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Determinants of country differences in effects of parental education on children's academic achievement

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Abstract

Background: In a previous study, the total, direct and indirect effects of parental education on reading, mathematics and science achievement have been estimated for Grade 4 pupils of 37 countries that participated in PIRLS and TIMSS 2011 studies (Gustafsson et al. in TIMSS and PIRLS 2011: Relationships among reading, mathematics, and science achievement at the fourth grade—implications for early learning. pp 183–289, 2013). Several theories proposed to account for the variation were reviewed. With this previous study as the point of departure, the current study was to identify determinants and mechanisms that can explain the substantial variation found in the relationship between parental education and school achievement across the 37 countries in the previous study.

Methods: The effects estimated in Gustafsson et al. (TIMSS and PIRLS 2011: Relationships among reading, mathematics, and science achievement at the fourth grade—implications for early learning. pp 183–289, 2013) formed the empirical data of the current study. In a first step of analysis the total, direct and indirect effects were described for the 37 countries, focusing on countries with a high and low level in these three respects. In the second step of analysis, two indicators of characteristics of the educational system, the Gini index as a measure of degree of economic inequality and the HDI as a measure of general societal development, were related to the estimated coefficients.

Results: We found different patterns of relations with the direct and the indirect effects of parental education, and the direct and indirect effects therefore tended to cancel, so that small or no total effects were found. We also found opposite results when we investigated bivariate correlations and when we investigated partial correlation with HDI and Gini.

Conclusion: The pattern of empirical findings thus is more complex than expect. There is, potentially, a large number of factors outside of the home which may be of importance mediating the relation between parental education and student achievement. However, the data available for the current study does not allow investigation of such factors, so this will be tasks for further research.

Keywords: Parental education, Academic achievements, Early literacy and numeracy activities, Literacy and numeracy abilities, PIRLS, TIMSS, Indirect effects

Background

Within each and every country students with more highly educated parents tend to achieve better results in school than their peers whose parents have less education. However, the amount of relationship between parental education and school achievement varies substantially across countries (Gustafsson et al. 2013). Several theories have been proposed to account for these relationships (see e.g., Davis-Kean 2005; Eccles 2005; Lareau 1987), but neither are the general mechanisms which account for the relation between parental education and student achievement well understood, nor are the determinants of the country differences in strength of relationship.

The present study takes its starting point in the results of a previous study reported by Gustafsson et al. (2013) for 37 countries participating in the TIMSS and PIRLS 2011 study in Grade 4. In this previous study the total amount of relationship between parental education and achievement was determined for each country, and the total effect was also decomposed into a direct effect and an indirect effect mediated via home resources, early literacy and numeracy activities in the home, and literacy and numeracy skills when beginning school. The main aim of the present paper is to identify patterns in the variation across countries in the amount of direct and indirect relationships between parental education and achievement in Grade 4 and to investigate country level correlates of this variation.

Previous research

Meta analyses have estimated the correlation between socio-economic status (SES) and overall school performance to about .30 at the individual level (e.g., Sirin 2005; White 1982). In most countries, parents' educational level, seen as an aspect of cultural capital, has been identified as the key component of SES (e.g., Yang 2003).

One theoretical framework which is used to explain the effect of parental education on achievement is Bourdieu's Cultural Capital Theory (Bourdieu and Passeron 1977). This theory basically argues that social classes preserve a strong cultural identity, and also that social origins have a strong influence on students' cultural resources. Skills, attitudes, and uses of language, to take a few examples, thus are differentiated according to class origins. Furthermore, pedagogical practices and assessment procedures are to a large extent related to the culture of the upper class, which contributes to making cultural capital the main determinant of school and occupational success.

Barone (2006) used data from PISA 2000 to test the Cultural Capital Theory, using SES and parental education as indicators of social class, and indices of cultural capital from the PISA questionnaire. He concluded that the indicators of family cultural capital only had modest explanatory power, and he also observed that the effects of these variables may be better interpreted as indirect signs of the importance of cognitive resources. Barone (2006) furthermore suggested that the limited explanatory power of the Cultural Capital Theory may be due to there being also other causal mechanisms that mediate the influence of social origins, such as occupational ambitions.

