0.003 (0.00)	0.003* (0.00)	0.001 (0.00)	-0.000 (0.00)	0.009*** (0.00)	0.000 (0.00)
Level of quality measure	-0.363** (0.16)	-0.173** (0.07)	-0.061 (0.07)	-0.794*** (0.09)	-0.435*** (0.09)	-0.043 (0.07)	-0.435*** (0.06)	-0.316*** (0.12)
N	295	303	307	291	310	306	299	307
Pseudo R^2	0.4099	0.2468	0.1819	0.6205	0.3979	0.2365	0.4811	0.2264

Notes: Standard errors are clustered on the ECEC group level; Significance levels: *10%, **5%, ***1%; Estimations are weighted using sampling and nonresponse weights; additional control variables: time between parent and institution interview in days, if the mother or the father answered the questionnaire, the number of children in the household, gender and age of the child, if the child has a chronic disease, if the educator has a degree focusing on ECEC, if the educator recently participated in professional development, influence of the federal pedagogical guidelines, if the institution is organized in groups or not and indicators for East Germany and urban areas; for item nonresponse means are imputed and binary indicators added to the models.

Sources: SOEP v31 and K2ID-SOEP.

3.B Figures

Figure 3.1: Predicted probability of no information gap for selected quality measures, by quality assessment of ECEC-professionals (in %)



Notes: Probabilities predicted from logistic regression models as described above. Error bars indicate univariate 95% confidence intervals on marginal effects obtained via delta method. The horizontal axis refers to quality reports of ECEC professionals. The vertical axis indicates the percentage of cases with no information gaps.

Source: SOEP v31 and K2ID-SOEP

3.C Additional Tables

Table 3.5: Descriptive statistics of independent variables

Parental background variables		N
Mother works full-time (%)	15.63	801
Mother works part-time (%)	44.51	801
Mother does not work (%)	39.86	801
Mother college degree (%)	28.62	801
Mother vocational degree (%)	57.41	801
Mother no degree (%)	13.84	801
Household net income (mean in Euro)	3489.74	774
Migration background of the mother (%)	28.51	801
ECEC center and staff characteristics		
Center size (number of children)	83.87	761
Share who do not pay fees (%)	16.55	481
Public provider (%)	67.3	596
Center under pressure (mean, scale 1-6)	2.51	597
Contact with parents (mean, scale 1-6)	2.86	605
Educator has qualification focused on ECEC (%)	38.28	534
Educator took part in professional development on quality during last 12 months (%)	34.78	472
Educator took part in professional development (%) on cooperation with parents during last 12 months (%)	20.94	472
Share of children under 3 years in institution (%)	19.61	732
Influence of the state learning curriculum (mean, scale 1-6)	4.69	564
Control variables		
Attendance in hours per week (mean)	31.59	772
Attendance in months (mean)	20.53	798
Age of child in months (mean)	49.6	801
Mother answered parent questionnaire (%)	79.78	801
Female child (%)	43.26	801
Child had serious illness in the past (%)	41.27	634
Household in East Germany (%)	21.29	801
Household in urban area (%)	46.22	801
Days between parent and institution interviews (median)	189	801

Notes: Statistics are weighted using sampling and nonresponse weights.

Sources: SOEP v31 and K2ID-SOEP.

Table 3.6: Logistic regression of no information gap regarding structural features (1 = no information gap); marginal effects with standard errors in brackets; relative importance of different groups of covariates

	Opening hours	Group size	Written peda- gogical concept	Children per edu- cator	Number of edu- cators respon- sible for group	Number of children with non- German mother tongue	Share of educa- tors without degree
Only control variables							
Attendance in hours per week	0.010*** (0.00)	0.004 (0.00)	0.007* (0.00)	-0.002 (0.00)	-0.001 (0.00)	0.002 (0.00)	0.005 (0.00)
Attendance in months	0.004 (0.00)	0.003 (0.00)	-0.000 (0.00)	0.005* (0.00)	0.003 (0.00)	0.004* (0.00)	0.004 (0.00)
Level of quality measure	-0.038 (0.08)	-0.050 (0.07)	0.556*** (0.05)	0.134** (0.06)	-0.404*** (0.07)	0.022 (0.05)	-0.404*** (0.06)
N	298	474	448	455	529	440	412
Pseudo R^2	0.1946	0.1302	0.2315	0.1507	0.2028	0.1305	0.2434
Control variables and demand side							
Mother works full-time	0.149*** (0.04)	0.034 (0.09)	-0.204** (0.08)	-0.108 (0.10)	0.021 (0.09)	-0.030 (0.06)	-0.082 (0.08)
Mother does not work	-0.036 (0.07)	-0.019 (0.07)	-0.234*** (0.07)	0.009 (0.07)	-0.029 (0.06)	-0.063 (0.05)	0.017 (0.07)
Mother has college degree	0.111* (0.06)	-0.075 (0.07)	0.078 (0.07)	0.050 (0.07)	0.011 (0.06)	0.154*** (0.05)	0.070 (0.07)
Mother has no degree	0.040 (0.09)	-0.160* (0.09)	-0.117 (0.09)	-0.116 (0.10)	-0.047 (0.09)	0.084 (0.09)	0.004 (0.09)
Income above median	-0.161* (0.08)	-0.053 (0.08)	-0.047 (0.08)	-0.039 (0.08)	-0.079 (0.07)	-0.031 (0.05)	0.092 (0.08)
Migration background	-0.058 (0.07)	-0.029 (0.07)	-0.144** (0.06)	0.065 (0.06)	0.043 (0.06)	-0.055 (0.05)	-0.094 (0.06)
N	298	474	448	455	529	440	412
Pseudo R^2	0.2473	0.1435	0.3053	0.1696	0.2077	0.1800	0.2666
Control variables and supply side							
Center size	-0.000 (0.00)	0.001 (0.00)	-0.000 (0.00)	0.001 (0.00)	0.001* (0.00)	-0.001 (0.00)	-0.001** (0.00)
Share who do not pay fees	0.053 (0.15)	0.031 (0.19)	-0.363* (0.19)	-0.292* (0.16)	0.179 (0.18)	-0.126 (0.16)	-0.456** (0.19)
Public provider	0.113* (0.06)	0.168*** (0.06)	0.062 (0.06)	0.061 (0.06)	0.060 (0.05)	-0.008 (0.04)	0.033 (0.06)
Center under pressure	0.011 (0.02)	-0.005 (0.02)	-0.014 (0.02)	-0.049** (0.02)	-0.022 (0.02)	0.002 (0.01)	-0.013 (0.02)
Contact with parents	-0.101** (0.05)	0.057 (0.06)	0.019 (0.06)	0.107* (0.06)	-0.003 (0.06)	-0.002 (0.05)	-0.030 (0.05)
N	298	474	448	455	529	440	412
Pseudo R^2	0.2319	0.1561	0.2517	0.1819	0.2216	0.1420	0.2909

Notes to table 3.6: Standard errors are clustered on the ECEC group level; Significance levels: *10%, **5%, ***1%; Estimations are weighted using sampling and nonresponse weights; the models of the lower two panels also include the control variables attendance in hours per week, attendance in months and the level of the quality feature; additional control variables: time between parent and institution interview in days, if the mother or the father answered the questionnaire, the number of children in the household, gender and age of the child, if the child has a chronic disease, if the educator has a degree focusing on ECEC, if the educator recently participated in professional development, influence of the federal pedagogical guidelines, if the institution is organized in groups or not and indicators for East Germany and urban areas; for item nonresponse means are imputed and binary indicators added to the models.

Sources: SOEP v31 and K2ID-SOEP.

Table 3.7: Robustness tests: Share of no information gap for different thresholds (in %)

	Main specification (10 % threshold)⁺	Exact match	<i>Threshold</i>				N
			5%	15%	20%		
Opening hours	84.49	60.00	66.72	85.06	92.78	353	
Group size	58.50	26.15	37.68	69.31	77.55	647	
Children per educator	32.78	16.15	23.01	41.11	47.51	613	
Number of educators responsible for group	49.64	49.64	49.64	50.14	53.75	725	
Number of children with non-German mother tongue	12.92	11.95	12.19	13.72	17.67	685	
Share of educators without degree	37.89	37.89	37.89	37.89	38.88	593	

Notes: ⁺See table 1 column (5). Statistics are weighted using sampling and nonresponse weights. Thresholds only apply to continuous variables.

Source: SOEP v31 and K2ID-SOEP

Table 3.8: Robustness: Logistic regression of no information gap between parent and ECEC professional assessments (1 = no information gap) for selected outcomes using different thresholds; marginal effects with standard errors in brackets

	Opening hours			Group size			Children per educator		
	Main specification (10% threshold) ⁺	Exact match	20%	Main specification (10% threshold)	Exact match	20%	Main specification (10% threshold)	Exact match	20%
Demand side									
Mother works full-time	0.159*** (0.04)	0.088 (0.10)	0.041** (0.02)	0.000 (0.09)	-0.172** (0.07)	0.009 (0.06)	-0.105 (0.10)	-0.076 (0.06)	-0.010 (0.09)
Mother does not work	-0.015 (0.07)	0.023 (0.09)	-0.099** (0.05)	-0.024 (0.07)	-0.011 (0.06)	-0.067 (0.05)	0.012 (0.06)	0.092 (0.06)	0.049 (0.07)
Mother has college degree	0.101* (0.06)	-0.157* (0.08)	0.030 (0.04)	-0.086 (0.07)	0.099 (0.07)	-0.059 (0.06)	0.045 (0.07)	0.072 (0.06)	0.107 (0.07)
Mother has no degree	0.068 (0.08)	0.104 (0.10)	0.112*** (0.02)	-0.159* (0.09)	-0.038 (0.06)	-0.010 (0.06)	-0.123 (0.09)	-0.072* (0.04)	-0.024 (0.09)
Household net income (log)	-0.148* (0.09)	0.020 (0.10)	-0.058 (0.04)	-0.038 (0.08)	-0.029 (0.07)	0.033 (0.06)	-0.050 (0.08)	-0.003 (0.07)	-0.002 (0.08)
Migration background	-0.101 (0.07)	0.065 (0.08)	-0.045 (0.05)	-0.027 (0.07)	0.029 (0.06)	-0.046 (0.05)	0.038 (0.06)	0.012 (0.05)	-0.019 (0.07)
Supply side									
Center size	-0.000 (0.00)	0.001 (0.00)	0.002*** (0.00)	0.001 (0.00)	-0.000 (0.00)	0.001 (0.00)	0.001 (0.00)	0.000 (0.00)	0.001 (0.00)
Share who do not pay fees	-0.013 (0.16)	-0.046 (0.25)	0.106 (0.09)	-0.030 (0.19)	0.040 (0.13)	0.010 (0.15)	-0.248 (0.16)	0.055 (0.12)	-0.294 (0.19)
Public provider	0.119* (0.06)	0.074 (0.08)	0.113*** (0.03)	0.170*** (0.06)	0.092* (0.05)	0.152*** (0.06)	0.071 (0.06)	0.076* (0.04)	-0.002 (0.06)
Center under pressure	0.006 (0.02)	0.041 (0.03)	0.020 (0.02)	-0.006 (0.02)	-0.006 (0.02)	-0.010 (0.02)	-0.045** (0.02)	-0.025 (0.02)	-0.050** (0.02)
Contact with parents	-0.108** (0.05)	-0.103 (0.06)	-0.094** (0.04)	0.070 (0.06)	0.059 (0.05)	-0.053 (0.04)	0.119** (0.06)	0.080* (0.04)	0.044 (0.06)
Control variables									
Attendance in hours/week	0.010*** (0.00)	0.014*** (0.00)	0.003 (0.00)	0.004 (0.00)	0.000 (0.00)	0.005 (0.00)	-0.001 (0.00)	-0.001 (0.00)	-0.003 (0.00)
Attendance in months	0.005** (0.00)	-0.003 (0.00)	0.003** (0.00)	0.003 (0.00)	-0.004 (0.00)	0.003 (0.00)	0.006** (0.00)	0.001 (0.00)	0.004 (0.00)
Level of quality measure	-0.093 (0.10)	-0.303** (0.12)	-0.139 (0.10)	-0.050 (0.07)	-0.144** (0.06)	0.022 (0.05)	0.134** (0.06)	0.042 (0.05)	0.186*** (0.06)
N	298	296	298	474	472	472	455	424	455
Pseudo R^2	0.2862	0.2036	0.5235	0.1690	0.2202	0.2111	0.1997	0.2198	0.1990

Notes: ⁺ See table 1 column (5). Standard errors are clustered on the ECEC group level; Significance levels: *10%, **5%, ***1%; Estimations are weighted using sampling and nonresponse weights; additional control variables: time between parent and institution interview in days, if the mother or the father answered the questionnaire, the number of children in the household, gender and age of the child, if the child has a chronic disease, if the educator has a degree focusing on ECEC, if the educator recently participated in professional development, influence of the federal pedagogical guidelines, if the institution is organized in groups or not and indicators for East Germany and urban areas; for item nonresponse means are imputed and binary indicators added to the models.

Sources: SOEP v31 and K2ID-SOEP.

Table 3.9: Share of no information gap for different thresholds setting observations for which parents stated to not know the answer to a question to missing (in %)

	Main specification (10% threshold) including "don't know" (1)	Exact match (2)	Thresholds - excluding "don't know"				N for (2)-(5)
			5% (3)	10% (4)	15% (5)	20% (6)	
Written pedagogical concept (threshold not applicable)	58.50	86.59	n.a.	n.a.	n.a.	n.a.	386
Children per educator	32.78	17.31	24.67	35.14	44.06	50.92	593
Number of educators responsible for group	49.64	51.44	51.44	51.44	51.97	55.7	703
Number of children with non-German mother tongue	12.92	21.07	21.49	22.78	24.19	31.16	403
Share of educators without degree	37.89	50.10	50.10	50.10	50.10	51.40	479

Notes: Statistics are weighted using sampling and nonresponse weights. The table can be read as follows: The first column gives the percentage of mismatch between parents and ECEC-professionals answers using "don't know"-answers by the parents as mismatch and a 10% threshold. The next columns give the share of mismatch setting these answers to missing for different thresholds.

Sources: SOEP v31 and K2ID-SOEP.

Table 3.10: Logistic regression of no information gap between parent and ECEC professional assessment of structural features (1 = no information gap); marginal effects with standard errors in brackets; relative importance of different groups of covariates

	Opening hours	Group size	Written peda- gogical concept	Children per edu- cator	Number of edu- cators respon- sible for group	Number of children with non- German mother tongue	Share of educa- tors without degree
Only control variables							
Attendance in hours per week	0.010*** (0.00)	0.004 (0.00)	0.007* (0.00)	-0.002 (0.00)	-0.001 (0.00)	0.002 (0.00)	0.005 (0.00)
Attendance in months	0.004 (0.00)	0.003 (0.00)	-0.000 (0.00)	0.005* (0.00)	0.003 (0.00)	0.004* (0.00)	0.004 (0.00)
Level of quality measure	-0.038 (0.08)	-0.050 (0.07)	0.556*** (0.05)	0.134** (0.06)	-0.404*** (0.07)	0.022 (0.05)	-0.404*** (0.06)
N	298	474	448	455	529	440	412
Pseudo R^2	0.1946	0.1302	0.2315	0.1507	0.2028	0.1305	0.2434
Control variables and demand side							
Mother works full-time	0.149*** (0.04)	0.034 (0.09)	-0.204** (0.08)	-0.108 (0.10)	0.021 (0.09)	-0.030 (0.06)	-0.082 (0.08)
Mother does not work	-0.036 (0.07)	-0.019 (0.07)	-0.234*** (0.07)	0.009 (0.07)	-0.029 (0.06)	-0.063 (0.05)	0.017 (0.07)
Mother has college degree	0.111* (0.06)	-0.075 (0.07)	0.078 (0.07)	0.050 (0.07)	0.011 (0.06)	0.154*** (0.05)	0.070 (0.07)
Mother has no degree	0.040 (0.09)	-0.160* (0.09)	-0.117 (0.09)	-0.116 (0.10)	-0.047 (0.09)	0.084 (0.09)	0.004 (0.09)
Income above median	-0.161* (0.08)	-0.053 (0.08)	-0.047 (0.08)	-0.039 (0.08)	-0.079 (0.07)	-0.031 (0.05)	0.092 (0.08)
Migration background	-0.058 (0.07)	-0.029 (0.07)	-0.144** (0.06)	0.065 (0.06)	0.043 (0.06)	-0.055 (0.05)	-0.094 (0.06)
N	298	474	448	455	529	440	412
Pseudo R^2	0.2473	0.1435	0.3053	0.1696	0.2077	0.1800	0.2666
Control variables and supply side							
Center size	-0.000 (0.00)	0.001 (0.00)	-0.000 (0.00)	0.001 (0.00)	0.001* (0.00)	-0.001 (0.00)	-0.001** (0.00)
Share who do not pay fees	0.053 (0.15)	0.031 (0.19)	-0.363* (0.19)	-0.292* (0.16)	0.179 (0.18)	-0.126 (0.16)	-0.456** (0.19)
Public provider	0.113* (0.06)	0.168*** (0.06)	0.062 (0.06)	0.061 (0.06)	0.060 (0.05)	-0.008 (0.04)	0.033 (0.06)
Center under pressure	0.011 (0.02)	-0.005 (0.02)	-0.014 (0.02)	-0.049** (0.02)	-0.022 (0.02)	0.002 (0.01)	-0.013 (0.02)
Contact with parents	-0.101** (0.05)	0.057 (0.06)	0.019 (0.06)	0.107* (0.06)	-0.003 (0.06)	-0.002 (0.05)	-0.030 (0.05)
N	298	474	448	455	529	440	412
Pseudo R^2	0.2319	0.1561	0.2517	0.1819	0.2216	0.1420	0.2909

Notes to table 3.10: Standard errors are clustered on the ECEC group level; Significance levels: *10%, **5%, ***1%; Estimations are weighted using sampling and nonresponse weights; the models of the lower two panels also include the control variables attendance in hours per week, attendance in months and the level of the quality feature; additional control variables: time between parent and institution interview in days, if the mother or the father answered the questionnaire, the number of children in the household, gender and age of the child, if the child has a chronic disease, if the educator has a degree focusing on ECEC, if the educator recently participated in professional development, influence of the federal pedagogical guidelines, if the institution is organized in groups or not and indicators for East Germany and urban areas; for item nonresponse means are imputed and binary indicators added to the models.

