Socio-Emotional Skills and the Socioeconomic Achievement Gap

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Abstract

Empirical evidence suggests that children's socio-emotional skills—an important determinant of school achievement—vary by socio-economic family background. In this study, we assessed the degree to which differences in socio-emotional skills contribute to the achievement gap between socioeconomically advantaged and disadvantaged children. We used data on 74 countries from the 2018 Programme for International Student Assessment (PISA), which contains an extensive set of psychological measures, including growth mindset, self-efficacy, and work mastery. We developed three conceptual scenarios to analyze the role of socio-emotional skills in learning inequality: simple accumulation, multiplicative accumulation, and compensatory accumulation. Our findings are in line with the simple accumulation scenario: socioeconomically advantaged children have somewhat higher levels of socio-emotional skills than their disadvantaged peers, but the effect of these skills on academic performance is largely similar for both groups. Using a counterfactual decomposition method, we show that the measured socio-emotional skills explain no more than 8.8% of the socioeconomic achievement gap. Based on these findings, we argue that initiatives to promote social and emotional learning (SEL) are unlikely to substantially reduce educational inequalities.

Key words: Learning inequality, Achievement gap, Social and Emotional Learning (SEL), Non-cognitive skills, Programme for International Student Assessment (PISA), Socioeconomic inequality, Decomposition, International comparison

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Introduction

Achievement gaps between socioeconomically advantaged and disadvantaged children exist in all countries, and they are particularly pronounced in the United States (Bradbury et al. 2015; Gruijters and Behrman 2020; World Bank 2018). Moreover, recent research has shown that achievement gaps have increased over the last few decades (Chmielewski 2019). Gaps in academic performance lay the foundation for entrenched inequality in a range of desirable life outcomes, including income, happiness, health, and longevity (Almlund et al. 2011; Farkas 2003; Heckman, Stixrud, and Urzua 2006). Reducing socioeconomic inequalities in school achievement is therefore a key priority for policymakers and others with an interest in social justice. In order to do so, however, we need to understand the mechanisms behind achievement gaps.

Success in school relies not only on the development of cognitive capabilities, but also on a range of broader socio-emotional and psychological attitudes and competencies, often referred to as ‘socio-emotional skills⁴’ or ‘non-cognitive skills’. Skills such as self-efficacy, work ethic, and self-confidence are not only intrinsically important for children, but also have a major impact on educational performance and broader life outcomes (Almlund et al. 2011; Farkas 2003; OECD 2019c). Evidence suggests that socio-emotional skills are malleable, and can be developed through a process known as ‘social and emotional learning’ (SEL) (Sánchez Puerta, Valerio, and Bernal 2016). Research on the ‘Asian American achievement paradox’ (Hsin and Xie 2014; Lee and Zhou 2015) and the gender gap in achievement (DiPrete and Jennings 2012; Golsteyn and Schils 2014) has shown that socio-emotional skills can be an important explanation for group-based differences in learning. It is plausible that this explanation applies to socio-economic groups as well: if children from advantaged family backgrounds are more likely to acquire school-relevant socio-emotional skills, then this might explain part of their advantage in test scores and other measures of educational achievement.

The idea that socio-emotional skills contribute to socioeconomic achievement gaps is widespread in education and policy circles. For example, an influential joint policy paper by the American Enterprise Institute and the Brookings Institution mentioned “promoting social-emotional and character development” as one of its four key recommendations to reduce the education gap between children from middle-class and poor families, stating that SEL

⁴ To avoid confusion with socio-economic status, which is also abbreviated as ‘SES’, we will always write out ‘socio-emotional skills’ in this paper.

interventions are particularly important for low-income children, who “will fall further behind without it” (2015:60). A stakeholder survey commissioned by the UK Cabinet Office echoed this sentiment, concluding that “children and young people experiencing disadvantage or living in vulnerable circumstances were reported to have more to gain from social and emotional skills provision, and seen as less likely to be developing social and emotional skills at home” (Yeo and Graham 2015:7). A second commissioned review concluded that class-based inequalities in social and emotional skills “serve to perpetuate the cycle of advantage or disadvantage across generations” (Goodman et al. 2015:2). The provision of SEL-related services has grown into a huge industry, worth approximately USD 1.5 billion in 2020 and expected to increase to USD 3.9 billion by 2025 (Business Wire 2020). Programs to foster SEL are often explicitly framed as a way to reduce socio-economic achievement disparities. For example, SEL provider Wings for Kids argues that “Traits such as self-control, optimism, perseverance, confidence, and growth mindset are predictors of success in school and life. (...) This is particularly important for low-income children who, by virtue of their situation, can’t get a lot of the things we know are important to learning and have more obstacles to overcome than their wealthier peers.” (Wings for Kids n.d.). The Collaborative for Academic, Social, and Emotional Learning (CASEL), a leading advocate for SEL, argues that “SEL can help address various forms of inequity” (CASEL n.d.).

In spite of these sweeping claims, there is little empirical evidence on the relationship between socio-emotional skills and socioeconomic inequalities in learning. Our study therefore asks to what extent learning gaps between socioeconomically advantaged and socioeconomically disadvantaged children can be explained by socio-emotional skills. The 2018 Programme for International Student Assessment (PISA) allows us to answer this question using nationally representative data from high-school students in 74 countries, extending previous studies that have mostly focused on primary schoolers in the United States. The 2018 PISA survey measured a comprehensive set of academically relevant socio-emotional skills, including growth mindset and self-efficacy.

We develop three conceptual scenarios that distinguish between differences in the level of socio-emotional skills between socioeconomically advantaged and disadvantaged children: simple accumulation, in which advantaged children have higher levels but similar returns to socio-emotional skills compared to disadvantaged children, multiplicative accumulation, in which advantaged children have higher returns, and compensatory accumulation, in which disadvantaged children have higher returns. Based on these scenarios, we conduct a

counterfactual decomposition of the socioeconomic achievement gap in science scores. Our results show that if disadvantaged children had the same levels of and returns to socio-emotional skills as advantaged children, this would reduce the learning gap by no more than 8.8%. Most of this is due to compositional effects: contrary to popular wisdom, there is no systematic difference in the relative importance of these skills for socioeconomically advantaged and disadvantaged children. Because of potential reverse causality and omitted variable bias in observational data, we interpret these estimates as an upper bound on the socioeconomic achievement gap that can be explained by the observed socio-emotional skills. Based on these findings, which are relatively robust across global cultural contexts and levels of economic development, we argue that interventions to improve social and emotional skills are unlikely to substantially reduce class-based inequalities in academic performance.

Socio-Emotional Skills and Learning Outcomes

The terms ‘non-cognitive skills’, ‘social and emotional learning’, ‘psychosocial competencies’ and ‘life skills’ are often used interchangeably in the psychological literature (Sánchez Puerta et al. 2016). Educational psychologists have identified a wide range of socio-emotional skills that are considered beneficial for learning and for life outcomes more generally (Duckworth and Yeager 2015). Prominent examples are self-efficacy—“the conviction that one can successfully execute the behavior required to produce the outcomes” (Bandura 1977:141) and growth mindset—“the belief that your basic qualities are things you can cultivate through your efforts” (Dweck 2007:4). Non-cognitive ‘soft’ skills are often contrasted to ‘hard’ cognitive skills, such as performance in mathematics and reading tests. Recent meta-analytical evidence confirms that socio-emotional skills are competencies that can be learned, rather than permanent and unchangeable traits (Durlak et al. 2011; Murano, Sawyer, and Lipnevich 2020).

There is widespread agreement that socio-emotional skills are important for learning outcomes. Observational evidence is available for a range of skills, including self-efficacy (e.g. Rosen et al. 2010), conscientiousness (e.g. Poropat 2009), and motivational beliefs and goals (e.g. Eccles and Wigfield 2002), which remain positively correlated with achievement even after controlling for gender, family background and cognitive abilities. Some studies suggest that socio-emotional skills are at least as important as intelligence in predicting academic performance, especially when we look at their cumulative effect (Almlund et al. 2011; Heckman et al. 2006).

Researchers have also identified some of the mechanisms and causal channels that give rise to the association between socioemotional skills and learning outcomes. A prominent channel is motivation and effort. It has been observed, for example, that students with a growth mindset persist longer in challenging tasks (Dweck 2007). Such behavior might in turn be reinforced via positive teacher or peer feedback (Yeager et al. 2019). The influential expectancy value theory of achievement motivation positions that individuals' performance on an activity can be explained by 1) their beliefs about how well they will do on the activity and 2) the extent to which they value the activity (Wigfield and Eccles 2000). Socio-emotional skills contribute to both of these determinants. For example, self-efficacy raises the expectation that one can achieve the desired result (1), while work mastery, growth mindset, and competitiveness increase the subjective task value (2). This might be particularly important in the context of academic achievement tests, because “the act of test-taking requires effort, sustained attention, persistence, and tolerance of frustration on test questions that have no payoff” (Deluca and Rosenbaum 2001:371).

