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National context and socioeconomic inequalities in educational achievement

An overview of six high-income countries: France, Germany, Japan, the Netherlands, United Kingdom, and United States

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National context and socioeconomic inequalities in educational achievement - An overview of six high-income countries: France, Germany, Japan, the Netherlands, United Kingdom, and United States

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Abstract

Empirical research repeatedly shows cross-country differences in the extent and distribution of socioeconomic inequalities in educational achievement. This observation is the starting point for the comparative DICE-project (*D*evelopment of *I*nequalities in *C*hild *E*ducational Achievement: A Six-Country Study). It aims to improve the understanding of child development by socioeconomic status, operationalised in terms of parental education in six countries: France, Germany, Japan, the Netherlands, the United Kingdom, and the United States. The project moves beyond cross-sectional and single country snapshots and examines the development of inequalities from 3 years of age up to the end of lower secondary schooling.

In this contribution, we introduce the six countries. First, by synthesizing data from a range of international databases we provide a rich and multidimensional characterisation of macrostructural conditions in each country. Linking the contextual situation in the DICE-countries to general theoretical assumptions about the effects of macrostructural conditions, we highlight the implications for cross-national differences in inequalities in educational achievement. Second, we analyse PISA data providing information about achievement test scores at age 15. We study how the different packages of macrostructural characteristics described in the contextual section are reflected in terms of educational inequalities by the end of lower secondary schooling in each country.

Résumé

Les recherches empiriques ont mis en évidence des différences notables dans l'ampleur et la distribution des inégalités socio-économiques en matière de résultats scolaires entre pays. Cette observation est le point de départ du projet comparatif DICE (Development of Inequalities in Child Educational Achievement: A Six Country Study). Il vise à améliorer la compréhension des différences de développement de l'enfant selon le statut socio-économique, appréhendé par le niveau d'instruction des parents dans six pays (Allemagne, États-Unis, France, Japon, Pays-Bas et Royaume-Uni). Le projet va au-delà de l'analyse nationale et transversale en examinant le développement des inégalités de l'âge de 3 ans à la fin de l'enseignement secondaire (collège).

Dans cette contribution, nous présentons les six pays. Tout d'abord, en synthétisant les données d'une série de bases de données internationales, nous décrivons finement en recourant à des indicateurs multidimensionnels le contexte national de chacun. En reliant ce contexte national

aux hypothèses théoriques sur les effets des conditions macros, nous soulignons le rôle des différences transnationales dans les inégalités de réussite scolaire. Deuxièmement, nous analysons les indicateurs PISA de réussite scolaire à l'âge de 15 ans et étudions comment les différents ensembles de caractéristiques macros décrits dans la section contextuelle se traduisent en termes d'inégalités éducatives à la fin de l'enseignement secondaire dans les six pays.

Keywords

Socioeconomic inequality, cross-country comparisons, welfare regimes, early childcare, education, education systems, educational achievement, human capital formation, PISA.

Mot-clefs

Inégalité socio-économique, comparaison internationale, régimes de protection sociale, mode d'accueil des enfants, scolarité, système éducatif, résultats scolaires, formation du capital humain, PISA.

Link to INED

This contribution provides information on country-specific conditions, theoretical considerations and methodological issues relevant to the DICE-project (*D*evelopment of *I*nequalities in *C*hild *E*ducational Achievement: A Six Country Study). The analysis will be based on rich panel data sets from six countries, namely France, Germany, Japan, the Netherlands, the United Kingdom, and the United States. The French PI and her team are located at the INED.

Additional information about Dice project can be found on the website: https://dice.site.ined.eng/

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Contents

Acronyms and abbreviations

DEPP:	La Direction de l'évaluation, de la prospective et de la performance
DICE:	Development of Inequalities in Child Educational Achievement
ECEC:	Early Childhood Education and Care
ECLS-B:	Early Childhood Longitudinal Study, Birth Cohort
ECLS-K:	Early Childhood Longitudinal Study, Kindergarten-First Grade Waves
ELFE:	French Longitudinal Study of Children
ESCS:	Index of Economic, Social and Cultural Status (developed by the PISA consortium)
FR:	France
GDP:	Gross Domestic Product
GE:	Germany
IEA:	International Association for the Evaluation of Educational Achievement
ILSA:	International Large-Scale Assessment Studies
ISCED:	International Standard Classification of Education
JCPS:	Japan Child Panel Survey
JHPS:	Japan Household Panel Survey
JP:	Japan
KHPS:	Keio Household Panel Survey
LSN:	Longitudinal Study of Newborns
MCS:	Millennium Cohort Study
NEPS:	National Educational Panel Study
NL:	Netherlands
OECD:	Organisation for Economic Cooperation and Development
PIRLS:	Progress in International Reading Literacy Study
PISA:	Programme for International Student Assessment
PVI:	Private, voluntary and independent
SC:	Starting Cohort
SD:	Standard deviation
SES:	Socioeconomic status
UK:	United Kingdom
US:	United States

1. Introduction

International large-scale assessment studies (ILSA) such as the Progress in International Reading Literacy Study (PIRLS) in Grade 4 or the Programme for International Student Assessment (PISA) at age 15 have repeatedly shown that achievement test scores vary by the socioeconomic status (SES) of the parents at the end of primary and lower secondary school. The higher the parents' SES, the higher the test results of a child on average. These differences are observable in every single country under observation, although there is considerable variation between countries (e.g., Hußmann et al., 2017; Mullis et al., 2016; OECD, 2016c, p. 215) and over time (Chmielewski, 2019). Further research has shown that socioeconomic differences in educational achievement already exist at school entry and even earlier and that there are also some cross-country differences in the extent of socioeconomic inequalities at this early age (Bradbury et al., 2015; Linberg et al., 2019). Most studies on cross-national differences in the development of skills, overall or by SES, are based on the above-mentioned ILSAs, construct pseudo-cohorts and address, for example, the importance of specific structural features such as tracking (e.g., Ammermueller, 2013; Hanushek & Woessmann, 2006). Important gaps in the comparative literature remain in relation to the processes that give rise to disparities in achievement and socioemotional outcomes, particularly those operating early in the life course during the preschool and primary school years. We know relatively little about whether SES-related gaps in childhood outcomes evolve at different rates in different systems and whether they are underpinned by common or country-specific processes. These gaps are the starting point for the project *D*evelopment of *I*nequalities in *C*hild *E*ducational Achievement: A Six Country Study (DICE).

The DICE-study aims to improve the understanding of cross-national differences in child development by SES, operationalised in terms of parental education. The project moves beyond cross-sectional and single country snapshots and examines the development of inequalities beginning at 3 years of age up to the end of lower secondary schooling. In addition to documenting the development of inequalities in cognitive and socio-emotional skills, the aim of the DICE project is to understand the underlying mechanisms focusing on processes within families as well as on early childcare and schooling. The analysis will be based on rich panel data sets from six countries, namely France, Germany, Japan, the Netherlands, the United Kingdom, and the United States. The selection of countries was motivated primarily by the availability of rich, nationally representative, datasets spanning the full period of childhood. All these relatively wealthy countries have a well-established education system, compulsory education for at least 9 years, and well-established tertiary education systems. All the countries are capitalistic and have some form of welfare state. Nevertheless, as we document in detail below, there are remarkable differences in the organisation of the early childcare and education systems, and with respect to which and how families are targeted by policies. Hence, as we show, each of our six countries has different features that have been linked to lower as well as higher inequality. It is an open question whether the effects of these different systemic packages do, indeed, balance out or whether some combinations of policies and conditions appear more successful at limiting the emergence of childhood educational inequalities.

First, by synthesizing data from a range of international databases we provide a rich and multidimensional characterization of macrostructural conditions in each country. In this respect we consider three general aspects, namely (a) economic inequality, social welfare provision and deprivation, (b) early childhood education and care (ECEC), and (c) organization of primary and lower secondary education. These data provide relevant background information for our six country analyses. Linking the contextual situation in the DICE-countries to general theoretical assumptions about the effects of macrostructural conditions, we highlight the potential

implications of cross-national differences in each domain for socioeconomic inequalities in educational achievement, paying attention to variations depending on age and stage of the educational career of the children. The macrostructural features will guide the analysis of the country-specific data sets within DICE. Even if we cannot rigorously test the macrostructural assumptions, they guide the interpretation of the results based on the country-specific microdata. Conversely, the microdata helps us to identify within-countries processes that are responsible for social inequalities. By harmonising the data for the six countries, we can compare inequality-generating processes and uncover cross-country similarities and differences starting at an early stage in the educational career.

Second, we analyse PISA data providing information about achievement test scores at age 15. PISA provides the most comparable data on achievement for investigating how different packages of macrostructural characteristics described in the contextual section play out in the six DICE countries in terms of educational inequalities by the end of lower secondary schooling. The DICE analyses will allow us to build up a longitudinal picture of how social origin affects children from early childhood to adolescence - in multiple domains of development such as language or socioemotional child outcomes - and to quantify the role of a rich set of micro- and meso-level processes in driving the SES-related gaps in different countries. PISA data, for example, cannot be used for these purposes, given its cross-sectional nature, its focus only on academic skills in secondary education, and its limited information on childhood home environments. Nevertheless, PISA has several key strengths in relation to DICE, namely that it measures the skills of children in different countries for a common birth cohort year and calendar year and uses a common test instrument. PISA can give us a comparative snapshot of how academic skill inequalities have accumulated in earlier cohorts by the end of lower secondary schooling. From a methodological perspective, it provides valuable information on how much DICE comparisons are likely to be affected by methodological choices about the scaling of child outcome variables and SES indicators and by birth cohort variation across countries.

The paper is structured as follows: in the first section we outline central macrostructural processes considering theoretical assumptions and central empirical findings and link them to the situation in the six DICE countries. Based on these considerations and descriptions we present potential implications for cross-country differences and similarities in socioeconomic inequalities in educational achievement (section 2). In this section we also discuss the operationalization of SES and compare the DICE approach, which is based on parental educational qualifications, with the composite SES index approach favoured by the ILSAs. Afterwards we describe empirical results based on PISA (section 3).

2. Macrostructural conditions and socioeconomic inequalities in educational achievement: Theoretical considerations and situation in the DICE countries

Based on some general theoretical assumptions (section 2.1) we present selected macro- (and some meso-) structural features which might generate cross-country differences in the extent of socioeconomic inequalities in educational achievement and link these features to the situation in the six DICE countries. We start with indicators of economic inequality, social welfare provision and deprivation (section 2.2), followed by early childhood education and care (ECEC; section 2.3) as well as organization of primary and lower secondary education (section 2.4). Next, we summarize expectations for how macrostructural features might impact the level of inequality in educational achievements (section 2.5). In this section, we also discuss to what extent socioeconomic achievement inequalities might depend on the operationalization of SES.

For the sake of clarity, the description of macrostructural conditions refers to the situation at a common type point, selected as the mid-2010s to be both reasonably recent and within the observation periods of the majority of the panel studies used in DICE (see Appendix A). In the case of crucial variations or developments in the years before, we include information on trends since the 1990s, as some of the DICE cohorts were alive during that period. Hence, we describe the macrostructural conditions children and families from the specific country panels faced from birth to interview.

Please note that when we report changes between years these changes refer to changes from the current time to the past. Hence, we calculated, e.g., $A_{[situation\ in\ 2015]} - A_{[situation\ in\ 1995]}$.

Furthermore, we focus on the national situation as it applies to the majority of the population; regional differences within countries are not taken into account.

2.1 Some general theoretical considerations

The aim of this contribution is to understand the national contexts in which SES-related gaps in achievement evolve over childhood. Hence, the guiding question is: How do countries vary in terms of macrostructural conditions that have been linked to wider educational inequalities?

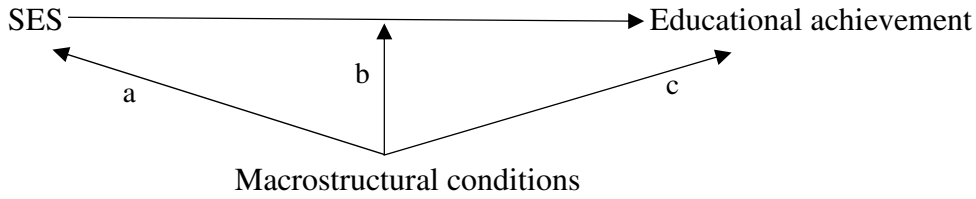
In general, we assume three potential types of macrostructural effects underlying cross-national variation in socioeconomic inequalities in educational achievement which are analytically distinct from each other (see also Figure 2-1):

a. Via various instruments, like tax redistribution, (financial) subsidies, or insurance, states could affect how sharply financial resources vary between socioeconomic groups as well as the relative size of those groups (e.g., the percent of individuals below some poverty line). If economic resources shape the development of children in a similar fashion across countries, country-specific differences in resource allocation should lead to cross-national differences in educational inequality (e.g., Blossfeld, 2016; Bradbury et al., 2019).

b. Another type of explanations highlights how institutional features might balance out effects of SES by, e.g., the opportunities children and their families face. Here, examples would be the design of public or private early childhood care and preschool education or the organisation of primary and secondary education. More technically speaking, the question is how institutional features interact with the socioeconomic origin of families and, hence, foster or buffer SES effects.

c. A third type of explanation involves direct effects of macrostructural features on the level and distribution of cognitive skills. Countries might show overall higher or lower levels and dispersion in skills due to, for example, relatively high investments in education. Overall, the absolute level and distribution of skills should be taken into account, since it may well be the case that those who perform poorly in country A show higher proficiencies in absolute terms than those who perform well in country B.

Figure 2-1. Analytical distinction of macrostructural effects



To understand cross-country differences in the extent of socioeconomic inequalities, it is necessary to, first, outline theoretical arguments that provide explanations of SES-related gaps in achievement outcomes and, then, link them to macrostructural conditions (for a similar approach see, e.g., Blossfeld, 2016; Bukodi et al., 2018). Therefore, we start with explanations focusing on children and their families and combine them in the next sections with selected contextual features.[1]

First, numerous arguments in the literature could be assigned to and followed from a resource approach or family investment model (e.g., Becker, 1993; Boudon, 1974; Bourdieu, 1983, 1986; Coleman, 1988; Erikson & Jonsson, 1996; Lareau & Weininger, 2003; Conger & Donnellan, 2007). The basic idea is that children and families have access to various resources, or types of capital, which might affect, amongst other things, the access children have to beneficial and stimulating learning environments, individual learning efficiency, and engagement and motivation (e.g., Erikson & Jonsson, 1996). In this respect, three types of resources are regularly mentioned in educational research: (1) economic resources such as household income (e.g., Bourdieu, 1983, p. 185); (2) cultural resources in the form of habits, various skills like language skills or strategic knowledge regarding, e.g., the education system but also qualifications and certificates (e.g., Becker, 1993; Bourdieu, 1983, 1986; Lareau & Weininger, 2003); (3) social resources in the form of social relationships and networks such as support and social control as well as in the form of shared norms and values (e.g., Bourdieu, 1983; Carbonaro, 1998; Coleman, 1988; Portes, 1998; Stanton-Salazar, 1997).

These resources might affect the development of skills through various paths; the following examples roughly illustrate this. While economic resources might facilitate supportive learning environments through, for example, beneficial learning materials or access to shadow education, cultural capital facilitates parents' support for children and the efficiency of their learning due to, e.g., familiarity with cultural codes used in lessons. In this respect, individual dispositions, abilities or previously acquired skills could also be mentioned, as learning growth may depend on initial conditions, for example with higher the previous skills leading to higher learning growth (e.g., Atkinson, 1974; Heckman, 2006; Merton, 1968; Stanovich, 1986). Finally, social capital in the form of social relations and obligations might facilitate not only helpful support but also the transmission of norms and values conducive to educational success (e.g., Coleman, 1988, pp. 104–106).

To explain social inequalities in child development, it is assumed that resources available to children vary systematically in relation to family SES. Therefore, children from privileged families have access to more and better educational resources; these families provide more demanding and development-related environments and show higher aspirations than less advantaged children and their families.

[1] Please note that we present in this section central ideas and assumptions of different theoretical approaches. Of course, they partly overlap and are not always mutually exclusive.

Second, research from, especially, developmental psychology and pedagogy point mainly to the role of parenting behaviour and interactions within families; in particular the family stress model could be named here (e.g., Conger & Donnellan, 2007; Conger & Elder Jr., 1994; Keizer, 2020; Masarik & Conger, 2017). This model posits that economic hardship impacts of the type and quality of parenting and interaction behaviours, which in turn impact on children's emotional, behavioural, cognitive, and physical well-being (e.g., Conger & Donnellan, 2007; Conger & Elder Jr., 1994; Keizer, 2020; Kulic et al., 2019, p. 560; Pinquart, 2017). In this respect, it is expected that sensitive, supportive interactions are conducive to achievement, while harsh and inconsistent parenting behaviour could lead to poorer outcomes (e.g., Keizer, 2020, pp. 54–55; McLoyd, 1998).

In the literature, it is assumed that processes and factors mentioned in the investment or resource approach are more strongly associated with achievement, while factors associated with the family stress model are more strongly linked to children's behaviour (problems) (e.g., Khanam & Nghiem, 2016; Yeung et al., 2002, p. 1863). Nevertheless, factors from both approaches could also interact with each other (Yeung et al., 2002, p. 1863), e.g., depressed parents might also be less involved in learning activities.

Third, another argument, which is often used in sociological stratification research, refers to the status maintaining motive (Boudon, 1974, pp. 29–30). Following this argument, privileged families have a higher incentive to attend further education and invest in education in order to secure their already achieved status than families from lower social strata (or social class). In consequence, privileged children and their families show higher educational aspirations which then might translate, amongst other things, into higher educational achievement.

Overall, according to these approaches, it can be assumed that socioeconomic inequalities in developmental outcomes emerge at an early age and widen over the years, at least partially, due to path dependency and different learning curves (e.g., Kulic et al., 2019, p. 561). Then, the question is in which way macrostructural features hamper or foster processes at the level of the child and the family and, in turn, lead to cross-country variation in socioeconomic inequalities in educational achievement.