Sources: SOEP v31 and K2ID-SOEP.

3.D Wording of Questions on the Perception of Quality Measures

1. Questions related to structural features

1.1 Opening times

Identical versions for ECEC professionals and parents:

What are the daily opening hours of the establishment on most days of the week?

from ____:____ to ____:____

1.2 Existence of written pedagogical concept

ECEC-professional version:

Does your facility have a written pedagogical concept / a general orientation or profile?

If so, please send us a print-out together with this questionnaire

Possible answers: yes, no

Parent version:

Does your facility have a written pedagogical concept / a general orientation or profile?

Possible answers: yes, no, do not know

1.3 Group size and number of non-German speaking children

ECEC-professional version:

Overall, how many children are currently enrolled in your group? Please also indicate how many girls, boys, children with a non-German mother tongue

Parent version:

How many children of what age are normally in the same group as your child? Can you say approximately how many children in the same group as your child speak a language other than German at home?

1.4 Children per educator and educator without degree

Identical versions for ECEC professionals and parents (apart from the do not know

option for parents):

We would now like to ask you a few questions about the approximate number of educators who are responsible for your core group.

- How many educators are responsible for this group?
- How many educators are generally present at the same time?
- How many of them have (still) not completed their training (trainees, interns, or volunteers)

2. Questions related to educational and play activities

ECEC professional version:

How often are the following activities offered to the children in your group?

⇒ These activities can be offered by educators of your institution or other persons who are not employed in your institution.

(Scale: several times a week; once a week; at least once a month; several times a year; at least once a year; activity not offered)

Parent version:

How often does your child participate in the following activities in the center?

⇒ These activities can be offered by educators of your institution or other persons who are not employed in your institution.

(Scale: several times a week; once a week; at least once a month; several times a year; at least once a year; never, even though activity is offered; activity not offered)

Identical items for ECEC professional and parents:

- Early musical education
- Painting and other artistic activities
- Development of the German language
- Opportunities to learn other languages besides German (e.g., English or French)
- Support in development of mathematical skills
- Trips to the library, museum, theater, cinema, or to a concert
- Trips into nature

To calculate the information gap we compare the answers of the ECEC professionals with the parents answers that the activities is offered (either used by the child or not) versus that it is not offered.

3. Questions related to the pedagogical focus

Identical versions for ECCE professionals and parents:

Does your facility focus on one or several special fields of activity in addition to normal pedagogic work?

A special field of activity exists when an essential portion of the facility's everyday life is used to promote this focus on a regular basis and the staff used for that purpose has the appropriate qualification. Please check where applicable. (ECEC professionals are asked to name up to three fields in maximum)

No

Yes, namely:

Speech promotion for all children (German)

Foreign languages

Mathematics

Motor skill activity/movement

Music

Natural sciences

Health

CHAPTER 4

The Effects of Early Childhood Education and Care Quality on Children’s Non-cognitive Skills¹

4.1 Introduction

One of the main benefits of early childhood education and care (ECEC) attendance lies in fostering children’s non-cognitive skills (see for example Barnett, 2011; Heckman et al., 2013). Non-cognitive skills, including personality traits as well as social and emotional skills, are competencies other than cognitive capability (such as intelligence or language skills). These skills are shown to impact a wide range of economic outcomes. For example, Deming (2017) shows the increasing importance of social skills in the labor market. Social and emotional skills are particularly relevant with regards to child development as they constitute basic skills that are considered to be most malleable during early childhood (see, for example McCrae and Costa, 1994). The literature also provides evidence for improvements of cognitive skills through ECEC, but these are sometimes not long-lasting, disappearing during the course of primary school. In contrast, effects on non-cognitive skills are usually more persistent. Among other things, high levels of non-cognitive skills are related to long-term benefits for health, education, and labor market outcomes (Almlund et al., 2011). Thus, positive effects of ECEC across many domains that are relevant from an economic perspective can be explained through improvements in non-cognitive skills.

¹I thank the German Federal Ministry of Education and Research who funded this research as part of the project “Nicht-monetäre Erträge von Bildung in den Bereichen Gesundheit, nicht-kognitive Fähigkeiten sowie gesellschaftliche und politische Partizipation” (NimoErt). I am grateful to C. Katharina Spieß, Jan Marcus, and Frauke Peter for their valuable comments on previous versions of this paper. I also thank Chris Ryan and members of the Melbourne Institute, participants of the BIEN-Jahrestagung 2017, the LERN-CIDER Workshop 2017, the Workshop on Education, Skills and Labor Market Outcomes in Osla, Norway, the 8th IWAE conference, and the 4th workshop on Education Economics in Leuven for helpful comments on earlier versions of this paper. I gratefully acknowledge helpful editorial assistance from Adam Lederer.

Much of the research establishing the aforementioned findings is based on small-scale, intensive early intervention studies in the US. Prominent examples are the Perry Preschool Program (Schweinhart et al., 2005) and the Abecedarian Project (Campbell et al., 2002). Yet, this may not be the most relevant evidence for policy makers, since it is not directly applicable to universal child care as widely implemented in many European countries. The literature on the effects of this type of child care is less conclusive. On the one hand, studies using data from Europe often detect positive, or at least, neutral effects. Notable examples are the studies by Felfe and Lalive (2012, 2018) and Bach et al. (2018) who provide evidence that, in Germany, ECEC attendance before the age of three leads to improvements in socio-emotional behavior and school readiness. Peter et al. (2016) similarly show that later entrance into ECEC leads to lower socio-emotional behavior for children in the UK. On the other hand, studies from North America find that ECEC attendance can have negative effects on children's non-cognitive outcomes. Among others, the studies by Baker et al. (2008) and Baker et al. (2015), which look at the introduction of a right to a place in child care in the Canadian province of Quebec, find generally negative effects on child behavior. One possible explanation for these differential findings might be the quality of the ECEC services, which, so far, is hardly directly analyzed in this strand of the economic literature.

Furthermore, attendance in ECEC is increasing in many countries. In the US, 67% of three to five year old children attend ECEC; in Germany the corresponding number is 97% (OECD, 2016). Therefore, from a policy perspective, to what extent ECEC has beneficial effects, in general, and whether it should be fostered, is no longer a relevant question. Rather, the focus is now on providing an ECEC environment that has the greatest beneficial effect on children (see e.g. Cascio, 2015). Additionally, there is an interest in whether ECEC can be seen as a complement or a substitute for investments in child development at home. For instance, Cornelissen et al. (2017) show that ECEC in Germany yields the highest returns for disadvantaged children. Thus, if ECEC can act as substitute, high quality care can be used to alleviate societal inequalities (see e.g. del Boca, 2015). However, for optimal implementation of such policies, it is necessary to know which quality aspects are especially important in fostering skills and, thus, investments that have the highest potential returns.

This paper adds to the literature by directly addressing the question of the effects of ECEC quality on the non-cognitive skills of children. Using a representative dataset for Germany, I examine the causal effects of specific quality features of ECEC on their prosocial behavior and personality traits. More specifically, the paper makes two main contributions: First, it is one of the first papers in the economic literature focusing on

the causal effects of ECEC quality on non-cognitive skills. Thus, it provides more detailed evidence on the effects of inputs for human capital formation, namely universal child care. Results are robust to a number of specification tests. Second, the paper analyzes the differential effects of ECEC quality with respect to parental socioeconomic background.

The paper is based on data from the German National Educational Panel Study (NEPS, for an overview see Blossfeld et al., 2011).² The analyses in this paper are based on a sub-sample of the NEPS, comprising 2,995 children attending childcare centers, who are an average of five years old at the time of the first interview. While the primary unit of observation in this part of the NEPS is the child, sampling is based on childcare centers. The affiliation of children to groups within the childcare center is also collected.³ The dataset contains data on 277 centers with 720 groups, so that on average twelve children in three groups per center are surveyed. The dataset includes data on various measures of non-cognitive skills and quality ratings of the childcare center. The set of skills included in this paper are the Strengths and Difficulties Questionnaire (SDQ, Goodman, 1997, used here to measure social skills⁴) and the Five Factor Model of personality traits (Big 5, McCrae and Costa, 1999). Measured ECEC quality comprises two subdimensions with several indicators in each: Structural quality is measured by the group size, child to teacher ratio, the education and professional development of teachers, as well as the material outfit of the group. Process quality is operationalized through indicators for activities in the group and trips outside of the center. Additionally, the dataset includes an extensive set of parental background characteristics including measures of the home environment as well interactions between parents and children.

Selection into centers with different quality levels depending on unobserved parental characteristics could lead to spurious correlations between ECEC quality and children's non-cognitive skills.⁵ At the same time, there is evidence that it is hard for parents to observe ECEC quality, especially on the group level.⁶ Nevertheless, to address po-

²Specifically, this paper uses data from the National Educational Panel Study (NEPS): Starting Cohort Kindergarten, 10.5157/NEPS:SC2:5.0.0. From 2008 to 2013, NEPS data was collected as part of the Framework Program for the Promotion of Empirical Educational Research (BMBF). As of 2014, NEPS is carried out by the Leibniz Institute for Educational Trajectories (LIfBi) at the University of Bamberg in cooperation with a nationwide Network.

³As explained in the institutional background section below, childcare centers in Germany are organized around groups which are basically equivalent to classrooms in other contexts of education.

⁴The SDQ is usually composed of five subscales, but only the one for prosocial behavior is included in the NEPS.

⁵Stahl et al. (2017) is an example showing this for Germany.

⁶See Mocan (2007) and Camehl et al. (2018).

tential selection issues, I use within center variation in quality.⁷ Even if parents can observe the quality of childcare centers, it is less likely that they also observe differences in quality between different groups within the same institution. Furthermore, many institutions have waiting lists for places and in most centers assignment to groups is carried out based on availability. That is, a child is assigned to the group that has available space. Furthermore, it seems unlikely that parents will reject an offered space in a childcare group in a center they already deemed acceptable. In addition, often specific information about the group that a child will join is not available before enrolling. Another threat to identification would be if centers would systematically change group quality by putting specific children into specific groups based on child characteristics. However, if they, for example, assign better qualified teachers to groups with children with low-non-cognitive skills to help them improve their skills, any positive effects can be interpreted as a lower bound. On the other hand, there is no reason to believe that highly qualified teachers would be specifically assigned to groups with high overall non-cognitive skill level. As the German ECEC-system is highly regulated⁸ and dominated by non-profit organizations, there is no incentive to create “elite” groups to encourage enrollment of children from certain social groups. It is also not clear if centers can observe child characteristics well enough before enrolling them into groups. The paper use these institutional features as well as the structure of the dataset to conduct a number of specification tests, among them regressions of observable child and parental characteristics on within center quality variation, placebo regressions, and the method for coefficient stability by Oster (2017). Another, methodological, issue that this paper addresses is the proliferation of statistical tests due to the multidimensionality of non-cognitive skills as well as ECEC quality features. I use different methods to adjust p-values and results are reported accordingly.

Overall, this paper provides evidence that there is a beneficial effect of the availability of materials for education and play on prosocial behavior as measured by the SDQ. The effects are around 8% of a standard deviation for a one-standard deviation change in quality. Additional analyses show that there are heterogenous effects with respect to the household income. Mostly children from households with relatively low income benefit from the availability of materials for playing and learning.

The remainder of the paper is structured as follows: Section two presents an overview of the literature. Section three provides conceptual background on the influence of

⁷This approach is similar to that employed by Ammermueller and Pischke (2009), who argue that assignment into primary school classes can be regarded as random in Germany when investigating peer effects in their paper. I argue that this is also the case for groups within childcare centers. A similar approach is also used by Araujo et al. (2016).

⁸Albeit not uniformly across all states and municipalities.

early educational investments on non-cognitive skills, the measurement of ECEC quality, and the German ECEC context. Section four describes the dataset and section five the empirical strategy. Section six presents descriptive statistics, the main results and robustness checks. Section seven concludes.

4.2 Previous Research

There is widespread acceptance in economics of the importance of early education and its ability to act as an early investment in skills (Barnett, 2011; Heckman et al., 2013). Existing research on the effects of ECEC on child outcomes is predominately based on small scale intensive early intervention studies. One important example is the Perry Preschool Program, the evaluations of which show many positive and long-term life outcomes (see e.g. Heckman et al., 2010a, 2013). One area especially emphasized in this literature are improvements in non-cognitive skills. Studies such as Heckman and Kautz (2012) and Heckman et al. (2013) attribute positive long-term effects (for example reduced prevalence of criminal behavior) of the Perry Preschool Program to improvements in non-cognitive skills like certain personality traits rather than cognitive skills. Conti et al. (2015) show reductions of risky health behavior, such as smoking by adults who took part in the Perry Preschool Program as children. In the context of labor economics, Heckman et al. (2006) show positive effects of personality traits on labor market outcomes. Heineck and Anger (2010) demonstrate this specifically for Germany. While there is substantial evidence that universal programs can have positive effects (see e.g. Havnes and Mogstad, 2011), the literature on the effects of universal ECEC provision on non-cognitive skills is growing, but less conclusive.⁹

A prominent subject for the analysis of the effects of universal ECEC on children's non-cognitive skills is a reform in the Canadian province of Quebec.¹⁰ The reform guaranteed a free full-day place in ECEC for five-year-old children and for four-year-old children for a nominal fee starting in 1997. Subsequently, the reform was expanded sequentially in yearly steps: The guarantee was then given to the parents of three-year-olds, then two-year-olds, and, ultimately all parents (see Baker et al., 2008, for a description). There is a relatively large body of research estimating intention-to-treat effects of this reform on child outcomes, and specifically, on child non-cognitive skills. Findings in Baker et al. (2008) from difference-in-difference estimations point toward harmful effects on children's aggressive, hyperactive, and insecure behavior for children aged two to three as well as family well-being. Baker et al. (2015) follow this up with outcomes of children in primary school who were affected by the reform. They also

⁹This section partly draws on a policy report published in German (Camehl, 2016).

¹⁰Data was collected as part of the National Longitudinal Survey of Children and Youth - NLSCY.

find increased behavioral problems through data on crime for young adults who were affected by the reform as children. Kottelenberg and Lehrer (2014) analyze the reform analogously, but specifically differentiate by the age of the children when the child was affected. They find that negative effects are strongest for children who were exposed to the reform before age two. For older children, the access expansion also had positive effects. Other studies on the effects of ECEC-attendance on children's non-cognitive skills for North-American countries are those by Magnuson et al. (2007), Loeb et al. (2007), and Herbst and Tekin (2010). These are all based on the Early Childhood Longitudinal Study (ECLS). Magnuson et al. (2007) investigate the effects of ECEC attendance on children's school readiness. With respect to non-cognitive skills, they specifically analyze self-control and externalizing behavior. They use a selection-on-observables (both OLS and matching methods) and an instrumental variables (IV) approach based on regional availability of child care. Overall, they find a higher degree of externalizing behavior and lower scores on self-control for children in first grade who entered ECEC before age five. Loeb et al. (2007) use a similar empirical strategy, further investigating the influence of the age of the child when they entered child care and the duration of attendance per week. Overall, they find negative effects of center-based child care on five to six year olds on a measure combining self-control, externalizing behavior, and a measure for interpersonal skills with the largest effects for children who entered before age three and small to neutral effects for those who entered later. Additionally, greater exposure in hours per week is associated with larger negative effects. Using regional variation with respect to subsidies that parents can receive for ECEC as an instrument, Herbst and Tekin (2010) find negative effects of children who had attended ECEC between the age of three and four. They attribute this to the relatively low quality ECEC-services that children received when attending because of the subsidy.

Chor et al. (2016) analyze the effects of ECEC on non-cognitive skills using a natural experiment in Australia where the state of Queensland abolished a public ECEC program. With a difference-in-difference approach, they find that ECEC attendance improves socio-emotional development for girls. Peter et al. (2016) analyze data from the Millenium Cohort Study (England) and use propensity score matching to analyze the effects of entering child care after the age of two and a half. They find negative effects of entering later on the socio-emotional development, especially for boys of low-income mothers. Goodman and Sianesi (2005) use data from the National Child Development Study, also from the UK. They use a matching approach and can differentiate between teachers and parental assessments of non-cognitive skills. Indeed, they find a positive effect of childcare attendance on teacher evaluations of social behavior

and a negative effect on parental assessments when the child attends primary school. One possible explanation is that both groups refer to different contexts during which they observe the child and, thus, both views may be valid. Apps et al. (2013) analyze, using a matching approach, data from the Longitudinal Study of Young People (LSYPE) in the UK, but find no significant differences in social skills and risky health behavior of teenagers who attended ECEC from age three onwards compared to those who did not. Two studies from Denmark (Datta Gupta and Simonsen, 2010, 2012), using the Danish longitudinal Survey of Children (DALSC) and regional availability of ECEC-services for an IV approach, also analyze the effects of center-based ECEC on children's non-cognitive skills. Datta Gupta and Simonsen (2010) find no significant effects of center based ECEC compared to family care while Datta Gupta and Simonsen (2012) report that children in primary school tend to like school more if they had previously attended ECEC.

For Germany, Felfe and Lalive (2012) use regional variation in childcare attendance rates as an instrument in a marginal treatment framework to estimate the causal effect of attending child care between age two and three. They argue that the regional variation can be interpreted as a proxy for supply of child care that is exogenous to the parents. Using survey data from the German Socio-Economic Panel Study, they find positive effects of childcare attendance, especially for children with a low socioeconomic background. In another study (Felfe and Lalive, 2018), the same authors analyze data from the school entrance examination in the German federal state of Schleswig Holstein. Using the same identification strategy as in Felfe and Lalive (2012), they find positive effects on the socio-emotional development, especially of children who were at the outset less likely to attend ECEC due to regional availability. Another study in the German context is Schlotter (2011) who, using a similar instrumental variables approach but a different dataset (the Children's Panel of the German Youth Institute), finds that earlier entrance into child care leads to higher levels of assertiveness, better ability to form friendships, and improved school readiness among children in primary school.