A second channel is learning behaviour: students with high levels of socio-emotional skills have more effective study habits (Crede and Kuncel 2008; Lubbers et al. 2010). For example, Zhang & Ziegler (2016) found that students with high levels of openness and conscientiousness were more likely to adopt a deep-learning approach, which involves seeking a profound—rather than superficial—understanding of the content. Socio-emotional skills may also lead students to choose more challenging tasks and subjects that help them to improve their academic performance (Almlund et al. 2011). Claro, Paunesku, and Dweck (2016) suggested that students with a growth mindset actively seek out learning opportunities and relish difficult tasks, whereas students with a fixed mindset try to avoid such situations. Finally, students with low socio-emotional skills are more likely to exhibit internalising or externalising ‘problem behaviours’ that may be harmful to learning (Almlund et al. 2011; Murano et al. 2020).

In summary, there is substantial evidence for a robust association between socio-emotional skills and learning outcomes, which operates through established psychological and behavioural mechanisms. There is some debate, however, about the extent to which this association is causal in nature. Almlund et al. (2011) observed that “problems with reverse causality are rife in personality psychology” (p. 89). For example, low school marks might result in lower self-confidence and disengagement, while high achievement can boost self-efficacy and motivation (Gonida, Kiosseoglou, and Leondari 2006; Holtmann, Menze, and Solga 2021; Rosenberg et al. 1995). A second challenge in estimating the causal relationship

between socio-emotional skills and learning outcomes is omitted variable bias. Many of the studies described above do not control for important student background characteristics such as family socio-economic status, school quality, and innate ability. The strongest evidence, therefore, is derived from experimental studies of SEL interventions. For example, Yeager and colleagues (2019) found that a one-hour growth mindset intervention in American high schools led to an 0.1 point gain in GPA among low-performing students, and increased their likelihood of enrolling in advanced mathematics courses. A similar intervention implemented over 8 sessions improved performance by 0.3 grade points (Blackwell, Trzesniewski, and Dweck 2007). A meta-analysis of 213 comprehensive school-based SEL programs found a substantial average achievement gain of 11 percentile points (Durlak et al. 2011). It should be noted, however, that these effect sizes not only depend on the causal association between socio-emotional skills and learning, but also on the effectiveness of the interventions themselves in improving socio-emotional skills.

The Role of Socio-Emotional Skills in the Stratification Process

In the previous section, we identified several socio-emotional skills that have been associated with learning outcomes in the psychological literature. Historically, psychologists have paid little attention to the relationship between socio-emotional skills and family socio-economic status. A major reason for this is the experimental turn in social psychology, which led to the marginalization of variables that cannot be easily manipulated. As a result, social psychology has “often failed to fully incorporate actors' social structural positions (e.g., their location in the social hierarchies of race, gender, socioeconomic status, or sexual identity)” (Hollander & Howard, 2000, p. 338).

Sociology, on the other hand, has traditionally focused on group differences in educational outcomes—especially differences based on gender, race, and class—and the mechanisms through which they arise. A longstanding debate in sociology relates to relative merits of ‘structural’ and ‘cultural’ explanations. Whereas structural explanations focus on differences in power and material resources as the main determinants of inequality, cultural explanations emphasize the role of the cultural norms, values, attitudes, and behavioral patterns to explain variation in intergroup outcomes (Lee & Zhou, 2015). Following contentious debates about the ‘culture of poverty’ thesis in the 1970s, sociologists have often been wary of cultural-psychological explanations for social and educational inequalities, partially out of fear that

such explanations might be construed as ‘blaming the victim’ of socio-economic injustice (Freeman et al., 2020; Vaisey, 2010). Scholars linking educational outcomes to behavioral and psychological factors have been accused of perpetuating a ‘deficit discourse’, which “justifies existing social conditions by identifying the problem of inequality as *located within*, rather than as *pressing upon*, disenfranchised communities” (Gorski, 2011, p. 154)⁵. Instead, sociologists have proposed a range of structural explanations for educational inequality, such as tracking and school segregation, disparities in school quality and funding, as well as privilege and institutionalized bias against disadvantaged groups (Van de Werfhorst & Mijs, 2010).

More recently, a new perspective has gained ground that acknowledges the structural roots of between-group differences in cultural-psychological characteristics and resources. Rather than treating structure and culture as competing explanations, this ‘emergent’ perspective considers cultural resources and behaviors to be mediating or enacting structural (dis)advantage (Freeman et al., 2020; Lee & Zhou, 2015). Scholars working in this tradition tend to define culture as an adaptable ‘toolkit’ or set of repertoires that individuals and groups can draw on, rather than as innate character traits or ingrained group characteristics (Small et al., 2010).

The emergent perspective outlined above is exemplified in the academic discourse around the ‘Asian American achievement paradox’: the finding that Asian Americans outperform all other ethnic groups, even when controlling for family background and a range of other structural characteristics (Hsin & Xie, 2014; Lee & Zhou, 2015; Liu & Xie, 2016). For example, based on a series of interviews with Chinese- and Vietnamese-American parents, Lee & Zhou (2015) explain how immigrant selectivity and other structural factors shape Asian American students’ cultural frames and mindsets to produce superior learning outcomes. Correspondingly, Hsin & Xie (2014) found that socio-emotional skills—specifically work ethic and the belief that effort rather than ability is primary source of success—explain a large share of the Asian American achievement advantage, although the effect varies by immigration status. Similar arguments have been used to explain the gender gap in academic achievement, which is partially accounted for by girls’ advantage in social and behavioral skills (DiPrete & Jennings, 2012; Golsteyn & Schils, 2014).

⁵ There are also practical reasons for the absence of psychological mechanisms and explanations in much of the sociological research on educational stratification: the datasets used by quantitative sociologists often do not include the psychological constructs necessary for a fine-grained analysis of the relationships between social origins, socio-emotional skills, and educational outcomes.

The emergent perspective is particularly suitable for analyzing socioeconomic achievement inequality. Extensive sociological research—summarized in the next section—shows how social class shapes children’s social and emotional skills, which in turn affect learning outcomes. Only a few studies, however, have explicitly considered the role of cultural-psychological factors in socioeconomic achievement inequality. For example, using the Early Childhood Longitudinal Study, Liu (2019) showed that socio-emotional skills explain 20% of the SES gap in learning outcomes. Burger, Mortimer & Johnson (2020) found that adolescent self-esteem and self-efficacy contributed to the intergenerational reproduction of advantage, primarily through school achievement. In a highly cited study, Claro, Paunesku & Dweck (2016) found that students with a growth mindset “were appreciably buffered against the deleterious effects of poverty on achievement” (p. 8664).

Although this emerging body of research provides important evidence on the role of socio-emotional skills in the educational stratification process, it also has a number of limitations. For example, it is mostly focused on the United States and tends to use a limited set of socio-emotional skills, often focusing on single variables and/or teacher reports of pupil behavior. In contrast, we look at 74 countries and use a comprehensive set of socio-emotional skills that have been elicited using validated psychometric instruments. In doing so, we contribute to the longstanding debate about the role of psycho-cultural characteristics in explaining between-group inequality.

Conceptual Framework:

Socio-Emotional Skills and the Socioeconomic Achievement Gap

In this study, we follow the OECD in conceptualizing the socioeconomic achievement gap as the difference in average test scores between children in the top and in the bottom SES quartile (OECD 2019:55). We are interested in the extent to which this gap is explained by socio-emotional skills. There are two ways in which socio-emotional skills can contribute to achievement inequality: because advantaged children have higher levels of academically relevant socio-emotional skills than disadvantaged children (an endowment effect), or because they derive more academic benefits from their socio-emotional skills—or, conversely, are less affected by a lack of socio-emotional skills (a returns effect). In the terminology of Lundberg, Johnson, and Stewart (2021), our theoretical estimand is therefore the potential average test scores that socioeconomically disadvantaged children would achieve if they had 1) the same

levels of socio-emotional skills as advantaged children, and 2) the same returns to socio-emotional skills as advantaged children, all other things remaining the same. Following previous research (DiPrete and Jennings 2012; Golsteyn and Schils 2014), we estimate these counterfactual scenarios using the Kitagawa-Oaxaca-Blinder (KOB) decomposition.

