



Equality and quality in education. A comparative study of 19 countries



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ABSTRACT

This contribution assesses the performance of national education systems along two important dimensions: The degree to which they help individuals develop capabilities necessary for their successful social integration (educational quality) and the degree to which they confer equal opportunities for social advancement (educational equality). It advances a new conceptualization to measure quality and equality in education and then uses it to study the relationship between institutional differentiation and these outcomes. It relies on data on final educational credentials and literacy among adults that circumvent some of the under-appreciated conceptual challenges entailed in the widespread analysis of international student assessment data.

The analyses reveal a positive relationship between educational quality and equality and show that education systems with a lower degree of institutional differentiation not only provide more educational equality but are also marked by higher levels of educational quality. While the latter association is partly driven by other institutional and macro-structural factors, I demonstrate that the higher levels of educational equality in less differentiated education systems do not entail an often-assumed trade-off for lower quality.

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1. Introduction

The education system in modern society is supposed to fulfill two largely uncontested functions: First, equip individuals with knowledge that allows them to take part in social, economic, and political life (Durkheim, 1922). Second, confer access to valuable credentials independent of individuals' socio-economic background, in other words, provide opportunities for social mobility (Coleman, 1968; Labaree, 1997). If we accept these two functions as fundamental elements of modern education systems, we should judge their performance according to the *quality* of knowledge they produce and the degree to which they provide *equality* of educational opportunities (in the remainder simply referred to as quality and equality). Both of these dimensions of educational outcomes are central and long-standing concerns of public policy and social science (Hallinan, 1988; Blossfeld and Shavit, 1993a).

This contribution asks whether countries can achieve both educational equality and educational quality *simultaneously* or whether certain institutional features of education systems may entail a trade-off between these two aims. In particular, I focus on the role of institutional differentiation – that is, the nature and timing of assigning students to different tracks or secondary schools (Hopper, 1968; Allmendinger, 1989) – as a potential joint determinant of equality and quality in education. For a fruitful sociological approach to these questions, I propose different conceptualizations and measures of educational outcomes than those used in a growing field of comparative research. Although many contributions in this field

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share the theoretical motivation laid out here, most of them revert to a specific type of readily available and increasingly popular data, namely international student assessments, often with very limited appreciation of the conceptual limitations and assumptions these data entail.

2. An equality–quality tradeoff in education?

A fundamental question in sociological research on education and a primary concern of educational policy-making is whether socio-economic equality in educational opportunities can be increased without lowering the quality of education. I label this the potential equality–quality tradeoff in education.

The tension between the aims of equality and quality is nowhere more crystallized than in the controversy about the effects of institutional differentiation. The U.S. literature on institutional differentiation – here, in the form of tracking and ability grouping – serves as a case in point (Oakes, 1985; Barr and Dreeben, 1983; Hallinan, 1994). Despite formidable empirical evidence on the negative effects of tracking on equality (Gamoran, 1987; Gamoran and Mare, 1989), defendants of differentiation argue for its positive effects based on the following mechanism: The sorting of students into different groups is supposed to increase classroom homogeneity with respect to student ability and learning potential. More homogeneous classrooms should allow more targeted instruction, which in turn is assumed to benefit students at all ability levels (Figlio and Page, 2002; Duflo et al., 2011). In this view, the abolishment or reduction of differentiation is seen as jeopardizing overall educational quality. Another version of this perspective goes beyond a concern for overall quality and specifically cautions against the dangers of decreasing quality at the top by exposing the highest achieving students to classrooms or schools with low achieving students.

Institutional differentiation has long been understood as the most central feature of education systems (Hopper, 1968). The great international variation in the nature and extent of differentiation makes this institutional characteristic a prime candidate for explaining cross-national differences in educational outcomes (Kerckhoff, 1995, 2001).

3. Comparative evidence: Shortcomings and alternatives

3.1. Existing comparative research based on student assessment data

For the longest time, reliable empirical estimates of international differences in educational outcomes and, more so, their explanation were largely elusive (Breen and Jonsson, 2005). Large-scale, coordinated surveys that assess student outcomes in many countries, such as the International Mathematics and Science Study (TIMSS) or the Program for International Student Assessment (PISA), set out to provide a wealth of new data to rectify this situation. Since then, a number of contributions have drawn on these data to assess the association between educational equality and quality and the role of institutional differentiation for both of these outcomes (for a review see Van de Werfhorst and Mijs, 2010).

Based on both TIMSS and PISA data, researchers have documented no or no consistent association between educational equality and quality (Woessmann, 2008; Schütz et al., 2008; Hanushek and Woessmann, 2006; Hermann and Horn, 2011). Furthermore, research has repeatedly shown that systems with more intense and early differentiation are marked by higher levels of socio-economic inequality in student test scores, that is, lower equality (Ammermüller, 2005; Marks, 2005; Marks et al., 2006; Hanushek and Woessmann, 2006; Brunello and Checchi, 2007; Horn, 2009; Schütz et al., 2008; Woessmann, 2009). In contrast, the relationship between institutional differentiation and average test scores is much weaker. Researchers have found either no association (Hanushek and Woessmann, 2006; Robert, 2010) or a small positive association that is sensitive to different model specifications (Horn, 2009). In short, the current literature based on student achievement data suggests that institutional differentiation is detrimental for educational equality and largely inconsequential for educational quality – a conclusion in line with the observation of a non-existent tradeoff between educational equality and quality.

3.2. Limitations of international student assessment data

Existing comparative studies based on student assessments thus yield rather consistent results. But are their findings robust to a different conceptualization and measurement approach? The alternative approach proposed here relies on measures of final competencies and credentials among adults to address the central sociological questions at stake in a more direct way and to circumvent some of the central limitations of student assessment data in answering those questions.

Most international achievement tests have been designed for the explicit purpose of measuring broad student competencies rather than the mastery of specific curricular content. For instance, PISA aims to provide measures of students' ability to "interactively use language, symbols, and text [to] function well in society [my emphasis]" (OECD, 2005); clearly a measure sociologist should be interested in (Kingston et al., 2003). However, measuring these competencies and their distribution at a selected age or grade has obvious drawbacks. A test taken at, say, age 15 or in eighth grade, provides but a snapshot of a longer developmental trajectory of student competencies (Kerckhoff, 1993). We may hope that these snapshot measures are reliable predictors of later student outcomes in terms of both competencies and credentials. But even if they were, they do not allow us to estimate the contribution of the education system and its institutional design towards the creation and distribution of final student competencies and credentials.

Fig. 1 helps illustrate why. It depicts stylized trajectories of growth in four different education systems. In country A, students from higher socio-economic (SES) backgrounds have a steeper learning curve than those from lower socio-economic backgrounds. The learning curves of these two groups diverge at a faster pace once differentiation has taken place. This pattern of cumulative advantage may emerge if socio-economically advantaged students are more likely to enter higher tracks where their learning is accelerated. Of course, any different measurement point would yield a much different estimate of both socio-economic inequalities in achievement and average achievement (see also Brunello and Checchi, 2007: p. 829). Yet, interpolating to later outcomes is impossible if the shape of learning curves differs across nations: In country B, disadvantaged students are able to eventually catch up to their higher SES peers. This pattern of “late blooming” may arise from better-targeted instruction in lower tracks, track mobility, or continuing education after completion of a particular track or school. Finally, in countries C and D student learning follows the same trajectory as in country A but the timing of differentiation differs. While the comparison of countries A and C may serve to identify the impact of differentiation thanks to the fortunate timing of the student assessment before and after the onset of differentiation, respectively, a comparison of countries C and D fails to provide this same analytic potential because, in both cases, differentiation occurs after the measurement point. In essence, analyses based on data collected at age 15 (as in many international student assessments) cannot partial out the impact of relatively late differentiation in secondary schools compared to fully comprehensive secondary school systems. Unfortunately, differentiation at age 16 is prevalent in many countries (Brunello and Checchi, 2007: p. 799).

In sum, when it comes to their ability to provide sociologically relevant measures of educational equality and quality and, in particular, their relationship to institutional features of education systems, international student assessment data may not only be subject to measurement error – as noisy predictors of later outcomes – but also suffer serious conceptual problems that lead me to test the robustness of the conclusions from existing research by drawing on an alternative approach.