Yamauchi and Leigh (2011) use data on structural ECEC quality features and address interactions between quality and attendance. Specifically, they use data on the child teacher ratio, the share of qualified staff, and information on the accreditation status of a center. Using selection on observables strategies (OLS and propensity score matching), they find negative effects of attending low quality child care before the age of three on children's behavior for children aged three years in Australia. The effects are mainly driven by centers with a high child teacher ratio as an indicator for low quality. Similar to Herbst and Tekin (2010), Baker et al. (2008) and Baker et al.

(2015) argue that low quality of the services is a main factor for the negative effects they find. Specifically, Baker et al. (2008) argue that by providing low cost or free ECEC services on a large scale, quality had to be reduced, at least in the short run due to the high costs. However, data on quality features is not available to them so they cannot explicitly evaluate their effects.

There is overall little research directly on the effects of ECEC quality in universal programs on child non-cognitive skills in the economic literature. For targeted programs, a study by Walters (2015) analyzes differential effects with respect to quality. He concludes that teacher education and class size do not seem to be significantly correlated with program effectiveness in the US Head-Start program. Jensen et al. (2016) find a positive effect of experimentally improving the skills of pedagogical staff on socio-emotional development of children. The authors implement a field experiment in Denmark in which professional development activities are randomly assigned to preschool teachers. They find overall positive effects of this part of structural quality on socio-emotional development of children. An example of a study directly investigating the effects of high quality ECEC from the educational literature is Bauchmüller et al. (2014). However, they analyze effects on cognitive skills. Using an instrumental variables strategy and Danish administrative data, the study finds positive effects of staff characteristics on language test scores in grade nine. Another important study from the economics literature is Araujo et al. (2016). They analyze the effects of classroom quality on children's math and language test scores as well as on executive function (that is, self regulation skills) in a preschool setting. The study, with administrative data from Ecuador, uses within institution variation in quality, finding positive effects both cognitive and non-cognitive skills.

4.3 Institutional and Conceptual Background

4.3.1 The German ECEC-system

Children enter primary school at age six in Germany. From age three onwards, almost all children attend formal ECEC (97%, OECD, 2016). The high share of children attending an ECEC institution is legislatively supported: Federal law mandates that ECEC institutions not just support families to combine work and family life but also foster the development of children to become self-reliant and socially aware individuals.¹¹ Consequently, in 2013 a policy reform granted the right to a slot in ECEC from age one onwards. Previously, the right to a place from the age of three was in place

¹¹Kinder- und Jugendhilfegesetz, Sozialgesetzbuch VIII, §22 Absatz 2. The German original specifically refers to personality of children.

since the 1990s (see e.g. Spiess, 2008). Thus, outside of the family, ECEC institutions are the main place of learning prior to school entry in Germany. In line with this, almost all institutions are non-profit (the share of for-profit centers is around 1%, see Statistisches Bundesamt, 2011) and highly subsidized.¹² A large share is also publicly run (around 40%), with almost all other institutions are run by the six *Träger der Kinder- und Jugendhilfe*, which include churches and other charitable organizations.

In the German federal system, policy concerning ECEC is generally carried out by the individual states. Regulations concerning fees vary by state, often even by county. Due to the high degree of subsidization, fees are generally low by international standards and often determined by household income. On average, a place in an ECEC institution costs 21.5% of an average wage in Germany, the OECD average for this figure, on the other hand, is 27.2% (OECD, 2015). In general, fees are not a signal for quality in the German context.

Overall, quality is described as mediocre by professional standards (Tietze et al., 2012). At the same time, information about quality is hard to acquire *ex ante* for parents as there is not an objective rating system, as in the US (Herbst, 2016). Furthermore, while parental satisfaction with communication between parents and centers is high, parental satisfaction with their ability to influence the center is relatively low in Germany (Camehl et al., 2015). By far the most important reason for the choice of child care is the proximity to the home of the parents (Stahl et al., 2017).

ECEC institutions are usually organized in groups. Children enter groups of about 20 children and usually several teachers. Some centers do not use this type of organization and use a so-called open group structure. However, this is relatively rare, with 8.4% of centers having an open group structure at the beginning of 2011 (Statistisches Bundesamt, 2011). Groups are also often organized by age such that some groups only take in children in a certain age range, with the specific group assignments determined by the center.

4.3.2 ECEC Quality as Investments in Non-cognitive Skills

The educational literature frequently uses different subdimensions of ECEC quality (compare Vandell and Wolfe, 2000). In this paper I focus on two important dimensions: First, *structural quality* indicators are the most tangible kind of quality measures, namely aspects related to the physical environment in the institution and also the objective characteristics of teachers. Often used indicators include the child-teacher-ratio, the education of teachers, and aspects such as available space or materials for playing and learning. Second, *process quality* indicators describe the day-to-day interactions

¹²For overviews of the German ECEC system see, e.g. Schober (2014); Spiess (1998).

and activities in the ECEC context. Important scales for rating this are the ECERS (Early Childhood Environment Rating Scale, see e.g. Sylva et al., 2003), and ORCE (Observational Ratings of the Caregiving Environment, see NICHD, 1996). In the educational literature, process quality is often regarded as the most important subset of overall quality with the other subsets rather being necessary conditions for beneficial effects of ECEC-services (Tietze et al., 2012).

From an economic perspective, early investments in education are essential for skill development. In general, early development of skills facilitates later development of other skills. This is the “skills-beget-skills” argument derived from the life cycle model of skill formation by Cunha and Heckman (2007). So if a child enters school with a well-developed set of non-cognitive skills, it will be easier for them to follow the teacher and thus develop further skills. The other way around, if a child lacks basic skills, these must be acquired before, or at the same time as other skills and educational content at school. In addition, it can be argued, that early skill development is particularly relevant for non-cognitive skills. For example, there is a large body of psychological literature showing that personality traits are especially malleable early in life (McCrae and Costa, 1994). Once certain traits are set, it may be very difficult to change them.

The quality of early educational investments can easily be incorporated into models for skill development. It is especially likely that non-cognitive skills are affected by quality of early educational investments as they are relatively broad skills that are used and shaped in many contexts of everyday life. For instance, social skills could be affected by the day-to-day activities of children with each other. These activities are included in measures for process quality. Similarly, a better child teacher ratio could enable teachers to have more meaningful interactions with children that, in turn, could also improve their social skills. Thus, the overall hypothesis of this paper is that higher values on quality features of the ECEC group a child attends should have beneficial effects on development of non-cognitive skills.

4.4 Data

This paper uses data from the National Educational Panel Study (NEPS, Blossfeld et al., 2011), which is the largest longitudinal study focusing on education in Germany. Its first wave was collected in 2010 with more than 60,000 participants. These include persons across all age groups, with specific questionnaires and tests developed for eight different starting cohorts. In this paper, I focus on the participants of one particular starting cohort, namely children in child care (starting cohort 2). Sampling is based on

childcare centers, so children who do not attend such an institution are not included in the dataset. However, as mentioned above, in Germany, the vast majority of children from age of three onwards attend childcare centers, so this does not compromise representativeness of the data.

Child outcomes

Prosocial behavior. The dataset includes the subscale of the strengths and difficulties questionnaire (SDQ, Goodman, 1997) on prosocial behavior. Assessments are given by parents. The five individual items of the scale are whether the child is considerate of other people’s feelings, shares toys or other items readily with other children, is helpful if someone is hurt or upset, is kind to younger children, and volunteers frequently to help others. These five items are combined to one score by assigned zero (“not true”), one (“somewhat true”), or two points (“certainly true”). Thus, the overall score ranges from zero to ten, with higher values implying better prosocial behavior.¹³ The SDQ is widely used as a measure for non-cognitive skills in the ECEC literature, examples including Chor et al. (2016) and Jensen et al. (2016). In Germany it is also used as part of the assessment for school readiness.¹⁴ However, subscales apart from the prosocial behavior given by the parents are not included in the NEPS. Table 4.1 shows that the mean of the prosocial scale is slightly above eight points.

Personality traits. The dataset also includes assessments of the child’s personality traits by their parents from the second interview wave. Thus data on personality traits come from one year after the ones of the SDQ. These assessments were done via the Big Five personality inventory (e.g. McCrae and Costa, 1999) in a short form that is also used in other large surveys (see Rammstedt and John, 2007, for more detail). The inventory comprises scales on openness defined as the tendency to be open to new cultural or intellectual experiences; conscientiousness defined as the tendency to be organized, responsible, and hardworking; extraversion defined as the tendency to be sociable, active, assertive and to orientate one’s energies to the outer world and to other people; agreeableness defined as the tendency to act in cooperation and in an unselfish manner, and neuroticism defined as a tendency toward anxiety, insecurity, impulsiveness and vulnerability.¹⁵ The scale on neuroticism is often reversed and then referred to as emotional stability in the literature and I follow this in the analyses below. Scores for each dimension are directly provided by the NEPS and correspond to means of three underlying items, each also having an eleven-point scale. Means of the different traits are given in table 4.1.

¹³This is different to the other subscales of the SDQ, where high scores indicate behavioral problems.

¹⁴Through this, it is also used in Felfe and Lalive (2018).

¹⁵Almlund et al. (2011) includes more detailed descriptions regarding these traits and a discussion of their connection to economic outcomes.

Quality inputs

Structural quality. The dataset includes the group size, which is the number of children in the group, the child to teacher ratio, the education of the teacher indicating whether the teacher has a high school degree or not, the number of professional development activities of the teacher within the last year, and a battery of items concerning materials for playing and learning that are available to the group. All information on quality is given by the teacher responsible for the group. There are fourteen items on materials that are available to the specific group including such items as picture books and puppets.¹⁶ For each item, the teacher indicates availability on a four-point scale from “not available” to “available for all children”. A summary measure is used in the analyses, which simply is the average of the ten individual items. Thus it can be interpreted as an overall availability measure, where low availability of one group of materials can be offset by high availability in others. Means of the different subdimensions of structural quality are given in table 4.1. For the analyses, all quality indicators are recoded such that higher values constitute a better level of quality.

Process quality. Process quality is measured by two item batteries.¹⁷ One is on the frequency of group trips outside of the center. These are, for example, trips into parks or the zoo.¹⁸ The frequency of these activities is measured on a six-point scale ranging from “Never” (1) over “Once a month” (4) to “Daily” (6). The second item battery is on activities done within the group and consists of ten individual items. For example, these include singing or role-playing.¹⁹ The frequency of these activities is measured on an eight-point scale ranging from “Never” (1) over “Once a week” (5) to “Several times a day” (8). Again, in the analyses I use summary scores that are the mean of the 10 items in each battery. According to the NEPS (Bäumer and Rossbach, 2016),

¹⁶The whole set of materials is: (1) picture books; (2) material and/or fancy dresses for role plays; (3) socially stimulative material; (4) dolls, hand puppets/finger puppets; (5) building stones; (6) poetry books/songbooks; (7) music instruments; (8) drawing and writing material, (9) books or other material that support letter-to-sound-allocation; (10) books and other material that support learning of letters; (11) books for first-time readers; (12) books or material that support dealing with geometric forms and special patterns; (13) books and material that familiarize children with figures/numbers and counting; (14) material that familiarizes children with measuring. Cronbach’s alpha for this battery is 0.72, thus indicating acceptable internal consistency for the battery.

¹⁷Information is again given by the group teacher.

¹⁸The whole set of trips is: (1) trips to the museum; (2) the theater, movies, concert; (3) the library; (4) the zoo, wildlife park; (5) to forest, park, meadow, waters; (6) sports ground, gym; (7) swimming pool; (8) businesses; (9) facilities of public life; (10) farm; (11) other places. Cronbach’s alpha for this item battery is 0.62 indicating comparatively poor evidence for the internal consistency of the scale.

¹⁹The whole set of activities is: (1) use of picture books, word games; (2) comparing, sorting and collecting things; (3) use of number games, dice; (4) puzzles; (5) construction and engineering games, Lego; (6) making things, painting, doing pottery; (7) role plays, doll games, Playmobil; (8) sports activities, motor games; (9) making music, singing, dancing; (10) experiencing nature, gardening. Cronbach’s alpha for this is 0.80 indicating good internal consistency of the battery.

these dimensions are related to the ECERS (Harms et al., 1998).²⁰ Means are again given in table 4.1.²¹

Covariates and sample restrictions

Additional information for each child from the parents is also available. Covariates can be grouped into child, maternal, and family characteristics. Child characteristics comprise a child age, gender, when the child entered child care, birthweight, and indicators on whether the child was preterm or if there were any problems following birth. Maternal background characteristics comprise mother's age, her education and, job status, as well as an indicator for migration background. Family characteristics include the household income as well as measures for the home environment and family climate. The home environment scale is the mean of six items that are measured on an eight-point scale ranging from (1) "never" to (8) "several times a day".²² The family climate scale is the mean of four items on whether members of the family have close ties and cooperate for which the individual scales are measured on a five-point scale ranging from (1) "does not apply at all" to (5) "applies completely".²³ However, including this information leads to a relatively restricted sample. Based on the sampling of childcare centers, the overall number of observations in the first wave of starting cohort 2 is 2,984 children. Due to unit-nonresponse of centers or groups within centers, of these, group level data for 2,510 children is available (column 1 in table 4.1). Independently, parents were surveyed, with the parents of 2,286 children answering the questionnaire (column 2 in table 4.1). However, there is not perfect overlap between these two groups. The third column of table 4.1 shows descriptive statistics for children for whom data is available both from their parents and from their ECEC teachers. This is the sample used for the analyses of the SDQ. The fourth column give the analytical sample for analyses of the personality traits, which is lower than the sample in column three due to panel attrition. The imposed restrictions are relatively large, but according to table 4.1 they are neither related to observable characteristics of the parents nor to those of the centers. The largest differences are in the order of low single digits in percent.

²⁰These measures are also used in a paper by Becker and Schober (2017) using the same dataset.

²¹For the analyses, indicators are again recoded such that higher values constitute a better level of quality.

²²This is the reverse of the original items in the NEPS-questionnaire so that higher values correspond to a higher frequency in activities. The individual items are (1) read aloud to the child; (2) point out individual letters; (3) practice individual numbers or counting; (4) teach the child little poems, nursery rhymes or songs; (5) paint, draw, make things at home; (6) going to the library.

²³The four individual items are: (1) "in our family, we cooperate with each other really well"; (2) "we only rarely talk about our issues in our family"; (3) "in our family we tell each other what concerns us about the others"; (4) "the members of our family are close to each other emotionally".

4.5 Empirical Strategy

Identification of causal effects

Correlations between ECEC quality and child non-cognitive skills are likely unreliable as estimates of potential causal effects. The major issues that could lead to biased estimates are selection or sorting into different quality levels based on either unobserved child, parental or center characteristics. One obvious example of self-selection would be that parents who are more motivated to foster their child's skills may be more likely to choose high quality ECEC services. Furthermore, children with low scores on non-cognitive skills prior to entering child care may be more likely to receive better quality, because their parents in this case find a high quality level especially important. I argue that these channels mainly affect the selection into different centers in the German context as shown by Stahl et al. (2017), but not selection into groups.

To mitigate bias due to selection into centers, I exploit institutional factors of the German ECEC-system in combination with a comprehensive set of parental background characteristics. First, using center fixed effects will render unimportant any unobserved factors of the center that could induce parents to self-select into them. By subtracting the center mean from individual and group measures, only within center variation in quality is used for identification. Any regional characteristics will be taken into account implicitly as well by this procedure. Usability of within center variation in quality is given by the fact that the NEPS is sampled on the institution level. This means that for every institution a number of child observations is available. For most centers, data for more than one group is also available: Out of the 277 centers, 223 have more than one group. However, using within center variation in quality will only account for characteristics that are the same on the center level and, thus will not help if there is selection into groups within the center (the level on which quality is measured). As mentioned above, there is evidence that evaluating the overall level of quality of an ECEC institution is difficult for parents (among others Mocan, 2007). This seems to be true in the German context as well (Camehl et al., 2018). Therefore, I argue that differentiation between the quality levels of different groups is even harder for parents and the selection into different groups based on this should essentially be exogenous to parents. I test these assumptions for observable factors by running regressions to predict within center quality differences by observable factors.

The estimated equation to analyze the effects of each ECEC quality indicator on each indicator for children's non-cognitive skills is:

$$Y_{igc} = X_{gc}\beta + Z_{igc}\gamma + \delta_c + \epsilon_{igc}$$

where i is the index for each individual, g the index for group, and c the index for center. Y includes the non-cognitive skill measurements and X the quality measurements. Z includes deviations of covariates from center means, δ indicates center-level fixed effects. Technically, the fixed effects are included through subtracting center means as mentioned above.²⁴ The set of included covariates is given in table 4.1. Since the data is not guaranteed to have the full population of children for groups and/or centers (for example, due to unit non-response), the procedure is likely to generate measurement error which could bias estimates downward if it affects the quality measures. For the outcome variables, potential measurement error is included in the error term and, thus, does not lead to biased results under the assumption that these errors are uncorrelated with the covariates.

Checking the validity of the identification strategy

One obvious case where parents have more information on the quality of a specific center is if the attending child already has an older sibling in the center. However, this could work in both directions: Parents may be more willing to send a child to a center with relatively low quality if this is offset by lower transport and coordination costs as opposed to sending their children to different centers. Furthermore, the center may have rules for favorable acceptance of siblings of children who already attend the center. Some limited information on siblings is available in the NEPS, so I run separate models both for children without siblings as well as for those with a sibling.²⁵ Another reason for self-selection could be that parents talk to other parents and choose a center according to this information. This is also more likely for parents who already have another child in child care, adding value to the separate analyses by the number of siblings. While this possibility cannot be ruled out completely, there is evidence that this may not be a severe problem in the German context.²⁶ Furthermore, in the analytical sample of the NEPS, 82% of centers had waiting lists from which spaces in groups were filled as they became available. It seems unlikely that parents will turn down a place in an institution that they have deemed acceptable overall based on the assignment to a group while they potentially observe less about the quality of this specific group than about the overall center quality. Nevertheless, I conduct robustness checks to see whether results are the same for those parents who have their child in

²⁴When generating the means, a specific mean is generated for each individual, leaving its observation out. This comes down to calculating the mean over all other observation in the center for each person and follows the approach by Ammermueller and Pischke (2009). Results are robust to different specifications such as using simple within transformations. Center means of quality are estimated taking the mean over all available groups for the center.

²⁵There is no direct information in the dataset on which center the siblings attended.