Research on child development and family processes has investigated differences between low and high SES home environments with respect to how well they support development of the child's cognitive and language skills, which in turn may explain differences in educational achievement between the two groups of children. In this line of

research, the potential mechanisms of the impact of SES on children's developmental outcomes are mediated by differentiated family acts and home environment. More educational resources, better parenting skills, rich cognitive stimulation and support, and lower rates of depression and financial stress function as channels linking high SES to high levels of cognitive development of children (e.g., Conger and Donnellan 2007; Conger et al. 2010; Linver et al. 2002).

Eccles (1993) developed the General Model of Family Socialization Influences, which model examines different parental influences on the development of student outcomes, such as educational attainment, motivation, and self-efficacy. They argued that "distal parent characteristics such as genetic endowment, education, cultural group membership, occupation, income, etc., influence their children's educational attainment through their influence first on parents' beliefs and behaviors, which, in turn, influence their developing children's skills, values, motivation and self-concepts, which, in turn, influence the children's engagement in a wide variety of activities. This engagement, over time, determines the children's educational attainments (Eccles 2005, p. 193)". This model emphasizes not only the direct effect of parental education on children's cognitive and non-cognitive outcomes, but also the mediation and interaction effects of parental education through parental expectations, values, intellectual investments in the form of time spent on reading and other activities of intellectual stimulation, and a stimulating home environment (see e.g., Bradley and Corwyn 2003; Davis-Kean 2005; Hoff and Tian 2005).

Gustafsson et al. (2013) reviewed the literature on such meditating effects and concluded that both experimental and observational studies have demonstrated effects on development of pre-literacy and literacy skills of teaching children phonological awareness, reading to the child, involving parents in their children's learning, and teaching oral language skills (Hoff 2003, 2006). It has also been shown that parents with a higher level of education to a larger extent are involved in such activities and practices. Thus, parents with higher education tend to interact more verbally with their child; they use more abstract words, more complex syntax and invite their child more often into decontextualized discourse, book-sharing and dialogical reading. Such language practices mirror the language of books and school and foster good literacy skills. These results provide support for an explanation of the effects of parental education as being mediated by activities and practices conducive to development of the child's cognitive and literacy skills (see e.g., Bornstein et al. 1998).

In their review Gustafsson et al. (2013) observed that other mediating mechanisms have also been proposed, such as parents' beliefs, values, expectations, attitudes and behaviors: well educated parents appear to have high expectations of their children, while at the same time adapting their expectations to the performances of their children. Parents with little education on the contrary, tend to have lower, or unrealistically high, expectations of their children (e.g., Alexander et al. 1994). Also, high parental education is related to a warm social climate in the home (Eccles 2007).

While a considerable amount of research has been done on the mechanisms through which parental education influences educational achievement, less is known about the variability of these across countries. Furthermore theories to account for such differences are even more scarce, so convincing explanations of cross-national variations in

the effects of SES on educational achievement and attainment are lacking (Breen and Jonsson 2005, p. 236). We therefore have to take a starting point in country characteristics of a broad and general nature which are available for all or most countries, and to reason on a common-sense basis, rather than on a research basis.

One such country characteristic is the general social and economic level of development of the country. Given the increasing importance of education in the knowledge society, one hypothesis is that parents with a higher level of education will put more emphasis on their children's development of knowledge and skills than parents with a lower level of education, and this difference will be more pronounced in countries with a high level of social and economic development than in countries with a lower level of development (e.g., Baker et al. 2002; Chudgar and Luschei 2009; Chiu 2007; Heyneman and Loxley 1982). We thus expect the relation between parental education and student achievement to increase as a function of the country level of social and economic development.

Another characteristic of countries that has been found important in many different circumstances is the degree of economic inequality. Countries with high levels of socioeconomic segregation tend to have lower level of academic performance and greater performance variation between students from high and low socioeconomic backgrounds (Willms 2006). Wilkinson and Pickett (2011) thus demonstrated that countries with less income inequality, among other things, are characterized by longer life expectancy, better physical and mental health, and better child well-being. It does seem reasonable to expect that the relation between parental education and student achievement will be higher in countries with unequal distributions of income than in countries with a more equal distribution, and there are studies which support this hypothesis (Willms 2006; see also Caro and Lenkeit 2012). Mayer (2002) investigated effects of increases in economic segregation in the US between 1970 and 1990 on the relation between level of parental income and the educational attainment of the child. It was found that the increase in segregation was associated with an increase in educational attainment among high-income children and a similar decrease in educational attainment among low-income children.

