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## Shadow education in the Netherlands

*The position of shadow education in the educational landscape and students' school careers*

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# 2

# Chapter 2

## A cross-national exploration of shadow education use by high and low SES families[ii]



**ABSTRACT**

Worldwide, an increasing number of students seek private supplementary tutoring, known as "shadow education." Various studies report social class differences in the use of shadow education. High-SES families may invest in shadow education as a form of concerted cultivation, seeking to improve their children's school achievement. In this study, we apply meta-analytic structural equation modeling to explore relationships between parental education, income, and the use of shadow education across nations and educational contexts. We find robust relationships between parental education, income, and the use of shadow education. Moreover, we assess a mediating role of shadow education in the relationship between SES and achievement. Shadow education appears to fulfill a competitive function for privileged families who seek to secure advantage in educational competition. We conclude that educational research, particularly research concerned with inequality of opportunities, needs to take account of the progressively prominent position of shadow education in the educational landscape.

[ii] This chapter is based on: Jansen, D., Elffers, L. & Jak, S. (2021). A cross-national exploration of shadow education use by high and low SES families. *International Studies in Sociology of Education*.

## INTRODUCTION

Worldwide, an increasing number of students seek private supplementary tutoring (Baker et al., 2001; Organisation for Economic Co-operation and Development [OECD], 2011, 2014). In some countries, for instance, South Korea and Greece, tutoring has been a regular practice for large parts of the student population for many decades (Park et al., 2016). Elsewhere, such as Thailand and various Northern-European countries, the use of private supplementary tutoring appears to be undergoing a gradual transition from a relatively marginal phenomenon to an institutionalized educational practice (Park et al., 2016). Private supplementary tutoring provides students with additional instruction or guidance in subjects that are part of the formal curriculum (Bray, 2010). In doing so, tutoring is said to "shadow" regular schooling, as it mimics the content and scope of formal education, to support students in their learning process and to enhance their academic performance. Hence, most authors refer to private supplementary education as shadow education (Bray, 1999, 2006; Byun et al., 2018). In this study, we adopt Bray's (1999) definition of the concept: fee-based, organized, out-of-school learning activities that provide students with additional instruction or guidance in school subjects.

As shadow education is obtaining an increasingly prominent position in the educational landscape in many nations, it is important to further our thinking about the functions it fulfills in students' school careers. In previous research, functions of shadow education have largely been described in terms of competition or compensation. The competitive function refers to the role shadow education can play in realizing an advantage in the educational competition. By providing additional training and support, shadow education can help to boost school performance, either by providing remediation when students are—or risk—lagging behind (Baker et al., 2001), or by further enhancing students' school performance in their quest to stay ahead of other students (Entrich & Lauterbach, 2019). Compensation refers to the role shadow education can play in offsetting for underperforming schools, by providing more or better instruction than the regular school or teacher (Hartmann, 2008).

If the use of shadow education indeed results in better school performance, it affects the course of students' educational trajectories, giving rise to diverging pathways (Kerckhoff, 1993) between students who (can afford to) make use of shadow education, and those who do not. While various studies report relationships between indicators of students' socioeconomic status (SES), such as family income, and the use of shadow education, SES is often included merely as a control variable instead of being studied as a predictor that potentially fuels the use of shadow

education (Byun et al., 2018). Recent studies (e.g., Matsuoka, 2015, 2019), however, point more directly to the role shadow education may play as a tool for the transmission of social privilege. Indeed, as the competition for education credentials increases (Baker, 2011), middle and upper-class families may be more willing to invest in the school career of their children, to enhance upward mobility and to avoid downward mobility.

Participation in shadow education is an after-school activity directly targeted at improving academic performance. As such, the strategy of investing in shadow education could fit Lareau's (2003) concept of 'concerted cultivation' in which middle and upper-class parents engage in to foster their children's school careers to transmit social class. Investment in shadow education as a form of concerted cultivation may be more pronounced in educational systems, or at high-stakes moments within educational systems, where students need to compete for access to certain educational tracks (Matsuoka, 2019). High-SES parents have been said to 'hoard opportunities' that enhance the school career of their children (Hamilton et al., 2018), and certain institutional characteristics may drive those parents to do so in particular. Therefore, it is not only relevant to map the relationship between social background characteristics and the use of shadow education, but also to relate such linkages to educational system's characteristics, such as its structure and quality, that may or may not motivate parents to invest in additional education.