3.3. An alternative approach

The alternative I propose here is simple. It assumes that the success of education systems can be judged based on the final educational status of its adult population. More specifically, I claim that a sociological analysis of educational quality and equality should rely on measures of relevant *final* competencies and credentials attained.

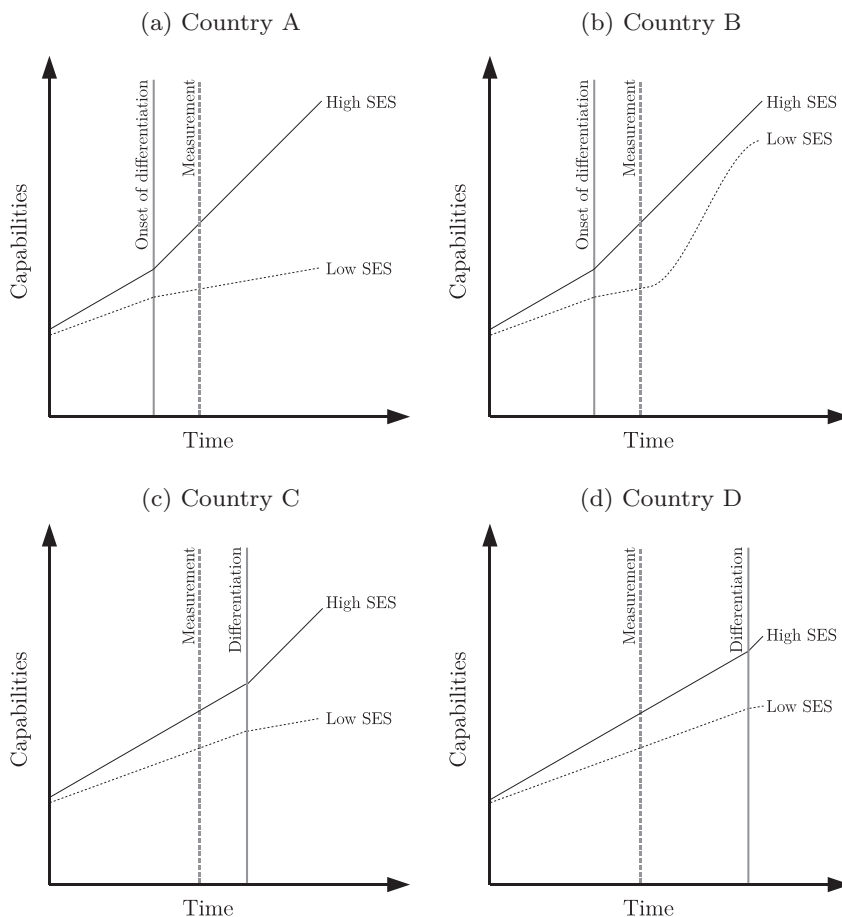


Fig. 1. Hypothetical learning curves.

To assess educational *quality*, I propose to draw on post-schooling measures of capabilities that serve as the functional prerequisite for social integration, such as multi-dimensional measures of adult literacy. Measures taken after the completion of formal schooling circumvent the conceptual problems pointed out above: They reflect the final outcome of different learning trajectories and different routes through the education system. Of course, post-schooling capability measures entail their own conceptual challenges. In particular, they may appear sensitive to influences from outside of the education system, such as on-the-job learning opportunities or more general societal conditions. Literacy and other capabilities are indeed also accumulated outside of formal schooling – however, not only by adults but also by students enrolled in schools. We know that even the learning of curricular content occurs when schools are not in progress, such as the summer break, and that this out-of-school learning is tremendously consequential for students' learning trajectories (Heyns, 1978; Downey et al., 2004). In this sense, measures of student capabilities may be no less sensitive to societal influences outside of formal schooling than measures of adult literacy – and the need to control for these influences is thus equally important in the analysis of both.

For a sociological assessment of educational *equality*, I propose to draw on measures of final educational attainment – educational degrees – rather than student test scores since they directly capture the distribution of valuable credentials that enable social mobility. While student assessments may be predictive of ultimate educational attainment – the degree to which they are has, however, not been established – they certainly provide a less direct and more error-prone measure of mobility-relevant educational outcomes.

4. Institutional and macrostructural contexts of equality and quality

How may these alternative measures of educational equality and quality relate to the structure of national education systems? In the theoretical hypotheses below, I focus on the central role of institutional differentiation but also consider possible associations with other institutional attributes and macro-social conditions that may account for bias in the effects of institutional differentiation.

4.1. Institutional differentiation

In comparative research, institutional differentiation is typically defined as the way in which educational opportunities are differentiated between and within educational levels through formal tracking or streaming as well as the timing and rigidity of student selection on the secondary level (Allmendinger, 1989; Müller and Shavit, 1998; Buchmann and Dalton, 2002; Buchmann and Park, 2009). Given the breadth of research on tracking in the United States, it may be important to remind the reader that the degree of formal differentiation of the U.S. education system is considerably lower than that of many other, particularly European nations (Rubinson, 1986). Highly differentiated education systems, that is, systems with strong, stable, or early student selection into separate educational pathways increase the information requirements for students to successfully navigate their educational careers. Guidance and management skills of high status parents become more consequential in this environment and confer children from high status backgrounds additional advantage in selecting the right educational track (Baker and Stevenson, 1986; Pfeffer, 2008). Once on this track, this advantage accumulates further in the form of steeper learning curves thanks to the exposure to more advanced curricular content (see DiPrete and Eirich, 2006: p. 286), making later changes of tracks more difficult. These are possible reasons for a negative relationship between the degree of institutional differentiation and educational equality.

In contrast, the relationship between institutional differentiation and educational quality is more difficult to ascertain a priori. As discussed above, defendants of institutional differentiation certainly offer a clear line of reasoning why this relationship should be positive: Higher average quality in highly stratified systems, so the argument goes, could result from both maximized achievement among high ability students whose learning progress is not hampered by the integration of lower ability students as well as higher achievement of lower ability students who profit from instruction geared to their needs. This argument assumes that the allocation of students to different classrooms is indeed based on ability – and its strength is thus limited by the extent to which factors other than ability impact the assignment process (Brunello et al., 2007), such as socio-economic factors. Also, one may alternatively assume that the achievement of lower ability students decreases when they are grouped with other low ability students. A high degree of institutional differentiation has been shown to be associated with a “cooling out” of educational expectations among low achieving students (Buchmann and Dalton, 2002; Buchmann and Park, 2009).¹ While the average effect of institutional differentiation on quality is therefore difficult to hypothesize a priori, it is clear that the analysis of educational quality will greatly profit from a consideration of the full distribution of capabilities rather than just the average.

¹ A long line of research in economics continues to debate the effects of being grouped with individuals of different ability levels (Sacerdote, 2011). In particular, it remains unclear whether heterogeneous peer effects – i.e., the varying impact of peers across the ability distribution – sum up to positive or negative average effects (Summers and Wolfe, 1977; Argys et al., 1996; Zimmer and Toma, 2000; Brunello et al., 2012).

4.2. Other institutional characteristics of education systems

Of course, national education systems differ in many more ways than merely their degree of institutional differentiation. In this paper, I therefore consider additional institutional features that have been proposed as important determinants of either educational quality or equality.

First, the size of the post-secondary education sector. Clearly, we should expect higher educational *quality* in a country in which a larger share of the population participates in higher education. Regarding educational *equality*, it has been proposed that the size of the post-secondary sector positively correlates with educational equality since in countries with higher post-secondary participation rates the access to secondary education is more likely to be saturated, in which case inequalities at that level can be expected to decrease (Raftery and Hout, 1993). The size of the post-secondary sector is also a prime example of an institutional characteristic that intersects with institutional differentiation: Highly differentiated systems often limit access to higher education by tying it to the successful completion of a particular secondary track or school type. Assessing the influence of these two characteristics jointly will be particularly useful to shed further light on the role of institutional differentiation.

Second, the degree to which education meets the same standards nationwide, typically referred to as the degree of standardization (Allmendinger, 1989). Institutional standardization encompasses not only the distribution of educational outputs measured through national benchmarks or testing systems – a hotly debated field of educational policy – but also that of educational inputs, such as schools' economic resources or curricular contents. While this multifaceted nature of standardization defies a prediction of the relationship between standardization and educational *quality*, I hypothesize a positive relationship with educational *equality*. By definition, standardized systems show fewer local disparities in terms of content and quality of education (Stevenson and Baker, 1991). They may therefore reduce the potential impact of economic characteristics and information advantages of high status parents on the selection of higher quality schools.