Parental effects on educational achievement in 37 countries

Below we briefly describe the Gustafsson et al. (2013) study which furnishes the data on which the current study is based. The main aim of this study was to determine the relationships between parental education and achievement for each country that participated in the TIMSS and PIRLS 2011 studies, and in particular to investigate to importance of activities in the home before beginning school for achievement in Grade 4.

The study was conducted with path modeling techniques. In the first step, a common model was fitted to the pooled data from all 37 countries. The model expressed hypotheses concerning the mechanisms through which Parental Education influence achievement via books in the home, frequency of early literacy and numeracy activities, and the child's ability to carry out literacy and numeracy tasks when starting school.

In the pooled data, the total effects of Parental Education were substantial for mathematics, science, and reading (.33, .35, and .35, respectively), and books in the home was an important mediating variable. The common model provided strong support for the

hypothesized chain of influence via books, early activities, and ability when entering school to achievement. The number of books was related to frequency of activities in the homes oriented towards both literacy and numeracy, and these activities influenced the general levels of literacy and numeracy skills the child had developed at the time of entering school. There also were effects on the Grade 4 measures of achievement in Mathematics, Science and Reading.

Gustafsson et al. (2013) then went on to estimate the model separately for each country, and the resulting models were presented both in tables and path diagrams. For each country a separation was made of the direct effect of Parental Education on achievement, and the indirect effect. These two sum to the total effect, which is the observed correlation between Parental Education and achievement. The total indirect effect summarizes all the different ways in which Parental Education relates to achievement, while the direct effect is the unmediated relation to achievement. Thus, the total indirect effect captures the effect which can be explained by the relations which go from Parental Education via the resources and different activities in the home to achievement, while the direct effect represents what is not explained by the home factors. However, Gustafsson et al. (2013) made no attempts to systematically analyze the patterns of differences in total, direct and indirect effects across countries, which is the purpose of the current paper.

Methods

The study thus takes advantage of the modeling results computed by Gustafsson et al. (2013), focusing on the estimates of total, direct and indirect effects. In addition the study involves two country level variables representing structural characteristics.

The Gini index is a measure of the inequality among values of a frequency distribution, such as levels of income. A Gini index of zero expresses perfect equality, where all values are the same. A Gini index of one expresses maximal inequality among values, such as where one person has all the income, and all others have none. The results depend on how income is defined, for example if income is measured pretax or not, and if social assistance is taken into account. The Gini index used here was computed with values from the year 2010, after tax and transfers, and was taken from OECD Income Distribution Database.[1] The Gini index was available for 31 out of the 37 participants.

The Human Development Index (HDI) (UNDP 2014) is a general measure of country level human development. The HDI is a composite index measuring three basic dimensions: life expectancy at birth; schooling, measured both as mean years of schooling received by persons aged 25 and older and expected years of schooling for a child at school entrance; and gross national income per capita. Here the HDI values for 2012 have been used.

The Gini index and the HDI had a significant correlation of −.58 so there is quite some overlap between these two indices. A scatterplot of the two country characteristics is presented in Fig. 1. Low Gini values and high HDI values are typical of many Western countries, including Scandinavian countries, Germany, Austria, Australia and Canada.

[1] OECD Income Distribution Database: Income distribution and poverty. http://stats.oecd.org/Index.aspx?DataSetCode=IDD.