The basic idea is that children and their families are not independent from their extra-familial environments. They are embedded in and affected by the offered opportunities and incentives, but also restrictions (Allmendinger, 1989, p. 231; Boudon, 1981; Bronfenbrenner, 1994; Duncan & Murnane, 2011; Kalil, 2015; McLanahan, 2004; Peter et al., 2010; Putnam, 2015). Furthermore, we would expect the way in which macrostructural environments impact child development to vary by age and stage in the educational career: at younger ages, after birth, macrostructural conditions should affect the acquisition of skills indirectly – in most cases – by affecting parents and, therefore, processes within the family (e.g., Bradbury et al., 2015, p. 43). As soon as children start attending childcare and school, macrostructural conditions should have a more direct impact by, e.g., shaping such learning contexts and offering alternatives. However, at this stage indirect effects are still possible, e.g., through the opportunities available after compulsory schooling and in the labour market which are perceived by the children and their families. In general, we assume that macrostructural contexts and families might have independent, compensatory or cumulating/strengthening effects that will vary in relevance over the course of childhood.

In the following subsections, we roughly outline how macrostructural factors may contribute to socioeconomic inequalities in development. We sketch out possible mechanisms considering three general macrostructural factors that have been studied and discussed within different dis-

ciplines including demography, economy, developmental psychology or sociology (e.g., Bradbury et al., 2019; Chmielewski, 2019; Marks, 2005; Peter et al., 2010; Pfeffer, 2008): differences in inequality and deprivation, in aspects of social welfare; in ECEC; and in the organisation of the school system. Our focus here is on system-level characteristics that are theoretically linked to within-country SES-related inequalities in children's environments. Therefore, we exclude from consideration a number of important indicators of country demographic composition, such as rates of single parenthood, fertility, immigration and maternal employment, since the relations between national aggregates on these measures and SES inequalities in childhood conditions is ambiguous. The implications of these characteristics for children in different socioeconomic groups depends on the way they are distributed across the population and the extent to which they are rewarded (or otherwise) in economic, social and cultural terms. We provide information on national averages of these sorts of contextual factors in Appendix Table B1 for reference, but do not discuss them further because of the difficulties of interpretation. Indeed, we note that an important contribution of the DICE project is to use microdata to systematically explore the contribution of these important factors to cross-national SES-related inequalities in childhood environments, something that is not possible with existing country-level international databases.

2.2 Economic inequality, social welfare provision and deprivation indicators

Theoretical considerations

Income inequality is linked to child development via the economic resources mechanism: greater inequalities in income between those at the top and bottom of the social hierarchy translate into greater differentiation in the ability of parents to invest in purchased goods and services that support their children's learning (e.g., Bradbury et al., 2015, pp. 77–78; Malin et al., 2014). There may also be implications for lower learning engagement due to the wish of those in low-income families to get started earlier in the labour market and earn money (Erikson & Jonsson, 1996, pp. 18–19). A large literature on the 'Great Gatsby Curve' has linked income inequality to lower social mobility (Corak, 2013) and educational achievement is a key mechanism by which advantage among the parental generation is transmitted to the offspring generation (Jerrim & Macmillan, 2015). Purchased goods and services also include residential location and relatively high within-country inequality might also lead to more social and ethnic residential segregation which, in turn, might increase differences in, e.g., the average social composition *between* various living spaces like neighbourhoods or schools as well as the degree of homogeneity *within* them. Such changes in the composition could additionally - and independently from individual characteristics - affect learning of children living and studying in a specific place (so called composition effects; see, e.g., Conger et al., 2011; Durlauf, 2004; Eksner & Stanat, 2012; Galster, 2008; Jencks & Mayer, 1990; Nonnenmacher, 2017; South et al., 2003; Willms & Chen, 1989).

These processes should matter already in the early years and over various stages of the life course. Effects caused by social or ethnic segregation (composition effects) should vary over the life course as the role played by other actors in the child's life varies: it is assumed that in younger years parents and their networks shape children's development to a greater extent (e.g., Leventhal & Brooks-Gunn, 2000, p. 822), whilst peers become more important as children get older (e.g., Aber et al., 1997, pp. 54, 56-57; Ellen & Turner, 1997, p. 839; McCulloch & Joshi, 2001, p. 581; Ream, 2005, p. 203).

Income inequality is the product of two processes. There is the degree of inequality generated by the market, and particularly the labour market, which may then be (at least partially) offset by the state through the redistribution of resources via the tax and transfer system. Countries vary not only in the extent of this redistribution overall, but in the extent to which different groups, such as families with young children or the elderly, are targeted with resources. According to the famous classification of Esping-Andersen, states can be assigned to different welfare regimes when considering aspects such as the triad of state, market, and family (Esping-Andersen, 1992, pp. 35–36), the way employment and social stratification are affected, and the extent to which individuals are able to live independently from the market (Blossfeld, 2016, p. 58). For our purposes, the conservative, liberal, and East Asian welfare regimes are relevant. Conservative regimes are characterised by a comprehensive system of social insurance linked to occupation and status; the family plays a central role for provision of welfare, and the state subsidies the family (Esping-Andersen & Myles, 2009, p. 647). In contrast, liberal regimes show a dominance of the market, while the state intervenes only minimally assuming that citizens can get welfare from the market (Blossfeld, 2016, p. 59; Esping-Andersen & Myles, 2009, p. 645). Thus, private insurance schemes are common (e.g., Blossfeld, 2016, p. 60). The East Asian regime encourages provision of services by firms and families. Additionally, social insurance and other benefits depend strongly on a high level of education and on being employed in a large firm (Blossfeld, 2016, pp. 66–67 referring to Esping-Andersen, 1992, p. 91). All in all, we might expect lower SES achievement inequalities in the conservative welfare regime and higher inequalities in the liberal regime. The East Asian regime should be in between (for similar expectations see, e.g., Blossfeld, 2016). However, broad classifications of regime can obscure nuances in the extent and nature of redistribution to certain groups. Below we therefore also consider three specific indicators: the before-tax-and-transfer Gini coefficient, which captures the 'raw' degree of inequality generated by the market; the after-tax Gini which, by comparison, captures the realised level of income inequality and the extent of redistribution within the population as a whole; and the percentage of gross domestic product (GDP) allocated to public spending on the family, which indicates the priority attached to children by the state. We would expect lower after-tax Gini coefficients to be associated with lower SES-related achievement inequalities, but this may be moderated by the extent to which state subsidies are focused on families with children in preference to other groups.

Income inequality is a relative concept but there are also mechanisms that link more absolute measures of disadvantage, such as poverty and unemployment, directly to children's development. According to the family stress model, economic pressure and hardships affect parents' well-being, e.g., mental health and relationships, which in turn might impact parenting behaviour (e.g., Conger & Donnellan, 2007, pp. 179–180; Conger & Elder Jr., 1994; Scaramella et al., 2008). As a result, a child's overall well-being (Conger & Donnellan, 2007, pp. 179–180), confidence (e.g., Sroufe, 2009, p. 190) as well as engagement and abilities such as problem solving or learning (Keizer, 2020, pp. 52–53) could be hampered by harsher, less supportive parenting behaviour and a lower quality of parental interaction behaviour. The proportion of low SES families affected by stressors like poverty and unemployment may, therefore, be negatively linked to the average achievement of children in that group.

Similar arguments about parental stress and parenting behaviour also apply to non-monetary aspects of disadvantage. Disparities in parental time, health, skills and connections between socioeconomic groups will tend to exacerbate economic inequalities to different degrees in different times and places (Bradbury et al., 2019; McLanahan, 2004). Below we consider two demographic indicators, adolescent fertility and low birth weight, two traditionally considered

'risk factors' for child development that are strongly concentrated in low-SES families. In contrast to most demographic indicators, therefore, it is reasonable to assume that low-SES groups are relatively disadvantaged along these dimensions in a cross-national sense in countries where rates of these risk factors are high.

Empirical evidence

There is empirical evidence for increasing social inequalities in educational achievement with increasing poverty, income inequality, and child poverty (e.g., Chmielewski & Reardon, 2016, pp. 15–16). However, these studies remain open on why the degree of inequality in a society affects social inequalities in achievement. There are numerous studies testing and confirming the family stress model - or at least selected paths of the model (see for an overview Keizer, 2020, pp. 55–56; Masarik & Conger, 2017). However, the reported effect sizes of income on parental well-being or parenting practices are often small (e.g., Mayer, 1998).

While some studies report cross-country differences in the extent of social inequalities in relation to welfare regime (Blossfeld, 2016; Peter et al., 2010), others do not find such effects (Chmielewski & Reardon, 2016). However, these results do not tell anything about the underlying mechanisms causing certain patterns that are observable at the macro level (see also Kroneberg, 2019, pp. 33–34). Furthermore, studies linking social welfare instruments, like different types of subsidies, to cross-national differences in SES-related gaps in children's outcomes are rare. Results from studies about the importance of early childcare and education as well as selected aspects of education system are presented in the next two sections.

Overall, it remains mostly an open question whether any and which of the explanatory approaches are responsible for the observable cross-country variation in social inequalities.

Conditions in the DICE countries

We start this section with the welfare regime classification to frame and guide our thoughts. The three continental European countries France, Germany, and the Netherlands are classified as conservative welfare regimes, whereas the UK and the US are described as liberal welfare regimes, and Japan is categorised as East Asian welfare regime (Blossfeld, 2016, pp. 66–67). Along this classification we would expect the lowest socioeconomic achievement inequalities in France, Germany, and the Netherlands; whilst the inequalities should be largest in the UK and the US.

The after-tax Gini coefficients for 2015 reported in Table 2-2 indeed align with our expectations: the lowest income inequality is seen in the Netherlands, Germany and France, Japan is in the middle, and the highest inequality is found in the US followed by the UK. Interestingly, these national differences seem mostly to reflect differences in approaches to redistribution. While the Netherlands had a notably low before-tax Gini in 2015, market inequality was virtually the same in the other five countries. Hence the relatively high level of realised income inequality in the US seems attributable to a more limited role of the state, rather than greater inherent inequality in the labour market. The patterning of after-tax Gini coefficients is generally stable between 1995 and 2015, although these measures are not strictly comparable due to definitional changes. With the exception of the Netherlands, there is evidence of a general rise in before-tax income inequality during this period, with a particularly sharp increase in Japan. But this did not translate into dramatic increases in after-tax income inequality, so there is little reason to expect strong cohort effects linked to wider inequality in cross-national comparisons of achievement gaps.

The next indicator we look at is the percentage of GDP spent on benefits targeted specifically to families, such as child allowances and credits, childcare support, income support during leave, and single parent payments. Here the country ordering is rather different. Family spending was lowest in the US and moderate in Japan, as expected on the basis of their respective regime types. There are noticeable differences in family spending among the three countries with the lowest income inequality: the value for France is nearly double that of the Netherlands, with Germany placed between the two. But perhaps the most striking statistic is that the UK, despite its relatively high overall income inequality, spent the largest proportion of GDP on family subsides of all the six countries in 2015. This seems, at least in part, to reflect a change in spending priorities, since a 75% increase over the 1995 level can be observed. All else equal, we might expect this to pull achievement inequalities for more recent cohorts in the UK closer to those in the continental European countries and Japan, and away from those in the US.

The picture with regard to deprivation indicators is also not consistent. The US stands out as having particularly high rates of child poverty and teenage pregnancy, factors which are likely to contribute to higher rates of hardship in low-SES families, but it stands out less in terms of unemployment and low birth weight. The UK also has internationally high rates of teen pregnancy, but a child poverty rate that dropped markedly between 1995 and 2015, in line with the aforementioned increase in family spending. However, among the three continental European countries, the ordering in terms of deprivation indicators tends to be the reverse of the ordering for family spending: deprivation rates are mostly the lowest in the Netherlands and highest in France, with France standing out as having the highest unemployment rate of all the six countries in both the 1996-2005 and 2006-2015 periods. Japan has relatively high rates of child poverty and low birth weight[2] but low SES Japanese families are perhaps protected by some of the lowest rates of unemployment and teenage pregnancy seen among the six DICE countries[3].

Overall, it is clear that the picture in terms of inequalities in economic resources is complex. The majority of indicators support the hypothesis that resources will be more unequally distributed across SES groups in the US than in any of the other countries. Beyond that, as we summarise in detail below in section 2.5, each country has relative strengths in some areas but weaknesses in others. The implications for achievement inequalities are therefore an open empirical question.

[2] The higher share of children with low birth weight, especially in Japan, could not only be a proxy indicator for maternal well-being and health, but also for beauty ideals and/or the wish to carry a smaller baby to foster a smoother delivery. Both might result in a lower body weight gain for the mother during pregnancy and, in turn, to a higher share of children with low birth weight (e.g., Takemoto et al., 2016). In this respect, in Japan the average birth weight also decreased in the last years (e.g., Takemoto et al., 2016). It might make sense then to take the causes of low birth weight into account in an explanation of socioeconomic achievement gaps, since they may also address different underlying mechanisms.

[3] The low unemployment rate in Japan is likely to disguise important differences in economic security between single mother and two parent families. The gender wage gap in Japan is the highest among the DICE countries and employed single mothers tend to face more unstable employment status and lower wages than equivalent male workers.

Table 2-2. Inequality, social welfare provision and deprivation, by country

Indicator	Year	FR	GE	JP	NL	UK	US
Welfare State Regime (e.g., Blossfeld, 2016; Passaretta & Skopek, 2018b; Peter et al., 2010)		Con-servative	Con-servative	East Asian	Con-servative	Liberal	Liberal
Gini coefficient[1]:	2015						
Before taxes and transfers		0.52	0.50	0.50	0.45	0.52	0.51
After taxes and transfers		0.30	0.29	0.34	0.29	0.36	0.39
Gini coefficient[1]:	1995[2]						
Before taxes and transfers		0.47	0.46	0.40	0.48	0.51	0.48
After taxes and transfers		0.28	0.27	0.32	0.30	0.34	0.36
% GDP spent on family (family – child allowances and credits, childcare support, income support during leave, sole parent payments)	2015	2.9	2.2	1.3	1.5	3.5	0.6
Change in % in GDP spent on family	2015 - 1995	0.3	0.2	0.8	0.1	1.5	0.1
Poverty rate (50% median income):	2015						
After taxes and transfers (0-17-year-olds)		11.3	11.2	13.9	10.4	11.2	19.9
Poverty rate (50% median income):	1995[2]						
After taxes and transfers (0-17-year-olds)		9.0	8.1	12.0	9.2	16.1	22.3
Average annual harmonised unemployment rate (average over the specified years)	2006 - 2015	9.3	6.7	4.2	5.5	6.7	7.0
	1996 - 2005	10.1	9.3	4.5	5.0	5.7	5.0
Adolescent fertility rate (births per 1,000 women ages 15-19)	2015	9.0	7.1	4.2	4.2	14.6	22.4
Change in adolescence fertility rate	2015 - 1995	-1.3	-7.1	0.1	-2.4	-15.8	-32.2
Low birth weight rate (% of total live births)	2015[3]	7.6	6.6	9.5	6.1	6.9	8.1
Change in % of low birthweight rate	2015 - 1995[4]	1.1	0.5	2.0	-1.1	-0.3	0.8

Notes. Income and poverty definitions were revised by the OECD in 2012 so figures from 1995 and 2015 cannot be compared directly.
[1] The Gini coefficient can range from 0 (complete equality) to 1 (complete inequality). [2] Information on GINI and poverty for France are from 1996 and for UK from 1994. [3] Numbers for low birth weight rate are from 2013 for Germany. [4] Numbers for low birth weight rate are from 2000 for France.
Statistical source: OECD Stats (OECD, 2019b).

2.3 ECEC and support for 0-5-year-olds[4]

Theoretical considerations

Early childhood education and care (ECEC) settings offer (additional) learning environments which might support the development of educational achievement as well as the development of social skills. In particular less advantaged groups should benefit from attending ECEC such as kindergartens with more learning-rich environments than are available at home. Consequently, SES-related gaps should decline when there are overall high shares of childcare attendance (e.g., Esping-Andersen et al., 2012; Skopek et al., 2017, p. 8). However, it could also be the case that learning gains from attending ECEC for children from lower social strata are balanced out due to lower learning efficiency caused by social inequalities in initial cognitive skills (Kulic et al., 2019, pp. 562–563). In this respect, the age at which ECEC starts might also matter: the equalising effect of ECEC should be larger at younger ages when differences in the

[4] In addition to centre-based childcare/childcare facilities (kindergarten, day care centre etc.), childminders might play an important role in some countries. For different reasons, we focus on the most prevalent forms of childcare and provide no or only short information on childminders as well as on informal care by relatives or other persons.

initial skills are smaller (Kulic et al., 2019, pp. 562–563). Hence, SES-related inequalities in cognitive skills should decline when there are overall high shares of childcare attendance *at a younger age*.

However, there are particularly large differences in the quality of childcare providers with respect to, e.g., quality and quantity of learning materials, concepts, or number of educators (e.g., Burger, 2010; Skopek et al., 2017, p. 8). Hence, SES-related gaps might increase when substantial quality differences exist since it is assumed that parents from higher social strata choose better equipped arrangements for their children and have the resources to pay for their attendance (e.g., Esping-Andersen et al., 2012; Skopek et al., 2017, p. 8). In this respect, a distinction is also needed between ECEC handled mainly as child *care* – allowing parents to work and fostering equity in incomes (Zoch & Hondralis, 2017) – or as preschool *education* with certain learning standards – fostering equity in learning environments and stimulating child development, which is some circumstances has been shown to benefit differentially children from less privileged and/or immigrant families (Cebolla-Boado et al., 2017; Klein & Becker, 2017; Kulic et al., 2019).

Empirical evidence

Results are mainly from experimental and intervention studies, especially from the US, and, to a lesser extent, from observational studies. The first type of study does not allow generalisations across societies (Kulic et al., 2019, pp. 563–565). The second type, while enabling comparisons between different forms of care, has methodological shortcomings that restrict the explanatory power of empirical results (Kulic et al., 2019, p. 565). With these shortcomings in mind, we present empirical evidence by referring mainly to the review article authored by Kulic et al. (2019).

Reviewing results from experimental research, meta-analysis, as well as results based on observational data, the authors conclude that ECEC attendance supports the development of cognitive skills (Kulic et al., 2019, pp. 563–564), with children from less advantaged families particularly benefitting from it (Kulic et al., 2019, pp. 564, 566). An important criteria is the quality of ECEC as well as of preschool programs: it can be shown, for example, that high-quality preschool programs can compensate (to a larger extent) disadvantage (Kulic et al., 2019, p. 566). Furthermore, a starting age of two or three years is most beneficial, while a too early start (within the first year of life) could have negative effects (Kulic et al., 2019, p. 565). There is also evidence that the importance of specific quality aspects is age-dependent (Burchinal et al., 2011; Kulic et al., 2019, p. 565, referring to Burchinal et al. 2011). While aspects of process quality like sensitivity and responsiveness of educators are more important for children aged zero to two, cognitive stimulation and structural quality are more important for 3-to-5-year-olds. Additionally, there are also studies which differentiate between underlying mechanisms, e.g., the interaction of home learning environment and quality of childcare for child development (e.g., Anders et al., 2012; Melhuish et al., 2008).