Third, the degree of privatization of the education systems. Those believing in efficiency gains induced by market competition, such as proponents of school choice, hypothesize positive effects of privatization on educational *quality*. Since a simplistic market model ignores important market imperfections in the education sector (such as great levels of imperfect information among its “consumers” and significant transaction costs during the market-exit of “suppliers”, i.e. school closings), I expect to reject the hypothesis implied in this position. Regarding the relationship between privatization and educational *equality*, I refer to what Arum et al. (2007) have proposed as the dual character of private educational institutions: As “client-seekers”, private schools aim at increasing enrollment and exert efforts to include and support students that otherwise might encounter fewer opportunities in the public sector. However, as “status-seekers” they also compete for prestige with other private and public institutions and therefore may seek to exclude otherwise able students through forms of student selection that are open to socio-economic discrimination. These countervailing effects of status- and prestige-seeking of private institutions leave the relationship between privatization and educational equality to be established empirically.

Finally, I consider the possibility that cross-national differences in adult training and professional development may play an important role in increasing adult literacy, counterbalancing shortcomings and inequities of the formal education system.

4.3. Macro-structural contexts

Since educational processes do not occur in isolation from broader societal contexts, my analyses also consider other macro-social and economic factors that may account for the observed association between institutional differentiation and educational performance (see Marks, 2005).

First, economists have produced extensive evidence on the relationship between education and economic development, arguing that educational investments are a central determinant of sustained economic growth (Schultz, 1961; Psacharopoulos, 1992; Barro, 1998; Hanushek and Woessmann, 2008; but also see Ramirez et al., 2006). That is, highly developed countries attained their current wealth partly based on the successful production of educational *quality*. Of course, part of the positive relationship between educational quality and economic development may also arise from influences that flow the other way: Wealthy countries may provide living conditions that are conducive to human flourishing in general, and the further development of individuals' skills in particular. Rather than seeking to establish the causality or directionality of this relationship, I will consider whether my main hypothesis on the influence of institutional differentiation is biased by the varying level of economic development among the countries included in this analysis. The same applies to the relationship between economic development and educational *equality*. Forceful theoretical arguments in favor of the positive effect of economic development on educational equality have famously been made in the industrialism hypothesis. It states that “the more industrialized a society, the smaller the influence of parental status on educational attainment.” (Treiman, 1970: p. 221). Although it has been rejected in most empirical research (Hout and DiPrete, 2006), it is fair to say that the industrialism hypothesis continues its existence as a widely held intuition and thus merits repeated empirical assessment.

Second, I consider a country's degree of a economic inequality and hypothesize a negative relationship to educational *quality*. Among industrialized countries, the labor markets of countries with higher levels of inequality tend to have a larger low-skill sector (Scharpf and Schmidt, 2000). As the name implies, this segment of the labor market requires less skills to begin with, but it may also confer less skills to workers than other sectors of the economy. In contrast, high-skilled white-collar occupations may serve to maintain or possibly even expand the literacy of workers by confronting them with

a variety of texts, documents, and quantitative information on a daily basis. As a result, countries with a more extensive low-skill sector, that is, more unequal countries, should show lower levels of adult literacy. Regarding the relationship between a society's level of social inequality and educational equality scholars have argued that a significant reduction in social inequality in education can only be achieved by redistributing economic resources (Jencks et al., 1972; Bowles and Gintis, 1976) or, as a somewhat weaker version of this, that "long-term commitments to socioeconomic equality may lead to an equalization of educational opportunities" (Blossfeld and Shavit, 1993b: p. 19). Based on this perspective, one may expect a negative association between overall social inequality and educational equality.

Third, I follow other comparative research on mobility processes that controls for former socialist status of countries (e.g., Beller and Hout, 2006; Hout, 2007).

5. Data, measures, and methods

5.1. Data and sample

This analysis draws on data from the International Adult Literacy Survey (IALS), an international comparative study assessing literacy in twenty industrialized nations. Although still much less frequently used than the international student assessment data reference above, these data have begun to support more comparative research over recent years (Brunello and Checchi, 2007; Pfeffer, 2008; Van de Werfhorst, 2011; Barone and van de Werfhorst, 2011; Park and Kyei, 2011; Gesthuizen et al., 2011). All countries participating in the IALS applied a common set of survey questions to a large, nationally representative sample of its adult population ranging in size between 1500 and 6000 individuals. For this analysis, I include the following countries, which collected data between 1994 and 1998: Belgium, Canada, Chile, the Czech Republic, Denmark, Finland, Great Britain (England and Wales), Germany (West-German respondents), Hungary, Ireland, Italy, Northern Ireland, Norway, New Zealand, Poland, Slovenia, Sweden, Switzerland (German-speaking part), and the United States.² Since the performance of education systems is the central focus of this contribution, individuals who have not attended school in the nation studied and instead obtained their highest educational degree in a foreign country, that is, most first generation immigrants, are excluded from this analysis. The analyses reported here are based on a sample of 25–65 year olds to also capture those who return to formal schooling at later points in their lives.

Stability analyses restricted to respondents aged 25–35, i.e. those for whom later-life influences on their literacy are reduced, yield the same substantive conclusion (available from the author). In further stability analyses I have replicated the presented analyses of educational equality based on a different dataset, the 1999 International Social Survey Program (ISSP), yielding the same substantive conclusions.³

5.2. Measures of educational quality

The IALS applied a very comprehensive concept of functional literacy that captures the essence of what may be considered the functional preconditions for social integration. It defines literacy as the ability to "use printed and written material to function in society" and measures it in three distinct dimensions: *Prose literacy* refers to the ability to understand and use information from a variety of texts, such as newspaper articles or poems; *document literacy* refers to the ability to locate and use information contained in a variety of formal documents, such as medical prescriptions or job applications; and *quantitative literacy* refers to the ability to master everyday mathematical skills such as those involved in balancing a checkbook or calculating tip. Each of these dimensions is assessed based on numerous items, which are combined via Item Response Theory scaling into a continuous measure ranging from 0 to 500. The literacy measures are highly correlated across these three dimensions ($r > .97$ in the analytic sample). I average them to obtain a comprehensive measure of functional literacy. In addition to analyses of international differences in mean levels of literacy, I also investigate differences across the full distribution of literacy with a focus on the upper end (90th percentile) and the bottom (10th percentile) (see also Hermann and Horn, 2011).⁴

5.3. Measures of educational equality

The IALS collected information on respondents' as well as their parents' educational attainment. This information on educational degrees is provided in the original International Standard Classification of Educational Degrees (ISCED 1976), which intends to maximize the cross-national comparability of national educational degrees while maintaining within-country

² The Netherlands have to be excluded from this analysis due to irregularities in the coding of educational degrees; Scotland is excluded due to the low number of cases but would otherwise constitute an interesting comparative case on its own (see Raffe et al., 1999); the restriction to West Germany is implemented by excluding individuals who grew up in the former German Democratic Republic, who by themselves are too small a group to be analyzed separately.

³ Since these latter sensitivity analyses rely on only 11 out of the 19 nations included here, the results are subject to a much lower level of statistical precision and not reported here (available from the author).

⁴ Brunello and Checchi (2007) have used the IALS literacy measures to investigate cross-national differences in educational quality conditional on individuals' educational attainment. In general, it seems unclear what quality measures that have been purged of the effects of educational participation mean. The approach advanced here, at least, advises against this strategy since it focuses on educational quality as the direct outcome of individuals' educational participation.

validity. One shortcoming of this scheme is its failure to adequately capture qualitative differences within educational levels. As a result, my measure of educational equality exclusively captures vertical inequalities and neglects important and multi-faceted forms of “horizontal differentiation” (Gerber and Cheung, 2008). While I discuss this shortcoming further in the conclusion, it is worth noting that there is evidence that the effects of institutional differentiation on educational equality are unbiased by certain aspects of horizontal differentiation, such as the distinction between vocational and academic tracks (see Pfeffer, 2008: 548–549).