²⁶Schober et al. (2016) report that only 3% of parents choose a center based on recommendations by other parents.

a center that has a waiting list. The argument goes as follows: If the center has a waiting list, it is more likely to be in an area with less supply than demand (at a given level of quality) and, therefore, assignment into groups is even more likely random to the parents. Furthermore, I include a comprehensive set of background variables, including the home environment as well as activities that parents undertake with their children. Stahl et al. (2017) show that children of migrants and low-educated parents in Germany experience lower ECEC quality, so these aspects should be controlled for. The home environment can be a good proxy for the overall interest or skills of parents to foster their children's skills, which should be strongly correlated with ECEC quality choices. Again, Stahl et al. (2017) show that parents with higher educational attainment rate quality as highly important for their choice of childcare center. At the same time, they have better potential to provide a beneficial home environment. The extensive background information also makes the tests for correlations between within center quality and observable characteristics a more plausible test for the main identifying assumption that within center variation is exogenous to parents.

In addition, there could be sorting into different quality levels induced by the centers. There are three possibilities: First, centers could sort low-skilled children into groups of high quality and, consequently, assign high-skilled children to low quality groups to mediate potential problems these children could have. Second, centers could do the reverse, and, lastly, centers may form groups in such a way that they are relatively similar in terms of child characteristics in order to balance the workload of the ECEC teachers. Furthermore, for the initial assignment into groups based on these reasons, it is necessary to assume that centers observe child characteristics before children enter the center. It is not clear that this is always possible for centers. Concerning the effect of quality on children's non-cognitive skills, this would lead to a bias of the effects toward zero, as children with lower non-cognitive skills would receive higher quality and vice-versa than under random assignment. To address the issue of potential non-random group formation, I conduct χ^2 -tests of independence between group membership within the center and children's observable characteristics similar to Feld and Zölitz (2015). This approach tests if the distribution of child background characteristics is independent of group status within each center. For example, if children with a migration background are systematically more likely to be in certain groups within centers, the null hypothesis of independence would be rejected.

As an additional robustness check, I conduct placebo regressions using quality to predict pre-determined child and parental characteristics such as the birthweight, if the child or mother had health problems after birth or migration background. Within center variation in quality should not affect these characteristics.

As a final robustness check, I use the method proposed by Oster (2017) to relate movements in the coefficient of determination to changes in the estimated effects. This gives an indication of how large unobserved factors would have to be to completely explain any observed correlations in the data.

Adjusting for multiple testing

Another issue to consider is the fact that to analyze the effects of quality on non-cognitive skills, a large number of hypothesis tests emerge. Counting the items in the batteries on materials, activities and trips individually, I have 34 quality features. Together with the six different outcome measures, in principle this leads to 204 hypothesis tests. Given a 10% significance level the expected value for statistically significant “results” is 20 if the data were generated completely at random. Therefore, I adjust p-values to reduce the risk to erroneously declare coefficients as statistically significant due to random variation in the data (i.e. to mitigate the “multiple-testing problem”). As a first step, I combine the scales on materials, activities, and trips into one scale as described above.²⁷ Furthermore, I adjust p-values for the results using two different methods, the Bonferroni method and the method proposed by Romano and Wolf (2005, 2016). The basic idea of the method by Bonferroni is to adjust p-values by the number of tests so that p-values give probabilities of observing the given data under the null-hypothesis taking into account that several tests were conducted.²⁸ In general, the method by Bonferroni is very conservative. However, the Big 5 personality scale was developed such that the individual scales should theoretically be independent of each other, so in this case Bonferroni is a helpful benchmark case. I do not take a stance as to the dependence structure of the different quality measures (for example, materials and activities could be negatively correlated as teachers try to compensate one with the other or positively for a group that has overall better quality), therefore taking a conservative approach has its merit.²⁹ However, there should be ample room for improvement through resampling methods that generate a multivariate distribution of the dependence structure in the data in the spirit of Romano and Wolf (2005). The basic idea is to adjust p-values only by the amount that different tests are independent from each other. If, in the most extreme case, two quality features are only different measures of one underlying factor, treating them as independent (as using the Bonferroni method would) would lead to low power and, thus, biased p-values. The bootstrap

²⁷In doing this, I hypothesize that the specific type of the educational or playing material or of the activity is less important than the overall volume of materials or activities.

²⁸In practice this just means multiplying p-values by the number of tests conducted.

²⁹There are comparatively easy to implement alternatives, such as the method by Holm (1979), that uses consecutively less strict numbers by which to multiply p-values. I also redid analyses with this method, but the improvement in power is marginal and does not lead to different results. For the sake of simplicity, I prefer the Bonferroni method.

can be used to simulate the dependence structure between the different variables, with power being gained by adjusting p-values in a data-driven way. Unfortunately, implementing this framework for a case with multiple outcome *and* multiple treatments is not straightforward. For example Heckman et al. (2010a) adjust their standard errors according to the Romano and Wolf (2005) procedure but only have a single treatment. To the best of my knowledge, there is currently no procedure outside of experimental studies (List et al., 2016) that can perfectly take into account both multiple outcomes and multiple treatments. To gain power (loosely defined as a higher probability to reject false null hypotheses), I adjust p-values by the approach by Romano and Wolf (2005, 2016); but it must be noted that these only take into account the fact that I have multiple outcomes, not that there are multiple treatments as well implying that this procedure may somewhat understate p-values.³⁰

4.6 Results

4.6.1 Descriptive Results

For using within center quality variations to identify the causal effects of quality on child non-cognitive skills to yield meaningful results, quality variations within centers must be large enough. Table 4.2 shows a decomposition of the variance of the different quality variables into within and between center variances. While, as expected, the between center variation is larger than the within variation, the latter is still a sizable share of the total variance. The lowest ratios of within to between center variation are 0.38 for the child-teacher ratio, and 0.52 for the group size; all other ratios are above 0.75. Thus, using within center quality differences seems to be a viable way to identify causal effects of quality.³¹

Concerning the within center quality variation it is possible to check if there is evidence in the data for selection into different groups within the center. To do this, table 4.3 shows correlations between the quality features and observable characteristics. The most important predictor seems to be household income with three significant coefficients on the seven quality features. However, the direction of the correlations is not coherent. While there is a positive correlation of household income with the child teacher ratio and the materials available in the group, it is negatively correlated with the education of the group teacher. Another notable correlation is the one between

³⁰As will become apparent below, both methods actually yield the same results.

³¹Karoly et al. (2013) show that for groups in childcare centers in Colorado, within center variation is 26% to 28% of total variation of process quality. The respective range here would be 35% to 74%.

the child's starting age and the child teacher ratio. This makes sense if children stay in the group into which they originally entered the center given the state regulations in Germany. Groups with younger children are obliged to have lower child teacher ratios. However, the overall number of significant relationships is 13 (out of 133) and, thus, relatively small. A simple test to put this into perspective assumes a binomial distribution of the p-values of the regressions. Imposing a 10% significance level means that the probability to observe the data at hand given that the true correlation is zero is 10%. So assuming that all correlations are truly zero would result in having 13 successes from a binomial distribution of 133 draws and a probability of 0.1. The corresponding cumulative probability is 46.16%, meaning that in roughly half the cases with a randomly generated dataset I would observe 12 or more significant correlations.

Lastly, to address the issue of potential nonrandom selection into different quality levels due to sorting into groups by the institution, I conduct χ^2 -tests for independence on the level of the institution. Since multiple groups with several children are available for every ECEC-institution in the analytical sample, I can examine if belonging to certain groups is related to observable characteristics of the children via χ^2 -tests (this is similar to the approach by Feld and Zölitz, 2015). This is also similar to the check above: Comparing the number of significant results to a binomial distribution. Since the test is done for each center and ten background variables, 2,140 separate tests emerge in this case.³² Table 4.4 shows that it is unlikely that children sort into quality levels based on their background characteristics, supporting the assumption that group assignment is random for practical purposes: Out of the 2,140 tests, 182 are statistically significant at the 10% level. The corresponding probability to observe this amount or more significant tests is 98.96%.

4.6.2 Main Results

Table 4.5 presents the results of OLS regressions of the quality features including the set of covariates described above on children's non-cognitive skills as a benchmark case. Adjusting for multiple testing, the positive correlation between materials for education and play and prosocial behavior is statistically significantly positive. Furthermore, the frequency of trips outside is statistically significantly related to lower prosocial behavior. From unadjusted p-values, the relationships between openness and the availability of materials as well as the number of professional development activities the teacher engaged in over the last year are statistically significantly related. This is also the case for the positive relationship between smaller group sizes and extraversion. However,

³²The characteristics used here are the child's gender and birthweight, ECEC entrance age, number of siblings, mother's migration background, mother's age, mother's education, if the mother works, the family climate, and the home environment.

these results should be treated as indicative evidence only.

Table 4.6 presents effect sizes of regressions using within center variation in quality. The results are relatively similar to those from the OLS regressions. The coefficients show a statistically significant positive effect (controlling for background variables and adjusted for multiple testing) of the availability of materials for education and play on prosocial behavior.³³ With respect to coefficients that are only statistically significant with unadjusted p-values, there are positive relationships of a smaller group size and extraversion as well as with the number of professional development activities that the teacher took part in during the previous year and openness. Furthermore, there is still a relatively large and negative relationship of the frequency of trips outside the center on prosocial behavior. This coefficient is somewhat puzzling, as the underlying hypothesis is that a higher number of trips means higher quality. Additional analyses show that this effect is, in fact, not linear but driven by a small number of children in groups that rarely take trips outside and, simultaneously, have comparatively high social skills. At the mean of the distribution and for those taking more trips than the average group, there is no effect of trips on prosocial behavior. Additionally there seems to be a negative relationship of the teachers' education with agreeableness, but again the results from unadjusted p-values should be treated as indicative evidence only.

With regard to the positive effects of the availability of materials for playing and learning, an additional question is through which channels this effects acts. One possibility through which high ECEC quality in general could indirectly effect skills is the home environment. Kuger et al. (2017) show that high ECEC quality in the US positively affects the home learning environment which is in turn important for child development (see, e.g. Cunha and Heckman, 2009). One could hypothesize that this is also the case in the German context. Thus, higher ECEC quality could generally improve the learning environment for children and, consequently, their non-cognitive skills. Direct effects would mean that children learn certain skills in the childcare center more easily if quality is higher within the group. This leaves the question of why there are positive effects of educational and playing materials on prosocial behavior specifically. Taking a step back and looking at the individual items of the scale for prosocial behavior is helpful in the regard. One item is that the child shares toys readily with other children. This is of course easier if the child can be sure that toys are in general readily available and that there are other options in terms of playing materials. Other items refer to social interactions, for example if the child is helpful or considerate to

³³Effect sizes are relatively small. However, this is not unusual in the literature regarding non-cognitive skills (see e.g. Anger et al., 2017).

other children. Many of the materials that comprise the quality scale refer to items that can be used together with others and thus encourage social interaction. Examples are materials for role playing or for sports activities. Indeed, Becker and Schober (2017) count the availability of materials toward process quality as they argue that these materials are specifically geared toward creating a positive learning environment as well as interactions between children and teachers.

4.6.3 Heterogeneous Effects

To further investigate the relationship between ECEC quality and child non-cognitive skills, the following section presents heterogeneous effects by family and child background characteristics. It is important to analyze these heterogeneous effects to elucidate whether ECEC quality can be regarded more as a substitute or complement for other factors influencing child development. In other words, do children from a in principle disadvantaged background profit more from high ECEC quality because it offsets these disadvantages or do children from a more advantaged environment profit more because they can make better use of the higher quality ECEC environment. Due to the fact that I find reliable main results for prosocial behavior, I show and interpret the corresponding heterogeneous effects for this outcome only.

Table 4.7 shows the effects for education and playing materials on prosocial behavior, rows refer to heterogeneous effects with respect to different characteristics. For household income educational and playing materials only have an effect statistically significantly different from zero for children who come from a household with below median household income.³⁴ This indicates that this quality feature is especially important for children from these households. A potential channel could be that households with low income cannot provide educational and playing materials at home. Thus ECEC quality can act as a substitute in this case. Also for other background characteristics (mother's education, home environment, family climate), the effects of ECEC quality are somewhat larger for children who are, in principle, disadvantaged. However, differences are not statistically significant due to lower samples sizes. On the other hand, for children who have a mother with a migration background or with a single parent, the ECEC quality indicator does not seem to lead to higher prosocial behavior. This indicates that there is no uniform pattern of the effect with respect to the SES of families. Last, the effect is only significant for children who have siblings.

³⁴The median is 3373€ net per month including all sources of income.

4.6.4 Robustness Checks

The main challenge to identifying the causal effect of ECEC-quality on child non-cognitive skills is selection into different quality centers based on unobserved parental characteristics. As described in the empirical strategy section, I conduct several robustness checks to empirically address this issue.

In the section on heterogenous results, I present estimates using only children with and without older siblings. The argument here is that parents with older children could be better informed about the quality of specific groups within centers as they have already gathered information compared to new parents who are only coming into contact with centers for the first time.³⁵ As shown in table 4.7, the effects of materials on prosocial behavior are in fact somewhat larger for children without siblings but not statistically significant. Therefore it seems unlikely that parents with several children choose higher quality groups according to better information they possess about within center quality variation.

Furthermore, I conduct regressions separately for centers that have a waiting list and those that do not. The argument here is that parents are less able to influence selection into groups within centers by quality if there is higher demand than supply as shown by the existence of waiting lists. The results for these calculations do not significantly differ from the main results.³⁶ The coefficient for the availability of educational and playing materials on prosocial behavior is 0.069 for centers without waiting lists and 0.092 for centers that have a waiting list. The argument laid out above was that parents have less choice if there are waiting lists because this is an indicator that demand for ECEC is higher than supply. If there is significant selection into different quality groups based on unobserved parental characteristics, the coefficient for those centers where supply is larger (i.e. those without a waiting list) should also be larger which is not the case here.

Next, as a further robustness check, I conduct placebo regressions of the treatment variables on other characteristics that should be, in principle, independent of them. The characteristics are chosen such that they should be predetermined with respect to ECEC quality. Note that this is different from the predictions of quality by socioeconomic background presented above. While these models provide evidence that quality is unrelated to socioeconomic background, placebo regressions provide evidence that there are no spurious correlations between quality and other observable characteristics. Table 4.8 shows evidence of this.

³⁵On the other hand, one could argue that parents with only one child are more flexible in their ECEC choice and can, therefore, choose higher quality. However, this should mainly be related to selection into centers, not groups within centers.

³⁶No extra table is shown for this result, but it is available upon request.

The identification above rests on the assumption that within center variations in quality are exogenous given the set of control variables. Using the method proposed by Oster (2017), I assess how important other, unobserved, characteristics would have to be compared to observed characteristics to render the results insignificant. Table 4.9 shows the corresponding results. The basic model only includes the quality indicators and yields an R^2 of 1%. When including all covariates and fixed effects, the model explains 15.77% of the variation in children’s non-cognitive skills. Considering this movement in R^2 , unobserved factors would have to be roughly four times as important as observed characteristics. Overall, the results imply that unobserved factors would have to be substantial compared to all factors already included in the model which comprise all unobserved characteristics of the institution as well as comprehensive background characteristics of the family of each child.

4.7 Conclusion

In this paper, I analyze the effect of ECEC quality on child non-cognitive skills. I study the effects of structural and process quality features on children’s prosocial behavior and their personality traits. The analyses are based on the National Educational Panel Study, a large and representative German longitudinal survey.

My identification strategy rests on the assumption that assignment into groups within an ECEC institution is plausibly exogenous. Identification of the causal effects of quality on non-cognitive skills, thus, is achieved by using within center variation in quality indicators. Consequently, I estimate these models by fixed effects that take into account unobserved characteristics of the institution and its region. Two *ex ante* tests support this identification strategy: There seems to be no selection into different quality groups and no sorting by parental background characteristics. Findings suggest that certain ECEC quality features can have beneficial effects on children’s non-cognitive skills. In particular, the SDQ subscale for prosocial behavior, as assessed by the parents, is positively affected by materials that are available in the group. The validity of this finding is supported by robustness checks: Placebo regressions of ECEC quality on predetermined characteristics yield insignificant results. Furthermore, analyses of R^2 -movements as suggested by Oster (2017) indicate that unobserved characteristics would have to be much more influential compared to the included fixed effects and comprehensive set of covariates. With respect to heterogeneities, I find evidence that the positive effects of availability of materials are larger for more disadvantaged children with respect to the household income. On the other hand, the effect seems to be larger for children from mother’s without a migration background as well as those who

live with both parents.

Structural quality features such as the material outfit of an ECEC institution are relatively easy to regulate compared to process quality features. The results of this paper suggest that increasing certain structural quality features, for example through improved standards, may be a viable way to foster children's non-cognitive skills.

Appendix

4.A Tables

Table 4.1: Descriptive statistics and sample selection

	Sample: All available centers (1)	Sample: All available parents (2)	Both parents and centers (3)	Analytical sample: SDQ (4)	Analytical sample: Big 5 (5)
Non-cognitive skills					
Prosocial behaviour (scale 0-10)	-	8.32	8.31	8.32	8.30
Openness (scale 0-10)	-	8.14	8.14	8.16	8.15
Conscientiousness (scale 0-10)	-	6.16	6.18	6.14	6.14
Extraversion (scale 0-10)	-	8.08	8.09	8.07	8.07
Agreeableness (scale 0-10)	-	5.77	5.77	5.75	5.76
Emotional Stability (scale 0-10)	-	6.41	6.42	6.42	6.41
ECEC quality					
Group size	20.56	-	20.67	20.77	20.89
Child teacher ratio	13.39	-	13.52	13.11	13.24
Teachers' education (high / low)	36.56	-	37.10	37.96	37.73
Prof. development (count)	2.00	-	2.02	2.05	2.02
Materials (scale 1-3)	1.63	-	1.63	1.62	1.62
Trips (scale 1-6)	2.25	-	2.25	2.23	2.23
Activities (scale 1-8)	7.11	-	7.13	7.13	7.13
Control variables					
Female (%)	-	49.83	50.57	49.58	50.08
Child age	-	5.21	5.20	5.20	5.20
Age child entered ECEC	-	2.63	2.64	2.66	2.65
Number of siblings	-	1.18	1.18	1.17	1.17
Birthweight (in grams)	-	3342	3340	3345	3353
Preterm (%)	-	11.07	11.07	10.83	10.38
Problems after birth (%)	-	14.27	13.84	13.38	12.66
Single parent (%)	-	21.09	21.32	21.02	18.88
Mother's age	-	35.86	35.80	35.86	36.27
Mother's education (years)	-	13.74	13.73	13.72	13.86
Mother works fulltime (%)	-	15.17	15.72	15.34	15.67
Mother works parttime (%)	-	42.13	42.72	43.74	45.70
Mother works irregularly (%)	-	8.18	8.46	8.33	7.98
Mother does not work (%)	-	34.52	33.11	32.59	30.65
Mother has migration background (%)	-	19.22	18.64	19.15	17.87
Household income in €	-	3411	3405	3384	3370
Family climate (scale 1-5)	-	4.40	4.40	4.39	4.38
Home environment (scale 1-8)	-	5.24	5.25	5.25	5.23
Father answered questionnaire (%)	-	8.88	8.78	8.81	8.56
N	2510	2286	1924	1533	1320

Notes: Each column gives descriptive statistics of one sample with restrictions described in the text. Number of observations can be lower for individual characteristics due to item non-response.