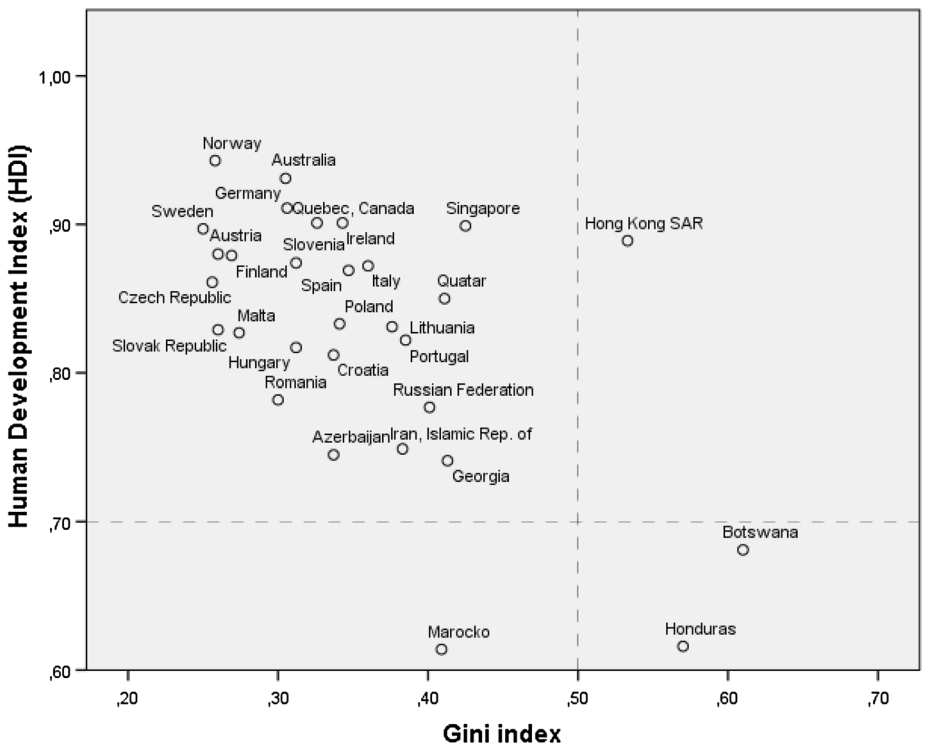

Fig. 1 *Scatter plot* of the relations between the Gini index and the HDI

Botswana and Honduras have high values on the Gini index and low on the HDI. Hong Kong has relative high values on both indices and Morocco has a low HDI value. One problem is that some countries may have so extreme values on one or both variables that they should be regarded as outliers. Using .70 and .50 as arbitrary cut-off values for outliers for HDI and Gini respectively, four countries (Botswana, Hong Kong, Honduras and Morocco) were identified as potential outliers (see Fig. 1). Comparisons were made between results obtained when these four countries were included and when they were excluded. The four countries will be referred to as outliers, but it must be remembered that this is an arbitrary and tentative classification. The correlation between the Gini index and the HDI reduced to −.40 when the four countries were excluded, which however, still is significant.

Results

Estimates of total, direct and indirect effects of Parental Education on achievement in the three subject matter domains are presented in Table 1. It is difficult to see any pattern in all these numbers but some observations can be made.

Parental Education had total effects which exceeded .40 in all three domains for Hungary, Iran, Romania and Poland. The lowest impact of Parental Education (lower than .16 in all subject domains) was observed for Azerbaijan and Hong Kong SAR. There thus were considerable differences in the amount of relationship between Parental Education and achievement across countries, even though it may also be noted that for many countries effects were between .30 and .40. From the list of countries with high and low