With respect to cross-country differences in social gaps in cognitive skills, Kulic et al. analyse PIRLS and PISA data and conclude that preschool attendance shapes cross-country variation (Kulic et al., 2019, pp. 566–567), whereby the relevance of preschool education and effect direction vary between countries and characteristics of the institutions, e.g., qualification of staff and child-staff ratio (e.g., Dämmrich & Esping-Andersen, 2017; Schütz, 2009). Besides results from the ILSAs, there are country case studies that use harmonisation to generate comparative analyses. Overall, these studies show again that there is cross-country variation in the relevance of ECEC for cognitive skills (e.g., Esping-Andersen et al., 2012; Linberg et al., 2019). However, a comprehensive test of cross-country variation requires not only information about

forms of and conditions in ECEC but also an understanding of processes of enrolment behaviour and, thus, the demand (e.g., income and parental education) and supply side (e.g., subsidies or publicly funded early education) of ECEC (for a similar assessment see, e.g., Esping-Andersen et al., 2012, p. 577; Kulic et al., 2019, pp. 567–569).

Conditions in the DICE countries

The six countries differ regarding their ECEC systems (for an overview see also OECD, 2016b). Information about key features of the ECEC systems of the six countries are presented in Table 2-3a.

One key difference between ECEC settings pertains to whether ECEC is, at least partly, classified as care or education setting. In relation to the role of ECEC, amongst other factors, responsibilities, existence of curriculum, and/or qualification levels of educators may vary. Overall, as argued previously, relatively early access to education should equalise SES-related gaps and the Netherlands, the UK (partially), Japan, and especially France provide this.

In France, children can attend preschools (*école maternelle*) from about age 3 to 6, for which the Ministry of National Education is responsible (OECD, 2016e, p. 1). In some cases, when there is availability and children are deemed to be ready, entry into preschool can happen from age 2, although this has become increasingly less common over time. As preschools are an integral part of the education system, the curriculum is defined by the Department for National Education and teachers have at least a three-year college degree (OECD, 2016e, pp. 1, 3, 15, 23). Teachers must also pass successfully the national exam (Fagnani, 2015, p. 91). Up to the age of 3, there is a diverse and decentralised ECEC system with a combination of publicly-subsidised centre-based (*crèche*) and home-based arrangements (*assistantes maternelles)* (Naumann et al., 2013, pp. 108-109, 115; OECD, 2004, pp. 14-15, 18, 20). Since 2007, there is a growing number of so-called multi-access centres (*établissements multiaccueil*) which offer different childcare options, like occasional, collective, or family-based childcare provided by childminders (Fagnani, 2015, pp. 79–85; Naumann et al., 2013, p. 115). Staff working in a crèche is required to hold relevant state qualifications, differently from *assistantes maternelles* for whom little formal training is required. Furthermore, before children enter preschool, parents in France must pay for ECEC, although fees are highly subsidised and are calculated according to household income (Fagnani, 2015, pp. 85–87; Naumann et al., 2013, pp. 117–118; OECD, 2004, p. 16).

In the UK, at age 4 to 5, most children in England and Wales attend a full-time *primary school reception class* before compulsory schooling starts (Eurydice, 2018a; Gambaro et al., 2015a, pp. 30–31). Childcare provision for children under the age of three includes day nursery (private, voluntary, and independent (PVI) sector or local authority, maintained), childminders and nannies (OECD, 2000a, pp. 9-10, 14). The number of centres offering both care and education (*combined nursery/family centres*) for children younger than 3 years is growing (OECD, 2000a, pp. 9-10, 14). In some regions there are also playgroups and pre-schools for children aged 2 to 5 years-old sponsored by the (local) community, voluntary groups, parents or private businesses (OECD, 2000a, p. 14). Provision under the age of three belong mainly to the PVI sector characterised by a rather low quality (Gambaro et al., 2015a, p. 32; Skopek & Passaretta, 2018, p. 109). While there is no specific curriculum, since 2017, a statuary framework sets standards for learning, development, and care for children from birth to age five (Department for Education, 2017). Furthermore, teaching in maintained nursery classes (starting at age 3) requires qualified teachers (Gambaro et al., 2015a, pp. 36–37). In contrast, PVI settings have only weak minimum qualification requirements at the setting level, namely 50% of the staff should hold a Level 2 qualification (exams taken at age 16), and all supervisory and managerial staff a Level 3 qualification (equivalent to secondary schooling) (Gambaro et al., 2015a, pp. 36–37).

Table 2-3a. ECEC system, by country

Indicator	Year	FR	GE	JP	NL	UK	US
Kind of care opportunities							
General		Age-split system with different responsibilities	Unified system with age-split	Unified system	Age-split system with different responsibilities	Highly mixed provision with guaranteed free places for 3–4-year-olds	No national ECEC *system* at all
At younger age		< Age 3: Centre-based care (*crèche*); licensed childminders Since 2007, growing share of multi-access centres (*établissements multiaccueil*) with different types of care. Since 2009, new type of collective arrangement (*jardins d'éveil*) for 2-to-3-year-olds	< Age 3: Nursery (*Kinderkrippe*), day nursery	Age 0-6: Integrated childcare centre (*hoikuen*) Age 0-6: ECEC Centres (*nintei kodomoen*) (since 2006)	< Age 4: Day-care centres, childminders; less popular are family day care services. Age 2.5-4: Playgroups	< Age 3: Day nursery, registered childminders, nannies	Age 0 to compulsory schooling: Babysitters, nannies, group childcare providers, day care centres, preschools; Seldom: Head Start targeting disadvantaged, poor children aged 0 to 2
At older age up to compulsory schooling		> Age 2/3: Preschool[1] (*école maternelle*)	> Age 2/3: *Kindergarten*; increasing share of institutions offering day care for all age groups (*Kindertagesstätte*)	> Age 3: Kindergarten (*yochien*) focusing more stronger on education	> Age 4: Kindergartens (since 1985, Act on Primary Education, integrated into primary schools)	> Age 4: Primary school reception class	Age 4 (seldom 3): Public pre-kindergarten programs; Age 3 and 4: Head Start programs
Responsibility		< Age 3: Ministry of Social Affairs and Health > Age 2/3: Ministry of National Education	Federal states (ECEC is not part of the school system)	Childcare centres: Ministry of Health, Labour and Welfare; Kindergarten: Ministry of Education, Culture, Sports, Science and Technology ECEC centres (since 2006): both ministries	< Age 4: Ministry of Social Affairs and Employment > Age 4: Ministry of Education, Culture and Science	Shared by education and social welfare ministries in Scotland, Wales and Northern Ireland England: Several departments	Head Start: U.S. Department of Health and Human Services Prekindergarten: State or local departments of education

Public vs. private	Mainly publicly subsidised, centrally financed but locally run; Non-profit organisations and parent cooperatives. Since 2003, for-profit childcare; Private preschools often run by Catholic or other faith organisations	Mainly offered by local authorities, non-profit organisations and seldom by profit-making organisations	Slightly higher share of private centres than public centre providers	Since 2005 (Child Care Act), completely privatized day care market (private-for-profit and non-profit organisations); Publicly funded playgroups	Maintained and PVI sector; Provision < age 3 mainly belong to the PVI sector with a rather low quality.	Mostly market based private care; Prekindergarten administered by school system.
Curriculum	Yes, in preschools ECEC before preschool: General framework (*Orientations générales pour les crèches*) and guidelines to ensure a high and equal level of sanitary, health, hygiene, and safety (*Orientations du code de la santé publique et les projets d'établissements*)	At least more broadly formulated guidelines (not mandatory and different between federal states); Since 2004, *Curricular Framework* as a national baseline for the pedagogical work in childcare settings by outlining, e.g., main educational goals and principals	Curriculum frameworks and guidelines about educational content (revised in 2008)	No official pre-primary curriculum before age 6; Since 2003 educational program for disadvantaged children providing pre-primary education; Small-scale programs (*stap-projects*)	England: Since 2017, statutory framework by Department of Education setting standards for learning, development and care for age 0 to 5 Scotland: Since 2007, various national practice guidance and framework papers Combined nursery/ family centres offer care and education	No official pre-primary curriculum before kindergarten (here, kindergarten is part of primary school at about age 5)
Staff-to-child-ratio[3]	In 2010: Childminder: 1 to 4 children Crèche: 1 educator to 5 children who are not yet walking or 1 to 8 older children In 2010/11: Preschool: 1 teacher to 25.7 children	In 2014: < Age 3: 1 educator to 4.4 children > Age 3: 1 educator to 9.5 children (High variation between federal states) Childminder: 1 to 5 children	In 2010: Integrated childcare centres: Age 1-2: 1 to 6 children; Age 3: 1 to 20 children; Age 4-5: 1 to 30 children; ECEC: Age 0: 1 to 3 children; Age 1-2: 1 to 6 children; Age 3-5: depends on type;	In 2018: Age 0: 1 to 4 children (Since 2019: 1 to 3); Groups with children aged 0 to 2: 4 educators to 16 children; Groups with children aged 0 to 4: depending on age distribution in this group;	In 2015 (England only): PVI: < Age 2: 1 to 3; Age 2: 1 to 4; Age 3 and 4: 1 to 8 or 1 to 13 if qualified teacher or early years professional (EYP); Maintained nursery class: Age 3: 1 to 13; Age 4 and 5: 1 to 30;	Varies depending on setting and state

	(No official regulations in preschools)		Kindergarten: 1 to 35 children	Since 2018, same ratios in preschools and day care	Childminder: 1 to 6 children < Age 8	
Qualification educator and childminder	Early childhood educator: high school diploma and vocational training program (27 month); Assistant paediatric nurses: professional certificate or completed four years secondary education and vocational qualification program (12 months); Preschool teacher (*école maternelle*): Three-year college degree and national exam Childminder: 120-hours training but no formal qualification necessary	State-recognised educators trained in vocational colleges at post-secondary level; Since 2004, growing number new graduate-level courses (e.g., ECEC university courses); Childminder: further education including 160 hours	Integrated childcare centres: nursery teacher qualification; Kindergarten: kindergarten teacher license; ECEC centres: Both depending on age of children	Secondary vocational education; Working with children aged 0 requires a (additional) certificate by attending a (short) course; Kindergarten as part of primary school: higher education (University of Applied Sciences (4year) degree)	England: Overall weak minimum qualification requirements at setting level, PVI: 50% of staff should hold Level 2 qualification (exams taken at age 16), and all supervisory and managerial staff Level 3 qualification (equivalent to secondary schooling); Maintained nursery classes: Qualified teacher; Childminders: Introductory course	Varies depending on setting and state
Subsidies	Fees are highly subsidised and are calculated according to household income	High variation between federal states and over time: some states offer free access to ECEC at least one year before compulsory schooling starts, in other states are fees to pay which could be subsidised	Low-income families have access to 55 hours per week in childcare canters and 20 hours per week in kindergartens without paying fees	Income dependent fees for care of children under the age of 4 are compensated directly through tax authorities; No fees for kindergarten attendance	Free part-time ECEC for children > 3 years and under certain criteria – in recent years, extended to free full-time ECEC (30h per week) for 3- to 4-year-olds in England, Scotland, and Wales (partly depends on working status and income of the parents); Subsidies in form of childcare vouchers and Childcare Tax Credit;	Tax credits and subsidies; Special offers for disadvantaged (Head start programs)

						2015/2016: reforms supporting mainly dual-income couples	
Total public expenditure on ECEC in % of GDP	2015	1.3	0.6	0.4	0.6	0.7	0.3
Change total public expenditure	2015 - 1995[2]	0.6	0.2	0.2	0.3	0.2	-0.1

Notes. [1] The terms preschool and nursery school are interchangeable. [2] Numbers on total public expenditure for ECEC are for the Netherlands, UK, and US from 1998. [3] If authors do not mention a specific year, we refer to the year of publication.

Source for *kind of care opportunities*: FR: Fagnani, 2015, pp. 79–85, 95-96; Naumann et al., 2013, pp. 108-109, 115; OECD, 2004, pp. 14-15, 18, 20 ‖ **GE:** Eckhardt, 2017, p. 99; OECD, 2016f, pp. 2–3; Passaretta & Skopek, 2018a, p. 21 ‖ **JP:** Abumiya, 2011, pp. 5–7; Jones, 2011, pp. 8–10 ‖ **NL:** Akgündüz & Plantenga, 2015, p. 101; Luijkx & de Heus, 2008, p. 48; OECD, 2016a, p. 4; van Huizen, 2018, pp. 53–54 ‖ **UK:** Eurydice, 2018a; Gambaro et al., 2015a, pp. 30–31; OECD, 2000a, pp. 9-10, 14 ‖ **US:** Kamerman & Gatenio-Gabel, 2007, p. 26; Magnuson & Waldfogel, 2015; Neumann, 2015; NIEER, 2019; OECD, 2000b, p. 18

Source for *responsibility*: **FR:** OECD, 2016e, pp. 1, 3, 15, 23 ‖ **GE:** Oberhuemer, 2015, p. 124; Passaretta & Skopek, 2018a, p. 20 ‖ **JP:** Abumiya, 2011, pp. 5–7; Jones, 2011, p. 9; Kimata & Kaneko, 2015, p. 62 ‖ **NL:** OECD, 2016a ‖ **UK:** OECD, 2000a, p. 13 ‖ **US:** Kamerman & Gatenio-Gabel, 2007, pp. 24-25, 30, 32

Source for *public versus private*: Fagnani, 2015, pp. 85–87; Naumann et al., 2013, pp. 117–118 ‖ **GE:** Autorengruppe Bildungsberichterstattung, 2018, p. 69 [Table C2-9web] ‖ **JP:** Jones, 2011, pp. 8–9 ‖ **NL:** Akgündüz & Plantenga, 2015, p. 101; van Huizen, 2018, p. 53 ‖ **UK:** Gambaro et al., 2015a, p. 32; Skopek & Passaretta, 2018, p. 109 ‖ **US:** NIEER, 2019

Source for *curriculum*: **FR:** Fagnani, 2015, pp. 87–88; OECD, 2016e, p. 1 ‖ **GE:** Berendes et al., 2019, pp. 218–219; Eckhardt, 2017, p. 99; Klinkhammer & Riedel, 2018, pp. 53–54 ‖ **JP:** Abumiya, 2011, pp. 5–7; Jones, 2011, p. 9; Kimata & Kaneko, 2015, p. 62; OECD, 2017b, p. 5 ‖ **NL:** Luijkx & de Heus, 2008, p. 48 ‖ **UK:** Department for Education, 2017; Eurydice, 2019 ‖ **US:** Kamerman & Gatenio-Gabel, 2007, pp. 30–31

Source for *staff-to-child-ratio*: **FR:** Fagnani, 2015, pp. 89, 92, 95-96; République Française, 2016 ‖ **GE:** Bock-Famulla et al., 2015, p. 23 ‖ **JP:** Abumiya, 2011, p. 7 ‖ **NL:** IKK, 2018; Rijksoverheid, 2018 ‖ **UK:** Gambaro et al., 2015a, p. 37

Source for *qualification educator and childminder*: **FR:** Fagnani, 2015, pp. 89, 91–92 ‖ **GE:** Bock-Famulla et al., 2015; Klinkhammer & Riedel, 2018, p. 62; Oberhuemer, 2015, p. 137 ‖ **JP:** Abumiya, 2011, p. 6 ‖ **NL:** Akgündüz & Plantenga, 2015, p. 107 ‖ **UK:** Gambaro et al., 2015a, pp. 36–37 ‖ **US:** Kamerman & Gatenio-Gabel, 2007, p. 31

Source for *subsidies*: **FR:** Fagnani, 2015, pp. 85–87; Naumann et al., 2013, pp. 117–118; OECD, 2004 ‖ **GE:** Oberhuemer, 2015, pp. 132–135 ‖ **JP:** Jones, 2011, p. 9; OECD, 2017b, p. 2‖ **UK:** Gambaro et al., 2015a, pp. 35–36 ‖ **NL:** Akgündüz & Plantenga, 2015, p. 103; van Huizen, 2018, pp. 52-53, 57 ‖ **UK:** Eurydice, 2018a, 2018b, 2019; Gambaro et al., 2015b, pp. 35–36; Melhuish & Gardiner, 2018; OECD, 2000a ‖ **US:** Magnuson & Waldfogel, 2015, pp. 200–204.

Source for *total public expenditure on ECEC in % of GDP*: OECD Stats (OECD, 2019b).

ECEC fees have been gradually eliminated for specific age and population groups (Eurydice, 2018a, 2018b, 2019; Melhuish & Gardiner, 2018; OECD, 2000a). There is free part-time ECEC for children 3 years and older. In England, for example, this comprises 12.5 hours per week (Melhuish & Gardiner, 2018, p. 26; OECD, 2000a, p. 15). Free ECEC attendance, at least part-time, is also available for 2-year-olds if their parents meet certain criteria such as being economically disadvantaged or living in disadvantaged areas. These criteria vary within UK (e.g., Eurydice, 2018a, 2018b, 2019; Melhuish & Gardiner, 2018, pp. 26–27). In recent years, free ECEC attendance for 3- to 4-year-olds has been extended to full-time day care (30h per week) in England, Scotland, and Wales (Eurydice, 2018a, 2019; Melhuish & Gardiner, 2018, p. 27; Welsh Government, 2018). Entitlement to free full-time ECEC partly depends on working status and income of the parents (e.g., Melhuish & Gardiner, 2018, p. 27). Before the entitlement there are two potential subsidies for working parents: childcare vouchers and a Childcare Tax Credit (Gambaro et al., 2015a, pp. 35–36).

In the Netherlands, there are kindergartens starting at age 4 which have been integrated into primary schools since 1985 (Ministry of Education, Culture and Science is responsible; OECD, 2016a, p. 4; van Huizen, 2018, p. 58), and, where educators or teachers must have a higher education qualification. Up to the age of 4 there are mainly day care centres, childminders, and playgroups (Ministry of Social Affairs and Employment is responsible; OECD, 2016a, p. 4). However, to work as an educator in ECEC one needs only a secondary vocational education (van Huizen, 2018, pp. 52-53, 57). There is no official pre-primary curriculum in the Netherlands before the age of 6 (Luijkx & de Heus, 2008, p. 48). As kindergartens are formally part of primary schools (and not of the ECEC system), kindergartens with a higher share of disadvantaged children receive more funding and can hire amongst others more (specialised) kindergarten staff (van Huizen, 2018, p. 58). Parents have to pay fees (the amount is income dependent) if their child attends an ECEC facility offered for children below the age of 4 (van Huizen, 2018, pp. 52–53, 57), and are then partly compensated directly by tax authorities (Akgündüz & Plantenga, 2015, p. 103). In contrast, kindergarten attendance is free of fees and almost all children in the Netherlands start kindergarten the day they turn four. Before entering kindergarten at age 4, children in the Netherlands attend ECEC mainly part-time for, e.g., two days per week (van Huizen, 2018, pp. 52–53).