Source: NEPS Data, Data Version SC2 5.0.0, own calculations.

Table 4.2: Within and between center variation in quality

	Mean	Total SD	Between SD	Within SD	Ratio within by between
	(1)	(2)	(3)	(4)	(5)
Structural quality features					
Groupsize	20.73	4.61	4.33	2.26	0.52
Child-teacher ratio	13.11	6.55	6.04	2.29	0.38
Teachers' education (high / low)	35.96	48.04	35.65	35.63	1
Professional development (count)	1.94	1.91	1.54	1.31	0.85
Available materials (scale 0-3)	1.62	0.43	0.34	0.28	0.82
Process quality features					
Trips (scale 1-6)	2.23	0.52	0.41	0.32	0.78
Activities (scale 1-8)	7.09	0.63	0.51	0.43	0.84

Notes: SD stands for standard deviation. The third column is the standard deviation of center means, the fourth column the standard deviation of groups within centers.

Source: NEPS Data, Data Version SC2 5.0.0, own calculations.

Table 4.3: Associations between observable characteristics and within center quality

	Groupsize	Structural quality				Process quality	
		Child- teacher ratio	Teachers' education	Professional development	Available materials	Trips outside	Activities in the group
Child female	-0.0008* (0.0050)	-0.0003 (0.0005)	-0.0005 (0.0005)	-0.004 (0.0005)	-0.0004 (0.0006)	-0.0001 (0.0004)	0.0002 (0.0004)
Startage	-0.0367 (0.0232)	-0.0658** (0.0305)	0.013 (0.0245)	-0.0594 (0.0449)	-0.0231 (0.0282)	-0.0385 (0.0252)	-0.0201 (0.0270)
Number of siblings	-0.0041 (0.0199)	-0.0175 (0.0243)	0.0007 (0.0250)	0.0263 (0.0303)	-0.0469* (0.0261)	-0.0176 (0.0202)	0.0146 (0.0258)
Problems after birth	-0.0009 (0.0006)	-0.0006 (0.0006)	0.0001 (0.0008)	-0.0006 (0.0006)	-0.0014** (0.0007)	0.0012* (0.0007)	-0.0001 (0.0007)
Single parent	-0.0009 (0.0006)	-0.0005 (0.0006)	0.0001 (0.0008)	-0.0006 (0.0007)	-0.0014** (0.0007)	0.0012 (0.0007)	-0.0001 (0.0007)
Mothers education	-0.0197 (0.0293)	0.0427* (0.0235)	0.0128 (0.0281)	-0.0337 (0.0232)	0.0261 (0.0252)	0.0239 (0.0311)	0.0059 (0.0278)
Mother works parttime	-0.0005 (0.0005)	0.0005 (0.0006)	-0.0006 (0.0005)	-0.0003 (0.0008)	0.0006 (0.0005)	0.0009* (0.0006)	0.0001 (0.0004)
Mother works irregularly	0.0024** (0.0009)	0.0007 (0.0008)	-0.001 (0.0009)	0.0002 (0.0006)	-0.0002 (0.0010)	0.0003 (0.0008)	0.0001 (0.0010)
Mother does not work	-0.0003 (0.0006)	-0.0009 (0.0006)	0.0006 (0.0007)	-0.0002 (0.0006)	-0.0007 (0.0005)	-0.0017** (0.0007)	-0.0003 (0.0006)
Migration background	0.0005 (0.0009)	-0.0005 (0.0007)	-0.0001 (0.0007)	0.0001 (0.0007)	0.0003 (0.0007)	0.0003 (0.0006)	0.0012 (0.0009)
HH income	0.0219 (0.0295)	0.0439** (0.0237)	-0.0284* (0.0149)	-0.0056 (0.0177)	0.0472*** (0.0180)	0.0107 (0.0212)	-0.0325 (0.0222)
Family climate	-0.0038 (0.0223)	0.0155 (0.0249)	-0.0435 (0.0279)	-0.0492* (0.0302)	0.0133 (0.0273)	0.0196 (0.0197)	-0.0073 (0.0203)

Notes: Each cell gives the regression coefficient of a regression with the quality feature in the column as the dependent and the observable characteristic in the row as the independent variable. Standard errors clustered on the institution level in parentheses. * 10%, ** 5%, *** 1% significance levels. Observable characteristics that show up in table 4.1 but not here were calculated as well but left out because there was no significant correlation. Source: NEPS Data, Data Version SC2 5.0.0, own calculations.

Table 4.4: Tests for sorting into groups within centers by observable characteristics

Centers in which the p-value of...	Number of centers	Resulting number of significant tests
... no χ^2 -test is ≤ 0.1	97	0
... one χ^2 -test is ≤ 0.1	68	68
... two χ^2 -test is ≤ 0.1	37	74
... three χ^2 -test is ≤ 0.1	9	27
... four χ^2 -test is ≤ 0.1	2	8
... five χ^2 -test are ≤ 0.1	1	5
	214	182

Notes: The table shows the number of rejected hypotheses (out of ten) of χ^2 -tests for independence between observable characteristics and group affiliation within each center (a rejected hypothesis means that children with the same characteristics are likely to be within the same group). Ten such tests are conducted for each center. The observable characteristics are: Child's gender, ECEC entrance age, number of siblings, migration background, mother's age, mother's education, if the mother works, the family climate and the home environment. Example: The first row states that for 97 centers, no hypothesis that an observable characteristic is independent of group affiliation within the center could be rejected at the 10% significance level.

Source: NEPS Data, Data Version SC2 5.0.0, own calculations.

Table 4.5: OLS regressions of quality features and children's non-cognitive skills

	Prosocial behavior	Openness	Conscien- tiousness	Extraversion	Agree- ableness	Emotional Stability
Group size	-0.001 (0.025)	0.016 (0.032)	0.022 (0.034)	0.053 [†] (0.030)	-0.035 (0.032)	-0.008 (0.030)
Child-teacher ratio	-0.011 (0.025)	-0.001 (0.031)	-0.046 (0.029)	-0.023 (0.033)	-0.024 (0.026)	0.012 (0.033)
Teachers' education	-0.023 (0.022)	0.002 (0.023)	-0.033 (0.024)	-0.015 (0.027)	-0.048 [†] (0.028)	0.002 (0.026)
Professional development	-0.012 (0.018)	0.050 [†] (0.024)	-0.005 (0.030)	0.013 (0.022)	-0.013 (0.027)	-0.011 (0.022)
Available materials	0.065** (0.026)	0.047 [†] (0.026)	-0.029 (0.029)	0.011 (0.027)	0.013 (0.029)	0.034 (0.027)
Trips outside	-0.062** (0.027)	-0.033 (0.034)	-0.010 (0.023)	-0.012 (0.027)	-0.009 (0.030)	0.001 (0.027)
Activities in the group	-0.002 (0.023)	0.003 (0.028)	-0.017 (0.025)	0.046 (0.028)	0.009 (0.026)	-0.011 (0.027)
N	1533	1320	1320	1319	1309	1321

Notes: Each column gives the result of one OLS regression with the column variable as the dependent variable controlling for all quality features as well as all observable characteristics shown in table 4.1. Standard errors clustered on the institution level in parentheses. **: 5% significance level adjusted for multiple testing (the Romano-Wolf and Bonferroni procedures yield the same results). [†]: unadjusted significance level at least 10%. Source: NEPS Data, Data Version SC2 5.0.0, own calculations.

Table 4.6: Regressions of within center quality and children's non-cognitive skills

	Prosocial behavior	Openness	Conscien- tiousness	Extraversion	Agree- ableness	Emotional Stability
Group size	-0.004 (0.023)	0.039 (0.033)	0.025 (0.028)	0.079 [†] (0.029)	-0.033 (0.031)	0.001 (0.030)
Child-teacher ratio	-0.004 (0.023)	-0.005 (0.033)	-0.027 (0.023)	-0.029 (0.033)	-0.019 (0.026)	0.019 (0.033)
Teachers' education	-0.035 [†] (0.019)	0.006 (0.021)	-0.018 (0.022)	-0.016 (0.025)	-0.049 [†] (0.026)	0.003 (0.027)
Professional development	-0.013 (0.015)	0.050 [†] (0.024)	-0.004 (0.026)	0.017 (0.021)	-0.015 (0.024)	-0.012 (0.022)
Available materials	0.076** (0.023)	0.035 (0.024)	-0.015 (0.026)	0.012 (0.027)	0.015 (0.025)	0.040 (0.025)
Trips outside	-0.062 [†] (0.021)	-0.018 (0.031)	0.009 (0.021)	-0.011 (0.025)	-0.010 (0.032)	-0.001 (0.025)
Activities in the group	-0.006 (0.021)	-0.001 (0.025)	-0.016 (0.022)	0.035 (0.026)	0.015 (0.024)	-0.019 (0.024)
N	1533	1320	1320	1319	1309	1321

Notes: Each column gives the result of one fixed effects regression with the column variable as the dependent variable controlling for all quality features as well as all observable characteristics shown in table 4.1. Standard errors clustered on the institution level in parentheses. **: 5% significance level adjusted for multiple testing (the Romano-Wolf and Bonferroni procedures yield the same results). [†]: unadjusted significance level at least 10%. Source: NEPS Data, Data Version SC2 5.0.0, own calculations.

Table 4.7: Heterogeneities in the effects of the availability of educational and playing materials on prosocial behavior

Heterogenous effects by:	(1)	(2)	In principle disadvantaged profit more (+) or less (-)
HH income (below / above median)	0.092* (0.032)	0.038 (0.046)	+
N	685	434	
Mother has <i>Abitur</i> (no / yes)	0.086 (0.033)	0.061 (0.031)	<i>no difference</i>
N	880	643	
Mother's migration background (yes / no)	0.032 (0.045)	0.086* (0.024)	-
N	292	1233	
Single parent (yes / no)	0.054 (0.060)	0.082* (0.023)	-
N	322	1210	
Home environment (below / above median)	0.085 (0.039)	0.069 (0.031)	<i>no difference</i>
N	749	784	
Family climate (below / above median)	0.092 (0.039)	0.064 (0.033)	<i>no difference</i>
N	582	713	
Child female (yes / no)	0.076 (0.032)	0.086 (0.034)	<i>not applicable</i>
N	760	773	
ECEC entrance age (after / prior to three)	0.077 (0.039)	0.079 (0.030)	<i>not applicable</i>
N	727	806	
Child has siblings (yes / no)	0.068* (0.024)	0.107 (0.048)	<i>not applicable</i>
N	1183	350	

Notes: Each panel shows coefficients from two regressions (same specification as in table 4.6) where the sample is split according to the values in parentheses. The left column of results shows the coefficients for the first value mentioned, the second for the value mentioned second. * 10% significance level adjusted for multiple testing (the Romano-Wolf and Bonferroni procedures yield the same results).

Source: NEPS Data, Data Version SC2 5.0.0, own calculations.

Table 4.8: Placebo regressions - using availability of educational and playing materials to predict predetermined characteristics

Dependent variable	
Birthweight	-0.013 (0.009)
Female child	0.007 (0.010)
Mother's age	-0.015 (0.011)
Mother's education	-0.018 (0.014)
Problems after birth	0.002 (0.009)
Preterm birth	0.012 (0.007)
Mother's migration background	0.005 (0.012)
N	1748

Notes: Each cell gives the coefficient of the availability of educational and playing materials from one regression using within center variation in quality. The variable on the left is the dependent variable, models include all other quality features as well as control variables as shown in table 4.1.

Source: NEPS Data, Data Version SC2 5.0.0, own calculations.

Table 4.9: Robustness test as suggested by Oster (2018)

	Identified set of β				δ	$\delta > 1$
	Basic	Main	Upper bound	Lower bound		
Quality measure						
Available materials	0.096 (0.027)	0.076 (0.023)	[0.096]	[0.056]	3.84	<i>yes</i>
R ²	0.0108	0.1577				

Notes: The coefficients in the first column come from regressions including only quality variables, the second column from regressions using within center variation in quality. The third and fourth column show bounds for the coefficients assuming that the variation explained through unobserved factors is of the same size as that explained through the model (i.e. $\delta = 1$, the hypothetical R² in that case would be 0.3046). The fifth column shows how much variation unobserved factors would have to explain in order to render the coefficient zero as a multiple of the variation explained by the model.

Source: NEPS Data, Data Version 5.0.0, own calculations.

CHAPTER 5

Involuntary Job Loss and Changes in Personality Traits¹

This chapter is not included in the online version of this dissertation due to copyright reasons. Please note the link to the published version in the acknowledgments below.

¹This chapter is joint work with Silke Anger (IAB, University Bamberg, and IZA) and Frauke Peter (DIW Berlin). The chapter has been published in the *Journal of Economic Psychology* 60, 71-91 (2017), <https://doi.org/10.1016/j.joep.2017.01.007>. The authors are grateful to the editors and two anonymous referees from the *Journal of Economic Psychology* for very helpful feedback and suggestions to improve the manuscript. The authors thank the participants of the 7th IWAAE conference, the SOEP-User Conference 2016, the IWH Workshop on Unemployment 2016, and the Annual Meeting of the German Economic Association 2016 for useful comments and discussions. We gratefully acknowledge helpful editorial assistance from Adam Lederer.

CHAPTER 6

Conclusion

6.1 Discussion and Limitations

This dissertation investigates relationships between different types of education and educational quality as well as their effects on non-cognitive skills and other non-monetary measures. Chapter 2 analyzes the effects of a parenting program on parenting skills, measures for child behavior, and maternal well-being. It focuses on maternal well-being and, at the same time, shows that all these aspects are positively influenced by the parenting program. Chapter 3 describes information asymmetries between parents and educators in ECEC institutions and investigates their relationship to parental and center characteristics. The chapter demonstrates the prevalence of these information asymmetries which, from a theoretical perspective, can be seen as a factor contributing to overall low ECEC quality in Germany. Chapter 4 analyzes the causal effects of ECEC quality on the personality traits and behavior of children. It reports positive effects of certain quality features on children's prosocial behavior. Last, chapter 5 analyzes the effects of job loss on personality traits. It finds a positive effect of job loss on the openness for workers who immediately find a new job after being displaced.

The introduction highlights four main contributions of the chapters (see table 1.1). Partly, these are shared by the chapters, and partly the chapters complement each other. First, the four chapters complement each other by analyzing different types of education. Chapter 2 analyses a non-formal educational program, chapter 3 considers both formal and informal education. Chapter 4 is concerned with formal education. All these chapters are also concerned with educational quality: Chapter 2 with respect to the home environment, chapters 3 and 4 with respect to ECEC. Furthermore, several chapters incorporate concepts from psychology into economics. Chapter 2 analyses the effects of a parenting program designed by psychologists from an economic point of view. Chapters 4 and 5 analyse the effects of educational quality and a life event,

respectively, on non-cognitive skills. Investigating non-cognitive skills is also a common contribution of these chapters with respect to the analyses of non-monetary returns to education. In this way, the chapters complement chapter 2, which shows effects of a parenting program on maternal well-being. The dissertation also has additional substantial and methodological contributions (see table 1.1): It focuses mostly on ECEC and its effects, but this is complemented by one chapter on the stability of non-cognitive skills of adults (chapter 5). All chapters take into account potential heterogeneities in effects with respect to SES or directly show correlations of the measures of interest with SES-characteristics (chapter 3). All chapters focus on Germany and use an array of different methods and data sources.

Like for almost every scientific paper, there are naturally limitations to the results of the chapters of this dissertation. Specific assumptions of the methods used and circumstances under which these assumptions may not be fulfilled as well as limitations of the data are discussed in the individual chapters. The following describes and discusses some general limitations with respect to the overarching themes from the overall introduction to this dissertation.

While the effect of the parenting program on maternal well-being is the focus of **chapter 2**, it also provides some evidence on children's behavior as a channel through which the program could influence maternal well-being. However, the channels cannot precisely be disentangled. Whether the program directly affects maternal well-being or through improved parenting skills and child behavior is not entirely clear. The chapter only provides indicative evidence through the timing of the effects: parenting skills and child behavior are improved before the effect on maternal well-being becomes apparent. Furthermore, while one major theme of this dissertation is the quality of education, chapter 2 uses a dichotomous measure for non-formal education (that is, participation in the program versus no participation). Analyzing the parenting program is in itself a contribution to the literature, but it is limited compared to the other chapters in which more detailed data on educational quality is available. There is no specific information on the quality of the program for different individuals and how this could lead to heterogeneous effects. However, collecting data on quality of the treatment is generally difficult to implement in an RCT for two main reasons. First, assessing the quality of the educational program would mean that the sample size would have to be much larger as including quality of the treatment would basically mean to include multiple treatments. Second, and related to this, it is often an aim of RCTs to standardize the treatment to make estimates as precise as possible.

Chapter 3 analyzes information asymmetries between parents and educators with respect to educational quality in ECEC. It does so by investigating gaps between par-

ents and educators assessments of quality features. One limitation is that the quality features are only measured at one point in time, after the child is already attending the ECEC institution. With respect to the main motivation of the research question (that is, information asymmetries leading to low quality), the most relevant point in time for parents would be when they choose the ECEC institution. This is the case because at this point in time, quality assessments are likely to have the largest influence on choices, as switching centers will accrue additional costs. Measuring quality after the child has already entered the center could bias the information gaps in various ways. Over time, parents could gather additional information. In this case the prevalence of information gaps described in the chapter would be lower compared to the time before the child entered the ECEC institution and, thus, represent a lower bound. On the other hand, if quality changes over time without parents noticing, then the direction of a potential bias is undetermined.