Table 1 Estimates of total, direct and indirect effects

Country	Total effects			Direct effects			Indirect effects		
	Math	Science	Reading	Math	Science	Reading	Math	Science	Reading
Azerbaijan	.11	.14	.15	.06	.08	.11	.05	.06	.03
Australia	.33	.35	.33	.23	.22	.21	.11	.14	.12
Austria	.31	.33	.32	.09	.10	.10	.22	.23	.22
Botswana	.41	.45	.48	.32	.34	.38	.09	.10	.10
Chinese Taipei	.37	.39	.34	.20	.22	.20	.17	.17	.13
Croatia	.31	.32	.31	.17	.17	.16	.14	.15	.14
Czech Republic	.31	.29	.29	.17	.13	.13	.14	.16	.16
Finland	.29	.28	.28	.16	.13	.12	.13	.15	.16
Georgia	.28	.29	.31	.15	.15	.17	.13	.14	.14
Germany	.36	.38	.36	.17	.15	.15	.19	.23	.21
Honduras	.34	.36	.34	.31	.31	.29	.03	.05	.05
Hong Kong SAR	.16	.15	.12	.07	.05	.04	.09	.10	.08
Hungary	.55	.55	.53	.27	.26	.29	.28	.29	.24
Iran, Islamic Rep. of	.44	.45	.43	.25	.25	.25	.19	.20	.18
Ireland	.33	.34	.34	.17	.16	.16	.17	.19	.19
Italy	.24	.28	.3	.15	.14	.16	.09	.14	.14
Lithuania	.36	.35	.35	.19	.18	.16	.17	.18	.19
Malta	.34	.45	.44	.21	.30	.30	.13	.15	.15
Morocco	.19	.19	.24	.18	.16	.19	.00	.03	.05
Oman	.30	.31	.32	.21	.22	.23	.09	.08	.09
Norway	.25	.28	.26	.16	.11	.11	.10	.17	.16
Poland	.43	.44	.43	.27	.28	.29	.15	.16	.14
Portugal	.30	.30	.31	.13	.13	.14	.18	.17	.18
Qatar	.39	.38	.40	.31	.30	.32	.09	.08	.08
Romania	.43	.47	.49	.21	.23	.25	.22	.24	.24
Russian Federation	.27	.27	.30	.15	.14	.17	.11	.13	.13
Saudi Arabia	.18	.25	.24	.09	.15	.16	.09	.10	.09
Singapore	.39	.44	.41	.25	.27	.24	.15	.17	.17
Slovak Republic	.37	.38	.38	.16	.16	.16	.21	.21	.21
Slovenia	.38	.39	.35	.23	.21	.18	.15	.17	.17
Spain	.37	.33	.31	.21	.14	.16	.17	.19	.16
Sweden	.32	.34	.34	.13	.10	.12	.20	.25	.22
United Arab Emirates	.39	.40	.42	.25	.27	.26	.14	.13	.15
Dubai, UAE	.41	.42	.42	.25	.26	.25	.16	.16	.17
Abu Dhabi, UAE	.40	.39	.40	.27	.27	.25	.13	.12	.15
Quebec, Canada	.25	.29	.27	.18	.18	.17	.08	.11	.10

Table 1 continued

Country	Total effects			Direct effects			Indirect effects		
	Math	Science	Reading	Math	Science	Reading	Math	Science	Reading
N. Ireland	.38	.39	.36	.25	.23	.22	.13	.16	.14
Average	.33	.35	.34	.19	.19	.20	.14	.15	.15
Standard deviation	.09	.09	.09	.07	.07	.07	.06	.06	.05

impact, it is not possible to see any simple and clear grouping of countries which may explain the differences. Thus, among countries with high impact, there were some East European countries. However, the Russian Federation was among the countries with lowest impact, so the pattern is far from clear. Among East Asian countries, there were both examples of countries with the highest impact (Singapore) and the lowest impact (Hong Kong SAR). These examples indicate that the amount of effect of Parental education on educational achievement cannot be accounted for in simple terms.

The correlations among the direct and indirect effects of Parental Education were all close to zero, and none of these was significant. The absence of correlations between direct and total indirect effects implies that countries can have all possible combinations of large and small estimates of direct and indirect effects. These results also indicate that there are different mechanisms at work behind the direct and indirect effects.

Figure 2 presents a scatter plot of the indirect and direct effects for Mathematics. Comparisons also were made between the scatter plots with the four outliers included (Fig. 2b) and excluded (Fig. 2a). Parental Education had the smallest direct effects on Mathematics achievement for Azerbaijan, Hong Kong SAR, Saudi Arabia and Austria. Countries with the largest direct effects of Parental education on Mathematics achievement were Botswana, Honduras, Qatar, Poland and Hungary. The largest indirect effects of Parental Education on Mathematics were observed for Hungary, Austria, Romania, Slovak Republic, and Sweden, while the smallest indirect effects were observed for Morocco, Azerbaijan, Hong Kong and Quebec. The four outlier countries all had a low indirect effect of Parental Education on Mathematics achievement. Botswana and