So far, a selection of the research on shadow education has focused on one country or a limited number of countries in one region, predominantly in Southeast Asia, limiting the possibility of cross-contextual exploration of shadow education functions. For this study, we conducted a cross-national exploration of the use of shadow education in relation to students' socioeconomic status and characteristics of the formal educational system in which they are educated. We capitalize on the available international research base on shadow education by testing a meta-analytic model to explore parental income and educational level as a predictor of shadow education use, and the extent to which such a relationship varies across educational systems. Below, we outline how we built our model based on the current state of the evidence on predictors and outcomes of shadow education use.

## THEORETICAL FRAMEWORK

### Socioeconomic status and the use of shadow education

Students' socioeconomic status (SES) has been linked to the use of shadow education. In many studies, parental income is applied as the primary indicator of a student's social background (e.g., Kim & Lee, 2010). The argument for establishing

a relationship between family income and the use of shadow education is straightforward: a higher family income generates more financial resources to invest in shadow education. Other studies apply indicators of parental level of education (e.g., Lee, 2007). One argument for relating parental level of education to the use of shadow education comes from social reproduction theory (Bourdieu & Passeron, 1977; Fitzmaurice et al., 2020), where the practice would be conceptualized as an instrument to realize educational outcomes needed to enable the transmission of social privilege across generations. Highly educated parents are also more likely to aspire to higher education for their children (Crozier et al., 2011; Sianou-Kyrgiou, 2008), which would render them more likely to invest in their children's education. Many shadow education studies include both parental income and educational level as indicators of SES, which are known to be correlated (Entrich, 2020; Entrich & Lauterbach, 2019). Some studies examine SES as a main determinant of shadow education usage (e.g., Southgate, 2009), whereas others assess the effect of SES on shadow education usage while controlling for other student-level variables (Atalmis et al., 2016b; Buchmann et al., 2010; Guill & Bos, 2014; Lee, 2007). Both strands of research report a positive relationship between SES and the use of shadow education. Therefore, we expect to find a positive association between SES and the use of shadow education in our meta-analysis, both in terms of parental income and educational background.

Although students with varying socioeconomic backgrounds may engage in some form of tutoring, Buchmann et al. (2010) suggest that students from advantaged families buy into more intensive — i.e., more expensive – forms of shadow education to stay ahead of the competition for admission to universities. Thus, the type of shadow education students participate in appears to relate to their SES (Atalmis et al., 2016b).

**The use of shadow education and achievement**

Parents invest in shadow education with the presumption that this will result in improved learning outcomes. Numerous studies have examined direct and indirect relationships between shadow education and achievement. In South Korea, some research reports small positive effects, often attributed to participation in forms of test preparation (Byun, 2014). Others report small negative (Guill & Bos, 2014) or subject-related effects (Zhang & Xie, 2016), whereas only a few reported finding no effects at all (e.g., Smyth, 2008). These differences in findings may be associated with varying levels of methodological rigor, particularly regarding how authors deal with self-selection problems (Dang & Rogers, 2008). As explained below, we tried to control for the rigor of the analytic strategy applied.

**Shadow education as a mediator between SES and achievement**

In line with our argument that investment in shadow education can be seen as a form of concerted cultivation, we expect shadow education to mediate the relationship between SES and school achievement (cf. Bodovski & Farkas, 2008). The mediating role of shadow education has been the subject of recent scholarly attention (Atalmis et al., 2016b; Buchmann et al., 2010); however, the relationship between SES and shadow education, and the relationship between shadow education and achievement, have not been examined jointly in a structural meta-analytical model. Examining the potential mediating role of shadow education in the relationship between SES and achievement is particularly important for understanding the role of shadow education in generating inequalities in educational outcomes. In our model, we position shadow education in the middle (Figure 2), mediating the relationship between SES and achievement.