Following the empirical and theoretical evidence, we develop three potential scenarios, based on the size and direction of the endowment and returns components (illustrated in Figure 1). In the first scenario ('simple accumulation'⁶), advantaged children have higher average levels of socio-emotional skills than disadvantaged children, and similar returns to these skills. In the second scenario ('multiplicative accumulation'), advantaged children have higher average levels of socio-emotional skills and higher returns to these skills. In the third scenario ('compensatory accumulation') advantaged children have higher average levels of socio-emotional skills, but lower returns to these skills. We do not discuss potential scenarios in which advantaged children have lower average levels of socio-emotional skills, because the positive association between family socio-economic status and socio-emotional learning is well-established in the empirical literature. Moreover, in line with the literature, each of the three scenario's assumes a positive association between socio-emotional skills and learning outcomes. In the following sections, we discuss the theoretical and empirical support for each of the three scenarios.

⁶ The naming of the scenarios is based on Erola & Kilpi-Jakonen (2017), p. 7

Figure 1: Stylized illustration of the three conceptual scenarios

Note: These stylized illustrations assume that socio-emotional skills are standardized within countries, as is the case in our empirical analysis. Please note that that total socioeconomic gap in learning outcomes is the same in each of the three scenarios. The three components (endowment, intercept and returns) do not necessarily add up to the total gap because of the interaction component, which is not shown here.

Scenario 1: Simple accumulation

In the first scenario (illustrated in the top panel in Figure 1), socioeconomically advantaged children have higher average levels of educationally relevant socio-emotional skills (indicated on the x-axis), and similar return to these skills (as indicated by the parallel slopes of the regression lines for advantaged and disadvantaged children). Socio-emotional skills therewith contribute to learning inequality through endowment effects: if disadvantaged children had the same average levels of socio-emotional skills as advantaged children, the gap would be reduced. The idea that socioeconomic gaps in learning outcomes are reinforced by differences in socio-emotional skills is also known as ‘structural amplification’ (Ross and Mirowsky 2011; Shanahan et al. 2014). Figure 1 also displays a substantial unexplained gap in learning outcomes, which is reflected in the difference between the intercepts. Because socio-emotional skills are standardized within countries, this unexplained gap represents the difference in predicted learning between an advantaged and a disadvantaged child with a country-average level of socio-emotional skills. Because the returns effect is 0 in this scenario, the total explained gap is equivalent to the endowment effect.

The strength of compositional effect, in turn, depends on two factors: the difference in average levels of socio-emotional skills between advantaged and disadvantaged children, and the (causal) effect of socio-emotional skills on learning outcomes. Since we have discussed the evidence for the latter in a previous section, we will focus on the former here. The extent to which children from different socio-economic backgrounds differ in their levels of socio-emotional skills is an interesting question in itself, especially among the age group considered in this study. The available evidence shows a robust positive association between socio-economic status and socio-emotional skills—including self-confidence, impulse control, self-efficacy, and motivation—in a range of contexts, including the United States, rural China, Germany, the United Kingdom, Ethiopia, Vietnam, Peru, and India (Attanasio et al. 2020; Borghans et al. 2008; Cunha and Heckman 2007; Dercon and Krishnan 2009; Falci 2011; Holtmann et al. 2021; Leight and Liu 2020). Gronqvist et. al (2010) found that socio-emotional skills are transmitted from parents to children to the same extent as cognitive skills.

There are three main explanations for the positive association between family SES and socio-emotional skills. First, the childhood environments of socioeconomically advantaged children tend to more conducive to the development of socio-emotional skills (Yeung, Linver, and Brooks-Gunn 2002). This refers primarily to the family environment but can also include the

neighborhood and the school (Jennings and DiPrete 2010). Conversely, children who grow up in poverty are more likely to experience parental absence, stressful family events, and economic hardship, all which make it more difficult to develop favorable social and emotional skills (Borghans et al. 2008; McLanahan and Percheski 2008). Second, middle class parents actively cultivate educationally relevant socio-emotional skills in their children. Child development, including the development of social and emotional skills, is strongly dependent on parenting style and other parental inputs, which are known to differ by class (Bodovski and Farkas 2008; Lareau 2003). For example, middle-class children are more likely to participate in organized extracurricular activities that provide opportunities for skill development (Weininger, Lareau, and Conley 2015). Calarco (2014) showed how middle-class parents deliberately ‘coach’ their children to acquire skills and attitudes that are valued by teachers. They may also send their children to schools that are more conducive to fostering socio-emotional skills. Third, children’s self-image and perceived efficacy depend on their relative social position and the corresponding opportunities for personal development and status attainment (Boyden, Dercon, and Singh 2015; Hitlin and Johnson 2015). The experience of (relative) poverty may therefore result in disillusionment and lower socio-emotional skills.

In addition to the positive association between SES and socio-emotional skills, the ‘simple accumulation’ scenario assumes that the returns to socio-emotional skills are similar for advantaged and disadvantaged children. There is some evidence to suggest that socio-emotional skills work in approximately the same way for all children, regardless of their class background. For example, Destin et al. (2019) found that the association between growth mindset and academic achievement was similar for low- and high-SES children. Moreover, based on a sample of 81,000 US high school students, Damian et al. (2015) concluded that the effect of personality traits on status attainment is largely independent of family background. However, there is also empirical and theoretical evidence for either compensatory or multiplicative effects of socio-emotional skills, as we will discuss in the following scenarios.

Scenario 2: Multiplicative accumulation

In addition to their higher average levels of socio-emotional skills, it is possible that socioeconomically advantaged children experience higher returns to these skills, so that the achievement gap increases with levels of socio-emotional skill. This scenario, which can be

described as a Matthew effect (Merton 1968) or as multiplicative accumulation (Erola and Kilpi-Jakonen 2017), is illustrated in the second panel of Figure 1.

Multiplicative effects occur when socio-economically advantaged children have more opportunities to convert their socio-emotional skills into educational performance. High-SES children may be better at translating their intentions into academic outcomes, for example, because they have better access to study resources (time, books and other educational materials, a quiet place to study, adults to provide feedback etc.). Conversely, a poor child with high levels of motivation and a positive mindset might still be thwarted in their efforts because of a lack of these resources—for example, because their parents are unable to help them with homework, or because they need to perform household chores or paid work. Schoon & Heckhausen (2019) argued that “agency is less effective in situations where the socio-economic risks are over-powering” (p. 144). As an illustration, imagine a child attending a low-quality school with underqualified and demotivated teachers, having to work long hours after school to contribute to the family income. It is plausible that such deprived conditions would result in poor school results regardless of the child’s level of determination, self-esteem, and other positive characteristics. This notion is supported by Deluca and Rosenbaum (2001), who found that the relationship between school effort and educational attainment is weaker for low-SES students than for their high-SES peers (see also Gil-Hernández 2021). Similarly, Yeager et al. (2019) found that their growth mindset intervention was only successful in schools where peer norms were supportive of challenge-seeking. They hypothesized that students in unsupportive peer climates “risked paying a social price for taking on intellectual challenges in front of peers who thought it undesirable to do so” (p. 368).

In the multiplicative accumulation scenario, efforts to increase SEL will be less effective for disadvantaged children. If an intervention were to succeed in improving socio-emotional skills across the board, it would also increase inequality, because high-SES children benefit more from a similar increase in than low-SES children.

Scenario 3: Compensatory accumulation

When socio-emotional skills produce higher academic returns for socioeconomically disadvantaged students, the achievement gap narrows with higher levels of socio-emotional skills: this is the scenario described as ‘compensatory accumulation’ in Figure 1 (bottom panel). For example, it could be that disadvantaged children have lower levels of resilience

than their wealthier peers, but that resilience is more important to their learning outcomes. This is the scenario envisioned in many SEL interventions, which are often assumed to be particularly beneficial for children from disadvantaged backgrounds (e.g. AEI/Brookings Working Group on Poverty and Opportunity 2015; Yeo and Graham 2015).

The resource substitution hypothesis (Ross and Mirowsky 2011; Shanahan et al. 2014) suggests that socio-emotional skills are more important for children with lower levels of socio-economic resources. It assumes that underprivileged children can compensate for a lack of social and economic capital through a growth mindset, a positive work attitude and similar socio-emotional characteristics. Conversely, it is plausible that high-SES children are more protected from the negative effects of lacking socio-emotional skills, because they have alternative sources of support and motivation to fall back on. There is considerable empirical support for this scenario. For example, Shanahan et al. (2014) found that youth from less educated parents benefit to a greater degree from valued personality characteristics, but they are less likely to possess such characteristics. They describe this scenario as ‘resource substitution with structural amplification’. Also, Liu (2020) observed a negative interaction between socio-emotional skills and family SES, wherein the academic performance of children with high socio-emotional skills is less affected by their socio-economic status. Finally, Claro et al. found that growth mindset is more predictive of academic success for low-income students, stating that “a fixed mindset is more debilitating (and a growth mindset is more protective) when individuals must overcome significant barriers to succeed” (2016:8667).