A similar limitation is relevant for **chapter 4** which analyses the effects of ECEC quality on the non-cognitive skills of children. Again, the quality of education is measured only at one point in time when the child already attends the ECEC institution. While specification tests and robustness checks of the results provide evidence that the empirical strategy of the chapter is valid, another required assumption is that quality is stable over time. If quality changes randomly, this would bias results toward zero.¹ In addition, the chapter describes other types of measurement errors that could bias effects toward zero. For most of the tested relationships between ECEC quality and children's skills I do not find statistically significant effects. Therefore, I would not conclude that there is no effect (that is, a "precise zero" effect) for these, but rather that potential effects are too small to detect given the sample size. In addition, there is only one measurement point for the outcomes, meaning that any dynamic effects of quality on skills (such as subsequent improved development) cannot be addressed in this chapter.

Similarly in **chapter 5**, which analyses the effects of job loss on personality traits, the data contains three measures of the outcome over an eight year period. Thus, the outcomes are measured every four years. While this has the advantage of covering a long time period, it limits the results with respect to the dynamics that can be represented by the results. For instance, if a person experiences a job loss directly after a measurement of the outcome, almost four years pass before the outcome is measured again. Furthermore, there could be important heterogeneities that the chapter could not analyze in terms of the selection of different people into different types of jobs and

¹Quality changes which are correlated with selection into groups would have shown up in the robustness tests of the chapter and therefore should not pose a significant problem.

how these are in turn related to personality traits. Certain non-cognitive skills such as social skills could be more important for more complex jobs compared to routine jobs (Deming, 2017). These issues are accounted for by the identification strategy with respect to mean effects, but this does not preclude differential effects by job category which could not be included in the study due to the relatively small sample size.

6.2 Potential Future Research

There are multiple avenues for future research beyond the contributions of this dissertation. First, there are further research questions that result directly from the aforementioned limitations. With the help of better data, for example additional points in time (for existing longitudinal datasets), or new datasets with larger sample sizes, dynamic effects and heterogeneities could be analyzed in more sophisticated ways. It is important to continue research in this direction, as often overall means can hide crucial aspects of relationships. For example, with respect to parenting programs, it might be interesting to see if parents with *ex ante* low parenting skills benefit most from the training or those who already have above average skills. With respect to ECEC quality, it might be interesting to see if children experience different quality levels over time, as regulations stipulate that younger children should receive higher quality ECEC and how this affects their development. This might help explain skill differences between SES-groups since, on average, children from in principle disadvantaged background enter ECEC on average at an older age.² More extensive data on both inputs (i.e. educational quality) and outcomes (i.e. non-cognitive skills) would also be instrumental for investigating development of skills over time.

However, and second, there are also specific research questions extending or complementing each chapter. Again, these can be directly linked to the four overall themes described in the introduction: considering different areas of education, including educational quality, incorporating concepts from psychology into economic models, and analyzing non-monetary returns to education.

Concerning the effects of parenting programs analyzed in **chapter 2**, additional outcomes from the parents would be a natural extension of the analyses of such programs. In addition, one could analyze the outcomes of other types of education for children on their parents. Comparatively few studies in the economics of education literature focus on the effects of children's education or programs geared toward their skills on

²For example, in the dataset analyzed in chapter 4, for every additional year of education of the mother, children enter ECEC on average three weeks earlier. Source: NEPS Data, Data Version SC2 5.0.0, own calculation.

the parents. Another open question is if these types of programs can also have effects on fathers. Could there be similar interventions specifically aimed at fathers to increase their participation with raising children and to raise their satisfaction with family life? Or are fathers only more affected if they participate more in care work in general? Overall, these extensions add to the incorporation of concepts from psychology into economics, as psychologists typically design these programs, and it would add to the research on non-formal education that generally receives less attention in the economic literature. One further aspect that is not covered in this dissertation with respect to non-formal education is how this is related to formal educational activities.³ With respect to the parenting program analyzed in chapter 2, one could ask if participation in the program is determined by formal educational attainment with the hypothesis that individuals with higher attainment are more likely to participate. This could have important repercussions in terms of policies that promote these kinds of programs. On the other hand, parental participation in the program could also have returns in terms of children's achievement in formal education. This could then be extended by indicators for educational quality as described above. One hypothesis would be that higher quality programs have a greater potential to yield benefits for parents, like the effects shown in Kuger et al. (2017) with respect to ECEC and the home environment.

With respect to parental choice of formal education, the information parents possess is crucial. **Chapter 3** descriptively analyzes information asymmetries between parents and educators with respect to ECEC quality. Concerning this research topic, one could go a step further and try to directly analyze the effects of these information asymmetries on parents' actual search behavior, their assessments of how well-informed they feel, and potentially child outcomes. It is yet unclear if a high incidence of information asymmetries causes the individual child to receive low quality ECEC. If so, the level of information of parents may well affect child outcomes. One could also analyze if information asymmetries are related to ECEC quality regulations in different regions within Germany. This is interesting as both quality standards and the supply of ECEC services vary not just between German states but also between municipalities and between providers. If there are certain regions with lower incidence of information asymmetries, one could investigate if this is related to certain fiscal policies or regulations.

Chapter 4 analyzes causal effects of educational quality features. Another direction for further research of ECEC quality could go in the direction of value-added models. This means that a different way to identify high quality ECEC could be via skill devel-

³This is depicted by the missing arrow from *non-formal learning* to *formal learning* in figure 1.1 in the introduction.

opment of children through ECEC attendance. This would require skill measurements of children at the beginning of ECEC and, ideally, directly after they leave ECEC. Those centers with the largest improvements in skills of children could then be identified as the best. An example of subsequent analyses would be to investigate if there are relationships between ECEC quality defined in this way and different types of regulations across German states or municipalities. While the quality of ECEC is inherently important, the peer group a child enters when parents choose an ECEC institution is also a crucial factor. The identification strategy in chapter 4 is similar to the one used by Ammermueller and Pischke (2009) in employing assignment into groups as a plausibly exogenous treatment. This could similarly be used to identify peer effects in ECEC, something that is rarely done in the economic literature on ECEC. This could be carried out with respect to the effects of peers' SES or other characteristics, such as migration background. This is especially relevant for Germany in light of increased migration. However, one could also argue that, rather than these characteristics, the most important factors are peers' cognitive and non-cognitive skills. Additionally, other returns to educational quality, such as health or well-being could be analyzed

With respect to the relationship of non-cognitive skills and other experiences in life, such as the effects of job loss analyzed in **chapter 5**, another direction could be to analyze if individuals are affected differently depending upon their existent personality traits. This could be done with respect to stability of the traits themselves as well as other outcomes such as health and well-being. Going further, one could try to identify certain personality types from combinations of skills that are more or less likely to be affected by job loss. A systematic way to do this would be to employ statistical learning methods to efficiently go through interactions between different skills or between skills and other background characteristics.⁴ An additional direction for the research on skill changes would be to design interventions to foster specific skills or skill sets that are related to positive later life outcomes for example with respect to labor market or health outcomes. However, further research is needed with respect to the specific sets of skills that are beneficial for individuals. For example, with respect to personality traits, it is not always clear if higher scores linearly represent desirable skills or just "neutral" differences in personality over the entire distributions of both traits and outcomes.⁵ As

⁴Statistical learning provides techniques that can be used to choose combinations of characteristics that provide the best predictive fit of a model by systematically going through a large number of potential models. This, in turn, means that significant interactions should be uncovered by the method. Whether these are also economically significant is then up to interpretation.

⁵One example is gender differences. For instance, high scores on the agreeableness trait from the Big 5 personality inventory are related to high levels of trust and cooperation. At the same time, high levels of agreeableness have been shown to be connected with lower earnings for men (Mueller and Plug, 2006).

noted in the introduction, the aim should be to foster skills beyond certain minimums, such that individuals do not suffer disadvantages from low non-cognitive skills.

6.3 Policy Recommendations

Each chapter of this dissertation mentions specific policy recommendations that follow from the respective results. However, there are also overall recommendations that can be derived from the chapters and that are connected to the four broad themes of this dissertation as described in the introduction.

First, this dissertation emphasizes the importance of educational quality. At the same time, it points toward the importance of the availability of information about educational quality in order to make informed choices. One way to achieve both aims is to introduce minimum standards that are common for regions which should be as large as possible. Regulations on education vary in Germany by state and sometimes (as in the case of ECEC) by municipalities or providers. This makes it more likely that in some regions, there are no or very low minimum standards with respect to educational quality. Enforcement of standards has to be carried out in a very decentralized way which is potentially more prone to errors. At the same time, the current decentralization makes providing information inefficient, as many parallel channels of informing individuals must be operated. Individuals from principally disadvantaged backgrounds are more likely to be negatively affected by this current state as they often have fewer resources to gather information. This adds to the point that information about education should be made more accessible, as it could help to alleviate the transmission of societal inequalities. Both from an equity and efficiency point of view, children should not receive lower educational quality because information is not available to their parents.

With respect to accounting for different areas of education, this dissertation emphasizes that non-formal education programs can also have positive impacts. Non-formal educational programs should be fostered by policy, especially since they have the potential to be very target-oriented (such as in the case of parenting programs) and result in positive outcomes at a low cost. Such programs could be another way to reduce societal inequalities in terms of the chances that individuals face in life. However, this needs to be implemented based on scientific evidence, as not all programs have the same potential rate of return.

Last, policy should consider non-monetary effects of life experiences and returns to education, both on the affected individuals and on those for whom the education is directed and individuals in their proximity. For example, chapter 5 shows that job

loss can have severe impacts apart from the loss of income even affecting non-cognitive skills. In several chapters, this dissertation demonstrates that, from an economic point of view, the returns to education for individuals extend beyond improved income to skills and to well-being. Concepts from psychology combined with economic models and methods can help provide insights into the specifics of this. Overall, policy makers should take into account different types of education, educational quality, and their relationships with non-cognitive skills and other non-monetary returns to education, as these are important for both the individual and society as a whole.

Bibliography

- Abraham, K.G., J.C. Haltiwanger, L.K. Sandusky and J.R. Spletzer (2016): The Consequences of Long Term Unemployment: Evidence from Matched Employer-Employee Data, *IZA Discussion Paper*, 10223.
- Achenbach, T.M. and L.A. Rescorla (2000): *Manual for the ASEBA Preschool Forms & Profiles*, Burlington, VT: University of Vermont.
- Akerlof, G. (1970): The Market for “Lemons”: Quality Uncertainty and the Market Mechanism, *The Quarterly Journal of Economics*, 84(3), 488–500.
- Almlund, M., A. Duckworth, J. Heckman and T. Kautz (2011): Personality Psychology and Economics, in: E. Hanushek, S. Machin, and L. Woessmann (Eds.), *Handbook of the Economics of Education, Volume 4*, Amsterdam: Elsevier, pp. 1–181.
- Altonji, J.G., T.E. Elder and C.R. Taber (2005): Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools, *Journal of Political Economy*, 113, 151–184.
- Ammermueller, A. and J.S. Pischke (2009): Peer Effects in European Primary Schools: Evidence from the Progress in International Reading Literacy Study, *Journal of Labor Economics*, 3, 315–348.
- Anders, Y., H.G. Rossbach, S. Weinert, S. Ebert, S. Kuger, S. Lehl and J. von Maurice (2012): Home and Preschool Learning Environments and their Relations to the Development of Early Numeracy Skills, *Early Childhood Research Quarterly*, 27(2), 231–244.
- Anderson, M. (2008): Multiple inference and gender differences in the effects of early intervention: A reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects, *Journal of the American Statistical Association*, 103(484), 1481–1495.
- Anger, S., G. Camehl and F. Peter (2017): Involuntary Job Loss and Changes in Personality Traits, *Journal of Economic Psychology*, 60, 71–91.

- Ansari, A. and E. Gershoff (2016): Parent Involvement in Head Start and Children's Development: Indirect Effects Through Parenting, *Journal of Marriage and Family*, 78(2), 562–579.
- Ansari, A., K. Purtell and E.T. Gershoff (2016): Parenting Gains in Head Start as a Function of Initial Parenting Skill, *Journal of Marriage and Family*, 78(5), 1195–1207.
- Apps, P., S. Mendolia and I. Walker (2013): The Impact of Pre-school on Adolescents' Outcomes: Evidence from a Recent English Cohort, *Economics of Education Review*, 37, 183–199.
- Araujo, M.C., P. Carneiro, Y. Cruz-Aguayo and N. Schady (2016): Teacher Quality and Learning Outcomes in Kindergarten, *The Quarterly Journal of Economics*, 131(3), 1415–1453.
- Arnold, D.S., S.G. O'Leary, L.S. Wolff and M.M. Acker (1993): The Parenting Scale: A Measure of Dysfunctional Parenting in Discipline Situations, *Psychological Assessment*, 5(2), 131–144.
- Artz, B. and D.M. Welsch (2014): Childcare Quality and Pricing: Evidence from Wisconsin, *Applied Economics*, 46(35), 4276–4289.
- Asendorpf, J.A. (2007): *Psychologie der Persönlichkeit*, Heidelberg: Springer.
- Auger, A., G. Farkas, M. Burchinal, G. Duncan and D. Vandell (2014): Preschool Center Care Quality Effects on Academic Achievement: An Instrumental Variables Analysis, *Developmental Psychology*, 50, 2559–2571.
- Bach, M., J. Koebe and F. Peter (2018): Early Childcare Entry and Personality Traits in Adolescence, *DIW Berlin, mimeo*.
- Baker, M., J. Gruber and K. Milligan (2008): Universal Child Care, Maternal Labor Supply, and Family Well-Being, *Journal of Political Economy*, 116(4), 709–745.
- Baker, M., J. Gruber and K. Milligan (2015): Non-Cognitive Deficits and Young Adult Outcomes: The Long-Run Impacts of a Universal Child Care Program, *NBER Working Papers*, 21571.
- Barnett, W. (1995): Long-term Effects of Early Childhood Programs on Cognitive and School Outcomes, *The Future of Children*, 5(3), 25–50.

- Barnett, W. (2011): Effectiveness of Early Educational Intervention, *Science*, 333(6045), 975–978.
- Barros, S. and T.B. Leal (2015): Parents’ and Teachers’ Perceptions of Quality in Portuguese Childcare Classrooms, *European Journal of Psychology of Education*, 30(2), 209–226.
- Bassok, D., A.J. Markowitz, D. Player and M. Zagardo (2017): Do Parents Know “High Quality” Preschool When They See It?, *EdPolicy Works Working Papers Series*, 54.
- Bauchmüller, R., M. Gørtz and A. Würtz Rasmussen (2014): Long-run Benefits from Universal High Quality Preschooling, *Early Childhood Research Quarterly*, 29(4), 457–470.
- Bäumer, T. and H. Rossbach (2016): Measurement of Preschool Quality With the National Educational Panel Study - Results of a Methodological Study, in: H.-P. Blossfeld, J. von Maurice, M. Bayer, and J. Skopek (Eds.), *Methodological Issues of Longitudinal Surveys. The Example of the National Educational Panel Study*, Wiesbaden: Springer VS, pp. 543–560.
- Becker, B. and P.S. Schober (2017): Not Just Any Child Care Center? Social and Ethnic disparities in the Use of Early Education Institutions With a Beneficial Learning Environment, *Early Education and Development*, 28(8), 1011–1034.
- Becker, G. (1962): Investment in Human Capital: A Theoretical Analysis, *Journal of Political Economy*, 70(5), 9–49.
- Becker, G. (1993): *Human Capital - A theoretical and emirical analysis, with special reference to education*, 3rd Edition, Chicago and London: The University of Chicago Press.
- Behrman, J.R. and N. Birdsall (1983): The Quality of Schooling: Quantity Alone is Misleading, *American Economic Review*, 73(5), 928–946.
- Belfield, C.R., M. Nores, S. Barnett and L. Schweinhart (2006): The High/Scope Perry Preschool Program: Cost-Benefit Analysis Using Data from the Age-40 Follow up, *Journal of Human Resources*, 41(1), 162–190.
- Berger, E.M. and C.K. Spiess (2011): Maternal Life Satisfaction and Child Outcomes: Are They Related?, *Journal of Economic Psychology*, 32(1), 142–158.
- Blau, D. and A.P. Hagy (1998): The Demand for Quality in Child Care, *Journal of Political Economy*, 106(1), 104–146.

- Blau, D.M. (2001): *The Child Care Problem: An Economic Analysis*, New York: Russel Sage Foundation.
- Blossfeld, H., H. Rossbach and J. Maurice (2011): Education as a Lifelong Process - The German National Educational Panel Study (NEPS), *Zeitschrift für Erziehungswissenschaft*, Sonderheft 14.
- Bock-Famulla, K., J. Lange and E. Strunz (2015): *Länderreport Frühkindliche Bildungssysteme 2015*, Bielefeld: Bertelsmann Verlag.
- Borghans, L., A.L. Duckworth, J.J. Heckman and B. ter Weel (2008): The Economics and Psychology of Personality Traits, *Journal of Human Resources*, 43, 972–1059.
- Boyce, C.J., A.M. Wood, M. Daly and C. Sedikides (2015): Personality Change Following Unemployment, *Journal of Applied Psychology*, 100(4), 991–1011.
- Brodeur, A. and M. Connolly (2013): Do Higher Child Care Subsidies Improve Parental Well-being? Evidence from Quebec’s Family Policies, *Journal of Economic Behavior & Organization*, 93, 1–16.
- Brooks-Gunn, J., L. Berlin and A. Fuligni (2000): Early Childhood Intervention Programs: What about the Family?, in: J. P. Shonkoff and S. J. Meisels (Eds.), *Handbook of Early Childhood Intervention* (2 ed.), New York: Cambridge University Press, pp. 549–588.
- Brooks-Gunn, J., M. McCormick, S. Shapiro, A. Benasich and G. Black (1994): The Effects of Early Education Intervention on Maternal Employment, Public Assistance, and Health Insurance: The Infant Health and Development Program, *American Journal of Public Health*, 84(6), 924–931.
- Browning, M. and M. Gørtz (2012): Spending Time and Money within the Household, *The Scandinavian Journal of Economics*, 114(3), 681–704.
- Burger, K. (2010): How Does Early Childhood Care and Education Affect Cognitive Development? An International Review of the Effects of Early Intervention for Children From Different Social Backgrounds, *Early Childhood Research Quarterly*, 25, 140–165.
- Cahuc, P., S. Carcillo and A. Zylberberg (2014): *Labor Economics*, 2nd Edition, Cambridge, MA: MIT Press.
- Camehl, G. (2016): Wie beeinflusst der Besuch einer Kindertageseinrichtung nicht-kognitive Fähigkeiten?, *DIW Roundup*, 105.