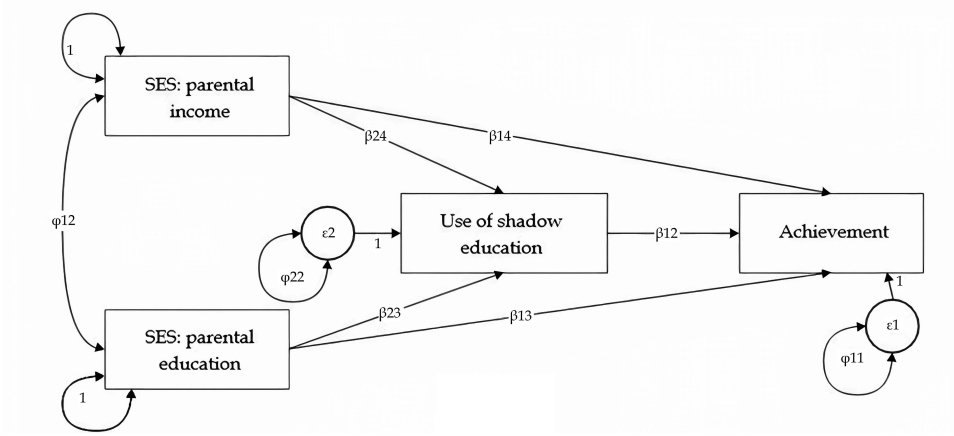


*Figure 2*. Path model with use of shadow education mediating the relationship between parental income and education and achievement

**Differences between educational systems**

In the introduction, we outlined the competitive and compensatory functions that shadow education may fulfill. Whether the use of shadow education fulfills one or both functions may depend on the educational context. Indeed, researchers have investigated the role institutional factors play in students' propensity to use shadow education (Byun et al., 2018).

**Institutional quality and the use of shadow education**

If the quality of instruction provided in regular schools is low, this could result in a stronger tendency to turn to shadow education, to compensate for insufficient instruction, as an alternative to improve school achievement for families who can afford to do so (Bray, 1999). For instance, in countries with a relatively low gross domestic product (GDP) per capita, which limits public investments in the schooling system, parents may feel the need to buy high-quality, private supplementary education (Byun et al., 2018; Lee, 2007). Hartmann (2008) highlights that in low-income countries, such as Egypt (see also Abdel-Moneim, 2021; Sobhy, 2012), students may experience deficiencies in the public schooling system, leading them to value shadow education more than regular schooling, and to increasingly rely on shadow education to secure learning progress. Such findings are echoed by studies on Kenya (Buchmann, 2002) and Cambodia (Bray et al., 2018), but compensatory functions of shadow education may apply to high-income countries as well (Bray, 1999). Based on these findings, we would expect to find a stronger relationship between SES, the use of shadow education, and academic achievement in educational systems where students risk lower school achievement due to lower institutional quality. We included an indicator of the institutional quality of schools and the relative performance of the student population to examine if there are indications that the use of shadow education by privileged families is more prominent in systems where supplemental tutoring may be seen as necessary due to low quality of regular schools.

**Institutional structure and the use of shadow education**

The competitive function of shadow education is likely to be more prominent in systems, or at certain moments within systems, where competition to access higher tracks is more intense. By assigning students to different tracks in secondary education, tracking defines students' prospects for post-secondary education and the labor market. Approaching track selection, students may seek shadow education to avoid lower track placement (Matsuoka, 2019). Parents may wish to safeguard the prospects of their children for future access to higher education by investing in shadow education (Addi-Raccah & Dana, 2015; Matsuoka, 2015). Relative risk aversion theory suggests this mechanism would particularly hold for high-SES students, as higher levels of education would be needed to avoid downward social mobility (Breen & Goldthorpe, 1997). Hence, we hypothesize that the more tracked systems are, the stronger the association between SES and shadow education use will be. In addition, we may expect to find these patterns more strongly in studies that focus on upper secondary education, as students in that stage are closer to selection for higher education. The current state of the evidence on this relationship

is mixed. Several studies examining causal effects discuss no apparent differences in shadow education usage according to grade level (Ryu & Kang, 2013), whereas others did (Dongre & Tewary, 2015). The discrepancies between these studies' findings are discussed below.