In Japan, children between 0 to 6 years and with both parents being employed can attend an integrated childcare centre (*hoikuen*). After the age of 3 they can also choose a kindergarten (*yochien*) which focuses more on education compared to those starting at earlier ages (Jones, 2011, pp. 8–10). While the childcare centres are under the responsibility of the Ministry of Health, Labour and Welfare and provide eight hours of care, kindergartens offer four hours per day and are under the responsibility of the Ministry of Education, Culture, Sports, Science and Technology (Jones, 2011, p. 9; Kimata & Kaneko, 2015, p. 62). There are separate curriculum frameworks for childcare centres and kindergartens (OECD, 2017b, p. 5), which have been revised and made increasingly consistent in 2008 (Abumiya, 2011; Jones, 2011, p. 9). Hence, overall these curricula are mostly consistent with each other with respect to educational content (OECD, 2017b, p. 5). Since 2006, both ministries have collaborated in the authorisation of a new unified system, the ECEC centres (*nintei kodomoen*) (Abumiya, 2011, pp. 5–7). There are tuition fees for ECEC attendance (Jones, 2011, p. 9). Only low-income families have access to 55 hours per week in childcare centres and 20 hours per week in kindergartens without paying fees (OECD, 2017b, p. 2). Entitlement to free full-time ECEC for children age 3 and above was introduced in October 2019 for all public ECEC centres together with the equivalent subsidy to private ECEC centre users (The Japan Times, 2018).

So far, the comparable early access to education and the corresponding design and qualification requirements for staff as well as available subsidies would let us expect equalising effects of ECEC on social inequalities in these four countries, especially in France. The situation is, however, different in Germany and the US.

In Germany, there is an age-split as well as a unified ECEC system. Children up to the age of 3 can attend a nursery (*Kinderkrippe*) or a day nursery. Afterwards, children can attend *Kindergarten* from age 3 or even from age 2. In addition, there is an increasing number of institutions offering day care for all age groups (*Kindertagesstätte*; Eckhardt, 2017, p. 99; OECD, 2016f, pp. 2–3; Passaretta & Skopek, 2018a, p. 21). ECEC in Germany is not part of the school system and is almost exclusively assigned to the child and youth welfare sector (Oberhuemer, 2015, p. 124; Passaretta & Skopek, 2018a, p. 20). "(The) 16 federal states are responsible for (the) settings, and they interpret federal law in different ways with their own laws" (Berendes et al., 2019, p. 218). Day-care centres are called upon to encourage children's development into a responsible and autonomous member of the community according to the federal Social Security Code VIII, established in 1990s (Eckhardt, 2017, p. 99; Klinkhammer & Riedel, 2018, pp. 53–54). As a consequence of the PISA shock caused by the comparatively low test results of students in Germany in 2000, in the following years each state developed educational plans on pre-school education. These plans, which differ between states, are sometimes not mandatory and are not comparable to school curricula (Berendes et al., 2019, p. 219; Klinkhammer & Riedel, 2018, pp. 53–54; OECD, 2016f, p. 6) but resemble more broadly formulated guidelines. However, they at least introduced "[…] a new element of hierarchical direction and standard setting in a field which until then had been highly decentralised, and characterised by a low level of regulation that had allowed a high degree of autonomy to the (mainly not-for-profit) providers." (Klinkhammer & Riedel, 2018, pp. 53–54) Furthermore, in 2004 the federal states adopted a common Curricular Framework building a national baseline for the pedagogical work in childcare settings by outlining, e.g., main educational goals and principals (Klinkhammer & Riedel, 2018, p. 54; Oberhuemer, 2015, p. 136). Furthermore, the overwhelming majority of the ECEC staff are state-recognised educators trained in vocational colleges at post-secondary level (Klinkhammer & Riedel, 2018, p. 62). As a consequence of the Bologna Process the number of new graduate-level courses, like ECEC university courses, has been growing since 2004 (Klinkhammer & Riedel, 2018, p. 62; Oberhuemer, 2015, p. 137). However, the share of ECEC staff with academic qualifications averages at about 5% thus remaining quite low (Klinkhammer & Riedel, 2018, p. 62); but again, there is high variation between the federal states (e.g., Bock-Famulla et al., 2015). Furthermore, there is high variation between the states and over time with respect to whether and to which extent there are fees (Oberhuemer, 2015, pp. 132–135). While some states offer free access to ECEC at least one year before compulsory schooling starts, in other states parents need to pay for childcare (Oberhuemer, 2015, pp. 132–133). In states with fees there are partial voucher systems developed to support disadvantaged families (Oberhuemer, 2015, p. 134). Additionally, care institutions are supported with, for example, additional staff and/or funding when they are in disadvantaged areas and/or have specific needs due to a higher share of children with, e.g., disabilities (Oberhuemer, 2015, p. 135).

In conclusion, as the care aspect dominates the German system and the qualification levels are rather low, we would assume stronger social inequalities in Germany due to missing or at least lower equalising effects of ECEC attendance. This assumption is supported by empirical evidence for social inequalities in enrolment and quality of care: there is evidence for SES-related gaps in enrolment rates, especially in childcare before the age of 3, as well as in the kind of institutions attended (Kalicki & Egert, 2012; Klinkhammer & Riedel, 2018, p. 60; Oberhuemer,

2015, pp. 129–132). Hence, while the enrolment rate for children younger than 3 years old increased for all social groups, it increased more strongly for families with higher educational qualification (Alt et al., 2014; Krapf, 2014). Besides the enrolment rate, the amount of hours also varies depending mainly on social origin (Oberhuemer, 2015, p. 140). Studies also reported that the quality of ECEC differs according to the social and ethnic origin (e.g., Tietze et al., 2013): children from lower social strata and of immigrant origin tend to attend ECEC of somewhat lower quality.

In the US, there is neither a common ECEC *system* nor a national coordinated policy framework (Kamerman & Gatenio-Gabel, 2007, p. 26; Magnuson & Waldfogel, 2015; Neumann, 2015; OECD, 2000b, p. 18). Instead, there are three systems operating alongside and in competition with one another (Kamerman & Gatenio-Gabel, 2007, p. 26; NIEER, 2019; OECD, 2000b, p. 18): (1.) market-based private ECEC in centres and private homes; (2.) Head Start programs, targeting disadvantaged, poor children aged 3 and 4 (with a very small Early Head Start program serving children aged 0-2); and (3.) public pre-kindergarten programs administered by school systems serving 4-year-olds (and in some case 3-year-olds). The market-based private ECEC system is very diverse, and includes babysitters, nannies, group child care providers, day care centres, and nursery schools/preschools. Head Start is a federal government program administered by the U.S. Department of Health and Human Services created as an anti-poverty program and as such serves only children in poverty (with a few slots reserved for children with disabilities). Finally, public pre-kindergarten programs, administered by school systems, provide free preschool in the year or two before kindergarten (i.e., for 4- and sometimes 3-year-olds). Such programs are expanding; however, public pre-kindergarten and Head Start together still serve only about one third of 4-year-olds nationally (NIEER, 2019). Low and middle-income families may receive some help with fees through tax credits or subsidies, but not all families receive such help. Because care is expensive and is mostly privately purchased, the age of enrolment, type, and quality of extrafamilial care children receive varies considerably depending on family income (Magnuson & Waldfogel, 2015, pp. 200–204). Consequently, we would assume pronounced social inequalities for the US, with potentially the most disadvantaged group being those just above the poverty threshold for Head Start eligibility.

Besides the above-mentioned types and conditions of the ECEC in the six countries, another relevant indicator is expenditures (see Table 2-3a). Expenditures for childcare and preschools (e.g., for equipment or salaries) might lower social inequalities in child development insofar as they lead to a reduction of quality differences between care institutions and preschools and, thus, support equity in opportunity. The relative public expenditures on ECEC mirror the above-described situation: with respect to GDP, relative public expenditures on ECEC are highest in France and lowest in the US with the other four countries in between. All countries experienced an increase in the share of public expenditures on ECEC, especially France. The only exception is the US. Therefore, we would assume that high public expenditures for ECEC might decrease social inequalities in France, while the restraint of the US government in ECEC funding might exacerbate social inequalities there. The strength of these effects depends, of course, on how the benefits of expenditure are distributed across settings and the populations they serve.

Finally, there is high cross-national variation with respect to the enrolment rate for children aged 0 to 2 years (see Table 2-3b.). In 2015, the participation rate was highest in the Netherlands (59%) and France (52%), followed by Germany (37%), the UK (34%) and the US (28%) (see Table 2-3b). The proportion of children in this age-group attending ECEC has grown in recent decades. By age 4, enrolment in ECEC is virtually universal in all countries but the US.

It is in enrolment of age 3-year-olds that countries vary the most, from under half of all children in the US to over 99 percent in France.

Table 2-3b. ECEC enrolment, by country

Indicator	Year	FR	GE	JP	NL	UK	US
Enrolment rates in ECEC 0- to 2-year-olds	2015[1]	52.3	37.2	22.5	59.3	34.4	28.0
Change in enrolment rates 0- to 2-year-olds	2015 - 2005[1]	8.4	20.4	6.3	*n.d.*	-2.6	0.6
Average usual weekly hours in ECEC 0- to 2-year-olds	2015[2]	32.2	31.6	*n.d.*	16.9	16.9	*n.d.*
Enrolment rates in ECEC or primary education 3-year-olds	2015[1]	99.4	93.3	79.8	82.7	100.0	42.6
Change in enrolment rates 3-year-olds	2015 - 2005[1]	-0.6	12.8	10.9	0.7		3.9
Enrolment rates in ECEC or primary education 4-year-olds	2015[1]	100.0	96.7	94.3	96.0	100.0	66.2
Change in enrolment rates 4-year-olds	2015 - 2005[1]	0.0	7.8	-0.4	-2.4		-2.2
Enrolment rates in ECEC or primary education 5-year-olds	2015[1]	100.2	98.1	96.9	99.2	98.1	91.0
Change in enrolment rates 5-year-olds	2015 - 2005[1]	0.2	5.1	-2.0	-0.5	-1.9	-2.1

Notes. *nd* means no data available. [1] Data on enrolment rates for Germany from 2006 and 2015 and for the US from 2006 and 2011. The average enrolment rate for children between 0 and 2 years in the Netherlands is from 2017. [2] Data for Germany on average hours is from 2017.
Statistical sources: OECD Family data base (OECD, 2019a).

Overall, the high ECEC enrolment rates and the responsibility of the ministry of education for ECEC institutions even for young children lead us to expect that early SES-related inequalities should be lower in France and the Netherlands, and perhaps to a lesser extent also in Japan and the UK.

2.4 Organisation of primary and lower secondary education[5]

Theoretical considerations

There are different aspects of education systems discussed in the literature which may foster or buffer social inequalities in child development (for an overview, e.g., Dollmann, 2019; Kerckhoff, 2001; Pfeffer, 2008; Skopek et al., 2019). One such aspect is the degree of standardisation (e.g., Allmendinger, 1989; Bukodi et al., 2018, pp. 30–31; van de Werfhorst & Mijs, 2010, p. 411). Standardisation could refer to, e.g., the financing of schools and teachers as well as the curriculum and central exams (e.g., Bol et al., 2014). In general, it is assumed that a higher degree of standardisation supports equity and, at least partly, lowers parental influence (e.g., Bukodi et al., 2018, pp. 30–31).

Another aspect is the degree of grouping by performance/abilities or tracking which is often perceived as influential for achievement gaps (e.g., Chmielewski, 2014). Broadly speaking,

[5] The description in this section focused on most common features in each country and does not consider the permeability of the system or alternative pathways (for an overview also see France: Ichou & Vallet, 2011; Ichou & Vallet, 2013; Germany: Eckhardt, 2017; Helbig & Nikolai, 2015; Japan: Kariya, 2010; Kitamura, 2019; Rohlen, 1998a, 1998b, 1998c; Sato & McLaughlin, 1998; Netherlands: Luijkx & de Heus, 2008; UK: Machin & Vignoles, 2006; US: Yanushevsky, 2011)

two types of tracking can be distinguished: the differentiation of students between schools along achievement which is often called external tracking, and the differentiation by achievement within schools, mainly in majors, which is called course-by-course tracking or internal tracking (Bol et al., 2014; Gamoran, 2010). On the one hand, it is argued that homogeneous contexts may maximise learning through a focused curriculum and an adequate pace in teaching. On the other hand, this might lead to a lower learning growth for underperforming children which may cause long-term systematic disadvantages for them and, thus, promote a widening of the performance gap (Hanushek & Woessmann, 2006, p. C64). An advantage of integrated/comprehensive schools might be that in heterogeneous classes low-achievers can benefit from high-performers who can be seen as role-models and/or offer intellectual exposure, while high-performers would not lose anything from being in school with low-performers (Hanushek & Woessmann, 2006, p. C64). As selection into tracks is confounded with social origin due to social inequalities in prior achievement as well as socially biased decisions at transition points (e.g., Bukodi et al., 2018, pp. 29–30; Gross et al., 2016, p. 22; Skopek et al., 2019, pp. 216–217), it is assumed that tracking will increase social inequalities (e.g., Skopek et al., 2017, p. 9; van de Werfhorst & Mijs, 2010). In this respect, it is also assumed that the age at which selection first occurs plays a crucial role (e.g., Gross et al., 2016, p. 20): the earlier the tracking takes place, the less knowledge about the performance potential of the children is known and, thus, the more the assignment decision can be affected by stereotypes and/or parental class position. In consequence, social inequalities in school achievement might increase during secondary school due to early tracking. In this respect, it is assumed that the degree of selectivity of tracked systems plays a central role, namely whether academic achievement, parental will, or a mix of both is decisive for track placement (e.g., Dollmann, 2019, pp. 273–274).

Empirical evidence

There are numerous studies focusing on whether educational achievement is more affected by socioeconomic status in (external) tracked versus comprehensive school systems. Three relatively newer reviews conclude that the majority of studies support the assumption that tracking goes hand in hand with higher social inequalities (Dollmann, 2019, pp. 275–276; Skopek et al., 2019; van de Werfhorst & Mijs, 2010); only a few studies find no evidence for tracking effects (e.g., Dollmann, 2019, p. 276) or positive effects (e.g., Esser & Seuring, 2020). There is also evidence that the effects of tracking depend on the achievement level. Among top-performers, socioeconomic inequality is reduced in comprehensive systems (van de Werfhorst, 2018). However, cross-national studies on the effects of tracking have, among others, one crucial shortcoming: they often do not control for previous skills (Dollmann, 2019, p. 276; Esser, 2016). When controlling for previous skills in so called pseudo-cohorts or pseudo-panels, it turns out that effects might differ depending on the skill domain under study (see for an overview Skopek et al., 2019, pp. 224–225): Dämmrich and Triventi (2018) found increasing social inequalities in reading skills from primary up to secondary school in tracked systems, but partially decreasing gaps in mathematics. They also found empirical evidence that social inequalities would shrink if tracking decisions depended solely on prior achievement (Dollmann, 2019, p. 277).

Often, cross-national studies do not consider the consequences of course-by-course tracking. One exception is the work by Chmielewski (2014, 2017). Based on PISA, Chmielewski showed that SES inequalities in achievement were similar in countries with course-by-course tracking and with academic/vocational streaming. However, in the latter the track placement explained larger portions of SES-related gaps than did course-by-course tracking (Chmielewski, 2014). Hence, there were more pronounced SES-related gaps among students of the same track in course-by-course tracking (Chmielewski, 2014, p. 318).

With respect to standardisation there is mixed evidence (Dollmann, 2019, pp. 278–279; van de Werfhorst & Mijs, 2010, pp. 419–420). In particular, numerous studies support the assumption about decreasing social inequalities with increasing degree of standardisation, like central examinations, national curriculum, or standardised school resources, whilst higher levels of school autonomy seem to foster social inequalities. It has also been shown that the negative effects of tracking can be buffered by the degree of standardisation (Bol et al., 2014; van de Werfhorst & Mijs, 2010). However, there are also studies that do not find any equalising effect for standardisation (Dollmann, 2019, pp. 278–279).

Conditions in the DICE countries

In general, the six countries have well-established education systems with at least 9 years of compulsory school starting between the age of 4 (Northern Ireland and some states in the US) and 6 (France[6], Germany, and Japan).

There are remarkable differences in the organisation of the education systems, like educational tracking or degree of standardisation (see Table 2-4). In Germany and the Netherlands[7], vocational or academic tracks are offered in separate schools from the age of 10 and 12 respectively, which means that children have to make a transition at that stage.[8] In the other countries, children attend comprehensive schools up to the age of 15 or 16. Bol and colleagues generated a tracking-index that considers the age of first selection, number of tracks, and duration of the tracked curriculum (Bol et al., p. 1557; see also Table 2-4): The highest values and, thus, the highest degree of tracking, are shown in Germany and the Netherlands; whilst the lowest occur in the UK and the US. However, the index does not cover different learning environments due to other reasons such as within-school tracking (ability grouping in selected subjects, selecting advanced courses) which are particularly common in the UK and the US (Chmielewski, 2014) or private schools (see also Table 2-4).

[6] Since 2019, the starting age of schooling has been lowered from 6 to 3 years of age. Children do not have to attend school if parents declare to home school their child.

[7] Please note that in the Netherlands children can also opt for secondary schools in which the first two years (age 12 and 13) are relatively mixed. In 2008, for example, about 78% of first two years of secondary schoolclasses was heterogeneous (mixed levels in one class); this has dropped to 60% by 2014 (Muskens & Tholen, 2015).

[8] The number of school types and the regulations on parents' influence (final say) vary over time and place.