I conceptualize educational equality as the degree to which individuals’ final educational degree is independent of the educational status attained by their parents. A low association between the educational status of parents and their children indicates higher equality of educational opportunities. The strength of this association can be estimated in a loglinear framework. Pfeffer (2008) discusses the advantages of this method in detail and applies it to the same data to provide a parsimonious estimate of the overall degree of educational equality across all educational levels. Specifically, the uniform difference model (Xie, 1992; Erikson and Goldthorpe, 1992) proves most effective in producing an estimate of cross-national differences in educational equality:

$$f_{ijt} = \mu \gamma_i^O \gamma_j^D \gamma_k^C \gamma_{ik}^{OC} \gamma_{jk}^{DC} \exp(\Psi_{ij}^{OD} \Phi_k^C) \quad (1)$$

The central parameter of interest (Φ_k^C) estimates the degree of association between individuals’ highest degree attained (D) and the highest degree attained by either of their parents (O) for each country (C) while constraining the pattern of intergenerational association in educational status to be constant across nations (Ψ_{ij}^{OD}) and controlling for cross-national differences in the aggregate distribution of educational degrees (Φ_{ik}^{OC} , Φ_{jk}^{DC}). After reverting the sign of these estimated “uniform difference” parameter estimates and centering them at the cross-national mean, higher values stand for higher levels of educational equality and zero indicates the cross-national average (for further details see Pfeffer, 2008: pp. 549–553).

5.4. Measures of institutional and macrostructural contexts

For the assessment of institutional characteristics of education systems, that is, the independent variables of the comparative analysis, I draw on existing classifications of countries along the institutional dimensions outlined above (see Müller and Shavit, 1998; Buchmann and Dalton, 2002; Pfeffer, 2008; Buchmann and Park, 2009). The institutional feature at the center of this contribution, differentiation, is measured in three categories: Weak differentiation entails that most students attend comprehensive schools, that they are able to move from one track to another even if this does not necessarily occur very frequently, and that access to post-secondary education is not formally predetermined by the choice of one track. High differentiation, on the other hand, describes systems that divide students into separate schools of which only one or some types prepare for post-secondary education and others are “dead-end” pathways that preclude the attainment of higher levels of education. Mobility between these schools is also very limited. Finally, I distinguish a separate type of highly differentiated systems where students are selected for different types of secondary schools at a very early age (typically grades four to six) and these decisions are basically irrevocable as mobility between school types is minimal. A further characteristic that these systems share is a strong vocational sector designed to lead students from lower-track secondary schools through an apprenticeship system into skilled occupations and in some cases, as an option of higher vocational education, to master craftsmanship (*Meister*). This is the model followed by the German and Swiss system of dual vocational education, which combines company-based training with formal school-based instruction (Müller and Shavit, 1998). Since this strong vocational orientation is in many ways intended to compensate for strong and early selection, I label these systems as marked by “early and compensated differentiation”. Whether this compensatory purpose is indeed accomplished awaits empirical investigation.

While I believe that this qualitative and coarse categorization appropriately captures the *Gestalt* of institutional differentiation, others may prefer a different approach that draws on more detailed quantitative indicators of differentiation, such as the share of students assigned to differentiated learning environments during primary and secondary schooling, the number of different school types, or the typical age at which differentiation begins. I use such indicators collected by other researchers (Brunello and Checchi, 2007; Horn, 2009) for sensitivity analyses.

The measures of institutional standardization, the prevalence of private schooling, and the relative size of the post-secondary education sector are described in Appendix A.1. I treat these institutional features as control variables to assess whether they drive part of the effects of institutional differentiation on quality and equality. Similarly, I introduce controls for other macro-structural features of the nations studied, namely the level of economic development and the extent of social inequality (also see Appendix A.1). Again, I stress that I neither seek to establish the causality or directionality of any of these associations nor should my analyses be construed as an exercise in capturing all determinants of educational quality and equality. Instead, I introduce these additional characteristics to reduce the potential bias resulting from the exclusive focus on school factors when assessing educational outcomes.

The institutional and macro-economic measures are chiefly based on information from around the time at which the IALS data were collected. However, the educational participation of the individuals included in my analyses spans four full decades. While many of the institutional characteristics studied are subject to a great degree of path dependence, which limits

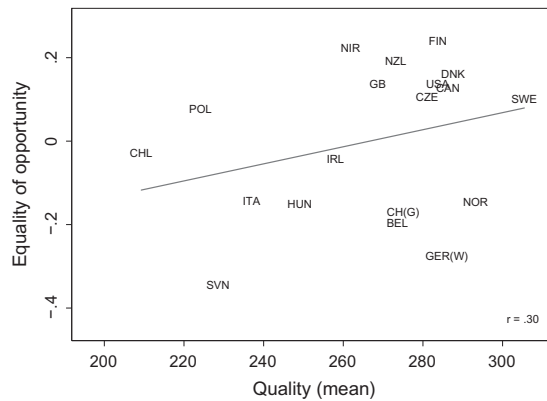


Fig. 2. Equality and (mean) quality.

the over-time variability of cross-national differences in these characteristics, changes are certainly possible. Where available, I test the stability of my results by using institutional indicators based on different decades (see Appendix A.2) as well as a replication of the analyses based on the youngest cohort only, for which the timing of the institutional information is most appropriate, yielding the same substantive results (available upon request).

6. Findings

6.1. The equality–quality tradeoff

Fig. 2 (for country labels see Appendix A.1) displays the relationship between a nation's degree of educational equality and educational quality. We observe a clear though not perfect positive relationship between these two outcomes ($r = .30$). This is good news: Rather than implying a trade-off between equality and quality, education systems can perform high on both dimensions, as exemplified for instance by Scandinavian countries like Sweden, Denmark, or Finland. However, we can also already identify some exceptions to this general trend. Germany, for instance, stands out as a country with a rather high level of educational quality in combination with comparatively low levels of equality. The same could be said for Belgium, Switzerland, and Norway.

Figs. 3 and 4 report the relationship between educational equality and quality at the top and the bottom of the distribution of literacy, respectively. In particular the assumption of a trade-off between equality and quality at the top cannot be confirmed empirically. If anything, educational equality is even more clearly positively related to quality at the top of the distribution than at the bottom.

The positive correlation between equality and quality documented here already foreshadows that important institutional factors may influence both dimensions in the same direction. Below, I determine whether institutional differentiation is one such institutional characteristic that drives both educational equality and quality.

6.2. Institutional differentiation and educational equality

My assessment of the relationship between institutional differentiation and educational equality draws on Pfeffer's (2008) analysis and extends it by considering additional macro-structural factors.⁵ Model 1 in Table 1 reveals that highly differentiated education systems are marked by significantly less equality than education systems with a low degree of differentiation (reference category). Systems with early and compensated differentiation, of which there are two in this country sample, do even worse.⁶ In models 2 through 5, other institutional characteristics are added as separate controls, following a common strategy in comparative research that is based on a limited number of nations and that consequently lacks the statistical power to introduce all or at least more controls at once. The important conclusion to draw from the latter models is that the relationship between institutional differentiation and educational equality is largely unaffected by other institutional characteristics of education systems, which themselves do not appear to exert independent influences on the level of equality. Models 6 through 9 assess whether the effects of institutional differentiation are also stable to the inclusion of other macrostructural characteristics that have been hypothesized to impact educational equality. The answer is yes. None of the macro-structural factors

⁵ An additional replication of this analysis based on the ISSP-1999 data is also available from the author.

⁶ I note that the assessment of statistical significance in comparative research does not aim at making inferences to a larger population of countries. The relation of coefficients and their standard errors nevertheless indicates the degree of confidence that we can hold in claiming these effects to be meaningful, that is, not just due to random error (see Kenworthy, 2007).

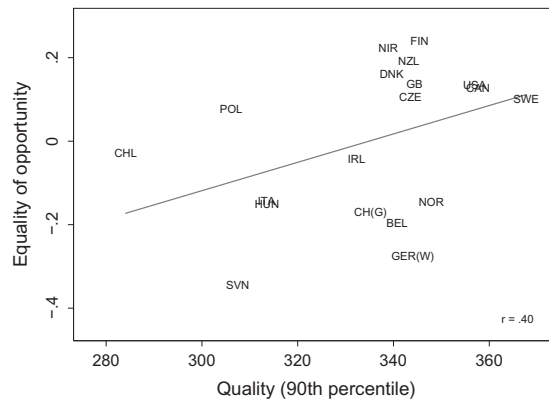


Fig. 3. Equality and quality at the top.