**Accounting for differences between studies**

Conducting a meta-analysis requires accounting for differences in the sample, the type of shadow education that was studied, and the methodological rigor with which this was done, as these may all affect model fit. In our study, we applied three moderators to account for such potential differences.

*Sample.* There are considerable differences between studies in terms of sample characteristics. Sample populations tend to be described in terms of gender, family size, and urbanicity. Gender (being male) has been found to have a positive influence on shadow education usage (Kim & Lee, 2010), but differences tend to be small (Buchmann et al., 2010; Byun, 2014). As for family size, many studies control for the number of siblings of the students (Byun, 2014), but this variable has been studied primarily in South and Southeast Asian countries. Other studies note that students living in urban (as opposed to rural) areas are more likely to have access to shadow education and thus might be more prone to use these services (Zhang & Xie, 2016). However, as only a few (primarily Asian) studies include data on gender, family size, and urbanicity, we excluded these factors from our meta-analysis.

*Type of shadow education*. The type of shadow education that students attend may differ, and certain characteristics could matter for students' propensity to resort to shadow education. However, not all studies include information about the type of shadow education. Some (e.g., Byun, 2014) distinguish various types, such as one-on-one tutoring and cram schools, while others (e.g., Areepattamannil & Kaur, 2013) analyze whether students make use of some form of private tutoring without further distinguishing between types of shadow education. Such aggregation (see Bray & Kobakhidze, 2014) may lead to overestimating student-level effect sizes, as students from different social strata are assumed to follow the same program. Hence, we expect that aggregating the programs into one measure will not explain the heterogeneity in SES-related effect sizes, whereas specifying the program measure will explain this heterogeneity.

*Methodological rigor***.** Above, we explained that differences in effect sizes reported in various studies might be associated with varying levels of methodological rigor, particularly regarding how authors deal with self-selection problems (Dang & Rogers, 2008). It is difficult to compare the moderating effect of differences in analytical strategies applied, but we included the publication status of studies as a moderator, as published articles tend to apply more rigorous strategies.

## RESEARCH QUESTIONS

In our theoretical framework, we reviewed single-site studies examining relationships between SES (parental education, income), the use of shadow education, and achievement, as well as conditions under which such effects are likely to be stronger or weaker. We synthesized the available evidence on those relationships, to address the following research questions:

RQ1. To what extent is students' social background, in terms of parental education and income, associated with their use of shadow education?
RQ2. To what extent does the use of shadow education mediate the relationship between SES and achievement?
RQ3. Do the relationships examined under RQ1 and RQ2 vary according to indicators of institutional structure and quality?

## METHODS

### Literature search

We used a combination of the keywords 'shadow education,' 'private' AND ('tutoring' OR 'tuition' OR 'supplement* education') to search six databases: ERIC, PsycINFO, Web of Science, Sociological abstracts, Scopus, and Google Scholar. Our inclusion criteria required that each article:

A. Include a measure of shadow education use, as expenditures or participation;
B. Feature students in primary or secondary education;
C. Be empirical; suitable for a correlational meta-analysis by reporting Pearson's *r* or featuring statistical information for its calculation;
D. Be in English.

Criterion A forms the basis of our quality appraisal, strengthening the review by only including studies that explicitly examined private supplementary tutoring, both in definition and instrumentation. Initial searches provided 961 unique, relevant articles. The first and second authors of the present study checked abstracts against criterion A, resulting in the exclusion of 532 articles. A total of 429 articles were thoroughly read, with 48 failing to meet criterion A. Three of the remaining 381 articles did not concern students in primary or secondary education, so they were excluded for not complying with criterion B. A further 354 articles were excluded for not reporting bivariate correlations or information to calculate them, resulting in 24 articles suitable for inclusion.

To include articles that did not report bivariate correlations, we contacted authors to ask if they could provide us with such bivariate correlations and if they were currently conducting (unpublished) research on shadow education. Eight authors provided bivariate correlation data, which increased the sample to 32 articles. Of the other 346 articles initially excluded, we retained 30 that reported a logistic regression model or t-statistic, allowing us to calculate semi-partial correlations (Aloe, 2014). The final sample, then, comprised 62 articles (Figure 3).