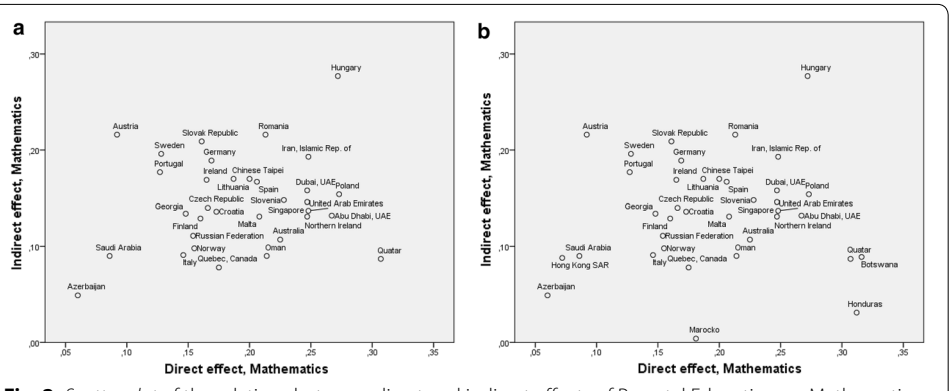

Fig. 2 *Scatter plot* of the relations between direct and indirect effects of Parental Education on Mathematics. **a** Without outliers, **b** With outliers

Honduras had the highest direct effects among all the countries, while for Hong Kong a rather low direct effect was observed, with Morocco at an intermediate level.

Figure 2 makes it clear that the very high total effects of Parental Education observed for Hungary, Romania and Iran were due to the fact that for these countries both direct and indirect effects were high. Similarly, the small total effects observed for Azerbaijan and Hong Kong were due to the fact that for these two countries both direct and indirect effects were small. The results for Science and Reading were highly similar to those for Mathematics, even though there also were some differences (not shown here). Thus, one difference was that for Reading all the Scandinavian countries had relatively high indirect effects, while this was not to the same extent true for Mathematics. However, to be

Table 2 Bivariate and partial correlations between country characteristics and the estimated effects of parental education on three subject domains

Estimated effects of Parental Education on three subject domains	Gini index				Human development index			
	Bivariate correlation		Partial[a] correlation		Bivariate correlation		Partial[b] correlation	
	With outliers[c]	Without outliers	With outliers	Without outliers	With outliers	Without outliers	With outliers	Without outliers
Total effect on Math	−.18	.03	−.04	−.16	.00	−.11	.07	.14
Total effect on Science	−.02	.00	−.25	−.28	−.13	−.13	.24	.34
Total effect on Reading	−.10	.01	−.19	−.22	−.10	−.10	.19	.28
Direct effect on Math	.36*	.29	−.36*	−.09	−.26	.06	.25	.30
Direct effect on Science	.35	.30	−.43*	−.28	−.33	−.11	.29	.36
Direct effect on Reading	.38*	.34	−.51*	−.40*	−.43*	−.24	.30	.39*
Indirect effect on Math	−.49**	−.23	.50*	.14	.38*	−.02	−.36*	−.34
Indirect effect, Science	−.58**	−.39*	.62*	.39*	.49**	.21	−.44*	−.42*
Indirect effect on Reading	−.57**	−.36	.56*	.34	.43*	.17	−.40*	−.38*
Number of countries	31	27	31	27	34	30	31	27

* Correlation is significant at the .05 level (2-tailed)

** Correlation is significant at the .01 level (2-tailed)

[a] Partial correlation of Gini and estimated Parental Education effects controlling for HDI

[b] Partial correlation of HDI and estimated Parental Education effects controlling for Gini

[c] Outlier countries with extreme values in HDI and Gini are Botswana, Honduras, Hong Kong and Morocco

able to interpret these results we need to understand the determinants of the direct and indirect effects.

Bivariate and partial correlations between the two measures of country characteristics and the estimated effects of Parental Education with and without the outlier countries are presented in Table 2. When the outlier countries were included positive bivariate correlations between the Gini index and the direct effect of Parental Education were observed, while correlations with the indirect effects were negative. Most of these correlations were significant. When the four outlier countries were excluded the same pattern remained, but with lower correlations, most of which were non-significant. For the HDI bivariate correlations were negative with the direct effects and positive with the indirect effects, most correlations being significant. However, none of the bivariate correlations with the HDI was significant when outlier countries were excluded.