Context specificity

It is plausible that the relationship between relationship between family background, socio-emotional skills, and learning may be context dependent. For example, it is often suggested that socio-emotional skills and academic motivation are less stratified by social class in East Asian societies (Lee and Zhou 2015; Liu and Xie 2016). This would imply a smaller—or even absent—endowment effect in Asian societies. It is also possible that skills and attitudes such as fear of failure and competitiveness will be valued differently in individualistic societies, compared to more collectivist ones, leading to differences in the size and/or direction of the return effects. This suggests that effects of socio-emotional skills may vary systematically between global cultural regions. On the other hand, Bandura (2002) argues that the effect of self-efficacy on performance is independent of the cultural context.

Secondly, it is possible that the effects of socio-emotional skills and their association with SES and learning outcomes may depend on the country's overall level of economic development. The group defined as disadvantaged in our study—the bottom SES quartile—will be more deprived in absolute terms in lower-income societies, where malnutrition, preventable diseases, and other poverty-induced stressors remain prevalent among the most disadvantaged children. Prolonged exposure to such compounding risks can overwhelm children and stifle their social and emotional development (Boyden et al. 2015; Dercon and Krishnan 2009). This may entail wider SES gap in socio-emotional skills in lower-income countries, which may result in larger compositional effects. The returns to socio-emotional skills may also be lower for children living in absolute poverty and deprivation, in line with the multiplicative accumulation scenario. These comparisons remain exploratory, because we have little empirical evidence to hypothesize about the differential role of socio-emotional skills in various global contexts.

Methods

Data and measures

The Programme for International Student Assessment (PISA) is a school-based survey that takes place every three years. It has historically focused on providing standardized, internationally comparative measures of competence in mathematics, reading, and science, and is widely used for assessing inequalities in learning. We use the PISA 2018 dataset (released in December 2019) which covered 78 countries and was the first to include a comprehensive set of psychometrically validated socio-emotional skills (OECD 2019a). PISA provides nationally representative data on the learning outcomes and socio-economic backgrounds of 15-year-olds who are enrolled in school. The only exceptions to this are China, which only surveyed four higher-income provinces, and Azerbaijan, which only surveyed the capital Baku—findings for these countries should therefore be interpreted with caution⁷.

In our empirical analyses, we dropped four countries that did not administer the full set of socio-emotional skill questions, as well as the 50% of children that were neither socioeconomically advantaged nor disadvantaged (see below). Of the remaining sample, a further 34,818 observations (12.3%) were dropped due to item non-response. Our analytical sample therewith consists of 248,375 students in 74 countries.

⁷ Our main findings and conclusions are robust to the exclusion of China and Azerbaijan.

Our primary outcome variable was students' science test score, which is standardized across countries to have mean of 500 and a standard deviation of 100. To define socioeconomic status, we used PISA's Index of Economic, Social and Cultural Status (ESCR), which combines information on the social, financial, human, and cultural resources of students' households. We followed the OECD in defining the top quartile of the ESCR distribution within each country as 'socioeconomically advantaged' and the bottom quartile as 'socioeconomically disadvantaged' (OECD 2019:55). The labels 'advantaged' and 'disadvantaged' thus refer to the relative socio-economic standing of children's households within their countries, rather than to absolute standards of poverty or wealth.

We considered five socio-emotional skills, which were included in the PISA survey because of their relevance to educational attainment and achievement. Each of these indicators have been extensive tested for cross-cultural compatibility and internal consistency (see Appendix A for more details). All of the socio-emotional indicators are standardized within countries.

Self-efficacy was measured with five Likert scale items focusing on students' perception about their general competence, especially in the face of adversity (example: "My belief in myself gets me through hard times") (please refer to Appendix A for a full list of items). This skill is closely related to the concepts such as resilience or 'grit', which is defined as "the perseverance and passion for achieving long-term goals" (Duckworth 2016:21).

Fear of failure is the "general tendency to self-protectively avoid potential mistakes and failures because they are experienced as shameful" (OECD 2019a:230). Fear of failure can serve as an extrinsic motivation for learning but may also be harmful to performance if it leads students to avoid potentially challenging tasks. It was measured with three items (example: "When I am failing, I worry about what others think of me").

Work mastery reflects students' "dispositional desire to work hard to master tasks" (OECD 2019a:230) which is considered an intrinsic motivation for learning. The definition of this variable in PISA has much in common with the 'big five' personality trait conscientiousness, which is strongly related to behaviors such as hard work, ambition, and self-discipline (Meyer et al. 2019). It was measured by four items (example: "If I am not good at something, I would rather keep struggling to master it than move on to something I may be good at").

Competitiveness reflects the "dispositional desire to outperform others" (OECD 2019a:230) which can be an extrinsic motivation for performance. It was measured with three items (example: "It is important for me to perform better than other people on a task").

Growth mindset, also known as an ‘incremental mindset’, was measured using a single item measured on a 4-point Likert scale: “Your intelligence is something about you that you can’t change very much”. This item was converted to a binary variable where students who (strongly) agreed with the statement are considered to have a fixed mindset, while those who (strongly) disagreed with the statement were considered to have a growth mindset. Across the PISA countries, 55% of respondents had a growth mindset.

Empirical Approach

Counterfactual decomposition techniques can help us to understand the sources of between-group inequality. To assess the extent to which the socioeconomic achievement gap in PISA science scores is explained by socio-emotional skills, we employ the well-known Kitagawa-Oaxaca-Blinder (KOB) decomposition (Kitagawa 1955; Oaxaca 1973). The KOB method decomposes the achievement gap into four components: 1) a component resulting from differences in the intercepts between the two groups (intercepts component) 2) a component explained by differences in the returns to socio-emotional skills (returns component) 3) a component explained by compositional differences in socio-emotional skills (endowment component) and 4) a component resulting from the interaction between endowments and returns (interaction component). The decomposition can be written as

$$\underbrace{\bar{Y}^A - \bar{Y}^D}_{gap} = \underbrace{(\hat{a}^A - \hat{a}^D)}_{intercepts} + \underbrace{(\hat{\beta}^A - \hat{\beta}^D)\bar{x}^P}_{returns} + \underbrace{(\bar{X}^A - \bar{X}^D)\hat{\beta}^P}_{endowments} + \underbrace{(\hat{\beta}^A - \hat{\beta}^D)(\bar{X}^A - \bar{X}^D)}_{interaction} \quad (1)$$

Where $\bar{Y}$ stands for the mean PISA science score, $\bar{X}$ contains the mean values of the explanatory variables, and $\hat{\beta}$ are the estimated regression coefficients for each group, where A indicates the group of socioeconomically advantaged children, and D indicates the group of disadvantaged children. The returns, endowment, and interaction components can be further decomposed into the contributions of each explanatory variable (Jann 2008).

The endowment (or compositional) component is based on a counterfactual scenario in which disadvantaged students are assigned the same average levels of socio-emotional skills as advantaged children, but retain their own intercept and coefficients (essentially, this entails a shift along the ‘advantaged’ regression line in Figure 2). The extent to which this improves their predicted learning outcomes depends on 1) the size of the socioeconomic gap in socio-emotional skills and 2) the strength of the association between non-cognitive skills and learning outcomes for disadvantaged children. Many SEL interventions with marginalized children are

based on this logic: by improving disadvantaged children's social and emotional skills, such as self-efficacy and growth mindset, they seek to improve their educational performance and reduce the gap with their wealthier peers. Each of our conceptual scenarios (simple accumulation, multiplicative accumulation, and compensatory accumulation) assumes a positive endowment effect.

The returns (or coefficient) component relies on a counterfactual scenario in which disadvantaged children are assigned the returns to socio-emotional skills that have been observed in advantaged children. In Figure 2, this entails shifting the slope of the regression line, while keeping its intercept in place. In the 'simple accumulation' scenario the returns effect is 0, because advantaged and disadvantaged children have the same returns to socio-emotional skills (indicated by the parallel regression lines). In the 'compensatory accumulation' scenario the returns effect is positive: if disadvantaged children were assigned the (lower) returns of their wealthier peers, this would increase their predicted performance. The reason is that disadvantaged children are assumed to have below-average socio-emotional skills, so that attaching increased importance to these skills would be detrimental to their performance, relative the reference category (children with country-average socio-emotional skills). In the 'multiplicative accumulation' scenario the opposite occurs: assigning the disadvantaged group the (higher) coefficients of the advantaged group reduces their predicted performance, leading to a negative returns component.