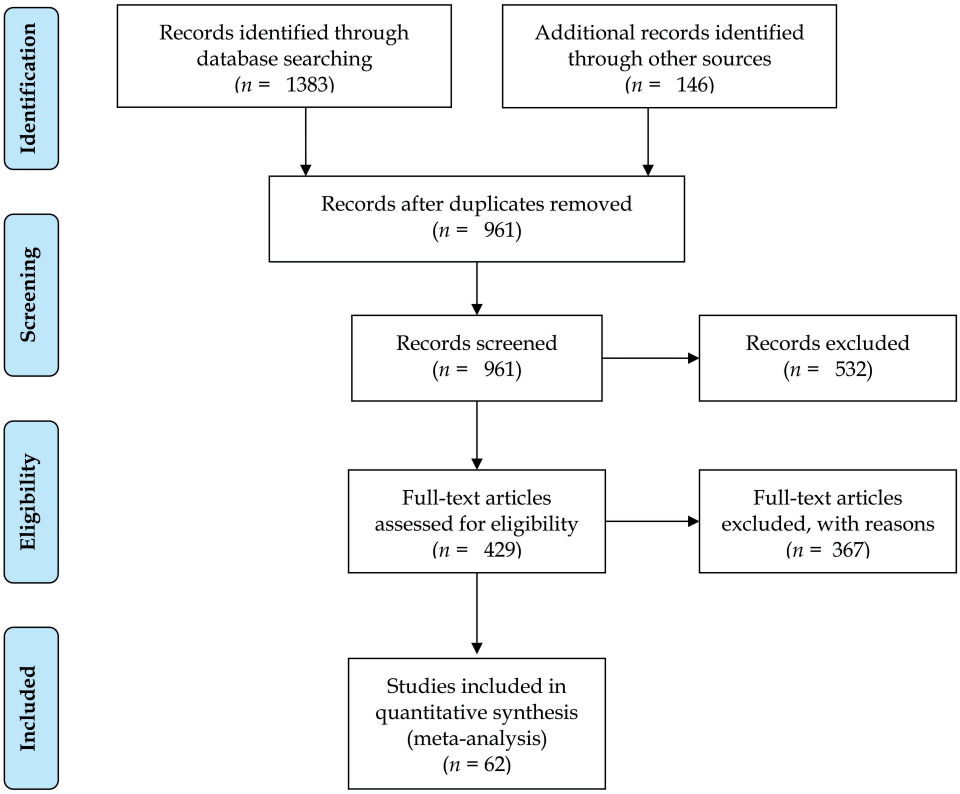


*Figure 3*. PRISMA diagram of studies included in the meta-analysis

**Data extraction**

*Effect sizes.* We extracted Pearson's r to code associations between parental education, parental income, shadow education use, and achievement. Students' SES was coded by parental education and parental income as separate variables. Shadow education use was coded either as participation or expenditure, and the measurement method for shadow education was also coded. Some of the bivariate effect sizes were calculated based on group mean differences between tutored and

non-tutored students. Achievement was mainly coded as scores. All articles were coded by the primary author of this paper, with 30% also coded by the third author. Interrater reliability for the effect was found to be reliable, ICC(3,1) = .97.

If bivariate information was not available, and the authors reported a logistic regression analysis, we coded semi-partial correlations obtained from their reported regression models, for which we used the formulas of Aloe (2014). Notably, semi-partial correlations generally underestimate true effect sizes due to the presence of confounders (Aloe, 2014), and control for different variables across models. Indeed, these effect sizes should not be combined with bivariate effect sizes (Aloe, 2014); thus, analyses of semi-partial correlations were included only as an exploratory measure.

*Moderators.* We extracted six moderators from the papers: national student performance, teaching quality, tracking, grade level, program measure, and publication status. National student performance was measured using PISA 2012 data obtained from the OECD (OECD, 2014). The share of low-performing students was based on the share of students scoring below the PISA-baseline of performance for reading, math, and science. Countries for which more than 20% of students scored below such baseline were coded as 1 for low-performing students, and the remaining countries were coded with 0. There was no data for Latvia, India, Sri Lanka, Kenya, Malawi, Mauritius, Namibia, Zambia, and Tanzania. To facilitate the inclusion of data points regarding these countries, they were added to the low-performance group, as they all have relatively low GDPs.