- Camehl, G., P. Schober and C. Spiess (2018): Information Asymmetries Between Parents and Educators in German Childcare Institutions, *Education Economics*, (forthcoming).
- Camehl, G., P.S. Schober and C.K. Spiess (2015): A SOEP-Related Study: Early Childhood Education and Care Quality in the Socio-Economic Panel (K2ID-SOEP), in: S. Gerstorf and J. Schupp (Eds.), *SOEP Wave Report 2014*, Berlin: DIW Berlin, pp. 31–33.
- Camehl, G., J. Stahl, P. Schober and C.K. Spiess (2015): Does Better, Cheaper Day Care Make for More Satisfied Parents?, *DIW Economic Bulletin*, 45/46.
- Cameron, A.C. and P.K. Trivedi (2005): *Microeconometrics. Methods and Applications*, New York: Cambridge University Press.
- Camilli, G., S. Vargas, S. Ryan and W. Barnett (2010): Meta-Analysis of the Effects of Early Education Interventions on Cognitive and Social Development, *Teachers College Record*, 112(3), 579–620.
- Campbell, F., C. Ramey, E. Pungello, J. Sparling and S. Miller-Johnson (2002): Early Childhood Education: Young Adult Outcomes From the Abecedarian Project, *Applied Developmental Science*, 6(1), 42–57.
- Carneiro, P. and R. Ginja (2016): Partial Insurance and Investments in Children, *The Economic Journal*, 126(596), F66–F95.
- Cascio, E. (2015): The promises and pitfalls of universal education, *IZA World of Labor*, 116.
- Caucutt, E.M., L. Lochner and Y. Park (2017): Correlation, Consumption, Confusion, or Constraints: Why Do Poor Children Perform so Poorly?, *The Scandinavian Journal of Economics*, 119(1), 102–147.
- Charles, K.K. and M. Stephens, Jr (2004): Job Displacement, Disability, and Divorce, *Journal of Labor Economics*, 22(2), 489–522.
- Chor, E., M.E. Andresen and A. Kalil (2016): The Impact of Universal Prekindergarten on Family Behavior and Child Outcomes, *Economics of Education Review*, 55, 168–181.
- Clark, A., E. Diener, Y. Georgellis and R.E. Lucas (2008): Lags and Leads in Life Satisfaction: a Test of the Baseline Hypothesis, *Economic Journal*, 118(529), F222–F243.

- Cobb-Clark, D. and T. Crossley (2003): Econometrics for Evaluation: An Introduction to Recent Developments, *The Economic Record*, 79(247), 491–511.
- Cobb-Clark, D., N. Salamanca and A. Zhu (2016): Parenting Style as an Investment in Human Development, *IZA Discussion Paper*, 9686.
- Cobb-Clark, D. and S. Schurer (2012): The Stability of Big Five Personality Traits, *Economics Letters*, 115(1), 11–15.
- Cobb-Clark, D. and S. Schurer (2013): Two Economists’ Musings on the Stability of Locus of Control, *Economic Journal*, 123, 358–400.
- Cohen, J. (1988): *Statistical Power Analysis for the Behavioral Sciences*, Hillsdale, NJ: Lawrence Earlbaum Associates.
- Conti, G., J.J. Heckman and R. Pinto (2015): The Effects of Two Influential Early Childhood Interventions on Health and Healthy Behaviors, *IZA Discussion Papers*, 9247.
- Cornelissen, T., C. Dustmann, U. Schönberg and A. Raute (2017): Who Benefits from Universal Child Care?: Estimating Marginal Returns to Early Child Care Attendance, *Journal of Political Economy*, (forthcoming).
- Cryer, D. and M. Burchinal (1997): Parents as Child Care Consumers, *Early Childhood Research Quarterly*, 12, 35–58.
- Cryer, D., W. Tietze and H. Wessels (2002): Parents’ Perceptions of Their Children’s Child Care: A Cross-national Comparison, *Early Childhood Research Quarterly*, 17, 259–277.
- Cunha, F. and J. Heckman (2007): The Technology of Skill Formation, *IZA Discussion Papers*, 2550.
- Cunha, F. and J.J. Heckman (2009): The Economics and Psychology of Inequality and Human Development, *NBER Working Paper*, 14695.
- Dahlen, H.M. (2016): The Impact of Maternal Depression on Child Academic and Socioemotional Outcomes, *Economics of Education Review*, 52, 77–90.
- Darling, N. and L. Steinberg (1993): Parenting Style as Context: An Integrative Model, *Psychological Bulletin*, 113(3), 487–496.
- Datta Gupta, N. and M. Simonsen (2010): Non-cognitive Child Outcomes and Universal High Quality Child Care, *Journal of Public Economics*, 94((1-2)), 30–43.

- Datta Gupta, N. and M. Simonsen (2012): The Effects of Type of Non-parental Child Care on Pre-teen Skills and Risky Behavior, *Economics Letters*, 116(3), 622–625.
- Dearing, E., K. McCartney and B. Taylor (2009): Does Higher Quality Early Child Care Promote Low-income Children’s Math and Reading Achievement in Middle Childhood?, *Child Development*, 80(5), 1329–1349.
- Dehne, M. and J. Schupp (2007): Persönlichkeitsmerkmale im Sozio-oekonomischen Panel (SOEP): Konzept, Umsetzung und empirische Eigenschaften, *DIW Research Notes*, 26.
- del Boca, D. (2015): Chidcare choices and child development, *IZA World of Labor*, 134.
- del Boca, D., C. Flinn and M. Wiswall (2014): Household choice and child development, *The Review of Economic Studies*, 81(1), 137–185.
- Deming, D.J. (2017): The growing importance of social skills in the labor market, *The Quarterly Journal of Economics*, 132(4), 1593–1640.
- Diener, E. and M. Chan (2011): Happy People Live Longer: Subjective Well-Being Contributes to Health and Longevity, *Applied Psychology: Health and Well-Being*, 3(1), 1–43.
- Diskowski, D. (2009): Zur Entwicklung der Kindertagesbetreuung - Die Qualitäts- und die Bildungsdebatte in der Kindertagesbetreuung, *Recht der Jugend und des Bildungswesens*, 1, 93–113.
- Döpfner, M., J. Plück, C. Kinnen and Arbeitsgruppe Deutsche Child Behavior Checklist (2014): *CBCL/6-18R, TRF/6-18R, YSR/11-18R. Deutsche Schulalter-Formen der Child Behavior Checklist von Thomas M. Achenbach. Elternfragebogen über das Verhalten von Kindern und Jugendlichen (CBCL/6-18R), Lehrerfragebogen über das Verhalten von Kindern und Jugendlichen (TRF/6-18R), Fragebogen für Jugendliche (YSR/11-18R)*, Göttingen: Hogrefe.
- Duckworth, A.L., C. Peterson, M.D. Matthews and D.R. Kelly (2007): Grit: Perseverance and Passion for Long-Term Goals, *Journal of Personality and Social Psychology*, 92(6), 1087–1101.
- Elango, S., J. Garcia, J.J. Heckman and A. Hojman (2015): Early Childhood Education, *IZA Discussion Papers*, 9476.

- European Child Care and Education - Study Group (1997): *European Child Care and Education Study. Cross National Analyses of the Quality and Effects of Early Childhood Programmes on Children's Development*, Berlin: Freie Universität Berlin.
- Feld, J. and U. Zölitz (2015): Understanding Peer Effects: On the Nature, Estimation and Channels of Peer Effects, *IZA Discussion Papers*, 9448.
- Felfe, C. and R. Lalive (2012): Early Child Care and Child Development: For Whom it Works and Why, *IZA Discussion Papers*, 7100.
- Felfe, C. and R. Lalive (2018): Does Early Child Care Affect Children's Development?, *Journal of Public Economics*, 159, 33–53.
- Fenge, R. and M. Wrede (2015): The Quality of Child Care: A Signaling Game with Incomplete Information, *Beiträge zur Jahrestagung des Vereins für Socialpolitik 2015: Ökonomische Entwicklung - Theorie und Politik - Session: Children*, E07-V1.
- Froehlich Chow, A. and M.L. Humbert (2014): Perceptions on Early Childhood Educators: Factors Influencing the Promotion of Physical Activity Opportunities in Canadian Rural Care Centers, *Child Indicators Research*, 7, 57–73.
- Goodman, A. and B. Sianesi (2005): Early Education and Children's Outcomes: How Long Do the Impacts Last?, *Fiscal Studies*, 26(4), 513–548.
- Goodman, R. (1997): The Strengths and Difficulties Questionnaire: A Research Note, *Journal of Child Psychology and Psychiatry*, 38(5), 581–586.
- Gormley Jr., W.T., D. Phillips and T. Gayer (2008): Preschool Programs can Boost School Readiness, *Science*, 320, 1723–1724.
- Grammatikopoulos, V., A. Gregoriadis, N. Tsigilis and E. Zachopoulou (2014): Parental Conceptions of Quality in Greek Early Childhood Education, *European Early Childhood Education Research Journal*, 22(1), 134–148.
- Hagy, A.P. (1997): The Demand for Child Care Quality: A Hedonic Price Theory Approach, *Journal of Human Resources*, 33, 683–710.
- Hainmueller, J. (2012): Entropy Balancing for Causal Effects: A Multivariate Reweighting Method to Produce Balanced Samples in Observational Studies, *Political Analysis*, 20, 25–46.
- Hainmueller, J. and Y. Xu (2013): Ebalance: A Stata Package for Entropy Balancing, *Journal of Statistical Software*, 54(7), 1–18.

- Hanushek, E.A. and S.G. Rivkin (2010): Generalizations about Using Value-Added Measures of Teacher Quality, *American Economic Review: Papers and Proceedings*, 100(2), 267–271.
- Harms, T., R.M. Clifford and D. Cryer (1998): *Early Childhood Environment Rating Scale-Revised (ECERS-R)*, New York: Teachers College Press.
- Harris, N. and B. Tinning (2012): Hearing Parents’ and Carers’ Voices: Experiences of Accessing Quality Long Day Care in Northern Regional Australia, *Australasian Journal of Early Childhood*, 37(3), 14–21.
- Havnes, T. and M. Mogstad (2011): No Child Left Behind: Subsidized Child Care and Children’s Long-Run Outcomes, *American Economic Journal: Economic Policy*, 3(2), 97–129.
- Havnes, T. and M. Mogstad (2015): Is Universal Child Care Leveling the Playing Field?, *Journal of Public Economics*, 127(C), 100–114.
- Heckman, J. (2006): Skill Formation and the Economics of Investing in Disadvantaged Children, *Science*, 312(5782), 1900–1902.
- Heckman, J.J. (2011): The American Family in Black & White: A Post-Racial Strategy for Improving Skills to Promote Equality, *Daedalus*, 140(2), 70–89.
- Heckman, J.J. and T. Kautz (2012): Hard Evidence on Soft Skills, *Labour Economics*, 19, 451–464.
- Heckman, J.J., S.H. Moon, R. Pinto, P. Savelyev and A. Yavitz (2010a): Analyzing Social Experiments as Implemented: A Reexamination of the Evidence from the HighScope Perry Preschool Program, *Quantitative Economics*, 1(1), 1–46.
- Heckman, J.J., S.H. Moon, R. Pinto, P.A. Savelyev and A. Yavitz (2010b): The Rate of Return to the HighScope Perry Preschool Program, *Journal of Public Economics*, 94, 128.
- Heckman, J.J. and S. Mosso (2014): The Economics of Human Development and Social Mobility, *Annual Review of Economics*, 6, 689–733.
- Heckman, J.J., R. Pinto and P. Savelyev (2013): Understanding the Mechanisms through which an Influential Early Childhood Program Boosted Adult Outcomes, *American Economic Review*, 103(6), 2052–2086.

- Heckman, J.J. and L.K. Raut (2016): Intergenerational Long-term Effects of Preschool-structural Estimates from a Discrete Dynamic Programming Model, *Journal of Econometrics*, 191(1), 164–175.
- Heckman, J.J., J. Stixrud and S. Urzua (2006): The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior, *Journal of Labor Economics*, 24(3), 411–482.
- Heineck, G. and S. Anger (2010): The Returns to Cognitive Abilities and Personality Traits in Germany, *Labour Economics*, 17(3), 535–546.
- Heinrichs, N., K. Hahlweg, H. Bertram, A. Kuschel, S. Naumann and S. Harstick (2006): Die langfristige Wirksamkeit eines Elterntrainings zur universellen Prävention kindlicher Verhaltensstörungen, *Zeitschrift für Klinische Psychologie und Psychotherapie*, 35(2), 82–96.
- Heinrichs, N. and A. Jensen-Doss (2010): The Effects of Incentives on Families' Long-term Outcomes in a Parenting Program, *Journal of Clinical Child & Adolescent Psychology*, 39(5), 705–712.
- Helburn, S. and B. Bergmann (2002): *America's Childcare Problem: The Way Out*, New York: Palgrave Press.
- Helliwell, J., R. Layard and J. Sachs (2016): *World Happiness Report 2016, Update (Vol. I)*, New York: Sustainable Development Solutions Network.
- Henrich, G. and P. Herschbach (2000): Fragen zur Lebenszufriedenheit (FLZ-M), in: U. Ravens-Sieberer, A. Cieza, M. Bullinger, N. von Steinbuechel, and E. Poepfel (Eds.), *Lebensqualität und Gesundheitsökonomie in der Medizin. Konzepte, Methoden, Anwendung*, Landsberg: ecomed.
- Herbst, C. (2016): The Impact of Quality Rating and Improvement Systems on Families' Child Care Choices and the Supply of Child Care Labor, *IZA Discussion Papers*, 10383.
- Herbst, C.M. and E. Tekin (2010): Child Care Subsidies and Child Development, *Economics of Education Review*, 29(4), 618–638.
- Holm, S. (1979): A simple Sequentially Rejective Multiple Test Procedure, *Scandinavian Journal of Statistics*, 6(2), 65–70.

- Howe, N., E. Jacobs, G. Vukelich and H. Recchia (2013): Canadian Parents' Knowledge and Satisfaction Regarding their Child's Day-care Experience, *Journal of Early Childhood Research*, 11(2), 133–148.
- Huff-Stevens, A. and J. Schaller (2011): Short-run Effects of Parental Job Loss on Children's Academic Achievement, *Economics of Education Review*, 30(2), 289–299.
- Jensen, B., P. Jensen and A.W. Rasmussen (2016): Does Professional Development of Preschool Teachers Improve Child Socio-Emotional Outcomes?, *Labour Economics*, 45, 26–39.
- Johansen, A.S., A. Leibowitz and L.J. Waite (1996): The Importance of Child-Care Characteristics to Choice of Care, *Journal of Marriage and Family*, 58, 759–772.
- Kahneman, D. (2003): Maps of Bounded Rationality: Psychology for Behavioral Economics, *The American Economic Review*, 93(5), 1449–1475.
- Karoly, L.A., G.L. Zellman and M. Perlman (2013): Understanding Variation in Classroom Quality within Early Childhood Centers: Evidence from Colorado's Quality Rating and Improvement System, *Early Childhood Research Quarterly*, 28(4), 645–657.
- Kärrby, G. and J. Giota (1995): Parental Conceptions of Quality in Daycare Centers in Relation to Quality Measured by the ECERS, *Early Child Development and Care*, 110(1), 1–18.
- Kassenboehmer, S.C. and J.P. Haisken-DeNew (2009): Your're Fired! The Negative Effect of Entry Unemployment on Life Satisfaction, *The Economic Journal*, 546, 448–462.
- Keys, T.D., G. Farkas, M.R. Burchinal, G.J. Duncan, D.L. Vandell, W. Li, E. Ruzek and C. Howes (2013): Preschool Center Quality and School Readiness: Quality Effects and Variation by Demographic and Child Characteristics, *Child Development*, 84(4), 1171–1190.
- Khoury-Kassabri, M., S. Attar-Schwartz and H. Zur (2014): The Likelihood of Using Corporal Punishment by Kindergarten Teachers: The Role of Parent-Teacher Partnership, Attitudes, and Religiosity, *Child Indicators Research*, 7, 368–386.
- Klebanov, P.K., J. Brooks-Gunn and M.C. McCormick (2001): Maternal Coping Strategies and Emotional Distress: Results of an Early Intervention Program for Low Birth Weight Young Children, *Developmental Psychology*, 37(5), 654.

- Klein, O. and B. Becker (2017): Preschools as Language Learning Environments for Children of Immigrants. Differential Effects by Familial Language use Across Different Preschool Contexts, *Research in Social Stratification and Mobility*, 48, 20–31.
- Kluczniok, K. and H.G. Roßbach (2014): Conceptions of Educational Quality for Kindergartens, *Zeitschrift für Erziehungswissenschaft*, 17, 145–158.
- Kottelenberg, M.J. and S.F. Lehrer (2014): Do the Perils of Universal Childcare Depend on the Child’s Age?, *CESifo Economic Studies*, 60(2), 338–365.
- Kuger, S., K. Kluczniok, D. Kaplan and H.G. Rossbach (2016): Stability and Patterns of Classroom Quality in German Early Childhood Education and Care, *School Effectiveness and School Improvement: An International Journal of Research, Policy and Practice*, 27(3), 418–440.
- Kuger, S., J. Marcus and C.K. Spiess (2017): Does Quality of Early Childhood Education and Care Affect the Home Learning Environment of Children?, *DIW Berlin Discussion Papers*, 1687.
- LaLonde, R. (1986): Evaluating the Econometric Evaluations of Training Programs, *American Economic Review*, 76(4), 604–620.
- Lehrer, J.S., L. Lemay and N. Bigras (2015): Parental Perceptions of Child Care Quality in Centre-Based and Home-Based Settings: Associations with External Quality Ratings, *International Journal of Early Childhood*, 47(3), 481–497.
- Lindo, J.M. (2011): Parental Job Loss and Infant Health, *Journal of Health Economics*, 30(5), 869–879.
- Lindsay, G., S. Strand and H. Davis (2011): A Comparison of the Effectiveness of Three Parenting Programmes in Improving Parenting Skills, Parent Mental Well-being and Children’s Behavior when Implemented on a Large Scale in Community Settings in 18 English Local Authorities: The Parenting Early Intervention Pathfinder (PEIP), *BMC Public Health*, 11, 962–975.
- List, J., A.M. Shaikh and Y. Xu (2016): Multiple Hypothesis Testing in Experimental Economics, *NBER Working Papers*, 21875.
- Loeb, S., M. Bridges, D. Bassok, B. Fuller and R.W. Rumberger (2007): How Much is Too Much? The Influence of Preschool Centers on Children’s Social and Cognitive Development, *Economics of Education Review*, 26(1), 52–66.