Table 2-4. Primary and lower secondary education, by country

Indicator	Year	FR	GE	JP	NL	UK	US
Age at start of compulsory education	2014	6 (since 2019: 3)	6	6	5	5 (NIR: 4)	4-6
Age at which students are first tracked, external tracking only	2015	15	10	15	12	16	*na*
Tracking index (Bol et al., 2014, p. 1557) [considering: age of first selection, number of tracks, duration of tracked curriculum]	2004	-0.474	1.862	-0.474	0.937	-1.043	-1.321
Course-by-course tracking[1] (at least some, incl. all), based on PISA 2015 data	2015	24	30	53	71	99	83
Course-by-course tracking[1] (all), based on PISA 2015 data	2015	3	8	10	56	8	7
Curriculum-based external exit exam in secondary school in math (values from 0 to 1) (Woessmann et al., 2009, p. 119)	2003	*nd*	0.4	1.0	1.0	1.0	0.1
Government expenditure per student, primary education (% of GDP per capita)	2015[2]	17.5	17.5	22.5	17.0	25.1	19.9
Government expenditure per student, secondary education (% of GDP per capita)	2015[3]	26.5	23.0	24.0	22.9	22.5	23.1

Notes. *nd* means no data available. *na* means does not apply [1] Course-by-course tracking some or all displays the proportion of students with ability grouping between classes in at least some or all subjects. [2] Number for government expenditure (primary education) for Japan from 2014 [3] Number for government expenditure (secondary education) for Japan and the UK from 2014.
Statistical sources: Source for compulsory school start: OECD, 2018a, p. 429, Table X1.3. Source for age of first tracking: OECD, 2016d, p. 167, Figure II.5.8. Numbers for course-by-course tracking are from PISA 2015, own calculations. Data on government expenditure per student in primary and secondary education are from World Bank Development Indicators (World Bank).

With respect to the degree of standardisation, external exit exams lead to strong output standardisation in Japan[9], the Netherlands, and the UK (see Table 2-4).

Low-SES children in the UK would seem to benefit from three equality-promoting features: early age of school enrolment, absence of external tracking, and highly standardised central exams. In contrast, in Germany SES-related gaps in achievement should be highest due to relatively late school entry, early external tracking, and weak exam standardisation. The other countries are somewhere in between: for example, the Netherlands has early school entry and central exit exams but implements external tracking at age 12; the US has early school entry and does not use external tracking but lacks centralised exams.

[9] Strictly speaking, there is no exit exam at the end of lower secondary schools. Graduation from lower secondary schools is approved nearly mechanically based on age. You need to take external standardised exams if you wish to go to (non-mandatory) higher secondary school. About 97% of lower secondary school graduates take such exams.

Finally, government expenditure per student in primary education as % of GDP seems to be especially high in the UK whilst, in secondary education, it is France that spends the most. Thus, expenditures when correlated with school and teacher resources could help to offset social inequalities by most in the UK (primary) and France (secondary).

2.5 Summary and predictions for socioeconomic inequalities in educational achievement

Table 2-5 summarises cross-national differences in factors that can be theoretically linked to social inequalities in educational achievement. As already mentioned in section 2.1, there are competing predictions and various processes might counteract each other. Competing and contradicting predictions are often observable for Japan and the UK. In contrast, in the case of the US, the picture is very consistent: inequalities in educational skills should be very pronounced there. With the exception of some deprivation indicators, the picture for France is also consistent: inequalities in educational achievements should be relatively low.

Table 2-5. Expectations about social inequalities depending on macrostructural conditions

Macrostructural aspect	**Sub-dimension**	**Expectations for more pronounced ↑ or less pronounced ↓ social inequalities in**					
		FR	**GE**	**JP**	**NL**	**UK**	**US**
Inequality, social welfare and deprivation [see Table 2-2]	Gini after taxes and transfers					↑	↑
	% GDP spent on family	↓				↓	↑
	Child poverty rate after taxes and transfers			↑			↑
	Unemployment rate	↑		↓	↓		
	Adolescent fertility			↓	↓	↑	↑
	Underweight at birth			↑			↑
ECEC [see Table 2-3a and Table 2-3b]	Responsibility of Ministry of Education (at least partly) or at least some standards	↓		↓	↓		
	Qualifications of educators	↓					
	Subsidies						↑
	Expenditures ECEC	↓		↑			↑
	Early enrolment rate (< 2yrs.)	↓		↑	↓		↑
Primary and secondary education [see Table 2-4]	Early age of school entry				↓	↓	(↓)
	External tracking		↑		↑		
	Course-by-course tracking					↑	↑
	Central exams	*nd*		↓	↓	↓	
	Expenditures, primary education					↓	
	Expenditures, secondary education	↓					

Note. *nd* means no data available.

Obviously, different, and partially conflicting, predictions are possible for a country in relation to the different macrostructural aspects. Hence, it is possible that a country offers a comprehensive school system, but, simultaneously, has a comparably less developed safety net of social goods and insurance. In addition to policy differences, the social composition - such as migration status and family structure - may vary across countries and affect the magnitude of SES-related gaps in achievement and socioemotional outcomes (e.g., Chmielewski, 2019; Marks, 2005). To complicate predictions further, system theory suggests that aspects of social organisation might interact in both reinforcing and off-setting ways (e.g., Diez Roux, 2011; Sanderson, 2006) so that the consequences for educational inequality of a set of national circumstances will be more than simply the sum of its parts.

Furthermore, the associations are based on rough indicators at a highly aggregated level. There might be some important omissions that could modify our understanding of how conditions play out for different socioeconomic groups across the six countries. Beyond gross expenditure levels, we have not considered indicators of the quality of learning environments in ECEC settings or schools, such as teaching concepts. The role of non-governmental religious or charity organisations may vary in importance across countries. Perhaps most importantly, aggregate indicators do not tell us how resources are distributed within a country across socioeconomic groups. We would expect the degree of residential segregation to be a possible driver of educational inequalities. The DICE project is singularly well placed to provide evidence on this point by consistently documenting cross-national social inequalities in a wide range of inputs, as well as outcomes, at different developmental stages.

Differences in inequalities depending on the operationalisation of SES

Up to now, we referred to the SES of a family as a generic term. However, we might expect variation in socioeconomic educational inequality – within and between countries – depending on the specific indicator used to capture a family's status (e.g., Bukodi et al., 2018; Chmielewski & Reardon, 2016, p. 5).

Education, income (gross income, earnings, disposable household income), occupation (class, status, prestige), and wealth, household possessions and number of books are all indicators used to measure socioeconomic status in education research. These do, of course, covary, but these correlations are often far from perfect (e.g., Chmielewski & Reardon, 2016, p. 5).

Theoretically, these indicators cover at least partly different processes. For example, the education level of parents is central with respect to strategic knowledge at central transitions and support for children in, e.g., preparing for exams and homework, but also with respect to the status maintenance motive and, thus, the wish that the child reaches at least the same educational qualification level as the parents (e.g., Blossfeld, 2016, p. 57; Bukodi et al., 2018, p. 28). Additionally, from a psychological perspective, higher educational degrees could be related to, e.g., higher complexity of speech which could in turn improve child language development (e.g., Hart & Risley, 1992; Hoff, 2003; Huttenlocher et al., 2010). Financial resources are meaningful for the reasons explicated in the family stress model, as well as for handling the costs of learning in general (e.g., shadow education; learning environment at home; but also financing high quality ECEC) or school (type) selection (e.g., if more expensive private schools are available or choosing a school type with shorter duration in order to enter the labour market earlier in case of poor families) (e.g., Bradbury et al., 2015, p. 141; Chmielewski & Reardon, 2016, p. 5; Marks, 2005, pp. 485–486; Skopek et al., 2017, p. 7). Occupational class indicates mainly the amount of family resources, like permanent income, wealth or the general degree of financial security. Thus, class is a broader indicator than income capturing additional aspects like income security (Bukodi et al., 2018, p. 28 referring to Goldthorpe & McKnight, 2006) and social prestige. Finally, number of books refers mainly to cultural aspects, like cultural climate and learning stimulation at home (e.g., van de Werfhorst & Mijs, 2010, p. 417). However, this indicator might also reflect a financial aspect with respect to, for example, the size and stability of family dwellings.

A common approach is to combine multiple indicators into a single SES index, as in the PISA index of Economic, Social, and Cultural Capital (see section 3). From a theoretical perspective this has advantages, as it mirrors the conceptualisation of SES as a multidimensional construct

that reflects access to, or control over, a broad set of resources or capitals. However, this approach has drawbacks when the goal is to explain why outcomes differ across groups since it prevents exploration of the ways in which different elements of the index might act as distinct mechanisms through which advantage is transmitted from parents to children. The processes by which family income affects child development are likely different from the processes associated with parental education levels or social prestige and, moreover, the relative salience of different components may vary depending on the country context (e.g., Bukodi & Goldthorpe, 2013; Erola et al., 2016; Grätz & Wiborg, 2020). These differences cannot be unpicked when the operationalisation of stratification itself is based on a single composite measure that equates families with different mixtures of the constituent elements.

The approach taken in the DICE project is therefore to focus on explaining inequalities between groups defined in terms of a single indicator, and we selected parental education as a relatively stable measure of long-term access to social and economic resources (e.g., Bradbury et al., 2015). Particularly at the stage of the lifecycle when children are young, the current income of parents tends to fluctuate and is a noisy measure of lifetime earnings and hence of long-term access to social and economic resources. Measurement of occupational status is complicated when a large fraction of parents, and particularly mothers, are out of the labour force or combining work with caring responsibilities. From a human capital perspective, education is viewed as an investment undertaken early in life that yields returns in the labour market, where the nature of those returns will depend heavily on national institutional and policy structures such as the fiscal and wage bargaining systems. In theory, therefore, DICE defines education groups of parents with common 'raw' levels of human capital and explores how that capital is rewarded differently in different contexts, in terms of the resources it generates both for parents and their children. For example, we can explore the possibility that income inequalities between parental education groups are smaller in some countries (for example due to greater progressivity of the tax and transfer system), leading to smaller education-related gaps in children's material environments and ultimately in their developmental outcomes. This perspective is also helpful from a public policy point of view, in that it conceptualises education as a structural form of parental advantage and factors that are more responsive to short-term interventions, such as income and employment behaviours, as mechanisms by which that advantage is transmitted.

A key issue in cross-national research is whether family background is defined in relative (within-country) or absolute criterion-referenced terms. Most research uses a relative approach in which advantage and disadvantage are denoted by membership of top and bottom quantile groups, for example in terms of income or a composite SES index. This approach is consistent with a theoretical perspective in which SES is a measure of one's ranking within a hierarchy and it bypasses knotty issues of how and where absolute thresholds should be drawn for different populations. A relative approach is harder to implement when education is the stratifying variable because qualifications are typically on an ordinal rather than continuous scale and the distribution can rarely be sliced into equal-sized quantiles across countries. In addition, there are conceptual reasons why a purely relative approach based on within-country rank is problematic when studying the moderating role of country context: it is not possible to tell whether cross-country differences in outcome gaps reflect a difference in the mechanisms that transmit parental resources to children (a genuine moderating or buffering effect) or whether they simply reflect differences in the composition of the top and bottom groups. To give an example, larger child outcome gaps between the top and bottom income quintile groups in the US - as compared to other countries - may occur because income matters more for children's life chances in the US (e.g., because of a greater role for the market), or because the two groups

are respectively richer and poorer than their equivalents in other countries, or both (Bradbury et al., 2019). An absolute approach to the categorisation of family background helps to clarify the mechanisms involved by eliminating the second of these explanations.

Given the focus of DICE on parental education gaps, ideally, we would like to present evidence from the ILSAs on achievement gaps between groups defined by equivalent levels of parental education across countries. Unfortunately, the nature of the data available in PISA and the other international studies precludes this. First, parental qualifications are reported by parents themselves in only a sub-set of countries: to define education groups for the countries of interest we must rely on reports from the students, who are aged 15 in PISA and even younger in the IEA studies. Research suggests that child reports of parental qualifications do not always match parents report and that this measurement error can bias estimates of education-related achievement gaps in unknown ways (Hovestadt & Schneider, 2021; Jerrim & Micklewright, 2014).

Our own analysis supports the contention that child reports are not reliable. The Millennium Cohort Study, the DICE source of microdata for the UK, surveyed a representative cohort of 19,000 children born in the UK in 2000-2002 and, based on parents' own reports, 38% of children had parents with low qualification levels (equivalent to Level 3B or below on the International Standard Classification of Education or ISCED; authors' calculations). PISA 2015, which collected data on children born in 2000, puts the proportion of UK children in this group at just 20%, a discrepancy that is far too large to be accounted for solely by differences in study coverage. Second, the ISCED categories used to harmonise parental qualifications in PISA map poorly onto the national systems used in the six DICE countries, and sometimes do not allow within-country distinctions to be made between qualification levels that have qualitatively different interpretations. For example, for the US, in PISA it is not possible to distinguish parents who have a 2-year associate's degree from those who have a 4-year bachelor's degree, a fundamental distinction within the US educational system.

For these reasons, we abandoned attempts to compare countries in PISA in terms of parental education-related gaps in achievement, and instead chose to rely on estimates based on PISA's composite SES index. It is an open question, and one DICE is well-placed to address, whether the cross-national pattern of achievement inequalities by education will mirror the pattern in inequalities by composite SES. We know of no other data sources that could throw light on this, and indeed DICE will provide the first comparative evidence for these countries on education-related gaps in child outcomes. As discussed in the following section, however, the PISA data has unique features that enable us to explore the consequences for cross-national inequality comparisons of different conceptual choices about the scaling of both SES and child outcomes.

3. How do the six countries fare in PISA?

As discussed earlier, key strengths of PISA in relation to DICE include measurement for children from a common birth cohort year, in a common calendar year, using a common test instrument. It therefore provides compelling comparative evidence on the accumulation of academic skill inequalities by the end of lower secondary schooling and enables us to test the sensitivity of conclusions about cross-national variation in SES-related gaps to a range of methodological assumptions.

In the results presented below, we focus on inequalities in reading test scores taken from the 2018 and 2009 rounds of PISA. We use 2018 as the most recent year available and reading (rather than maths or science scores) because reading was the focus of the latest data collection

in 2018[10]. To give a sense of the stability (or otherwise) of cross-national rankings in terms of socioeconomic inequality, we provide comparable estimates from PISA 2009, the closest prior round in which comparable estimates for reading skills were published. Children are aged 15 when surveyed by PISA, so these results relate to children born in 1994 and 2003. The cohorts used in DICE include children born between 1992 and 2012 (see Appendix A). The PISA results therefore give an indication of cohort trends for children surveyed in the older DICE studies, but it should be acknowledged that cross-national patterns of inequalities may be different for the younger cohorts that are the basis of our preschool and primary school analyses, and who have not yet reached the end of lower secondary schooling.

3.1 The PISA data and operationalisations

PISA is conceptualised and administered by the OECD (Gustafsson & Rosén, 2014, pp. 20–21). PISA tests students in schools and has high participation rates at the student level (OECD, 2016c, p. 295). The PISA samples are designed to be representative of all 15-year-olds engaged in education within the country (for more details about sampling see OECD, 2017a, chapter 4).

Published PISA statistics give us a rare opportunity to explore the effects of within-country standardisation of both the dependent variable (test scores) and the independent variable (SES index) on cross-national comparisons of achievement inequalities. In principle, both test scores and SES are measured on a common scale across countries. PISA achievement test scores are expressed as "proficiencies" on a fixed metric, scaled to have a mean of 500 and a standard deviation of 100 across OECD countries (OECD, 2019c). The index of Economic, Social, and Cultural Status (ESCS) is a composite index derived from equally weighted indicators of parental education, parental occupation, and an index summarising a number of home possessions that can be taken as proxies for material wealth or cultural capital. The ESCS index is similarly scaled, setting 0 as the value of an average OECD student and 1 the standard deviation across equally-weighted OECD countries (OECD, 2019d).

A key indicator of achievement inequality published by PISA is the gap in mean test scores (Y) between the top and bottom national quarters of the ESCS index, expressed as follows (where k indexes country).

$$\Delta Y_k = \bar{Y}_{Q4,k} - \bar{Y}_{Q1,k} \quad (1)$$

This measure relates a within-country standardised (relative) measure of SES inequalities to an unstandardised (absolute) measure of achievement inequality. It tells us about the gap in 'real' skills or proficiencies between groups of children who are at common ranking positions in terms of SES within their own countries.

The ability to measure skills on a common metric is unique to the ILSAs like PISA. Where testing instruments differ across countries, as in the DICE project, comparability requires within-country standardisation of test scores, such that one unit on the metric equates to one standard deviation of the national distribution. The same standardised achievement gap equates to a larger unstandardised gap in a country with a larger overall variance in skills. We can explore the implications of within-country test score standardisation for comparisons of achievement gaps with PISA data by applying a test score adjustment factor, λ_{Yk}, to convert standardised gaps to unstandardised (absolute) ones.

[10] The focal skills in PISA rotate by triennial survey wave. Reading skills were the focus in 2000, 2009 and 2018; maths the focus in 2003 and 2012; and science the focus in 2006 and 2015.

$$\lambda_{Yk} = \frac{SD(Y_k)}{SD(Y_{OECD})} \qquad (2)$$

The adjustment factor λ_{Yk} scales the standardised gaps by the ratio of the national test score standard deviation (SD) to the overall OECD test score standard deviation. Gaps are therefore adjusted upwards in countries with above-average variability in skills and adjusted downwards in countries with below-average variability.

As discussed above, relative or standardised measures of SES raise issues for the interpretation of cross-national differences in achievement gaps, as they potentially reflect both differences in resources between groups and in the buffering effects of national context for a given resource disparity. To illustrate, the difference in mean ESCS scores between top and bottom groups was 2.65 points in Germany in 2018 but only 1.86 units in Japan. The parental resources of advantaged and disadvantaged children in Japan were markedly more similar to one another than in Germany, and this greater homogeneity may result in lower measured achievement gaps, even if additional resources confer the same benefits in the two countries. Again, we can apply an adjustment factor, here to convert gaps using within-country standardised measures of SES to unstandardised (absolute) SES-related gaps.

$$\lambda_{Xk} = \frac{\overline{ESCS}_{Q4,OECD} - \overline{ESCS}_{Q1,OECD}}{\overline{ESCS}_{Q4,k} - \overline{ESCS}_{Q1,k}} = \frac{\Delta ESCS_{OECD}}{\Delta ESCS_k} \quad (3)$$

Application of the factor λ_{Xk} simulates the gaps we would see in a country when the disparity in resources between the top and bottom groups (as captured by points on the common ESCS scale) is fixed at the OECD average. Relative to a standardised baseline, conversion to an un-standardised SES scale leads to downward adjustment of gaps in a country with above-average inequality in socioeconomic resources (where the "distance" between top and bottom groups is large) and upward adjustment of gaps in countries with below-average socioeconomic inequality.