A well-known problem in KOB decompositions is that the size and composition of the returns component is dependent on the choice of the reference category, or the zero point for scale variables (Fortin, Lemieux, and Firpo 2011; Jones and Kelley 1984). However, Kim (2013) states that "any detailed decomposition method is acceptable as long as there are theoretical or practical reasons to believe that the researcher's choice of reference group (or weighting factors) produces a meaningful decomposition result" (p. 358). In our case, standardizing the socio-emotional skill variables within countries makes sense because it gives an intuitive interpretation to the intercept component: it is the average difference in learning outcomes between an advantaged and a disadvantaged child with country-average levels of socio-emotional skills. It is likely that socio-emotional skills can only explain part of the achievement gap in learning outcomes, so that an unexplained component remains even after accounting for the effects of socio-emotional skills. The intercept component—the part of the gap that is due to 'group membership' (Jann 2008)—can be interpreted as the group difference in learning outcomes that is due to factors other socio-emotional skills. These may include differences in

school quality, the home environment, innate ability, or any other variables not included in the model.

Finally, the interaction effect accounts for the possibility that cross-group differences in endowments and coefficients can occur simultaneously. It reflects the incremental change in the gap that would occur if the disadvantaged group were assigned the levels and returns to socio-emotional skills of the advantaged group, over and above the ‘pure’ endowment and returns effects (Jones and Kelley 1984).

Importantly, our conceptual scenarios presume the existence of a causal relationship between socio-emotional skills and learning outcomes. If socio-emotional skills are unrelated to PISA test scores, or if the observed relationship is spurious, then socio-emotional skills cannot explain group differences in learning. KOB decompositions only have a causal interpretation under the strict assumption that the underlying relationships are themselves causal (Jackson and VanderWeele 2018). As we have explained previously, however, cross-sectional associations between socio-emotional skills and academic performance may be affected by reverse causality and omitted variable bias. Reverse causality occurs when academically gifted children develop more positive socio-emotional traits and attitudes, a scenario that is intuitively plausible and has been observed in previous research (Borghans et al. 2008; Gonida et al. 2006; Rosenberg et al. 1995). Omitted variable bias occurs when socio-emotional skills serve as a proxy for unobserved factors—such as parenting styles or school-level factors—that exert causal effect on learning outcomes.

We therefore interpret both the compositional and the returns effects as upper bounds on the true or causal share of the socioeconomic achievement gap that is explained by the socio-emotional skills included in our model. This upper bound interpretation is warranted because both reverse causality and omitted variable bias inflate the contribution of socio-emotional skills to learning inequality. It is therefore plausible to assume that the true contribution is lower than what is observed in our cross-sectional decomposition. An upper bound interpretation can be substantively meaningful, especially if the upper bound is fairly low—as is the case in our findings.

We started the empirical analysis by calculating the abovementioned KOB decomposition across all countries in our sample. In all our analyses we used the plausible values, replicate weights and sample weights as recommended by PISA (OECD 2021). We applied PISA’s senate weight, which gives equal weight to each country, and standardized each of the

explanatory variables within countries. This means that we seek to explain the socioeconomic achievement gap within each country. Our aggregate estimates can be interpreted as averages across the 78 countries. These averages may hide important country- and regional-level heterogeneity, however, which is why we repeated the analyses using groups of countries as well as for each country individually. In line with our substantive interest, country groups were defined by cultural regions (West, East Asia, Latin America, and Middle East & North Africa) and GDP categories (lower middle, upper middle, and high income). Finally, we checked the robustness of our findings to using a different measure of learning outcomes (reading and mathematics scores) and different specifications of the ‘advantaged’ and ‘disadvantaged’ groups. In both cases, the results did not change substantively.

Results

We start by presenting the findings for the full the PISA sample. Country-level differences have been averaged out by standardizing all variables within countries. Across all countries, the average difference in PISA science scores between disadvantaged (bottom SES quartile) and advantaged (top SES quartile) children is 70.5 points (0.71 SD): this is the ‘gap’ we are seeking to explain. In practical terms, 0.71 SD is a very large gap, equivalent to almost three years of schooling (Avvisati and Givord 2021).

The Oaxaca decomposition is based on 1) group differences in the means of the explanatory variables and 2) group differences in the coefficients of the explanatory variables when regressing science scores on socio-emotional skills separately for each SES group. These constitutive elements of the decomposition are presented in Figure 1. The figure shows that, on average, advantaged children had higher levels of socio-emotional skills than disadvantaged children. The difference is 0.036 SD for fear of failure, 0.22 SD for competitiveness, 0.24 SD for work mastery and 0.31 SD for self-efficacy (remember that all socio-emotional skills are standardized within countries). Advantaged children were also 12.6 percentage points more likely to have a growth mindset (a binary variable). Although these differences are substantial and significant, they are relatively smaller than the socioeconomic achievement gap in science scores, which was 0.74 SD. The SES gap in socio-emotional skills is thus much smaller than the SES gap in cognitive skills, a finding that is in line with previous research (Hsin and Xie 2017). It is also important to remember that overall agreement with the statements underlying these skills was quite high for both advantaged and disadvantaged children.

Figure 2: Means and coefficients of socio-emotional skills, by SES group

The bottom panel of Figure 2 shows the returns to socio-emotional skills for each group. Each of the socio-emotional skills had a positive and significant effect on science scores, controlling for all other skills. Differences in the returns between advantaged and disadvantaged children show a mixed picture: self-efficacy and fear of failure had a somewhat larger association with learning outcomes for advantaged children, whereas work mastery and growth mindset were

more beneficial to disadvantaged children. The most striking result here is the coefficient of growth mindset (a binary variable) which is associated with the 33 point (0.33 SD) increase in science scores for disadvantaged children and a 23 point (0.23 SD) increase for advantaged children. This is a very large effect: as a comparison, the effect of a standard deviation increase in household socio-economic status (ESCS) is around 30 points. For the other socio-emotional skills, the effects were more modest, ranging between +1 and +10 points for a standard deviation increase in the respective variable. Our findings thus confirm previous studies that highlighted the positive associations between socio-emotional skills and learning outcomes; but we find no consistent pattern in the relative importance of these skills for socioeconomically advantaged and disadvantaged children.

Table 1: KOB decomposition of the socioeconomic gap in science scores, all PISA countries

	Aggregate	Detailed
Overall		
Advantaged (top 25% SES)	506.7***	506.7***
Disadvantaged (bottom 25% SES)	432.3***	432.3***
Difference	74.42***	74.42***
Endowments	7.296***	7.296***
Returns	68.55***	68.55***
Interaction	-1.428***	-1.428***
Endowments		
Socio-emotional skills:	7.296***	
Self-efficacy (st.)		0.337**
Competitiveness (st.)		0.848***
Fear of failure (st.)		0.0476**
Work mastery (st.)		1.956***
Growth mindset (centered)		4.107***
Returns		
Socio-emotional skills:	0.681***	
Self-efficacy (st.)		-0.209**
Competitiveness (st.)		0.0527
Fear of failure (st.)		-0.0404**
Work mastery (st.)		0.304***
Growth mindset (centered)		0.574***
Intercept	67.87***	67.87***
Interaction		
Socio-emotional skills:	-1.428***	
Self-efficacy (st.)		0.462**
Competitiveness (st.)		-0.114
Fear of failure (st.)		0.112***
Work mastery (st.)		-0.683***
Growth mindset (centered)		-1.205***
Observations	248,375	248,375

Based on the differences in means and coefficients, we calculated the KOB decomposition of the socioeconomic achievement gap in science scores (presented in Table 1). Across all countries, the average gap in science scores between advantaged and disadvantaged children was 74.4 points. The table shows that 7.3 of this 74.4-point gap (9.8%) was due to compositional differences in socio-emotional skills ($p < 0.001$, confidence interval: 9.4% – 10.3%). Endowment effects occur when advantaged students perform better than disadvantaged students because they have, on average, higher academically relevant socio-emotional skills.

Returns effects occur when low- and high-SES students differ in their ability to convert socio-emotional skills into achievement. Differences in the returns to socio-emotional skills explained only a relatively insubstantial 0.68 points, or 0.92% of the socioeconomic gap in learning outcomes ($p < 0.001$, confidence interval: 0.64% – 1.19%). The interaction between endowments and returns explained -1.43 points (-1.92%) of the achievement gap. The negative figure suggests that the interaction worked to the advantage of the advantaged group.