Interestingly enough the signs for the partial correlations were opposite to those for the bivariate correlations. Thus, with control for HDI, Gini related negatively to the direct Parental Education effect and positively to the indirect effect. The partial correlations of the Gini index were quite strong, and especially so for the indirect effects. After excluding the outliers, the Gini index was significantly related to the direct Parental Education effect on reading (−.40) and the indirect effect on science (.39). The opposite pattern was found for the partial correlations with HDI, these being positively related to the direct effect of Parental education and negatively related to the indirect effect. The patterns of results were quite similar when outliers were included and excluded, there being significant relations for the indirect effects, and close to significant relations with the direct effects.

Discussion and conclusions

We had hypothesized the relation between parental education and student achievement to increase as a function of the country level of social and economic development, and we also had hypothesized that the relation between parental education and student achievement would be higher in countries with unequal distributions of income than in countries with a more equal distribution. However, the empirical results gave only little support to these hypotheses, there being no relation between the total effect of parental education and the two indicators of country characteristics. Instead we found different patterns of relations with the direct and the indirect effects of parental education, and we also found opposite results when we investigated bivariate correlations and when we investigated partial correlation with HDI and Gini. The pattern of empirical findings thus is more complex than is expressed in our hypotheses.

The HDI and Gini measures were negatively correlated (Fig. 1). When examining the effect of these measures, confounding effects between the two need to be partialed out, and we therefore favor the partial correlations. These showed a tendency that the direct effect of parental education was positively associated with the HDI, and while the indirect effect was negatively correlated with the HDI. The indirect effect expresses the effect of parental education on achievement which is mediated via within-family resources, activities and processes. The results thus indicate that for countries with a higher level of social and economic development there is a lower impact of parental education on

student development of knowledge and skills via activities in the home. One possible explanation for this may be that high-HDI countries tend to provide a more equitable education with respect to socio-economic status than low-HDI countries do (Gustafsson et al. 2016).

The partial correlations between the Gini index and the indirect effect of Parental Education were positive, which implies that for countries characterized by more economic inequality there was a stronger impact of parental education on student development of knowledge and skills via activities in the home. This result is in agreement with previous research (Caro and Lenkeit 2012; Mayer 2002; Willms 2006) which has shown societal inequity to be related to greater performance differences between students from high and low socioeconomic backgrounds. Thus, here too a possible explanation for the pattern of relations is that education is more equitable in countries with less economic inequity.

It must be emphasized that the results discussed so far only pertain to the indirect effects of parental education on student achievement. For the direct effects the patterns of results generally were the opposite of those obtained for the indirect effects. The direct and indirect effects therefore tended to cancel, so that small or no total effects were found. Regrettably, however, the direct effects are more difficult to interpret given that the indirect effects, because they represent the part of the relation between parental education and student achievement which is not mediated via resources and activities in the home. There is, potentially, a large number of factors outside of the home which may be of importance for the relation between parental education and student achievement, such as organizational differentiation of schooling (van de Werfhorst and Mijs 2010); whether resource allocation to schools is compensatory or non-compensatory (Gustafsson et al. 2016); and the extent to which meritocracy is emphasized for social mobility (Breen and Jonsson 2005). However, the data available for the current study does not allow investigation of such factors, so this will be tasks for further research.

Analyses were made both with the four countries identified as potential outliers included and excluded. Some differences were observed which may be due to an unreasonably strong influence from the outliers. However, it should also be noted that the number of countries in the current study is rather small, so the exclusion of countries is likely to influence the outcomes even though the countries are not outliers in a strict sense, if not else because it increases the risk for Type I error. It may also be observed that the overall patterns of results by and large were the same with and without exclusion of countries, which suggests that the findings of the current study are not driven by a few outliers.

Given that our results are based on a cross-sectional study, we should be careful not to make causal interpretations of the correlations. Variables not included in our model, which correlate with both the Gini index and the effect estimate may be the actual determinants of the outcomes. For example, among the low Gini countries there may be an overrepresentation of countries which emphasize early literacy and numeracy activities in the home and which could be expected to cause a high indirect effect of parental education. This interpretation is supported by the fact that the Scandinavian countries, which are characterized by such an emphasis, have low Gini index values. However, only Sweden has a particularly large indirect effect, and the set of countries with low Gini

values is quite mixed geographically, so the support for this particular hypothesis is not strong.

Authors' contributions
This article is a joint effort from both the authors. Both authors read and approved the final manuscript.

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Competing interests
The authors declare that they have no competing interests.

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