For teaching quality, PISA 2012 data was used as well. We conducted a factor analysis on the items in which school principals stated which factors they believed were hindering students' learning in their school. These nineteen items comprised four components, from which we extracted nine teacher-related items with Cronbach's α of .83 (e.g., teachers being ill-prepared for classes or not meeting individual students' needs). The share of principals reporting 'to some extent' or 'a lot' for these questions was used as an indicator of low-performing teachers.

For the tracking index, we used indicators developed by Bol and Van de Werfhorst (2013), e.g., the age of first selection and length of the tracked curriculum. For students' grade level, we coded whether most of the sample was in primary, lower secondary, or upper secondary education. Few studies examined primary education (e.g., Nath, 2008), so this category was combined with lower secondary education. For program measure, we coded whether the study measured a one-on-one program, a small-group program, a tutorial center, or used a general measure of shadow education. There were few studies in each category, so we aggregated them into two measures – general and specific. Lastly, we also accounted for publication source by coding whether the article was published or unpublished. When available,

we also coded intensity as average hours per week spent on shadow education. For moderators, all studies were coded by the primary author and 30% also coded by the second author, achieving interrater reliability (Cohen's ϰ) of .82



**Analyses**

*Publication bias and statistical outliers.* We applied two strategies to evaluate and account for publication bias (Lipsey & Wilson, 2001). First, the moderator publication source was evaluated for all effect sizes. Second, we created funnel plots and examined them to determine if smaller studies were spread evenly around the center, both visually and through a rank correlation test (Begg & Mazumdar, 1994) and Egger's test (Egger et al., 1997). Statistical outliers were checked using the influence command from the R package metafor (Viechtbauer, 2010).

*Testing the overall model using MASEM.* As the overall model is a mediation model, we applied meta-analytical structural equation modeling (MASEM). In the first stage, we estimated the pooled correlation matrix between the four variables using the random-effects model (Cheung, 2015a). In the second stage, we fit the structural model to the pooled correlation matrix using weighted least-squares estimation. The mediation model is a saturated model, so by definition, the fit is perfect. MASEM analyses were executed using the metaSEM package in R (Cheung, 2015b). $I^2$ was evaluated as a measure of heterogeneity, indicating the proportion of the total observed variance due to between-study variance (Lipsey & Wilson, 2001). The statistical significance of the parameter estimates was evaluated using 95% likelihood-based confidence intervals; an interval excluding zero indicated the parameter estimate was significantly different from zero at the 5% α level (Cheung, 2015a). Mediation was tested by examining indirect effects, calculated as the product of the direct effects. Moderation was tested using subgroup analyses (Jak & Cheung, 2018); the model was separately fitted for groups of studies created using the moderator of interest. Equality of the direct effects was tested to evaluate if these differed across subgroups.

MASEM offers only limited possibilities to include continuous moderator variables in the model. Therefore, in addition to the MASEM analyses, we tested the individual relationships between pairs of variables in the model using three-level meta-analyses (Cheung, 2015a), to account for the dependency of effect sizes related to achievement, and to evaluate the effects of the (continuous) moderator variables of national student performance, teaching quality and tracking using meta-regression. In the three-level model, we converted Pearson's r to Z using Fisher's r-to-Z transformation, after which each effect size was weighted by the inverse variance (Lipsey & Wilson, 2001). Mean effect sizes were converted back to Pearson's *r* for ease of interpretation.

## FINDINGS

### Description of studies

A total of 62 unique quantitative articles met our inclusion criteria. They represent 189 studies. A single article might investigate multiple samples; we treated each sample as a separate study. Most of these articles ($k$ = 51) were published in journals; only eleven were unpublished. Most ($k$ = 48) measured shadow education using a general measure. Only a few ($k$ = 12) articles reported program intensity (3.08 hours/week on average). More than half of the articles examined students in lower secondary education ($k$ = 38); a few examined primary education ($k$ = 10). Overall, we obtained 363 bivariate and 94 semi-partial effect sizes representing 742,981 and 632,301 students, respectively. The average participation rate in shadow education for the whole sample of students was 33%.