Table 3-1 summarises the four different definitions of the socioeconomic achievement gaps that can be derived from the same underlying set of PISA data.

Table 3-1. Calculation of achievement gaps in PISA test scores, depending on standardisation of test scores and SES

		SES (ESCS index)	
		Standardised	Unstandardised
Test scores	Standardised	$\frac{\Delta Y_k}{\lambda_{Yk}}$	$\frac{\lambda_{Xk}}{\lambda_{Yk}}\Delta Y_k$
	Unstandardised	ΔY_k	$\lambda_{Xk}\Delta Y_k$

3.2 Country rankings depending on standardisation

Table 3-2 shows the adjustment factors that will be applied to estimates of socioeconomic inequalities in reading test scores from PISA 2009 and 2018.

Table 3-2. Factors for adjusting within-country standardised SES-related gaps to unstandardised (absolute) SES-related gaps

	Adjustment to unstandardised (absolute) test scores, λ_{Yk}		Adjustment to unstandardised (absolute) SES differentials, λ_{Xk}	
	2009	2018	2009	2018
OECD average	1.00	1.00	1.00	1.00
France	1.13	1.02	1.09	1.04
Germany	1.02	1.06	1.01	0.89
Japan	1.08	0.98	1.25	1.26
Netherlands	0.95	1.05	1.08	1.09
UK	1.02	1.01	1.15	1.02
US	1.04	1.09	0.98	0.91

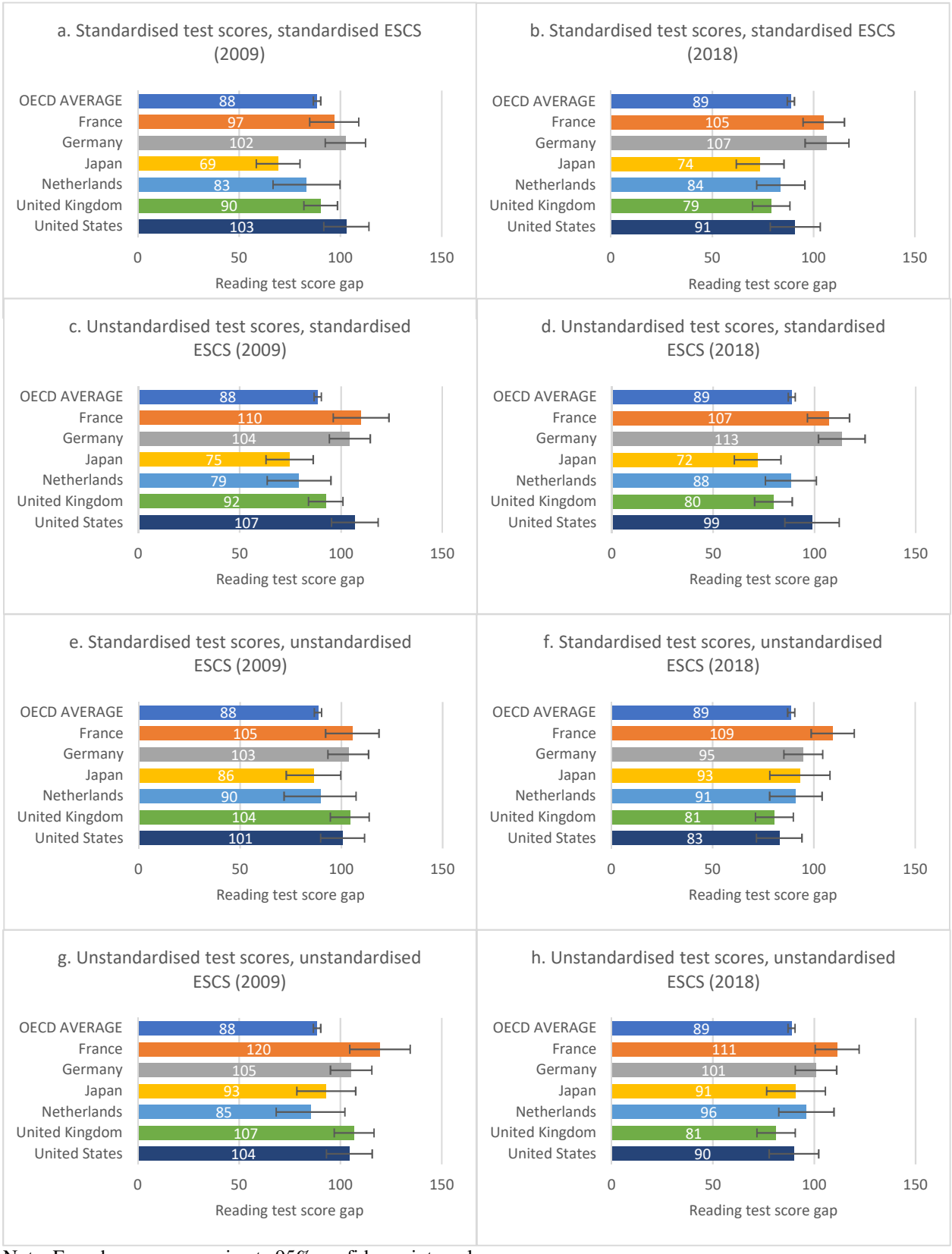
Note: Calculated according to equations 2 and 3 using published PISA statistics.

If we take the fully standardised estimates of achievement gaps as the baseline, these relate differences in within-country SES position or rank to movements in position in the national achievement distribution. The factors in Table 3-2 show the national adjustments made to these baseline estimates when we express increments in test scores and ESCS in terms of common, rather than national, distributions. For example, when we covert from 2009 standardised test scores to absolute test scores, we see that gaps in France widen (λ_{Yk}=1.13) relative to gaps in the Netherlands (λ_{Yk}=0.95). The extent of socioeconomic inequality in reading proficiency is relatively understated by standardised test scores in France, where skill variability is high, and relatively overstated in the Netherlands, where skill variability is low. Similarly, when we account for national differences in the level of socioeconomic inequality in 2009, gaps widen in Japan (λ_{Xk}=1.25) relative to gaps in the US (λ_{Xk}=0.98). Within-country achievement gaps in Japan are lower than those in the US in part because the difference in resources between top and bottom quartile groups (as measured by points on the ESCS scale) is much smaller in Japan than in the US. When we compare the achievement scores of two children who sit a fixed distance apart on the ESCS scale, gaps in Japan are more similar to gaps in the US.

Figure 3-1 compares SES-related gaps in reading test scores for two cohorts born nine years apart (left and right panels), using different methods for measuring inequalities. The estimates in the top panels contain purely relative, or standardised estimates, in which differentials in both reading skills and SES are benchmarked in reference to the national distributions. The bottom panels contain absolute, or unstandardised estimates, which correspond to gaps in 'real' reading proficiencies associated with a fixed disparity in socioeconomic resources between groups (set at the OECD average top quarter-bottom quarter ESCS differential[11]). The second and third panels document how the estimates change when first only test scores are expressed in unstandardised terms, but SES-related gaps remain relative to the national distribution; and second when a common SES disparity is used as the independent variable but test score variances remain standardised within country.

[11] The OECD average gap in mean ESCS points between the top and bottom ESCS quarters was 2.31 ESCS points in 2009 and 2.36 ESCS points in 2018.

Figure 3-1. SES-related gaps in reading achievement from PISA 2009 and 2018, standardised within-country or unstandardised (measured on a common metric)



Note: Error bars are approximate 95% confidence intervals.

Figure 3-1 reveals that there is considerable variation in levels of achievement inequalities across the six countries, but that the rank ordering of countries is dependent in part on the year

and the way achievement inequality is conceptualised. In 2018, for example, the fully standardised achievement gap (panel b) was 45% larger in Germany than in Japan - a statistically significant difference - and 14% larger in France than in the US (non-significant). When adjustment is made for the composition of the top and bottom socioeconomic groups in terms of levels of parental resources, however (panel f), the Germany/Japan difference becomes negligible while the France/US difference increases to a significant 32%. Comparison of the top two and bottom two panels suggests that the countries are more similar when we focus on unstandardised or absolute differences in inequalities than when we measure inequality in relation to the national context. Leaving France aside, in 2018, unstandardised achievement gaps in the other five countries were mostly not distinguishable from one another (with the exception of a larger gap in Germany than in the UK, panel h).

Regardless of the year or the conceptualisation of achievement inequality, France is consistently among the countries with the largest achievement gaps. This is somewhat surprising given our analysis of the macrostructural environment in France, which identified features of the social welfare system, ECEC, and the schooling system, all of which would be expected to restrain the extent of achievement inequalities. Achievement gaps are also generally high in Germany and of very similar magnitudes to those seen in France. Similarities between France and Germany are notable, given they have broadly similar social welfare regimes but quite different approaches to ECEC and school organisation. These structural differences do not seem to be associated with large and systematic differences between the two countries in the socioeconomic gradients in achievement at 15.

The comparative position of the US changes somewhat between 2009 and 2018. In 2009, inequalities in the US were of a similar magnitude to those in France and Germany and consistently larger than the equivalent gaps in the Netherlands and Japan. By 2018, however, US gaps compared favourably with those in France and were generally not distinguishable from those in the other four countries. Again, this is somewhat contradictory to our predictions, as the US stands out clearly from the other countries with a range of macrostructural characteristics that are theoretically linked to higher educational inequalities, and consistently so over at least the last 25 years. Similar to the US, the UK's record on achievement inequality appears to improve a little between 2009 and 2018, a trend potentially linked to wider social changes that saw the dramatic increases in public family expenditure and decreases in child poverty rates discussed in Section 2. Gaps in the UK are very similar to those in the US when SES is measured on a common scale (bottom four panels), but they are smaller when within-country SES standardisation is used because there is less differentiation in terms of resources between top and bottom groups in the UK.

Achievement gaps in the Netherlands and Japan were generally among the lowest and typically not statistically distinguishable from one another. They consistently compared favourably with gaps in France and Germany, and also compared favourably with the US and the UK in 2009, though these advantages had been eroded by 2018. Relatively muted gaps in Japan again present a regularity that requires further explanation, given the high levels of income inequality and relatively low levels of public welfare provision for families documented in section 2.

4. Conclusion

Overall, we find little evidence to support the hypotheses, derived from the analysis of macrostructural factors summarised in section 2.5, that socioeconomic inequalities might be the low-

est in France and the highest in US. The very different social, economic, and educational systems depicted in section 2 seem to result in educational inequalities that are surprisingly similar across countries.

This exploration of the data from the international databases leaves open many of the questions we seek to address in DICE. First, it is unclear whether the effects of the macrostructural differences documented in section 2 are confounded by the way demographic and cultural factors affect different SES groups in different countries. Differences in the characteristics and conditions of migrant and minority ethnic groups across countries, for example, may lead to differences in the composition of low- and high-SES groups that work to reinforce or offset the effect of social and educational policies on children's achievement. The same applies to social and cultural processes that shape how parental employment patterns and family structure intersect with SES. Second, inspection of achievement inequalities at the age of 15 tells us nothing about the timing of the evolution of inequality, or the routes by which children from different SES backgrounds end up with such disparate outcomes at the end of lower secondary schooling.

In general, the microdata analysed in DICE can help us to understand whether these inequalities arise from different processes in different countries. We can quantify, for example, the role of disposable income, family structure, and exposure to preschool or private education in accounting for the socioeconomic gaps within each country. We hypothesise that the role of different factors will vary across countries with, for example, income and preschool inequalities being greater drivers of the gaps in the US and school quality disparities a greater driver in Germany and the Netherlands. These analyses will therefore be able to establish links between specific macro-structural factors and childhood inequality in a way that is not possible via inspection of aggregate SES-related gaps alone. In a sense they will help to identify each country's strengths and weaknesses in limiting the intergenerational transmission of advantage and provide counterexamples from which each country can learn.

References

Aber, J. L., Gephart, M. A., Brooks-Gunn, J., & Connell, J. P. (1997). Development in context: Implications for studying neighborhood effects. In J. Brooks-Gunn, G. J. Duncan, & J. L. Aber (Eds.), *Neighborhood poverty: Context and consequences for children* (pp. 44–61). Russell Sage Foundation.

Abumiya, M. I. (2011). *Preschool education and care in Japan*. Tokyo, N.D. National Institute for Educational Policy Research.

Akgündüz, Y. E., & Plantenga, J. (2015). Equal access to high-quality childcare in the Netherlands. In L. Gambaro, K. Stewart, & J. Waldfogel (Eds.), *An equal start? Providing quality early education and care for disadvantaged children* (pp. 101–120). Policy Press.

Allmendinger, J. (1989). Educational systems and labor market outcomes. *European Sociological Review*, *5*(3), 231-250. https://doi.org/10.1093/oxfordjournals.esr.a036524

Alt, C., Berngruber, A., & Hubert, S. (2014). *Trotz Ausbau kein Platz? Zum Einfluss von Einstellungen und soziodemografischen Faktoren auf die Nichtinanspruchnahme öffentlicher Kindertagsbetreuung.* Deutsches Jugendinstitut. https://www.dji.de/?id=43721

Ammermueller, A. (2013). Institutional features of schooling systems and educational inequality: Cross-country evidence From PIRLS and PISA. *German Economic Review*, *14*(2), 190–213. https://doi.org/10.1111/j.1468-0475.2012.00565.x

Anders, Y., Roßbach, H.-G., Weinert, S., Ebert, S., Kuger, S., Lehrl, S., & von Maurice, J. (2012). Home and preschool learning environments and their relations to the development

of early numeracy skills. *Early Childhood Research Quarterly*, *27*(2), 231–244. https://doi.org/10.1016/j.ecresq.2011.08.003

Atkinson, J. W. (1974). Motivational determinants of intellective performance and cumulative achievement. In J. W. Atkinson & J. O. Raynor (Eds.), *Achievement and performance* (pp. 389–410). Winston.

Autorengruppe Bildungsberichterstattung. (2018). *Bildung in Deutschland 2018: Ein indikatorengestützter Bericht mit einer Analyse zu Bildung und Migration*. wbv. https://www.bildungsbericht.de/de/bildungsberichte-seit-2006/bildungsbericht-2018 https://doi.org/10.3278/6001820fw

Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis with special reference to education*. University of Chicago Press.

Begall, K., & Grunow, D. (2015). Labour force transitions around first childbirth in the Netherlands. *European Sociological Review*, *31*(6), 697–712. https://doi.org/10.1093/esr/jcv068

Berendes, K., Linberg, T., Müller, D., Wenz, S. E., Roßbach, H.-G., Schneider, T., & Weinert, S. (2019). Kindergarten and elementary school: Starting cohort 2 of the National Educational Panel Study. In H.-P. Blossfeld & H.-G. Roßbach (Eds.), *Education as a lifelong process: The German National Educational Panel Study (NEPS)* (Vol. 3, pp. 215–230). Springer VS. https://doi.org/10.1007/978-3-658-23162-0_12

Blossfeld, P. N. (2016). Inequality of educational opportunity and welfare regimes. *World Studies in Education*, *17*(2), 53–85. https://doi.org/10.7459/wse/17.2.05

Bock-Famulla, K., Lange, J., & Strunz, E. (2015). *Länderreport frühkindliche Bildungssysteme 2015: Transparenz schaffen – Governance stärken*. Verlag Bertelsmann Stiftung.

Bol, T., Witschge, J., van de Werfhorst, H. G., & Dronkers, J. (2014). Curricular tracking and central examinations: Counterbalancing the impact of social background on student achievement in 36 countries. *Social Forces*, *92*(4), 1545–1572. https://doi.org/10.1093/sf/sou003

Boudon, R. (1974). *Education, opportunity, and social inequality: Changing prospects in western society*. Wiley.

Boudon, R. (1981). *The logic of social action: An introduction to sociological analysis*. Routledge & Kegan Paul.

Bourdieu, P. (1983). Ökonomisches Kapital, kulturelles Kapital, soziales Kapital. In R. Kreckel (Ed.), *Soziale Welt Sonderband: Vol. 2. Soziale Ungleichheiten* (pp. 183–198). O. Schwartz.

Bourdieu, P. (1986). The forms of capital. In J. G. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241–258). Greenwood Press.

Bradbury, B., Corak, M., Waldfogel, J., & Washbrook, E. (2015). *Too many children left behind: The U.S. Achievement gap in comparative perspective*. Russell Sage Foundation.

Bradbury, B., Waldfogel, J., & Washbrook, E. (2019). Income-related gaps in early child cognitive development: Why are they larger in the United States than in the United Kingdom, Australia, and Canada? *Demography*, *56*(1), 367–390. https://doi.org/10.1007/s13524-018-0738-8

Bronfenbrenner, U. (1994). Ecological models of human development. In T. Husén & T. N. Postlethwaite (Eds.), *The international encyclopedia of education* (2nd ed., pp. 37–43). Pergamon.

Bukodi, E., Eibl, F., Buchholz, S., Marzadro, S., Minello, A., Wahler, S., Blossfeld, H.-P., Erikson, R., & Schizzerotto, A. (2018). Linking the macro to the micro: A multidimensional approach to educational Inequalities in four European countries. *European Societies*, *20*(1), 26–64. https://doi.org/10.1080/14616696.2017.1329934

Bukodi, E., & Goldthorpe, J. H. (2013). Decomposing 'social origins': The effects of parents' class, status, and education on the educational attainment of their children. *European Sociological Review*, *29*(5), 1024–1039. https://doi.org/10.1093/esr/jcs079

Burchinal, M., Kainz, K., & Cai, Y. (2011). How well do our measures of quality predict child outcomes? A meta-analysis and coordinated analysis of data from large-scale studies of early childhood settings. In M. E. Zaslow, I. E. Martinez-Beck, K. E. Tout, & T. E. Halle (Eds.), *Quality measurement in early childhood settings* (pp. 11–31). Paul H. Brookes Publishing.

Burger, K. (2010). How does early childhood care and education affect cognitive development? An international review of the effects of early interventions for children from different social backgrounds. *Early Childhood Research Quarterly*, *25*(2), 140–165. https://doi.org/10.1016/j.ecresq.2009.11.001

Carbonaro, W. J. (1998). A little help from my friend's parents: Intergenerational closure and educational outcomes. *Sociology of Education*, *71*(4), 295–313. https://doi.org/10.2307/2673172

Cebolla-Boado, H., Radl, J., & Salazar, L. (2017). Preschool education as the great equalizer? A cross-country study into the sources of inequality in reading competence. *Acta Sociologica*, *60*(1), 41–60. https://doi.org/10.1177/0001699316654529

Chmielewski, A. K. (2014). An international comparison of achievement inequality in within- and between-school tracking systems. *American Journal of Education*, *120*(3), 293–324.