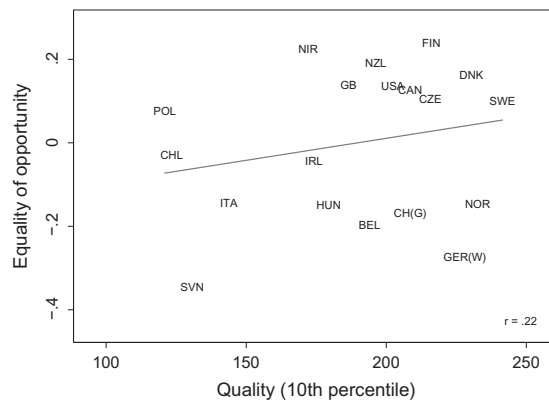


Fig. 4. Equality and quality at the bottom.

Table 1
Institutional and macro-economic context of equality.

	1	2	3	4	5	6	7	8	9
High differentiation	-0.16* (0.07)	-0.16* (0.08)	-0.16* (0.07)	-0.17* (0.08)	-0.12 (0.10)	-0.16 (0.10)	-0.16* (0.08)	-0.17* (0.08)	-0.14 (0.09)
Early and compensated differentiation	-0.32* (0.12)	-0.33* (0.12)	-0.30* (0.12)	-0.33* (0.13)	-0.29* (0.13)	-0.32* (0.13)	-0.32* (0.12)	-0.32* (0.12)	-0.32* (0.12)
Standardized		0.01 (0.08)							
Private sector			0.08 (0.08)						
Rel. size of PSE				-0.00 (0.01)					
Training					0.00 (0.00)				
GDP per capita						-0.00 (0.06)			
Industrialization							-0.00 (0.05)		
Income Gini								0.00 (0.01)	
Former socialist									-0.04 (0.11)
N	19	19	19	19	19	19	19	19	19
R2	0.37	0.37	0.41	0.37	0.39	0.37	0.37	0.38	0.38

Note: OLS regression coefficients; s.e. in parentheses.

* $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 2
Institutional and macro-economic context of quality.

	1	2	3	4	5	6	7	8	9
High differentiation	−36.64** (9.48)	−36.85** (9.72)	−36.66** (9.80)	−27.86** (9.42)	−32.48* (13.11)	−22.22* (11.48)	−29.40** (8.52)	−25.84** (7.56)	−36.79** (12.10)
Early and compensated differentiation	−1.69 (15.24)	−0.04 (15.98)	−1.58 (16.11)	8.44 (14.48)	1.34 (16.89)	−8.84 (14.55)	−0.10 (12.99)	−2.58 (11.27)	−1.69 (15.74)
Standardized		−4.98 (10.15)							
Private sector			0.34 (10.23)						
Rel. size of PSE				1.65* (0.76)					
Training					0.21 (0.44)				
GDP per capita						13.08* (6.74)			
Industrialization							13.22* (4.97)		
Income Gini								−1.85** (0.49)	
Former socialist									0.31 (14.24)
N	19	19	19	19	19	19	19	19	19
R2	0.50	0.51	0.50	0.62	0.51	0.60	0.66	0.74	0.50

Note: OLS regression coefficients; s.e. in parentheses.

* $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

exerts any notable influence on educational equality and thus leaves the main effects of institutional differentiation substantively unaltered.

As argued above, an alternative approach to measuring the influence of institutional differentiation relies on more detailed, quantitative indicators of institutional contexts. [Appendix A.2](#) reports the results based on such alternative specifications, which also reveal a strong negative and stable association between differentiation and educational equality ([Table 4](#)).

6.3. Institutional differentiation and overall educational quality

Applying the same sequence of regression models, [Table 2](#) reports the findings for average educational quality. Model 1 reveals a negative relationship between differentiation and educational quality when focusing on the difference between low and highly differentiated systems for the moment. The penalty of high institutional differentiation amounts to 37 points (more than half a standard deviation in the literacy score). As apparent in models 2, 3 and 5, this penalty is also observed when we take into account different levels of standardization, privatization, and adult training, respectively, which do not appear to influence educational quality. The relative size of the post-secondary sector (model 4), however, shows a clear and strong positive effect (on average, a 1.7 point increase in literacy for every one percent increase in the post-secondary graduation rate). I did hypothesize higher education to increase average literacy – any other finding would have been disheartening. Since institutional differentiation and the size of the post-secondary sector are positively related – by definition, highly differentiated countries close off access to post-secondary education for part of the student population – the latter also mediates part of the observed effect of institutional differentiation, which drops from 37 to 28 points. That is, the negative association between differentiation and educational quality is partly explained by the rationing of higher education that is a more common feature of highly differentiated systems.

The interpretation of the relationship between institutional differentiation and educational quality requires more nuance when taking into account the two countries with a system with high, but early and compensated, differentiation. Model 1 of [Table 2](#) shows that the average level of educational quality in these systems does not differ significantly from that in countries with a low degree of differentiation. One interpretation of this finding – that I return to below – is that the compensatory function of a strong vocational sector successfully sustains the continued growth of literacy among those individuals selected into the lower tracks of highly differentiated systems. Once I control for the size of the post-secondary sector, there is even tentative evidence for a slight quality advantage of these systems compared to countries with low differentiation. That is, without the rationing of access to higher education implied in these systems, they may even yield small benefits in terms of average quality.

Continuing with models 6 through 9, both hypotheses regarding the influence of macrostructural characteristics on educational quality are confirmed empirically: Wealthier countries show significantly higher levels of educational quality,

Table 3
Quality distribution by institutional differentiation.

	Low diff.	High diff.	Early and comp. diff.
10th Percentile	210	160	218
Mean	282	246	281
90th Percentile	348	319	340
N	9	8	2

whether we conceptualize national wealth as per capita gross domestic production (model 6) or the level of industrialization (model 7). More unequal countries, on the other hand, show lower levels of educational quality (model 8). Importantly, both macrostructural features also bias the effect of institutional differentiation since highly differentiated countries in this sample also tend to be less well-off and more unequal (see [Appendix A.1](#)). Considering either of these features decreases the gap between countries with high and low institutional differentiation by 30–40 percent. Finally, model 9 confirms the stability of the findings to the consideration of a nations' experience of socialism.

Again, the alternative specification of the effects of institutional differentiation as measured by quantitative indicators (see [Table 5](#) in [Appendix A.2](#)) support the conclusions drawn from [Table 2](#).

6.4. Institutional differentiation and educational quality across the distribution

6.4.1. High and low quality

The evidence just presented does not yet directly speak to the idea that institutional differentiation may help maximize capabilities at the top and/or hurt the development of skills at the bottom. For that, [Table 3](#) provides a description of the distribution of literacy at the top, the mean, and the bottom across the three types of institutional differentiation. We observe that systems with compensatory differentiation and systems with low differentiation are similar not only in terms of average quality but also at the bottom and the top of the distribution. Countries with high differentiation but without a strong vocational sector perform comparatively poorly across the points of the distribution chosen here and particularly so at the bottom.

One of the reasons for this may be the lack of a strong vocational sector. Poland may serve as an illustrative case (and representative of several Eastern European countries that fall into this institutional category): Despite a general emphasis on technical education in Poland – reflected in an option of technical secondary education, called *technicum*, as well as a lower-level track with a terminal vocational degree –, its vocational sector does not offer a sustained vocational pathway that extends from school- and employer-based apprenticeships to continued professional education for master craftsmanship. The latter, found in Germany and Switzerland, may help overcome some of the quality-reducing effects of high differentiation ([Köillo, 2006](#)), in other words fulfill its presumed compensatory function. However, additional analyses (available from the author) also reveal that this is only a partial explanation for these countries' performance in terms of educational quality. Among those who report their highest degree to be upper secondary schooling, individuals with a terminal vocational degree in Germany and Switzerland do indeed fair better compared to those holding such degree in other countries. Yet, the main difference in literacy outcomes between these two countries and the rest lies in academically oriented education: German and Swiss respondents with a terminal academically-oriented secondary degree (*Abitur* and *Matura*, respectively) outperform their counterparts in most other countries, joining the Scandinavian countries at the top of the literacy ranking. While I have earlier shown that the overall level of adult literacy is reduced by the role of the academic track in rationing access to university studies ([Table 2](#)), this track is still highly successful in producing educational quality for a selected part of the population. Resistance towards ongoing educational reform efforts in Germany that seek to diminish the degree of institutional differentiation is typically framed as a need to conserve this kind of quality benefit of the academic track.