In combination, endowments, returns and their interaction therefore explain 8.8% (9.8% + 0.9% – 1.9%) of the socioeconomic achievement gap. This 8.8% should be interpreted as an upper bound on the 'true' explained gap, because there is likely to be a certain amount of reverse causality in the effect of socio-emotional skills on learning outcomes, as well as unobserved confounding. Conversely, 91.2% of the gap (67.9 science points) remains unexplained, which equates to the intercept component in Table 1. As discussed previously, the intercept component reflects the difference in predicted science score between an advantaged and a disadvantaged child with country-average levels of socio-emotional skills. We interpret this as the share of the achievement gap that is due to factors unrelated to the socio-emotional skills that were assessed in this study. Such factors may include differences in innate ability; structural characteristics such as differences in school fundings, access extracurricular tuition, and teacher bias; as well as factors that are typically perceived as cultural, such as parenting styles, aspirations, and classroom behaviours.

Figure 3: Predicted science scores under different counterfactual scenarios (full sample)

Figure 3 illustrates the different counterfactual scenarios implied in the KOB decomposition: if disadvantaged children were to obtain the same levels of socio-emotional skills as advantaged children, while keeping their own returns, their performance in science would improve marginally. If they obtained the same returns to socio-emotional skills, while keeping their levels constant, this would hardly affect their performance at all. Finally, assigning the advantaged group's levels and returns to socio-emotional skills simultaneously still does not place the disadvantaged group anywhere near the advantaged group, suggesting that most of the gap is due to factors unrelated to socio-emotional skills.

The detailed decomposition allows us to assess the contribution of individual skills to the aggregate endowment and returns components. Table 1 shows that more than half of the compositional effect (4.1 points) was due to differences in growth mindset, which is followed by work mastery (2.0 points). This is because levels of growth mindset and work mastery differ substantially between advantaged and disadvantaged children, and both variables are positively correlated with learning outcomes (see Figure 2). Differences in fear of failure, on the other hand, were minimal, and as a result this variable hardly contributes to the endowment component. The aggregate returns effect, itself very small, resulted from minor differences in the returns to growth mindset, work mastery, and competitiveness.

Context specificity

The abovementioned findings represent averages across the 78 PISA countries. As discussed previously, however, the role of socio-emotional skills in learning inequality may differ between cultural regions, or between lower and higher income countries. Table 2 shows the aggregate KOB results with countries grouped by cultural region.

Table 2: Aggregate decomposition results, by country groupings

	Total gap	Endowments (%)	Returns (%)	Interaction (%)	Intercepts (%)
All countries	74.4	9.8	0.9	-1.9	91.2
East Asia	69.5	10.3	2.0	-4.4	92.1
Western	80.2	8.5	0.9	-1.7	92.4
Latin America	77.4	14.6	-0.8	1.8	84.4
MENA	73.0	10.8	-0.3	0.5	89.0
High income	80.6	9.3	1.1	-2.3	91.8
Upper middle income	65.5	10.2	0.6	-1.4	90.5
Lower middle income	72.7	15.9	-2.0	4.8	81.2

Note: Based on the KOB decompositions presented in Appendix D. MENA=Middle East & North Africa.

Strikingly, the socioeconomic gap in learning outcomes was relatively stable across regions, ranging from 69.5 points in East Asia to 80.2 points in Western countries. The role of socio-emotional skills in explaining this gap was also relatively similar in each of these regions: differences in returns played a minor role, while differences in the levels of socio-emotional skills explained a small but significant share of the gap, ranging from 8.5 points in the West to 14.6 points in Latin America. The total share of the socioeconomic gap in science achievement that was explained by the five socio-emotional skills amounted to 7.9% in East Asia, 7.6% in the West, 15.6% in Latin America, and 11.0% in the Middle East & North Africa. The detailed decompositions (presented in Appendix D) show that in each of the four regions, socio-economic differences in growth mindset made the largest contribution.

Differences in economic development might also affect the relative importance of socio-emotional skills in learning inequality. Table 2 summarizes the aggregate decomposition by World Bank income groups (high income, upper middle income, and lower middle income). Again, most of the explained achievement gap was due to socioeconomic differences in the levels of socio-emotional skills—growth mindset in particular—rather than to divergent

returns. The total share of the achievement gap in science achievement that was explained by compositional differences in socio-emotional skills amounted to 9.3% in high-income countries, 10.2% in upper middle-income countries, and 15.9% in lower middle-income countries. This provides tentative evidence that socio-economic differences in socio-emotional skills are larger in lower-income contexts, contributing to learning inequality. This may relate to the detrimental impact of absolute poverty and deprivation—which is likely to be more prevalent in lower-income countries—on social and emotional development (Boyden et al. 2015; Dercon and Krishnan 2009). It must be noted, however, that our sample only included five lower-middle income countries (Philippines, Ukraine, Moldova, Indonesia, and Morocco). We also performed the decomposition analysis for each country individually (presented in Appendix E). The individual-country analyses did not provide major deviations from the general pattern of modest compositional components and small returns components.

Table 3: Robustness checks

	Total gap	Endowments (%)	Returns (%)	Interaction (%)	Intercepts (%)
Original specification	74.4	9.8	0.9	-1.9	91.2
Socioeconomic groups:					
Top and bottom 10%	98.1	9.6	1.3	-2.7	91.8
Top and bottom 50%	46.7	10.1	0.4	-0.9	90.4
Outcome variable:					
Reading scores	77.9	10.7	1.0	-2.2	90.5
Math scores	76.1	9.5	1.2	-2.5	91.9

Note: Based on the KOB decompositions presented in Appendix B (socio-economic groups) and Appendix C (outcome variables)

Robustness checks

It could be argued that using the top and bottom quartile of the SES distribution to define ‘advantaged’ and ‘disadvantaged’ children is somewhat arbitrary, and it is possible that our results would change if we looked at the extreme ends of the socioeconomic distribution, or if we enlarged the groups. We therefore repeated the overall decomposition using two different specifications for the SES groups: the top and bottom decile, and the top and bottom half of the

SES distribution. In each of the three specifications, around 10% of the achievement gap was explained by compositional differences in socio-emotional skills, with the return and interaction components playing a relatively marginal role (see Table 3). We also checked whether our findings would be affected by using reading or mathematics performance as an outcome variable instead of science (Table 3). Again, the results were very similar for each of the three learning outcomes, strengthening the robustness of our main conclusions.

Discussion

The purpose of this study was to assess the extent to which socio-emotional skills (also known as non-cognitive skills) can explain the well-known gap in academic performance between low- and high-SES children. We developed three conceptual scenarios for the relationship between family background, socio-emotional skills, and learning outcomes: simple accumulation, multiplicative accumulation, and compensatory accumulation. Each of these scenarios is grounded in theory and supported by at least some of the empirical evidence.

Our empirical estimates, based on a counterfactual KOB decomposition, show that the observed socio-emotional skills make a modest contribution to socio-economic achievement inequality. We found that several of the socio-emotional skills measured in PISA—growth mindset in particular—have a strong association with learning outcomes. In combination, however, these skills explain no more than 8.8% of the socio-economic gap in learning outcomes, equivalent to 6.6 points in the PISA science test.

Most of this effect was due to compositional differences in the levels of socio-emotional skills between socioeconomically advantaged and disadvantaged children (simple accumulation). We found no evidence for either cumulative accumulation or compensatory accumulation: instead, disadvantaged children derived relatively similar academic returns from socio-emotional skills as advantaged children. This observation runs counter to the widely held assumption that social and emotional skills are particularly important and beneficial for socio-economically disadvantaged children, which underpins many SEL programs in the United States and elsewhere (e.g. AEI/Brookings Working Group on Poverty and Opportunity 2015).

The explained share of the learning gap is modest because differences in socio-emotional skills between the low- and high-SES groups are not that large: both display relatively high levels of school-relevant socio-emotional skills. For example, 84% of disadvantaged children and 90%

of advantaged 15-year-olds across the 78 countries (strongly) agreed with the statement “I feel proud that I have accomplished things”. This suggests that even young people growing up in difficult circumstances generally develop a sense of personal agency and accomplishment.

Moreover, we argue that the compositional and the returns effects observed in our counterfactual model represent an upper bound on the ‘true’ or causal share of the socioeconomic learning gap that is explained by the socio-emotional skills included in our model. We are unable to provide a more precise causal estimate because we are unable to rule out omitted variable bias and reverse causality. Potential omitted variables include parenting practices—to the extent that they are independent of SES—as well as school-level inputs that simultaneously increase socio-emotional skills and learning outcomes. Reverse causality occurs when high-achieving children develop more favorable socio-emotional skills—such as growth mindset and self-efficacy—through processes of positive reinforcement. Importantly, however, both omitted variable bias and reverse causality inflate the importance of socio-emotional skills, which is why we can interpret our estimate it as an upper bound on the underlying causal estimand.