Chmielewski, A. K. (2017). Social inequality in educational transitions under different types of secondary school curricular differentiation. In I. Schoon & R. K. Silbereisen (Eds.), *Pathways to adulthood: Educational opportunities, motivation and attainment in times of social change* (pp. 51–72). UCL, IOE Press.

Chmielewski, A. K. (2019). The global increase in the socioeconomic achievement gap, 1964 to 2015. *American Sociological Review*, *84*(3), 517–544. https://doi.org/10.1177/0003122419847165

Chmielewski, A. K., & Reardon, S. F. (2016). Patterns of cross-national variation in the association between income and academic achievement. *AERA Open*, *2*(3), 1-27. https://doi.org/10.1177/2332858416649593

CNV. (2020). *Ouderschapsverlof: Verlof om voor je kind te zorgen*. https://www.cnv.nl/werk-en-prive/verlof/ouderschapsverlof/#c1039

Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, *94*, 95-120. https://doi.org/10.1086/228943

Conger, D., Schwartz, A. E., & Stiefel, L. (2011). The effect of immigrant communities on foreign-born student achievement. *International Migration Review*, *45*(3), 675–701. https://doi.org/10.1111/j.1747-7379.2011.00862.x

Conger, R., & Elder Jr., G. H. (Eds.). (1994). *Families in troubled times: Adapting to change in rural America*. Routledge.

Conger, R. D., & Donnellan, M. B. (2007). An interactionist perspective on the socioeconomic context of human development. *Annual Review of Psychology*, *58*, 175–199. https://doi.org/10.1146/annurev.psych.58.110405.085551

Corak, M. (2013). Income inequality, equality of opportunity, and intergenerational mobility. *Journal of Economic Perspectives*, *27*(3), 79–102. https://doi.org/10.1257/jep.27.3.79

Dämmrich, J., & Esping-Andersen, G. (2017). Preschool and reading competencies: A cross-national analysis. In H.-P. Blossfeld, N. Kulic, J. Skopek, & M. Triventi (Eds.), *Childcare, early education and social inequality: An international perspective* (pp. 133–151). Edward Elgar Publishing.

Dämmrich, J., & Triventi, M. (2018). The dynamics of social inequalities in cognitive-related competencies along the early life course – A comparative study. *International Journal of Educational Research*, *88*, 73–84. https://doi.org/10.1016/j.ijer.2018.01.006

Department for Education. (2017). *Statutory framework for the early years foundation of stage: Setting the standards for learning, development and care for children from birth to five*. London.

Diez Roux, A. V. (2011). Complex systems thinking and current impasses in health disparities research. *American Journal of Public Health*, *101*(9), 1627–1634. https://doi.org/10.2105/AJPH.2011.300149

Dollmann, J. (2019). Educational institutions and inequalities in educational opportunities. In R. Becker (Ed.), *Research handbook on the sociology of education* (pp. 268–283). Edward Elgar Publishing.

Duncan, G. J., & Murnane, R. J. (Eds.). (2011). *Whither opportunity? Rising inequality, schools, and children's life chances*. Russel Sage Foundation.

Durlauf, S. N. (2004). Neighborhood effects. In J. V. Henderson & J.-F. Thisse (Eds.), *Handbooks in economics: Vol. 7. Handbook of regional and urban economics* (pp. 2174–2242). North-Holland; Elsevier.

Eckhardt, T. (2017). *The education system in the Federal Republic of Germany 2015/2016: A description of the responsibilities, structures and developments in education policy for the exchange of information in Europe*. Bonn. KMK.

Eksner, J., & Stanat, P. (2012). Effects of ethnically segregated learning settings in the United States and Germany. In K. S. Gallagher, R. Goodyear, D. J. Brewer, & R. Rueda (Eds.), *Urban education: A model for leadership and policy* (pp. 311–327). Routledge.

Ellen, I. G., & Turner, M. A. (1997). Does neighborhood matter? Assessing recent evidence. *Housing Policy Debate*, *8*(4), 833–866. https://doi.org/10.1080/10511482.1997.9521280

Erikson, R., & Jonsson, J. O. (1996). Introduction: Explaining class inequality in education: The Swedish test case. In R. Erikson & J. O. Jonsson (Eds.), *Social inequality series. Can education be equalized? The Swedish case in comparative perspective* (pp. 1–63). Westview Press.

Erola, J., Jalonen, S., & Lehti, H. (2016). Parental education, class and income over early life course and children's achievement. *Research in Social Stratification and Mobility*, *44*, 33–43. https://doi.org/10.1016/j.rssm.2016.01.003

Esping-Andersen, G., Garfinkel, I., Han, W.-J., Magnuson, K., Wagner, S., & Waldfogel, J. (2012). Child care and school performance in Denmark and the United States. *Children and Youth Services Review*, *34*(3), 576–589. https://doi.org/10.1016/j.childyouth.2011.10.010

Esping-Andersen, G. (1992). *Social foundations of postindustrial economies*. Oxford University Press.

Esping-Andersen, G., & Myles, J. (2009). The welfare state and redistribution. In W. Salvedra, B. Nolan, & T. Smeeding (Eds.), *Handbook on economic inequality* (pp. 639–664). Oxford University Press.

Esser, H. (2016). The model of ability tracking - theoretical expectations and empirical findings on how educational systems impact on educational success and inequality. In H.-P. Blossfeld, S. Buchholz, J. Skopek, & M. Triventi (Eds.), *eduLIFE Lifelong Learning Series. Models of secondary education and social inequality: An international comparison* (pp. 25–44). Edward Elgar Publishing.

Esser, H., & Seuring, J. (2020). Kognitive Homogenisierung, schulische Leistungen und soziale Bildungsungleich-heit. *Zeitschrift für Soziologie*, *49*(5-6), 277-301. https://doi.org/10.1515/zfsoz-2020-0025.

Eurydice. (2018a). *United Kingdom - England overview*. https://eacea.ec.europa.eu/national-policies/eurydice/content/united-kingdom-england_en

Eurydice. (2018b). *United Kingdom - Wales overview*. https://eacea.ec.europa.eu/national-policies/eurydice/content/united-kingdom-wales_en

Eurydice. (2019). *United Kingdom - Scotland overview*. https://eacea.ec.europa.eu/national-policies/eurydice/content/united-kingdom-scotland_en

Fagnani, J. (2015). Equal access to quality care: Lessons from France on providing high-quality and affordable early childhood education and care. In L. Gambaro, K. Stewart, & J. Waldfogel (Eds.), *An equal start? Providing quality early education and care for disadvantaged children* (pp. 77–99). Policy Press.

Galster, G. C. (2008). Quantifying the effect of neighbourhood on individuals: Challenges, alternative approaches, and promising directions. *Schmollers Jahrbuch*, *128*, 7–48.

Gambaro, L., Stewart, K., & Waldfogel, J. (2015a). Equal access to early childhood education and care? The case of the UK. In L. Gambaro, K. Stewart, & J. Waldfogel (Eds.), *An equal start? Providing quality early education and care for disadvantaged children* (pp. 29–52). Policy Press.

Gambaro, L., Stewart, K., & Waldfogel, J. (Eds.). (2015b). *An equal start? Providing quality early education and care for disadvantaged children*. Policy Press.

Gamoran, A. (2010). Tracking and inequality: New directions for research and practice. In M. W. Apple, S. J. Ball, & L. A. Handin (Eds.), *The Routledge international handbook of the sociology of education* (pp. 213–228). Routledge.

Goldthorpe, J. H., & McKnight, A. (2006). The economic basis of social class. In S. L. Morgan, D. B. Grusky, & G. S. Fields (Eds.), *Studies in social inequality. Mobility and inequality: Frontiers of research from sociology and economics* (pp. 109–136). Stanford University Press.

Grätz, M., & Wiborg, Ø. N. (2020). Reinforcing at the top or compensating at the bottom? Family background and academic performance in Germany, Norway, and the United States. *European Sociological Review*, *36*(3), 381–394. https://doi.org/10.1093/esr/jcz069

Gross, C., Meyer, H.-D., & Hadjar, A. (2016). Theorising the impact of education systems on inequalities. In A. Hadjar & C. Gross (Eds.), *Education systems and inequalities: International comparisons* (pp. 11–31). Policy Press.

Gustafsson, J.-E., & Rosén, M. (2014). Quality and credibility of international studies. In R. Strietholt, W. Bos, J.-E. Gustafsson, & M. Rosén (Eds.), *Educational policy Evaluation through international comparative assessments* (pp. 19–31). Waxmann.

Hanushek, E. A., & Woessmann, L. (2006). Does educational tracking affect performance and inequality? Differences-in-Differences evidence across countries. *The Economic Journal*, *116*(510), C63-C76. https://doi.org/10.1111/j.1468-0297.2006.01076.x

Hart, B., & Risley, T. R. (1992). American parenting of language-learning children: Persisting differences in family-child interactions observed in natural home environments. *Developmental Psychology*, *28*(6), 1096–1105. https://doi.org/10.1037/0012-1649.28.6.1096

Heckman, J. J. (2006). Skill formation and the economics of investing in disadvantaged children. *Science*, *312*(5782), 1900–1902. https://doi.org/10.1126/science.1128898

Helbig, M., & Nikolai, R. (2015). *Die unvergleichbaren: Der wandel der schulsysteme in den deutschen bundesländern seit 1949*. Verlag Julius Klinkhardt.

Hoff, E. (2003). The specificity of environmental influence: Socioeconomic status affects early vocabulary development via maternal speech. *Child Development*, *74*(5), 1368–1378. https://doi.org/10.1111/1467-8624.00612

Hovestadt, T., & Schneider, T. (2021). Liefern Jugendliche valide informationen zum Bildungsstand ihrer Eltern in standardisierten Erhebungen? Befunde zu Schülerinnen und Schülern der 9. Jahrgangsstufe in Deutschland. *Zeitschrift für Erziehungswissenschaft.* Advance online publication. https://doi.org/10.1007/s11618-021-01016-5

Hußmann, A., Stubbe, T. C., & Kasper, D. (2017). Soziale Herkunft und Lesekompetenzen von Schülerinnen und Schülern. In A. Hußmann, H. Wendt, W. Bos, A. Bremerich-Vos, D.

Kasper, E.-M. Lankes, N. McElvany, T. C. Stubbe, & R. Valtin (Eds.), *IGLU 2016: Lesekompetenzen von Grundschulkindern in Deutschland im internationalen Vergleich* (pp. 195–218). Waxmann.

Huttenlocher, J., Waterfall, H., Vasilyeva, M., Vevea, J., & Hedges, L. V. (2010). Sources of variability in children's language growth. *Cognitive Psychology*, *61*(4), 343–365. https://doi.org/10.1016/j.cogpsych.2010.08.002

Ichou, M., & Vallet, L. ‐ A. (2011). Do all roads lead to inequality? Trends in French upper secondary school analysed with four longitudinal surveys. *Oxford Review of Education*, *37*(2), 167–194. https://doi.org/10.1080/03054985.2011.559350

Ichou, M., & Vallet, L.-A. (2013). Academic achievement, tracking decisions, and their relative contribution to educational inequalities. In M. Jackson (Ed.), *Determined to succeed? Performance versus choice in educational attainment* (pp. 116–148). Stanford University Press.

IKK. (2018). *Overzicht maatregelen IKK 2019 en 2023.* Ministerie van Sociale Zaken en Werkgelegenheid.

Indexmundi. *Mother's mean age at first birth*. https://www.indexmundi.com/factbook/fields/mother's-mean-age-at-first-birth

The Japan Times. (2018). *Government approves free preschool education program starting Oct. 2019*. https://www.japantimes.co.jp/news/2018/12/28/national/government-approves-free-preschool-education-program-starting-oct-2019/#.XqgQs5ngpPY

Jencks, C., & Mayer, S. (1990). The social consequences of growing up in a poor neighborhood. In L. E. Lynn & M. G. H. McGeary (Eds.), *Inner-city poverty in the United States* (pp. 111–186). National Academies Press.

Jerrim, J., & Micklewright, J. (2014). Socio-economic gradients in children's cognitive skills: Are cross-country comparisons robust to who reports family background? *European Sociological Review*, *30*(6), 766–781. https://doi.org/10.1093/esr/jcu072

Jerrim, J., & Macmillan, L. (2015). Income inequality, intergenerational mobility, and the Great Gatsby Curve: Is education the key? *Social Forces*, *94*(2), 505–533. https://doi.org/10.1093/sf/sov075

Jones, R. S. (2011). *Education reform in Japan* (OECD Economics Department Working Papers No. 888). Paris. OECD. https://doi.org/10.1787/18151973

Kalicki, B., & Egert, F. (2012). Effekte der Früherziehung: Qualität der Betreuung und kindliche Entwicklung. *DJI Impulse*, *98*(2), 37–40.

Kalil, A. (2015). Inequality begins at home: The role of parenting in the diverging destinies of rich and poor children. In P. R. Amato, A. Booth, S. M. McHale, & J. van Hook (Eds.), *National Symposium on Family Issues: Vol. 5. Families in an era of increasing inequality: Diverging destinies* (Vol. 5, pp. 63–82). Springer. https://doi.org/10.1007/978-3-319-08308-7_5

Kamerman, S. B., & Gatenio-Gabel, S. (2007). Early childhood education and care in the United States: An overview of the current policy picture. *International Journal of Child Care and Education Policy*, *1*(1), 23–34. https://doi.org/10.1007/2288-6729-1-1-23

Kariya, T. (2010). The end of egalitarian education in Japan? The effects of policy changes in resource distribution on compulsory education. In J. A. Gordon, H. Fujita, & T. Kariya (Eds.), *Challenges to Japanese education: Economics, reform, and human rights* (pp. 54–66). Teachers College Press.

Keizer, R. (2020). The role of fathers in the intergenerational transmission of (dis)advantages: Linking sociological stratification questions to developmental psychology research. In H. E. Fitzgerald, K. von Klitzing, N. J. Cabrera, J. Scarano de Mendonça, & T. Skjøthaug (Eds.), *Handbook on fathers and child development: Prenatal to preschool* (pp. 47–64). Springer.

Kerckhoff, A. C. (2001). Education and social stratification processes in comparative perspective. *Sociology of Education*, *74*, 3–18.

Khanam, R., & Nghiem, S. (2016). Family income and child cognitive and noncognitive development in Australia: Does money matter? *Demography*, *53*(3), 597–621. https://doi.org/10.1007/s13524-016-0466-x

Kimata, A., & Kaneko, Y. (2015). Latest development of Japanese kindergarten education policy. In L. Huo, S. B. Neumann, & A. Nanakida (Eds.), *Early childhood education in three cultures: China, Japan and the United States* (pp. 61–82). Springer.

Kitamura, Y. (2019). Background and context of education system in Japan. In Y. Kitamura, T. Omomo, & M. Katsuno (Eds.), *Education in Japan* (pp. 1–24). Springer Singapore.

Klein, O., & Becker, B. (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. https://doi.org/10.1016/j.rssm.2017.01.001

Klinkhammer, N., & Riedel, B. (2018). An incomplete revolution? Changes and challenges within German early childhood education and care policy. In L. Miller, C. Cameron, C. Dalli, & N. Barbour (Eds.), *The SAGE handbook of early childhood policy* (pp. 49–70). SAGE reference.

Krapf, S. (2014). Who uses public childcare for 2-year-old children? Coherent family policies and usage patterns in Sweden, Finland and Western Germany. *International Journal of Social Welfare*, *23*(1), 25–40. https://doi.org/10.1111/ijsw.12031

Kroneberg, C. (2019). Theory development in comparative social research. *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie*, *71*(S1), 29–51. https://doi.org/10.1007/s11577-019-00604-y

Kulic, N., Skopek, J., Triventi, M., & Blossfeld, H.-P. (2019). Social background and children's cognitive skills: The role of early childhood education and care in a cross-national perspective. *Annual Review of Sociology*, *45*(1), 557–579. https://doi.org/10.1146/annurev-soc-073018-022401

Lareau, A., & Weininger, E. B. (2003). Cultural capital in educational research: A critical assessment. *Theory and Society*, *32*(5/6), 567–606. https://doi.org/10.1023/B:RYSO.0000004951.04408.b0

Leventhal, T., & Brooks-Gunn, J. (2000). The neighborhoods they live in: The effects of neighborhood residence on child and adolescent outcomes. *Psychological Bulletin*, *126*(2), 309–337. https://doi.org/10.1037/0033-2909.126.2.309

Linberg, T., Schneider, T., Waldfogel, J., & Wang, Y. (2019). Socioeconomic status gaps in child cognitive development in Germany and the United States. *Social Science Research*, *79*, 1–31. https://doi.org/10.1016/j.ssresearch.2018.11.002

Luijkx, R., & de Heus, M. (2008). The educational system of the Netherlands. In S. L. Schneider (Ed.), *The International Standard Classification of Education (ISCED-97): An evaluation of content and criterion validity for 15 European countries* (pp. 47–75). Mannheimer Zentrum für Europäische Sozialforschung.

Machin, S., & Vignoles, A. (2006). *Education policy in the UK* (CEE discussion papers CEE DP 57). London. http://eprints.lse.ac.uk/id/eprint/19430

Magnuson, K., & Waldfogel, J. (2015). Delivering high-quality early childhood education and care to low-income children: How well is the US doing? In L. Gambaro, K. Stewart, & J. Waldfogel (Eds.), *An equal start? Providing quality early education and care for disadvantaged children* (pp. 193–217). Policy Press.

Malin, J. L., Cabrera, N. J., & Rowe, M. L. (2014). Low-income minority mothers' and fathers' reading and children's interest: Longitudinal contributions to children's receptive vocabulary skills. *Early Childhood Research Quarterly*, *29*(4), 425–432. https://doi.org/10.1016/j.ecresq.2014.04.010

Marks, G. N. (2005). Cross-national differences and accounting for social class inequalities in education. *International Sociology*, *20*(4), 483–505. https://doi.org/10.1177/0268580905058328

Masarik, A. S., & Conger, R. D. (2017). Stress and child development: A review of the Family Stress Model. *Current Opinion in Psychology*, *13*, 85–90. https://doi.org/10.1016/j.copsyc.2016.05.008

Mayer, S. E. (1998). *What money can't buy: Family income and children's life changes*. Harvard Univ. Press.