The reported associations between differentiation and quality at the top and the bottom are impacted by other institutional and macro-economic factors ([Tables 6 and 7](#) in [Appendix A.3](#)) in much the same way as quality at the mean ([Table 2](#)): The influence of institutional differentiation is reduced when controlling for the size of the post-secondary sector, the level of economic development, and the degree of social inequality, but not affected by the inclusion of other institutional indicators, such as institutional standardization, privatization, and (at the top) the incidence of adult training. In the multiple regressions we can again observe the more detrimental consequences of high differentiation for quality at the bottom compared to the top (a gap of 50 points in [Table 7](#), model 1 compared to 30 points in [Table 6](#), model 1).

6.4.2. The full distribution of educational quality

Lastly, to provide a yet more detailed look at the full shape of educational quality beyond two arbitrarily chosen percentiles, [Fig. 5a](#) reports the distribution of individual-level literacy scores aggregated by type of institutional differentiation. The earlier finding of lower average literacy in nations with a highly differentiated education system is reflected in the left shift of the distribution of educational quality in these countries. Also, the bulge at the lower end of this distribution corresponds to the earlier finding of higher penalties of institutional differentiation at the bottom (10th percentile). For the two countries with early and compensated differentiation, the distribution of educational quality appears compressed mainly because this

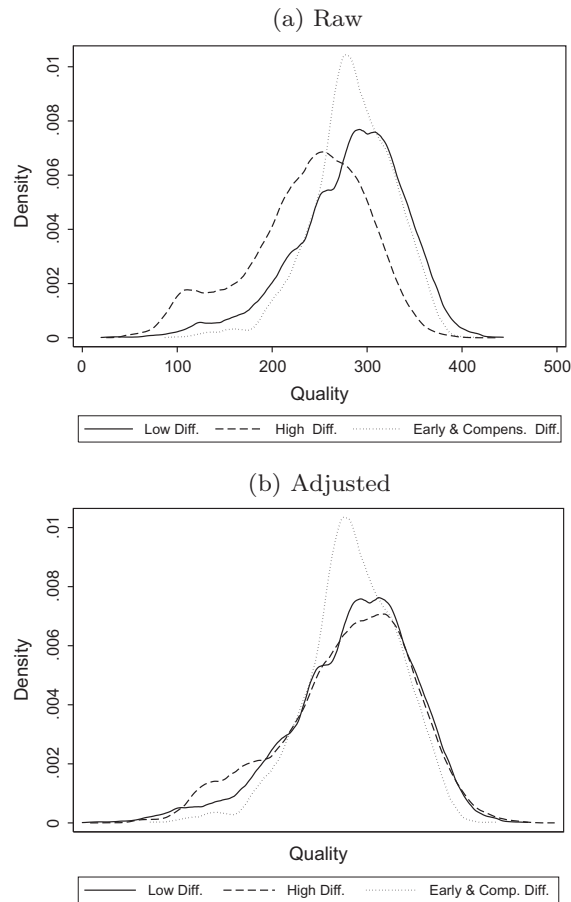


Fig. 5. Institutional differentiation and distribution of quality.

curve aggregates individual literacy values from only two countries and the smoother curves for the other types are based on aggregate information from more countries (nine with low differentiation and eight with high differentiation, respectively). If these curves are displayed for each country separately, the countries with very high institutional differentiation indeed do not stand out as countries with an exceptionally compressed quality distribution (available from the author).

From the regression analyses presented above we have learned that the association between institutional differentiation and educational quality is reduced when controlling for other institutional and macro-structural institutional factors. To adjust for these factors in this distributional analysis, I regress individual literacy scores on all contextual variables (excluding differentiation) based on a sample of individuals pooled across all countries. The difference between the expected and observed literacy scores (i.e., the regression's error term) provides a measure of quality that is purged of these other contextual effects. The distribution of this residualized literacy score (Fig. 5b) is more similar across types of institutional differentiation than in its raw version. In other words, controlling for all contextual characteristics at once (which is not feasible in the macro-level regression models) further reduces the quality differences between systems with different levels of differentiation. But even after these adjustments, we can still observe a left skew for highly differentiated systems caused by a persisting bulge at the bottom of the distribution – likely accounting for the overall negative effect of high differentiation found in the macro-level regressions (Table 2).

7. Summary and conclusion

This contribution assesses two of the most fundamental functions of national education systems, the creation of skills that enable individuals' integration into society and the provision of opportunities for social mobility. I have described and explained cross-national differences in the quality of educational outcomes and the degree of equality in educational opportunity by drawing on an approach that circumvents the considerable conceptual limitations entailed in widely used data from international student assessments. I have laid my explanatory focus on the arguably most central institutional characteristic of national education systems, the differentiation of learning opportunities at the secondary level, and additionally taken into account the role of other institutional characteristics and macro-structural factors.

The results presented here contain several positive messages. First and foremost, I could not detect any evidence for a trade-off between educational quality and equality (of educational opportunity). The opposite is the case: Countries with better outcomes on one of these performance dimensions also tend to do better on the other dimension. Educational policy makers therefore do not have to choose between two valued outcomes when attempting to reform education systems.

One of the most influential features of national education systems, which is amenable to reform, is the nature and intensity of student selection into different educational tracks and school types. For this specific institutional characteristic, the presented analyses confirmed consistent, negative effects on educational equality. The fact that this association is stable to the consideration of other institutional and macroeconomic features provides more confidence in the potential equality-enhancing effects of reforms that decrease institutional differentiation (Meghir and Palme, 2005; Pekkarinen et al., 2009). Opposition to this type of reforms has mainly been based on the concern that less differentiated education systems may produce poorer quality outcomes. The empirical evidence produced here does not lend support to this concern. Countries with a high degree of differentiation are in fact marked by lower levels of educational quality, although a large part of this disadvantage arises from other factors, such as a relatively small post-secondary education sector, lacking economic growth, and high levels of economic inequality. This contribution shows that it is important to consider such characteristics to adequately explain cross-national differences in educational quality. It should, however, also be noted that even with these controls in place I still observe a higher proportion of adults with very low literacy outcomes in highly differentiated systems.

A sweeping critique of institutional differentiation as the perpetrator of low levels of literacy, on the other hand, also seems unwarranted. The countries included in this analysis with the most highly differentiated education systems, namely Germany and Switzerland, do not suffer from comparatively lower quality at the bottom (nor, for that matter, do they show higher quality at the top). I have ascribed this finding to a strong vocational sector that partly compensates for the quality losses associated with differentiation as well as to the concentration of educational quality in the top-most academic tracks in these systems. Broad statements about the quality-enhancing or quality-restricting effects of institutional differentiation are also limited by the fact that other institutional characteristics and macro-structural features play an important role in accounting for differences in educational quality between systems of varying degrees of institutional differentiation. Nevertheless, a conservative interpretation of my findings suggests that ambitious educational reforms aimed at increasing equality of educational opportunities by decreasing the differentiation of the education system could be able to do so at no cost in terms of educational quality. This conclusion may be particularly relevant for those countries in which institutional differentiation is highest, Germany and Switzerland, and resistance to reform still substantial. In addition, arguments in the defense of high differentiation that (in many cases wrongly) assume superior educational quality fail to appreciate the quality-reducing effect of the restricted access to post-secondary education that typically accompanies high institutional differentiation.

The aim of this study has been to find answers to fundamental sociological questions about the performance of education systems and I have argued that comparative analyses addressing these questions with international student assessment data are based on problematic conceptual grounds. Using a different conceptualization and measurement approach, this contribution nevertheless attests to the robustness of many of the conclusions in this prior research, such as the central role institutional differentiation plays in explaining levels of educational quality and equality. On the other hand, the approach applied here allows the analysis of factors that research based on student assessment data cannot consider, most importantly the role of the size of the post-secondary sector as a mediator of some of the observed associations between institutional differentiation and educational quality.