In interpreting these conclusions, a number of limitations should be kept in mind. Our upper bound interpretation of the explained socioeconomic achievement gap would be violated if we had excluded certain socio-emotional skills that are highly correlated with SES and have a strong causal effect on learning outcomes. Over the years, educational psychologists have come up with a wide range of skills or traits that are considered to be important for learning outcomes, and not all of them are measured in PISA. However, the PISA questionnaires were designed to include a comprehensive set of the most learning-relevant socio-emotional skills (OECD 2019a). Skills that were not included in PISA—such as ‘grit’—tend to be strongly correlated with included skills like work mastery and self-efficacy (Usher et al. 2019), so that their omission is unlikely to dramatically affect the results. In light of the possibility, however, we emphasize that the upper bound interpretation applies only to the socio-emotional skills included in our model. A second potential limitation is structural measurement error in the socio-emotional skills variables. Respondents might provide excessively positive responses to questions about their psychological dispositions, either out of social desirability or because of self-deception (Borghans et al. 2008). It is important to note, however, that this would only affect our results if the degree of ‘faking’ differed between low- and high-SES students.

These limitations, however, do not diminish our core finding that socio-emotional skills explain at most a small share of the learning gap between high- and low-SES children. This finding has major policy implications. Most importantly, it suggests that SEL-type interventions are unlikely to achieve their stated goal of substantially reducing achievement gaps. Even if such interventions were able to close the socioeconomic gap in socio-emotional skills—which is unlikely, considering the myriad ways in which children’s social and emotional development is linked to social origins—this would reduce the learning gap by no more than 8.8%.

Our findings therewith challenge some of the more sweeping claims in the popular psychological literature, which sometimes appears to suggest that educational success is simply a question of mindset and attitude (Duckworth 2016; Dweck 2007). This literature often disregards class- and poverty-related constraints, which operate not only through socio-emotional skills but also through the (lack of) support from family and peer groups, the unequal distribution of educational resources, outright discrimination, and several other channels. This is not to say that social and emotional skills are not important: they have a deep intrinsic value, and we found that several of them show remarkably large correlations with learning outcomes. Unfortunately, however, they are not a magic bullet for tackling the socioeconomic achievement gap.

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Appendix A: Measurement of Socio-Emotional Skills

The socio-emotional skill variables used in this study are composite indicators provided by PISA. The underlying questionnaire items (measured on a Likert scale) are provided in Table A1. Cronbach Alpha figures within countries ranged from 0.64 to 0.91, suggesting strong internal consistency.

Table A1: Questionnaire items underlying the socio-emotional constructs in PISA 2018

Indicator	Items	Cronbach's Alpha
Self-efficacy	<ul style="list-style-type: none"> • I usually manage one way or another • I feel proud that I have accomplished things • I feel that I can handle many things at a time • My belief in myself gets me through hard times • When I'm in a difficult situation, I can usually find my way out of it 	.65-.90
Competitiveness	<ul style="list-style-type: none"> • I enjoy working in situations involving competition with others • It is important for me to perform better than other people on a task • I try harder when I'm in competition with other people 	.69-.91
Fear of failure	<ul style="list-style-type: none"> • When I am failing, I worry about what others think of me • When I am failing, I am afraid that I might not have enough talent • When I am failing, this makes me doubt my plans for the future 	.67-.89
Work mastery	<ul style="list-style-type: none"> • I find satisfaction in working as hard as I can • Once I start a task, I persist until it is finished • Part of the enjoyment I get from doing things is when I improve on my past performance • If I am not good at something, I would rather keep struggling to master it than move on to something I may be good at. 	.64-.89
Growth mindset	<ul style="list-style-type: none"> • Your intelligence is something about you that you can't change very much 	-

Different socio-emotional skills tend to be positively correlated (see Table A2), but the weak to moderate strength of the correlations (-.09 to .43) suggests they tap into different underlying constructs.

Table A2: Pairwise correlation between socio-emotional constructs

	Self- efficacy	Competitive ness	Fear of failure	Work mastery	Growth mindset
Self-efficacy	1.000				
Competitiveness	0.324***	1.000			
Fear of failure	-0.092***	0.097***	1.000		
Work mastery	0.430***	0.378***	0.070***	1.000	
Growth mindset	0.039***	-0.009***	-0.103***	0.052***	1.000

Appendix B: Different specification of socio-economic groups

Table A3: KOB decomposition of science scores using different specifications of socioeconomic (dis)advantage

	Top and bottom 10%		Top and bottom 50%	
	Aggregate	Detailed	Aggregate	Detailed
Overall				
Advantaged	518.5***	518.5***	492.4***	492.4***
Disadvantaged	420.7***	420.7***	445.6***	445.6***
Difference	97.89***	97.89***	46.74***	46.74***
Endowments	9.578***	9.578***	4.737***	4.737***
Returns	91.14***	91.14***	42.41***	42.41***
Interaction	-2.823***	-2.823***	-0.413***	-0.413***
Endowments				
Socio-emotional skills:	9.578***		4.737***	
Self-efficacy (st.)		0.359		0.186***
Competitiveness (st.)		1.079***		0.552***
Fear of failure (st.)		0.0442		0.0545***
Work mastery (st.)		3.018***		1.208***
Growth mindset (centered)		5.078***		2.736***
Returns				
Socio-emotional skills:	1.372***		0.183***	
Self-efficacy (st.)		-0.252		-0.113**
Competitiveness (st.)		0.0552		0.00458
Fear of failure (st.)		-0.0738*		-0.0262***
Work mastery (st.)		0.645***		0.115***
Growth mindset (centered)		0.997***		0.202***
Intercept	89.77***	89.77***	42.23***	42.23***
Interaction				
Socio-emotional skills:	-2.823***		-0.413***	
Self-efficacy (st.)		0.586		0.242**
Competitiveness (st.)		-0.121		-0.0105
Fear of failure (st.)		0.151**		0.0635***
Work mastery (st.)		-1.431***		-0.262***
Growth mindset (centered)		-2.008***		-0.446***
Observations	97,559	97,559	488,024	488,024

Appendix C: Reading and Mathematics Scores as Outcome Variables

Table A2: KOB decomposition of the socioeconomic gap in math and reading scores, all PISA countries

	Math		Reading	
	Aggregate	Detailed	Aggregate	Detailed
Overall				
Advantaged (top 25% SES)	509.2***	509.2***	506.6***	506.6***
Disadvantaged (bottom 25% SES)	433.2***	433.2***	428.7***	428.7***
Difference	76.01***	76.01***	77.82***	77.82***
Endowments	7.319***	7.319***	8.478***	8.478***
Returns	70.82***	70.82***	71.26***	71.26***
Interaction	-2.138***	-2.138***	-1.918***	-1.918***
Endowments				
Socio-emotional skills:	7.319***		8.478***	
Self-efficacy (st.)		0.339**		0.324*
Competitiveness (st.)		1.275***		0.383***
Fear of failure (st.)		0.0168		0.189***
Work mastery (st.)		1.732***		2.924***
Growth mindset (centered)		3.956***		4.658***
Returns				
Socio-emotional skills:	1.008***		0.903***	
Self-efficacy (st.)		-0.185*		-0.146
Competitiveness (st.)		0.0806		0.134**
Fear of failure (st.)		-0.0277**		-0.0526***
Work mastery (st.)		0.321***		0.392***
Growth mindset (centered)		0.820***		0.576***
Intercept	69.82***	69.82***	70.35***	70.35***
Interaction				
Socio-emotional skills:	-2.138***		-1.918***	
Self-efficacy (st.)		0.405*		0.320
Competitiveness (st.)		-0.175		-0.290**
Fear of failure (st.)		0.0722***		0.137***
Work mastery (st.)		-0.714***		-0.872***
Growth mindset (centered)		-1.727***		-1.213***
Observations	244,071	244,071	244,071	244,071