McCulloch, A., & Joshi, H. E. (2001). Neighbourhood and family influences on the cognitive ability of children in the British National Child Development Study. *Social Science & Medicine*, *53*(5), 579–591. https://doi.org/10.1016/S0277-9536(00)00362-2

McLanahan, S. (2004). Diverging destinies: How children are faring under the second demographic transition. *Demography*, *41*(4), 607–627. https://doi.org/10.1353/dem.2004.0033

McLoyd, V. C. (1998). Socioeconomic disadvantage and child development. *American Psychologist*, *53*(2), 185–204.

Melhuish, E., & Gardiner, J. (2018). *Study of Early Education and Development (SEED): Impact study on early education use and child outcomes up to age four years* (Department for Education). London.

Melhuish, E. C., Phan, M. B., Sylva, K., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (2008). Effects of the home learning environment and preschool center experience upon literacy and numeracy development in early primary school. *Journal of Social Issues*, *64*(1), 95–114. https://doi.org/10.1111/j.1540-4560.2008.00550.x

Merton, R. K. (1968). The Matthew Effect in science: The reward and communication systems of science are considered. *Science*, *159*(3810), 56–63. https://doi.org/10.1126/science.159.3810.56

Mullis, I. V.S., Martin, M. O., Foy, P., & Hooper, M. (2016). *TIMSS 2015 international results in mathematics*. TIMSS & PIRLS International Study Center.

Muskens, M., & Tholen, R. (2015). *Onderzoek sturen op cijfers en rendementen: Eindrapport 2015*. Nijmegen. ResearchNed.

Naumann, I., McLean, C., Koslowski, A., Tisdall, K., & Lloyd, E. (2013). *Early childhood education and care provision: International review of policy, delivery and funding: Final report*. Edinburgh. Scottish Government Social Research.

Neumann, S. B. (2015). Describing the early childhood policy landscape in the USA. In L. Huo, S. B. Neumann, & A. Nanakida (Eds.), *Early childhood education in three cultures: China, Japan and the United States* (pp. 53–60). Springer.

NIEER. (2019). *The state of preschool 2018: State preschool yearbook.* The National Institute for Early Education Research.

Nonnenmacher, A. (2017). Urban poverty areas and education. In A. Million, A. J. Heinrich, & T. Coelen (Eds.), *Education, space and urban planning: Education as a component of the city* (Vol. 24, pp. 119–126). Springer. https://doi.org/10.1007/978-3-319-38999-8_11

Oberhuemer, P. (2015). Access and quality issues in early childhood education and care: The case of Germany. In L. Gambaro, K. Stewart, & J. Waldfogel (Eds.), *An equal start? Providing quality early education and care for disadvantaged children* (pp. 121–146). Policy Press.

OECD. (2000a). *Early childhood education and care policy in the United Kingdom* (OECD Country Note). Paris. OECD.

OECD. (2000b). *Early childhood education and care policy in The United States of America* (OECD Country Note). Paris. OECD.
OECD. (2004). *Early childhood education and care policy in France* (OECD Country Note). Paris. OECD.
OECD. (2016a). *Netherlands 2016: Foundations for the future: Reviews of national policies for education*. Paris. OECD.
OECD. (2016b). *PF 4.1: Typology of childcare and early education services*. http://www.oecd.org/social/family/PF4-1-Typology-childcare-early-education-services.pdf
OECD. (2016c). *PISA 2015 results (Volume I): Excellence and equity in education*. Paris. OECD Publishing.
OECD. (2016d). *Pisa 2015 results (Volume II): Policies and practices for successful schools* (PISA 2015 results). Paris. OECD Publishing.
OECD. (2016e). *Starting Strong IV: Monitoring quality in early childhood education and care: Country note France*. Paris. OECD Publishing.
OECD. (2016f). *Starting strong IV: Early childhood education and care data: Country note Germany*. Paris. OECD.
OECD. (2017a). *PISA 2015: Technical report*. Paris. OECD Publishing.
OECD. (2017b). *Starting strong IV: Early childhood education and care data: Country note Japan*. Paris. OECD Publishing. https://doi.org/10.1787/9789264192829-en
OECD. (2018a). *Education policy in Japan: Building bridges towards 2030* (Reviews of National Policies for Education). Paris. OECD. https://doi.org/10.1787/9789264302402-en
OECD. (2018b). *Settling in 2018: Indicators of immigrant integration*. Paris. OECD Publishing.
OECD. (2019a). *OECD Family Database*. http://www.oecd.org/els/family/database.htm
OECD. (2019b). *OECD.Stat*. https://stats.oecd.org/
OECD. (2019c). *PISA 2018 results (Volume I): What students know and can do*. Paris. OECD Publishing. https://doi.org/10.1787/5f07c754-en
OECD. (2019d). *PISA 2018 results (Volume II): Where all students can succeed*. Paris. OECD Publishing. https://doi.org/10.1787/b5fd1b8f-en
Passaretta, G., & Skopek, J. (2018a). Germany: From birth to the end of compulsory school - social and migration-related achievement inequality in a stratified education system. In G. Passaretta & J. Skopek (Eds.), *ISOTIS Report (D 1.3). Roots and development of achievement gaps: A longitudinal assessment in selected European countries* (pp. 18–49).
Passaretta, G., & Skopek, J. (Eds.). (2018b). *ISOTIS Report (D 1.3). Roots and development of achievement gaps: A longitudinal assessment in selected European countries.*
Peter, T., Edgerton, J. D., & Roberts, L. W. (2010). Welfare regimes and educational inequality: A cross-national exploration. *International Studies in Sociology of Education*, *20*(3), 241–264.
Pfeffer, F. T. (2008). Persistent inequality in educational attainment and its institutional context. *European Sociological Review*, *24*(5), 543–565. https://doi.org/10.1093/esr/jcn026
Pinquart, M. (2017). Associations of parenting dimensions and styles with externalizing problems of children and adolescents: An updated meta-analysis. *Developmental Psychology*, *53*(5), 873–932. https://doi.org/10.1037/dev0000295
Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual Review of Sociology*, *24*(1), 1–24. https://doi.org/10.1146/annurev.soc.24.1.1
Putnam, R. D. (2015). *Our kids: The American dream in crisis*. Simon & Schuster.
Ream, R. K. (2005). Toward understanding how social capital mediates the impact of mobility on Mexican American achievement. *Social Forces*, *84*(1), 201–224. https://doi.org/10.1353/sof.2005.0121

République Française. (2016). *Public Health Act: R-2324-43*. https://www.legifrance.gouv.fr/affichCodeArticle.do;.tpdjo02v_3?idArticle=LEGIARTI000022320460&cidTexte=LEGITEXT000006072665&dateTexte=20110812

Rijksoverheid. (2018). *Kwaliteitseisen kinderopvang*. https://www.rijksoverheid.nl/onderwerpen/kinderopvang/kwaliteitseisen-kinderopvang-en-peuterspeelzalen

Rohlen, T. P. (1998a). Introduction. In T. P. Rohlen & C. Björk (Eds.), *Routledge library of modern Japan. Education and training in Japan (Volume I)* (pp. 1–45). Routledge.

Rohlen, T. P. (1998b). Is Japanese education becoming less egalitarian? Notes on high school stratification and reform. In T. P. Rohlen & C. Björk (Eds.), *Education and training in Japan (Volume III)* (pp. 1–30). Routledge.

Rohlen, T. P. (1998c). The juku phenomenon: An exploratory essay. In T. P. Rohlen & C. Björk (Eds.), *Education and training in Japan (Volume II)* (pp. 304–334). Routledge.

Sanderson, I. (2006). Complexity, 'practical rationality' and evidence-based policy making. *Policy & Politics*, *34*(1), 115–132. https://doi.org/10.1332/030557306775212188

Sato, N., & McLaughlin, M. W. (1998). Context matters: Teaching in Japan and in the United States. In T. P. Rohlen & C. Björk (Eds.), *Education and training in Japan (Volume II).* Routledge.

Scaramella, L. V., Sohr-Preston, S. L., Callahan, K. L., & Mirabile, S. P. (2008). A test of the Family Stress Model on toddler-aged children's adjustment among Hurricane Katrina impacted and nonimpacted low-income families. *Journal of Clinical Child and Adolescent Psychology*, *37*(3), 530–541. https://doi.org/10.1080/15374410802148202

Schütz, G. (2009). *Does the quality of pre-primary education pay off in secondary school? An international comparison using PISA 2003* (Ifo Working Paper No. 68). München. Institut für Wirtschaftsforschung.

Skopek, J., & Passaretta, G. (2018). United Kingdom: The evolution of social and ethnic inequalities in cognitive achievement from preschool to secondary schooling in the UK. In G. Passaretta & J. Skopek (Eds.), *ISOTIS Report (D 1.3). Roots and development of achievement gaps: A longitudinal assessment in selected European countries* (pp. 108–157).

Skopek, J., Triventi, M., & Buchholz, S. (2019). How do educational systems affect social inequality of educational opportunities? The role of tracking in comparative perspective. In R. Becker (Ed.), *Research handbook on the sociology of education* (pp. 214–232). Edward Elgar Publishing.

Skopek, J., van de Werfhorst, H. G., Rözer, J., Zachrisson, H. D., & van Huizen, T. (2017). *Inequality in various stages of the educational career: Patterns and mechanisms - literature review.* Inclusive Education and Social Support to Tackle Inequalities in Society.

South, S. J., Baumer, E. P., & Lutz, A. (2003). Interpreting community effects on youth educational attainment. *Youth & Society*, *35*(1), 3–36. https://doi.org/10.1177/0044118X03254560

Sroufe, L. A. (2009). From infant attachment to promotion of adolescent autonomy: Prospective, longitudinal data on the role of parents in development. In J. G. Borkowski, S. L. Ramey, & M. Bristol-Power (Eds.), *Monographs in parenting series. Parenting and the child's world: Influences on academic, intellectual, and social-emotional development* (pp. 187–202). Psychology Press.

Stanovich, K. E. (1986). Matthew Effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly*, *21*(4), 360–407. https://doi.org/10.1177/0022057409189001-204

Stanton-Salazar, R. D. (1997). A social capital framework for understanding the socialization of racial minority children and youths. *Harvard Educational Review*, *67*(1), 1–40.

Takemoto, Y., Ota, E., Yoneoka, D., Mori, R., & Takeda, S. (2016). Japanese secular trends in birthweight and the prevalence of low birthweight infants during the last three decades: A population-based study. *Scientific Reports*, *6*, 31396. https://doi.org/10.1038/srep31396

Tietze, W., Becker-Stoll, F., Bensel, J., Eckhardt, A. G., Haug-Schnabel, G., Kalicki, B., Keller, H., & Leyendecker, B. (Eds.). (2013). *NUBBEK - Nationale Untersuchung zur Bildung, Betreuung und Erziehung in der frühen Kindheit: Forschungsbericht*. Verlag das Netz.

van de Werfhorst, H. G. (2018). Early tracking and socioeconomic inequality in academic achievement: Studying reforms in nine countries. *Research in Social Stratification and Mobility*, *58*, 22–32. https://doi.org/10.1016/j.rssm.2018.09.002

van de Werfhorst, H. G., & Mijs, J. J. B. (2010). Achievement inequality and the institutional structure of educational systems: A comparative perspective. *Annual Review of Sociology*, *36*, 407–428.

van Huizen, T. (2018). Netherlands: The evolution of achievement gaps from early childhood to adolescents in the Netherlands. In G. Passaretta & J. Skopek (Eds.), *ISOTIS Report (D 1.3). Roots and development of achievement gaps: A longitudinal assessment in selected European countries* (pp. 50–87).

Welsh Government. (2018). *Childcare offer: Guidance for early implementer local authorities*. Cardiff.

Willms, J. D., & Chen, M. (1989). The effects of ability grouping on the ethnic achievement gap in Israeli elementary schools. *American Journal of Education*, *97*(3), 237–257. https://doi.org/10.1086/443926

Woessmann, L., Lüdermann, E., Schütz, G., & West, M. R. (2009). *School accountability, autonomy and choice around the world*. *IFO economic policy*. Edward Elgar Publishing.

World Bank. *Development Indicators*. https://databank.worldbank.org/source/world-development-indicators/

Yanushevsky, R. (2011). *Improving education in the US: A political paradox*. Algora Publishing. http://site.ebrary.com/lib/alltitles/docDetail.action?docID=10476683

Yeung, W. J., Linver, M. R., & Brooks-Gunn, J. (2002). How money matters for young children's development: Parental investment and family processes. *Child Development*, *73*(6), 1861–1879. https://doi.org/10.1111/1467-8624.t01-1-00511

Zoch, G., & Hondralis, I. (2017). The expansion of low-cost, state-subsidized childcare availability and mothers' return-to-work behaviour in East and West Germany. *European Sociological Review*, *33*(5), 693–707. https://doi.org/10.1093/esr/jcx068

Appendix

Appendix A: Children's birth cohort and year of data collection of surveys analysed in DICE

Table A1. Children's birth cohort and year of data collection of surveys analysed in DICE

Country	Birth cohorts	Year(s) of data collection
France		
ELFE birth cohort	2011	2011-2017
DEPP panel primary	2005	2011-2016
DEPP panel secondary	1996	2007-2013
Germany		
NEPS SC1	2012	2012-2019
NEPS SC2	2005-2006	2011-2019 (1st Grade: 2013)
NEPS SC3	1998-2000	2010-2017
Japan		
JCPS (KHPS & JHPS)	2003-2012	2010-2018
LSN21	2001	2001-2017
Netherlands		
Generation R	2002-2006	2002 - ongoing
UK		
MCS	2000-2002	2001, 2004, 2006, 2008, 2012, 2015, 2018
US		
ECLS-B	2001	2001-2008
ECLS-K 2011	2004-2005	2010-2016
ECLS-K 1998	1992-1993	1998-2007

Note. Acronyms stand for: ELFE: French Longitudinal Study of Children; DEPP: La Direction de l'évaluation, de la prospective et de la performance; NEPS: National Educational Panel Study; JCPS: Japan Child Panel Survey; LSN21: Longitudinal Study of Newborns; MCS: Millennium Cohort Study; ECLS-B: Early Childhood Longitudinal Study, Birth Cohort; ECLS-K: Early Childhood Longitudinal Study, Kindergarten-First Grade Waves.

Appendix B: Further indicators on macrostructural contexts

Table B1. Further country characteristics, by country

Indicator	Year	FR	GE	JP	NL	UK	US
Total fertility rate	2015	2.0	1.5	1.5	1.7	1.8	1.8
Change in fertility rate	2015 - 1995	0.2	0.3	0.1	0.2	0.1	-0.2
Mean age of women at first birth	2015[1]	28.1	29.4	30.7	29.6	28.5	26.4
% of children (aged 0-17) living with two parents	2015	77	83	88	86	75	69
OECD classification of country as immigrant destination	2017	Long-standing destinations with many low-educated migrants	Long-standing destinations with many low-educated migrants	Emerging destination countries with small immigrant populations	Long-standing destinations with many low-educated migrants	Long-standing destinations and many recent and highly educated migrants	Long-standing destinations and many recent and highly educated migrants
% population foreign-born	2015	12.1	14.9	1.6	11.7	13.2	14.5
Change in % foreign-born (pp)	2015 - 1995	1.6	5.7	0.5	3.0	6.0	3.8
% of 15-year-olds born abroad or with both parents born abroad (PISA 2015)	2015	13.2	16.9	0.5	10.7	16.7	23.1
GDP per capita US$	2015	36.6	41.4	34.5	45.2	44.5	56.8
Poverty rate (50% median income):	2015						
Before taxes and transfers (all)		36.4	33.5	33.0	26.7	29.8	26.7
After taxes and transfers (all)		8.1	10.1	15.7	7.8	10.9	16.8
Poverty rate (50% median income):	1995[2]						
Before taxes and transfers (all)		35.0	28.7	19.0	25.6	32.2	26.4
After taxes and transfers (all)		7.6	7.2	13.7	6.9	10.5	16.7
Total public spending as % of GDP	2015	32.0	24.9	21.9	17.7	21.6	18.8
Change in % total public spending as % of GDP	2015 - 1995	3.7	-0.3	8.6	-4.7	4.9	3.7
Percentage of total health expenditure financed by compulsory health insurance and government	2015	76.7	84.1	84.1	81.4	79.4	84.6
Change in % total health expenditure	2015 - 1995	-2.4	3.8	2.3	6.0	-4.7	38.4
Maternal employment rate with at least one child < 15 years	2014[3]	72	69	63	75	67	66
Length of paid maternity and parental leave (weeks)	2015	42.0	58.0	58.0	16.0	39.0	0.0
Change length of paid leave	2015 - 1995	26.0	-51.3	0.0	0.0	21.0	0.0
Length of parental leave with job protection (weeks)	2015	146.0	148.0	44.0	26.0	18.0	12.0
Length of paid father-specific leave (weeks)	2015	28.0	8.7	52.0[4]	0.4	2.0	0.0
Proportion of gross earnings replaced by maternity benefits	2014	100.0	100.0	67.0	100.0	31.1	0.0

Indicator	Year	FR	GE	JP	NL	UK	US
across paid maternity leave, at 100% of average earnings							
Proportion of gross earnings replaced by parental leave benefit(s) across weeks of paid parental and home care leave available to mothers, at 100% of average earnings	2014	26.1	65.0	59.9	(17.9)[5]	*nd*	*nd*

Notes. *nd* means no data available. [1] Numbers for mean age of women first birth are from 2010 for France and from 2014 for UK (here England and Wales only). [2] Poverty figures for France are from 1996 and for UK from 1994. [3] Numbers for maternal employment rate with at least one child under 15 are for Germany from 2013 and the other countries from 2014. [4] The total weeks of leaves taken by both parents should not exceed 52 weeks in Japan. Mothers can take additional 6 weeks of maternity leave. [5] There is no paid parental leave by law in the Netherlands in the classic sense (e.g., Begall & Grunow, 2015, p. 700). Parental leave payments rather depend on what is agreed in the collective labour agreement and the employer pays for the parental leave (CNV, 2020). Tax benefits were in place until 2015.

Statistical sources: Source for total fertility rate, share of population foreign-born, GDP per capita: World Bank Development Indicators (World Bank, https://databank.worldbank.org/source/world-development-indicators/). Source for mean age of women at first birth: Indexmundi (Indexmundi, https://www.indexmundi.com/factbook/fields/mother's-mean-age-at-first-birth). Source for share of children living with two parents, maternal employment rate, poverty rate, share of total public spending, share of health expenditure, length of parental leave and earning replacement rates: OECD Stats (OECD, 2019b). Source for immigrant destination classification: OECD, 2018b, p. 26. Source for share of 15-year-olds of immigrant origin: OECD, 2016c.