- Love, J.M., E.E. Kisker, C. Ross, H. Raikes, J. Constantine, K. Boller, J. Brooks-Gunn, R. Chazan-Cohen, L.B. Tarullo, C. Brady-Smith, A.S. Fuligni, P.Z. Schochet, D. Paulsell and C. Vogel (2005): The Effectiveness of Early Head Start for 3-year-old Children and their Parents: Lessons for Policy and Programs, *Developmental Psychology*, 41(6), 885.
- Magnuson, K.A., C. Ruhm and J. Waldfogel (2007): Does Prekindergarten Improve School Preparation and Performance?, *Economics of Education Review*, 26(1), 33–51.
- Marcus, J. (2013): The Effect of Unemployment on the Mental Health of Spouses: Evidence from Plant Closures in Germany, *Journal of Health Economics*, 32(3), 546–558.
- Marcus, J. (2014): Does Job Loss Make You Smoke and Gain Weight?, *Economica*, 81(324), 626–648.
- Masse, L. and W.S. Barnett (2007): Comparative Benefit-cost Analysis of the Abecedarian Program and its Policy Implications, *Economics of Education Review*, 26, 113–125.
- McCrae, R. and P. Costa (1994): The Stability of Personality: Observation and Evaluations, *Current Directions in Psychological Science*, 3, 173–175.
- McCrae, R. and P.J. Costa (1996): Toward a new Generation of Personality Theories: Theoretical Contexts for the Five-factor Model, in: J. Wiggins (Ed.), *The Five Factor Model of Personality: Theoretical Perspectives*, New York: Guilford, pp. 51–87.
- McCrae, R. and P.J. Costa (1999): A Five-factor Theory of Personality, in: L. A. Pervin and O. John (Eds.), *Handbook of Personality: Theory and Research*, New York: Guilford, pp. 139–153.
- Meyers, M.K. and L.P. Jordan (2006): Choice and Accommodation in Parental Child Care Decisions, *Community Development*, 37(2), 53–70.
- Mincer, J. (1958): Investments in Human Capital and Personal Income Distribution, *Journal of Political Economy*, 66(4), 281–302.
- Mocan, N. (2007): Can Consumers Detect Lemons? An Empirical Analysis of Information asymmetry in the Market for Child Care, *Journal of Population Economics*, 20(4), 743–780.

- Montie, J.E., Z. Xiang and J. Schweinhart (2008): Preschool Experience in 10 Countries: Cognitive and Language Performance at Age 7, *Early Childhood Research Quarterly*, 21, 313–331.
- Mueller, G. and E. Plug (2006): Estimating the Effect of Personality on Male-Female Earnings, *Industrial and Labor Relations Review*, 60(3), 3–22.
- Naumann, S., H. Bertram, A. Kuschel, N. Heinrichs, K. Hahlweg and M. Döpfner (2010): Der Erziehungsfragebogen (EFB). Ein Fragebogen zur Erfassung elterlicher Verhaltenstendenzen in schwierigen Erziehungssituationen, *Diagnostica*, 56, 144–157.
- NICHD (1996): Characteristics of Infant Child Care: Factors Contributing to Positive Caregiving, *Early Childhood Research Quarterly*, 11(3), 269–306.
- Nowak, C. and N. Heinrichs (2008): A Comprehensive Meta-Analysis of Triple P-Positive Parenting Program Using Hierarchical Linear Modeling: Effectiveness and Moderating Variables, *Clinical Child and Family Psychology Review*, 11, 114–144.
- OECD (2015): Structural Policy Indicators, in: *Economic Policy Reforms 2015 - Going for Growth*, Paris: OECD publishing, pp. 313–339.
- OECD (2016): *Education at a Glance 2016*, Paris: OECD publishing.
- OECD (2017): *How's Life? 2017: Measuring Well-being*, Paris: OECD Publishing.
- Olds, D. (2006): The Nurse-Family Partnership: An Evidence-Based Preventive Intervention, *Infant Mental Health Journal*, 27(1), 5–25.
- Oreopoulos, P., M. Page and A. Huff Stevens (2008): The Intergenerational Effect of Worker Displacement, *Journal of Labor Economics*, 26(3), 455–483.
- Oster, E. (2013): Unobservable Selection and Coefficient Stability: Theory and Validation, *NBER Working Papers*, 19054.
- Oster, E. (2017): Unobservable Selection and Coefficient Stability: Theory and Validation, *Journal of Business Economics and Statistics*, forthcoming.
- Oswald, A.J., E. Proto and D. Sgroi (2015): Happiness and Productivity, *Journal of Labor Economics*, 33(4), 789–822.
- Peter, F. (2016): The Effect of Involuntary Maternal Job Loss on Children's Behaviour and Non-cognitive Skills, *Labour Economics*, 42, 43–63.

- Peter, F.H., P.S. Schober and C.K. Spiess (2016): Early Birds in Day Care: The Social Gradient in Starting Day Care and Children's Non-cognitive Skills, *CESifo Economic Studies*, 62(4), 725–751.
- Pierrehumbert, B., T. Ramstein, A. Karmaniola, R. Miljkovitch and O. Halfon (2002): Quality of Child Care in the Preschool Years: A Comparison of the Influence of Home Care and Day Care Characteristics on Child Outcomes, *International Journal of Behavioral Development*, 26(5), 385–396.
- Rammstedt, B. and O.P. John (2007): Measuring Personality in One Minute or Less: A 10-item Short Version of the Big Five Inventory in English and German, *Journal of Research in Personality*, 41(1), 203–212.
- Rege, M., K. Telle and M. Votruba (2011): Parental Job Loss and Children's School Performance, *The Review of Economic Studies*, 78(3), 1–28.
- Rege, M., M. Votruba and T. Kjetill (2009): The Effect of Plant Downsizing on Disability Pension Utilization, *Journal of the European Economic Association*, 7(4), 754–785.
- Rentzou, K. and M. Sakellariou (2013): Researcher's and Parents' Perspectives on Quality of Care and Education, *Early Child Development and Care*, 183(2), 294–307.
- Richter, D., J. Koertner and D. Sassenroth (2014): Personality Has Minor Effects on Panel Attrition, *Journal of Research in Personality*, 53, 31–35.
- Roberts, B.W., K.E. Walton and W. Viechtbauer (2006): Patterns of Mean-Level Changes in Personality Traits Across the Life Course: A Meta-Analysis of Longitudinal Studies, *Psychological Bulletin*, 132(1), 1–25.
- Romano, J.P. and M. Wolf (2005): Stepwise Multiple Testing as Formalized Data Snooping, *Econometrica*, 73(4), 1237–1283.
- Romano, J.P. and M. Wolf (2016): Efficient Computation of Adjusted p-values for Resampling-based Stepdown Multiple Testing, *Statistics and Probability Letters*, 113, 38–40.
- Ruhm, C. and J. Waldfogel (2012): Long-term Effects of Early Childhood Care and Education, *Nordic Economic Policy Review*, 1(1), 23–51.
- Sanders, M.R. (1999): Triple P-Positive Parenting Program: Towards an Empirically Validated Multilevel Parenting and Family Support Strategy for the Prevention of

- Behavior and Emotional Problems in Children, *Clinical Child and Family Psychology Review*, 2(2), 71–90.
- Sanders, M.R. (2012): Development, Evaluation, and Multinational Dissemination of the Triple P-Positive Parenting Program, *Annual Review of Clinical Psychology*, 8, 1–35.
- Sanders, M.R., J.N. Kirby, C.L. Tellegen and J.J. Day (2014): The Triple P-Positive Parenting Program: A systematic review and meta-analysis of a multi-level system of parenting support, *Clinical Psychology Review*, 34(4), 337–357.
- Sandner, M. (2015): Effects of Early Childhood Intervention on Fertility and Maternal Employment: Evidence from a Randomized Controlled Trial, *SOEPpapers*, 799.
- Schaller, J. and M. Zerpa (2015): Short-Run Effects of Parental Job Loss on Child Health, *NBER Working Papers*, 21745.
- Schlotter, M. (2011): Age at Preschool Entrance and Noncognitive skills before School - An Instrumental Variable Approach, *ifo Working Papers*, 112.
- Schmitz, S. (2017): The Impact of Publicly Funded Childcare on Parental Well-being. Evidence from Cut-off Rules, *DIW Berlin, mimeo*.
- Schmitz, S., C.K. Spiess and J.F. Stahl (2017): Day Care Centers: Family Expenditures Increased Significantly at Some Points between 1996 and 2015, *DIW Economic Bulletin*, 42, 411–423.
- Schober, P.S. (2014): Early Childhood Education Activities and Care Arrangements for Children under Three in Germany: En Route to the Legal Entitlement, in: M. Leon (Ed.), *The Transformation of Care in European Societies*, London: Palgrave, pp. 208–232.
- Schober, P.S. and C. Schmitt (2017): Day-care Availability, Maternal Employment and Satisfaction of Parents: Evidence from Cultural and Policy Variations in Germany, *Journal of European Social Policy*, 27(5), 433–446.
- Schober, P.S. and C.K. Spiess (2013): Early Childhood Education Activities and Care Arrangements of Disadvantaged Children in Germany, *Child Indicators Research*, 6, 709–735.
- Schober, P.S., C.K. Spiess and J.F. Stahl (2016): Gute Gründe für gute Kitas. Wer nutzt welche Qualität von Kindertageseinrichtungen und was bedeutet sie für die

- Vereinbarkeit von Familien- und Erwerbsarbeit?, *Friedrich Ebert Stiftung Policy Report*.
- Schober, P.S., C.K. Spiess, J.F. Stahl, G. Zoch and G.F. Camehl (2017): The Early Childhood Education and Care Quality in the Socio-Economic Panel (SOEP-ECEC Quality) Study - K2ID-SOEP- Data, *DIW Data Documentation*, 91.
- Schober, P.S. and J. Stahl (2016): Expansion of Full-day Childcare and Subjective Well-being of Mothers: Interdependencies with Culture and Resources, *European Sociological Review*, 32(5), 593–606.
- Schröder, C., C.K. Spiess and J. Storck (2015): Private Spending on Children’s Education: Low-Income Families Pay Relatively More, *DIW Economic Bulletin*, 8, 113–123.
- Schröder, C. and S. Yitzhaki (2017): Revisiting the Evidence for Cardinal Treatment of Ordinal Variables, *European Economic Review*, 92, 337–358.
- Schröder, M., R. Siegers and C.K. Spiess (2013): Familien in Deutschland - FiD, *Schmollers Jahrbuch. Journal of Applied Social Science Studies*, 133, 595–606.
- Schultz, T.W. (1961): Investment in Human Capital, *American Economic Review*, 51(1), 1–17.
- Schweinhart, L., J. Montie, Z. Xiang, W. Barnett, C. Belfield and M. Nores (2005): *Lifetime Effects: The High/Scope Perry Preschool Study Through Age 40*, Ypsilanti, MI: High/Scope Press.
- Schwerdt, G. (2011): Labor Turnover Before Plant Closure: “Leaving the Sinking Ship” vs. “Captain Throwing Ballast Overboard”, *Labour Economics*, 18, 93–101.
- Smith, A. (1776): *An Inquiry into the Nature and Causes of the Wealth of Nations*, Oxford: Clarendon Press, Glasgow edition of the works and correspondence of Adam Smith; 2; 1979.
- Specht, J., B. Egloff and S.C. Schmukle (2011): Stability and Change of Personality across the Life Course: The Impact of Age and Major Life Events on Mean-level and Rank-order Stability of the Big Five, *Journal of Personality and Social Psychology*, 101, 862–882.
- Spence, M. (1973): Job Market Signaling, *The Quarterly Journal of Economics*, 87(3), 355–374.

- Spiess, C.K. (1998): *Staatliche Eingriffe in Märkte für Kinderbetreuung. Analysen im deutsch-amerikanischen Vergleich*, Frankfurt a.M.: Campus Verlag, Reihe Wirtschaftswissenschaften.
- Spiess, C.K. (2008): Early Childhood Education and Care in Germany: The Status Quo and Reform Proposals, *Zeitschrift für Betriebswirtschaftslehre*, 67, 1–20.
- Spiess, C.K. and W. Tietze (2002): Qualitätssicherung in Kindertageseinrichtungen - Gründe, Anforderungen und Umsetzungsüberlegungen für ein Gütesiegel, *Zeitschrift für Erziehungswissenschaften*, 1, 139–162.
- Srivastava, S., O. John, S. Gosling and P. J. (2003): Development of Personality in Early and Middle Adulthood: Set Like Plaster or Persistent Change?, *Journal of Personality and Social Psychology*, 84(5), 1041–1053.
- Stahl, J.F., P.S. Schober and C.K. Spiess (2017): Parental Socio-economic Status and Childcare Quality: Early Inequalities in Educational Opportunity?, *Early Childhood Research Quarterly*, forthcoming.
- Statistisches Bundesamt (2002): *Statistisches Jahrbuch 2002 für die Bundesrepublik Deutschland*, Wiesbaden: Metzler-Poeschl.
- Statistisches Bundesamt (2011): *Statistiken der Kinder- und Jugendhilfe. Kinder und tätige Personen in Tageseinrichtungen und in öffentlich geförderter Kindertagespflege am 01.03.2011*, Wiesbaden: Statistisches Bundesamt.
- Statistisches Bundesamt (2016): *Statistiken der Kinder- und Jugendhilfe. Kinder und tätige Personen in Tageseinrichtungen und in öffentlich geförderter Kindertagespflege am 01.03.2015*, Wiesbaden: Statistisches Bundesamt.
- Statistisches Bundesamt (2017): *Bildungsfinanzbericht 2017 - Im Auftrag des Bundesministeriums für Bildung und Forschung und der Ständigen Konferenz der Kultusminister der Länder in der Bundesrepublik Deutschland*, Wiesbaden: Statistisches Bundesamt.
- Sylva, K., I. Siraj-Blatchford and B. Taggart (2003): *Assessing Quality in the Early Years: Early Childhood Environment Rating Scale*, Stoke on Trent, UK and Sterling, USA: Trentham Books.
- Thaler, R.H. (2016): Behavioral Economics: Past, Present, and Future, *The American Economic Review*, 106(7), 1577–1600.

- Tietze, W., F. Becker-Stoll, J. Bense, A. Eckhardt, G. Haug-Schnabel, B. Kalicki, H. Keller and B. Leyendecker (2012): *NUBBEK. Nationale Untersuchung zur Bildung, Betreuung und Erziehung in der frühen Kindheit. Fragestellungen und Ergebnisse im Überblick*, Berlin: NUBBEK.
- Torquati, J.C., H.H. Raikes, C.A. Huddleston-Casas, J.A. Bovaird and B.A. Harris (2011): Family Income, Parent Education, and Perceived Constraints as Predictors of Observed Program Quality and Parent Rated Program Quality, *Early Childhood Research Quarterly*, 26(4), 453–464.
- Uysal, S.D. and W. Pohlmeier (2011): Unemployment Duration and Personality, *Journal of Economic Psychology*, 32(6), 980–992.
- Vandell, D.L. and B. Wolfe (2000): Child Care Quality: Does IT Matter and Does It Need to Be Improved?, *Institute for Research on Poverty Special Report*, 78.
- Viinikainen, J. and K. Kokko (2012): Personality Traits and Unemployment: Evidence from Longitudinal Data, *Journal of Economic Psychology*, 33, 1204–1222.
- Wagner, G.G., J.R. Frick and J. Schupp (2007): The German Socio-Economic Panel Study (SOEP) - Scope, evolution, and enhancements., *Schmollers Jahrbuch*, 127, 139–169.
- Waldfogel, J. (2015): The Role of Preschool in Reducing Inequality, *IZA World of Labor*, 219.
- Walters, C.R. (2015): Inputs in the Production of Early childhood Human Capital: Evidence from Head Start, *American Economic Journal: Economic Policy*, 7(4), 76–102.
- Weaven, S. and D. Grace (2010): Examining Parental and Staff Perceptions of Child-care Service Quality across Competing Business Structure, *Australasian Journal of Early Childhood*, 35(2), 54–62.
- Webster-Stratton, C., M. Reid and M. Hammond (2004): Treating Children with Early-onset Conduct Problems: Intervention Outcomes for Parent, Child, and Teacher Training, *Journal of Clinical Child and Adolescent Psychology*, 33(1), 105–124.
- Werquin, P. (2010): *Recognising Non-Formal and Informal Learning - Outcomes, Policies and Practices*, Paris: OECD Publishing.
- Wichert, L. and W. Pohlmeier (2010): Female Labor Force Participation and the Big Five, *ZEW Discussion Paper*, 10-003.

- Wrohlich, K. (2008): The Excess Demand for Subsidized Child Care in Germany, *Applied Economics*, 40, 1217–1228.
- Xiao, M. (2010): Is Quality Accreditation Effective? Evidence from the Childcare Market, *International Journal of Industrial Organization*, 28, 708–721.
- Yamauchi, C. (2010): The Availability of Child Care Centers, Perceived Search Costs and Parental Life Satisfaction, *Review of Economics of the Household*, 8(2), 231–253.
- Yamauchi, C. and A. Leigh (2011): Which Children Benefit from Non-parental Care?, *Economics of Education Review*, 30, 1468–1490.