The approach used here may also invite future research that extend and tests its findings. First, as pointed out earlier, my assessment of educational equality has only selectively attended to horizontal inequalities in education. That is, the analyses neglect important and multi-faceted forms of “horizontal differentiation”, such as quality and prestige differences between schools and colleges (Gerber and Cheung, 2008). A growing body of research focuses on these complex and sometimes more hidden forms of differentiating students within a given educational level. A cross-national comparative study attempting a joint assessment of the effects of horizontal differentiation on both education equality and quality would be particularly interesting. My own analyses of an arguably more fundamental form of educational differentiation should provide a convenient starting point. In addition, future research may seek to assess how the (vertical) educational equality assessed here relates to horizontal equalities. In fact, similar to existing theories on the development of educational equality over time (Lucas, 2001), one may hypothesize a trade-off between these two dimensions, with horizontal inequalities being more important in nations with low vertical inequality.

Second, the measures of educational degrees used here face another challenge. Educational credentials are subject to meaningful cross-national differences in terms of their influence on individuals' life chances (Shavit and Müller, 1998; Barone and van de Werfhorst, 2011; Van de Werfhorst, 2011). The question is whether these cross-national differences in educational returns challenge my conclusions about the negative relationship between differentiation and equality. Prior work has shown that in countries with higher institutional differentiation, educational degrees tend to be more closely tied to labor market outcomes (Allmendinger, 1989; Müller and Shavit, 1998). Consequently, inequality in educational opportunities, which has been shown to be higher in these countries, translates more directly into inequality in life chances; while in countries with less institutional differentiation, the degree to which those at the lower ranks of the educational hierarchy are also relegated to the lower ranks of the labor market may be comparatively weaker. This suggests that I have presented conservative estimates of the negative relationship between differentiation and equality.

Third, one may be tempted to consider whether international student assessments could be improved to reduce some of the conceptual challenges I have pointed out. One theoretical solution would be to collect student assessments at the

completion of final schooling. However, vast individual variation in the length of educational participation and, in particular, the possibility of individuals returning to formal education at later life stages make it exceedingly difficult to collect meaningful end-of-schooling measures in cross-sectional, large-scale comparative surveys. For instance, student surveys designed with this purpose in mind have collected assessment data in the last year of compulsory schooling (“Population 3” in TIMSS), failing to capture both those who dropped out of formal schooling as well as the learning growth of those participating in higher education and adult education (Porter et al., 2002: p. 10). Analyzing adults appears to be a much more feasible solution.

Fourth, I have based the analysis of educational quality on a measure of literacy that can be viewed as an important, but certainly not the only relevant capability for social integration. Future research and data collections may seek to assess different capabilities assumed relevant for integration into the “knowledge society”, such as the ability to weight the trustworthiness of different sources of information or the ability to engage in complex reasoning. Although the investigation of the distributional shape of the literacy measure used here did not lead to any concern about ceiling effects, future research may also direct more attention to different measures of educational quality at the very top of the distribution: If further economic growth of industrialized nations chiefly relies on technical innovations and creativeness, the crucial quality at the top may be less the ability to skillfully perform math tasks and understand a variety of written materials but to engage in the creative solution of much more complex analytical problems.

Fifth, although this study addresses questions that form part of lively policy debates, those exclusively concerned about causal inference to identify promising policy interventions are bound to be disappointed. The strength of this contribution lies in addressing broad, structural issues about education based on a new conceptualization and measurement approach. Like most cross-national comparative research and much of macro-sociological research in general, it provides associational evidence. This associational evidence speaks to a central macro-level issue, relies on careful empirical modeling, and is line with theoretically motivated hypotheses – which is why it should not be outright discarded due to a lack of causal inference. Instead, I note the potential attractiveness of the proposed conceptualization for those interested in adding credibility to a causal claim about the effects of institutional characteristics of national educational systems. Since the analysis of macro-level data does not invite the same econometric approaches to causal inference that are available for individual-level data, identification needs to come from a plausibly exogenous policy change involving, for the topics studied, a radical institutional discontinuity. This type of changes happen, but very seldom (Gamoran, 1996; Meghir and Palme, 2005). By using data from several cohorts of the adult population, this approach provides coverage of different historical periods (unlike age-standardized student assessments) and thus maximizes the opportunity for observing a fitting natural experiment.

Many of the suggested extensions will need to rely on other and new comparative data. Researchers may combine information from a variety of sources to separately estimate and explain the degree of equality and quality in education – instead of relying on a single data source containing information on both dimensions as I did here. The increasing availability of cross-nationally comparable measures of educational degrees and socio-economic background (Hoffmeyer-Zlotnik, 2003; Schneider, 2008) greatly facilitates the assessment of socio-economic inequalities in educational attainment for a broad range of countries and time points (e.g., Blossfeld and Shavit, 1993a; Shavit et al., 2007; Hertz et al., 2007; Brunello and Checchi, 2007; Breen et al., 2009). The choices are unfortunately still more limited for the assessment of educational quality among adults. While a follow-up to the IALS, the 2003 Adult Literacy and Lifeskills Survey (ALL), was implemented in only six countries, recently released data from the Programme for the International Assessment of Adult Competencies (PIAAC) contain adult skill measures for as many as 23 countries.

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Appendix A

A.1. Institutional and macrostructural features

Country	Code	Differ.	Stand.	Priv.	PSE	Train.	GDP	Ind.	Gini	F.Soc.
Belgium	BEL	High	Low	High	17	24.2	18,496	0.55	29.8	No
Canada	CAN	Low	Low	Low	14.2	37.0	19,274	1.27	28.3	No
Chile	CHL	High	High	High	8.7	26.1	3093	−1.42	54.5	No
Czech Rep.	CZE	High	High	Low	16.6	27.6	5249	0.32	25.7	Yes

(continued on next page)

Institutional and macrostructural features (continued)

Country	Code	Differ.	Stand.	Priv.	PSE	Train.	GDP	Ind.	Gini	F.Soc.
Denmark	DNK	Low	High	High	19.7	61.3	24,458	0.18	21.3	No
Finland	FIN	Low	High	Low	13.2	63.6	19,970	-0.24	22.8	No
Germany	GER	High ^a	High	Low	13.6	17.7	19,430	0.42	28.3	No
Great Britain	GB	Low	Low	High	16.9	46.6	19,671	0.58	31.2	No
Hungary	HUN	High	High	Low	13.3	18.2	4139	-0.81	29.4	Yes
Ireland	IRL	Low	High	Low	8.9	28.1	13,533	-1	32.4	No
Italy	ITA	High	High	Low	14.4	32.5	16,176	-0.51	34.8	No
New Zealand	NZL	Low	High	Low	14.2	52.7	11,431	-0.29	33.1	No
N. Ireland	NIR	High	Low	High	13.7	37.3	19,671	0.58	31.2	No
Norway	NOR	Low	High	Low	28.5	52.2	27,301	0.19	25.6	No
Poland	POL	High	High	Low	9.2	14.6	3053	-1.36	38.9	Yes
Slovenia	SVN	High	Low	Low	7.4	40.8	8004	0.79	26.4	Yes
Sweden	SWE	Low	High	Low	14	46.1	22,974	0.46	21.1	No
Switzerland	CH	High ^a	High	Low	9.8	48.5	33,030	-0.03	26.7	No
United States	USA	Low	Low	High	31.2	41.5	28,263	1.69	36.1	No

Notes:

Differentiation: Classification of countries according to the overall degree of differentiation based on narrative descriptions of national education systems (for a brief description of each system that illustrates the arguments behind the classificatory decisions for this and following institutional characteristics see Pfeffer, 2008). The categories are described in detail in section 5.4, in particular the group of countries with a special form of high differentiation that also includes early selection and a strong vocational system (high^a).

Standardization: Classification of countries according to the overall degree of standardization of educational governance and contents. Classifying the British system as unstandardized can be debated (see also Müller and Shavit, 1998: p. 12). The same holds for Slovenia. Reclassifying these cases as standardized does not affect the reported conclusions.

Privatization: Published figures on the share of private enrollment are subject to a good deal of historical change (for instance, Chile implemented radical privatization policies in the 1980s). They are therefore not used as strict and precise measures but instead to supplement a broad categorization based on narrative accounts.

Post-secondary education: Given that the IALS data consist of nationally representative samples, a convenient way to measure the inclusiveness of the post-secondary sector is to compute the population share of post-secondary degree holders directly from these data. Accordingly, this characteristic is indicated by a continuous measure of the percentage of tertiary degree holders (ISCED6/7) in the total population aged 25–65. Using measures from independent education statistics yields the same substantive conclusions (available from the author).