Appendix D: KOB decompositions, by country groups

Table A3: KOB decomposition, by country income groups

	High income		Upper middle		Lower middle	
	Aggregate	Detailed	Aggregate	Detailed	Aggregate	Detailed
Overall						
Advantaged (top 25% SES)	533.4***	533.4***	468.0***	468.0***	455.0***	455.0***
Disadvantaged (bottom 25% SES)	452.8***	452.8***	402.4***	402.4***	382.2***	382.2***
Difference	80.63***	80.63***	65.54***	65.54***	72.73***	72.73***
Endowments	7.512***	7.512***	6.715***	6.715***	11.57***	11.57***
Returns	74.96***	74.96***	59.72***	59.72***	57.64***	57.64***
Interaction	-1.845***	-1.845***	-0.891*	-0.891*	3.524**	3.524**
Endowments						
Socio-emotional skills:	7.512***		6.715***		11.57***	
Self-efficacy (st.)		0.384*		0.303		0.676
Competitiveness (st.)		0.943***		0.805***		0.639
Fear of failure (st.)		0.305***		0.0586*		-
Work mastery (st.)		1.668***		1.966***		5.431***
Growth mindset		4.211***		3.583***		4.829***
Returns						
Socio-emotional skills:	0.919***		0.409*		-1.422*	
Self-efficacy (st.)		-0.255**		-0.130		0.285
Competitiveness (st.)		0.0805		0.135		-0.311
Fear of failure (st.)		-0.0372		0.0663*		-
Work mastery (st.)		0.294***		0.0812		1.231**
Growth mindset		0.837***		0.256*		-
Intercept	74.04***	74.04***	59.31***	59.31***	59.06***	59.06***
Interaction						
Socio-emotional skills:	-1.845***		-0.891*		3.524**	
Self-efficacy (st.)		0.557**		0.298		-0.598
Competitiveness (st.)		-0.169		-0.312		0.731
Fear of failure (st.)		0.0899*		-0.106*		0.00910
Work mastery (st.)		-0.626***		-0.209		-2.542**
Growth mindset		-1.698***		-0.561*		5.924***
Observations	151,347	151,347	86,401	86,401	10,627	10,627

Table A4: KOB decomposition, by global cultural regions

	East Asia		Western		Latin America		MENA	
	Aggregate	Detailed	Aggregate	Detailed	Aggregate	Detailed	Aggregate	Aggregate
Overall								
Advantaged (top 25% SES)	525.7***	525.7***	522.6***	522.6***	460.3***	460.3***	463.5***	463.5***
Disadvantaged (bottom 25% SES)	456.2***	456.2***	442.5***	442.5***	382.9***	382.9***	390.5***	390.5***
Difference	69.49***	69.49***	80.17***	80.17***	77.45***	77.45***	73.02***	73.02***
Endowments	7.130***	7.130***	6.784***	6.784***	11.32***	11.32***	7.908***	7.908***
Returns	65.40***	65.40***	74.75***	74.75***	64.73***	64.73***	64.77***	64.77***
Interaction	-3.042***	-3.042***	-1.361***	-1.361***	1.405*	1.405*	0.340	0.340
Endowments								
Socio-emotional skills:	7.130***		6.784***		11.32***		7.908***	
Self-efficacy (st.)		-0.915**		0.524***		0.142		1.907***
Competitiveness (st.)		0.716**		0.894***		0.933***		1.022***
Fear of failure (st.)		0.883***		0.0220		-0.0478		-0.0237
Work mastery (st.)		3.137***		1.753***		1.773***		1.756***
Growth mindset (centered)		3.309***		3.591***		8.517***		3.246***
Returns								
Socio-emotional skills:	1.415***		0.704***		-0.621		-0.240	
Self-efficacy (st.)		-0.683**		-0.182		0.263		0.236
Competitiveness (st.)		0.218		0.0356		-0.0633		0.154
Fear of failure (st.)		0.374***		-0.0574*		0.00887		-0.0105
Work mastery (st.)		0.737***		0.281**		0.295*		0.0230
Growth mindset (centered)		0.769***		0.626***		-1.124***		-0.642***
Intercept	63.99***	63.99***	74.05***	74.05***	65.35***	65.35***	65.01***	65.01***
Interaction								
Socio-emotional skills:	-3.042***		-1.361***		1.405*		0.340	
Self-efficacy (st.)		1.516**		0.400		-0.516		-0.611
Competitiveness (st.)		-0.465		-0.0758		0.138		-0.395
Fear of failure (st.)		-0.754***		0.186***		0.0915		0.0651
Work mastery (st.)		-1.574***		-0.618***		-0.667*		-0.0714
Growth mindset (centered)		-1.765***		-1.253***		2.357***		1.352***
Observations	43,422	43,422	135,657	135,657	28,107	28,107	28,026	28,026

Appendix E: Country-Level Analyses

Country	Total gap	Endowments (%)	Returns (%)	Interaction (%)	Intercepts (%)
Macao	27.4	2.4	-4.2	7.4	94.5
Kazakhstan	29.8	13.1	-3.8	5.4	85.3
Kosovo	38.6	20.1	-0.3	1.8	78.5
Baku (Azerbaijan)	39.9	13.3	-0.6	1.0	86.2
Morocco	44.1	17.7	1.2	-1.0	82.1
Indonesia	48.8	17.0	-5.9	12.4	76.5
Montenegro	50.7	7.7	1.3	-2.4	93.4
Bosnia and Herzegovina	51.6	10.1	0.9	-1.7	90.7
Albania	53.7	8.3	0.4	0.1	91.3
Hong Kong	58.5	3.8	0.0	-0.0	96.3
Mexico	58.9	19.3	-1.4	2.7	79.4
Canada	60.1	12.6	1.2	-2.3	88.5
Jordan	61.8	16.8	-0.1	0.4	82.8
Dominican Republic	62.2	17.0	-1.8	3.8	81.0
Estonia	63.3	11.5	-2.8	6.1	85.3
Russian Federation	63.3	10.0	3.0	-7.1	94.0
Japan	64.2	9.0	0.5	-0.9	91.4
Italy	64.9	4.3	1.3	-2.2	96.5
Latvia	65.1	12.7	-0.9	1.4	86.9
Saudi Arabia	65.9	18.8	-1.6	3.3	79.5
Croatia	67.1	5.5	0.7	-0.8	94.6
Serbia	67.3	7.6	1.4	-2.7	93.6
Georgia	67.5	21.4	1.2	-4.0	81.4
Greece	69.6	8.8	1.3	-2.4	92.3
B-S-J-Z (China)	70.0	6.7	-1.1	3.1	91.3
Turkey	70.5	4.8	2.7	-4.3	96.8
Spain	70.5	4.5	0.8	-1.6	96.3
Thailand	70.6	16.6	-2.4	8.2	77.6
Iceland	72.3	17.3	-1.1	1.2	82.6
Colombia	72.7	23.8	0.1	0.1	75.9
Ireland	72.9	10.5	2.7	-5.4	92.2
Philippines	73.0	16.9	-7.2	18.0	72.4
Korea	74.1	8.5	0.3	-0.7	92.0
Netherlands	74.6	7.9	0.5	-0.5	92.2
Finland	76.2	26.2	2.9	-6.2	77.1
Slovenia	78.4	10.4	1.4	-2.7	90.8
Australia	78.7	16.7	0.0	-0.1	83.3
Costa Rica	79.1	11.8	-0.3	1.0	87.6
Ukraine	79.8	15.1	-1.4	3.4	83.0
Malaysia	80.2	13.2	-0.7	1.3	86.2
Denmark	80.7	16.1	4.5	-9.0	88.3
United Kingdom	81.0	9.2	0.5	-1.3	91.6
Chile	82.6	15.9	1.8	-3.5	85.8
Belarus	83.5	12.3	4.4	-9.5	92.8
Peru	83.6	13.7	-4.6	9.2	81.8
Qatar	85.0	14.7	-3.3	7.0	81.6

Romania	85.2	13.3	1.8	-2.6	87.5
Malta	85.5	15.4	2.1	-5.2	87.6
Uruguay	86.5	6.8	-1.2	2.7	91.7
Moldova	87.8	20.0	1.0	-1.6	80.6
Lithuania	88.3	10.5	-1.0	2.1	88.3
Austria	88.6	4.0	0.6	-0.9	96.2
Chinese Taipei	89.1	4.4	1.2	-1.7	96.1
Poland	89.1	8.9	1.8	-3.2	92.5
Sweden	89.9	13.8	0.3	-0.4	86.2
Panama	89.9	10.0	0.7	2.0	87.4
Brazil	91.2	15.9	-2.3	5.7	80.6
United States	92.5	18.0	2.0	-4.3	84.3
Slovak Republic	94.7	7.9	1.0	-2.6	93.6
New Zealand	95.0	21.2	2.2	-4.7	81.2
Singapore	95.3	9.8	2.6	-4.5	92.1
Brunei Darussalam	96.3	14.8	-0.9	3.8	82.3
Portugal	97.9	5.6	1.0	-1.4	94.8
Czech Republic	99.2	3.2	0.7	-1.7	97.8
Argentina	100.1	14.0	0.5	-0.9	86.4
United Arab Emirates	100.4	9.6	-4.1	7.1	87.3
Switzerland	100.5	2.6	0.7	-1.6	98.2
Germany	106.5	2.5	0.3	-0.1	97.3
France	107.3	2.7	1.1	-2.1	98.3
Bulgaria	107.7	9.9	-1.2	2.2	89.1
Hungary	110.3	9.3	0.9	-1.8	91.7
Luxembourg	118.4	4.6	-0.0	1.0	94.5