Training and Adult Education: Again taking advantage of the fact that the IALS data are nationally representative, this variable consists of the share of respondents indicating that they have participated in professional training or adult education within the preceding year.

GDP: GDP per capita data from the year 1990 (in constant 2000 US dollars) stem from the Worldbank Indicators database. This and the remaining indicators of macroeconomic context are not available separately for Northern Ireland. I assign Great Britain's value, but analyses without Northern Ireland yield virtually the same results.

Industrialization: Following Treiman and Yip (1989), this index is based on the percentage of the population that does not work in agriculture and the per capita energy consumption for the 1970s (averaged and mean mean-standardized). Due to missing data for Slovenia (at that time still part of Yugoslavia), the index value cannot be constructed for this case and is instead imputed based on the GDP per capita value. Excluding Slovenia for this analysis does not change the results.

Gini: Gini coefficients of disposable household income come from the mid 1990s (depending on availability in each country) from OECD and UN-WIDER data sources.

Former Socialist: A dummy indicator for former socialist countries.

Table 4

Institutional and macro-economic context of equality – quantitative indicators.

	1	2	3	4	5	6	7	8	9
Age of selection (BC80)	0.05** (0.01)	0.05** (0.01)	0.05** (0.01)	0.05** (0.02)	0.05* (0.02)	0.05** (0.01)	0.06** (0.02)	0.05** (0.01)	0.05** (0.01)
Age of selection (BC90)	0.04* (0.01)	0.04* (0.02)	0.04* (0.01)	0.04* (0.02)	0.04 (0.02)	0.05* (0.02)	0.04* (0.02)	0.04* (0.01)	0.04* (0.02)
Age of selection (H)	0.05** (0.02)	0.05* (0.02)	0.05* (0.02)	0.05** (0.02)	0.04* (0.02)	0.07*** (0.02)	0.05** (0.02)	0.05** (0.02)	0.06** (0.02)
Percent tracked (BC80)	-0.63** (0.16)	-0.71*** (0.17)	-0.60** (0.17)	-0.64** (0.18)	-0.61** (0.21)	-0.66** (0.17)	-0.74*** (0.18)	-0.63** (0.17)	-0.62** (0.17)
Percent tracked (BC90)	-0.49* (0.17)	-0.57** (0.19)	-0.45* (0.18)	-0.48* (0.19)	-0.43* (0.23)	-0.56** (0.19)	-0.56** (0.19)	-0.49* (0.17)	-0.49* (0.19)
Number of school types (H)	-0.07** (0.02)	-0.07* (0.02)	-0.07* (0.02)	-0.08** (0.02)	-0.06* (0.03)	-0.09** (0.02)	-0.07* (0.03)	-0.07** (0.02)	-0.09** (0.02)

Note: Linear regression coefficients; s.e. in parentheses.

* $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 5
Institutional and macro-economic context of quality – quantitative indicators.

	1	2	3	4	5	6	7	8	9
Age of selection (BC80)	3.08 (2.53)	3.31 (2.71)	3.24 (2.62)	1.11 (2.39)	−1.08 (3.20)	0.42 (2.07)	0.35 (2.39)	2.38 (1.76)	2.06 (2.49)
Age of selection (BC90)	2.66 (2.37)	2.94 (2.58)	2.82 (2.45)	0.95 (2.20)	−1.79 (3.07)	−0.91 (2.03)	0.20 (2.20)	1.94 (1.66)	1.18 (2.46)
Age of selection (H)	1.56 (2.50)	1.46 (2.64)	1.44 (2.64)	0.76 (2.38)	−4.73 (2.84)	−1.44 (2.31)	0.56 (1.96)	1.49 (1.70)	−0.97 (2.63)
Percent tracked (BC80)	−36.04 (30.91)	−41.24 (34.23)	−39.69 (32.31)	−10.77 (29.30)	4.85 (35.72)	−8.71 (24.58)	1.03 (29.64)	−36.10+ (20.62)	−21.69 (30.80)
Percent tracked (BC90)	−30.18 (29.03)	−36.37 (33.06)	−33.66 (30.44)	−7.94 (27.09)	16.18 (34.83)	9.73 (24.28)	3.93 (27.40)	−28.63 (19.73)	−9.48 (30.80)
Number of school types (H)	−4.67 (3.40)	−4.77 (3.70)	−4.73 (3.70)	−2.53 (3.61)	1.07 (4.21)	−1.76 (3.16)	−1.40 (2.96)	−3.18 (2.36)	−2.17 (3.61)

Note: Linear regression coefficients; s.e. in parentheses.

+ $p < .10$, * $p < 05$, ** $p < .01$, *** $p < .001$.

Table 6
Institutional and macro-economic context of quality at the top (90th percentile).

	1	2	3	4	5	6	7	8	9
High differentiation	−29.87** (7.69)	−30.36*** (7.40)	−29.91** (7.95)	−23.74** (7.96)	−29.69* (10.72)	−17.81* (9.25)	−22.63** (6.02)	−22.39** (6.89)	−29.06** (9.82)
Early and compensated differentiation	−8.73 (12.38)	−4.81 (12.17)	−8.37 (13.07)	−1.65 (12.23)	−8.60 (13.82)	−14.71 (11.72)	−7.14 (9.18)	−9.35 (10.27)	−8.73 (12.77)
Standardized		−11.78 (7.73)							
Private sector			1.08 (8.30)						
Rel. size of PSE				1.15* (0.64)					
Training					0.01 (0.36)				
GDP per capita						10.93* (5.43)			
Industrialization							13.21** (3.51)		
Income Gini								−1.28* (0.45)	
Former socialist									−1.62 (11.55)
N	19	19	19	19	19	19	19	19	19
R2	0.49	0.56	0.49	0.58	0.49	0.60	0.74	0.67	0.49

Note: Linear regression coefficients; s.e. in parentheses.

+ $p < .10$, * $p < 05$, ** $p < .01$, *** $p < .001$.

A.2. Alternative specification of institutional differentiation

Here, I report coefficients from alternative specifications of the effects of institutional differentiation as a sensitivity test for the findings reported in the main text. I draw on quantitative indicators of differentiation from published work by Brunello and Checchi (2007) (indicated by BC) as well as Horn (2009) (indicated by H; regressions based on these indicators exclude Chile and Slovenia, for which this information has not been assessed). Tables 4 and 5 follow the same sequence of models as that reported in Tables 1 and 2 but report only the coefficients for the different indicators of institutional differentiation. These indicators are:

- Age of Selection: The typical age of students at which educational differentiation begins. Indicators have been constructed for the 1980s (Brunello/Checchi) and 1990s (Brunello/Checchi and Horn).
- Percent Tracked: The typical length of school tracking, measured as the share of time spent in a differentiated context on the primary and secondary level (for details see Brunello and Checchi, 2007: p. 798), again constructed for both the 1980s and 1990s.

Table 7
Institutional and macro-economic context of quality at the bottom (10th percentile).

	1	2	3	4	5	6	7	8	9
High differentiation	−49.81** (13.86)	−49.65** (14.29)	−49.81** (14.32)	−37.40* (13.92)	−42.38* (19.09)	−34.00* (17.69)	−42.18** (13.79)	−34.66** (11.48)	−51.49* (17.68)
Early and compensated differentiation	8.49 (22.29)	7.17 (23.50)	8.43 (23.56)	22.83 (21.38)	13.91 (24.61)	0.65 (22.42)	10.17 (21.04)	7.24 (17.10)	8.49 (23.00)
Standardized		3.95 (14.93)							
Private sector			−0.18 (14.96)						
Rel. size of PSE				2.34* (1.12)					
Training					0.37 (0.64)				
GDP per capita						14.34 (10.38)			
Industrialization							13.93 (8.05)		
Income Gini								−2.60** (0.74)	
Former socialist									3.36 (20.81)
N	19	19	19	19	19	19	19	19	19
R2	0.49	0.49	0.49	0.60	0.50	0.54	0.57	0.72	0.49

Note: Linear regression coefficients; s.e. in parentheses.

* $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

- Number of School Types: The number of school types or distinct educational programs available for 15-year olds as reported by the OECD (Horn, 2009)

A.3. Institutional and macro-economic context of high and low quality

See Tables 6 and 7.

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