### Publication bias and outliers

Inspection of funnel plots (see supplemental material) revealed a few studies with small sample sizes that reported large correlations between SES, shadow education use, and achievement, suggesting potential publication bias. The Egger's test was significant for the relationship between parental education and shadow education use ($t$ = −3.79, $p$ = .00), and for the relationship between parental income and shadow education use ($t$ = −3.65, $p$ = .00), possibly indicating publication bias. The rank correlation test for funnel plot asymmetry was not significant for all effect sizes. Hence, there was only a mild indication that publication bias was problematic for the present meta-analysis. The influence command indicated one outlier for the covariance between parental income and education.

## MASEM

### Pooled correlations

Table 2 provides the pooled correlation matrix obtained from the first stage of the random-effects MASEM analysis. The lower triangle shows correlation coefficients and their 95% confidence intervals, while the upper triangle shows the between-study variance ($\tau^2$) for each individual association, as well as its confidence interval. The proportion of variance due to between-study variability ($I^2$) was high, meaning substantial heterogeneity was present. Table 2 shows that there was no significant relationship between shadow education use and achievement. The relationship between shadow education use and parental education was positive and statistically different from zero ($r$ pooled = .13, 95% CI [.08, .18]), as was the relationship between shadow education use and parental income ($r$ pooled = .14, 95% CI [.04, .23]). The

relationship between shadow education and achievement was not significantly different from zero (*r* pooled = .02, 95% CI [−.03, .06]).

**Overall model**

We fitted the path model (Figure 4) to the pooled correlation matrix from the previous analysis. Figure 4 displays the standardized parameter estimates of this model. Results show that the direct effect of parental education on shadow education use was positive and significant ($\beta$ = .09, 95% CI [.02, .16]), whereas the direct effect of parental income on shadow education was not ($\beta$ = .10, 95% CI [−.01, .21]). Hence, when controlling for parental education, the parameter estimate for the relationship between parental income and shadow education is not significantly different from zero. Mediation was tested by evaluating the significance of the indirect effects, which were not significantly different from zero. The model explained 6% of the variance in achievement and 3% of the variance in shadow education use.

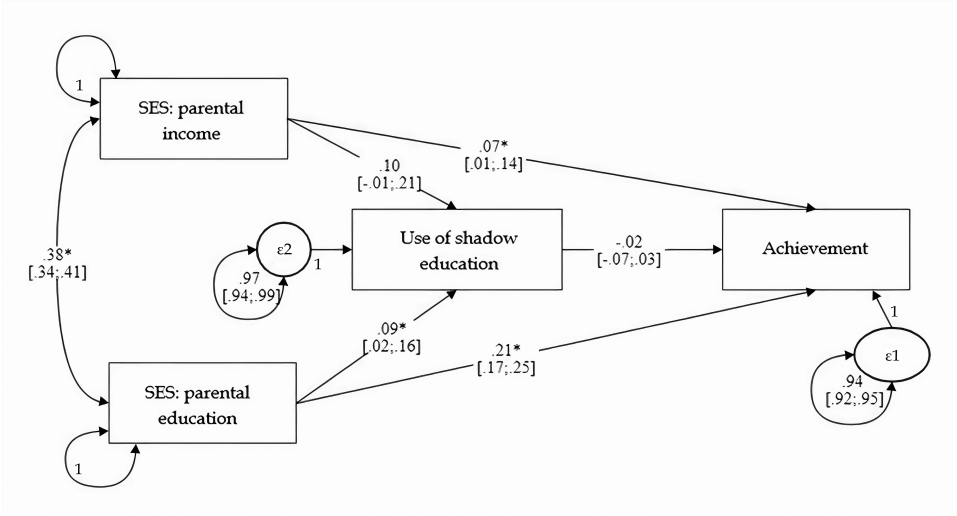


*Figure 4.* Model with coefficients (* = significantly different from zero).

Table 2. *Pooled correlations*[a] *(below diagonal) and between-study variances (above diagonal) with 95% confidence interval*

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1. Achievement | 1 | .03 [.02, .04] | .01 [.01, .02] | .01 [.00, .02] |
| 2. Use of shadow education | .02 [-.03, .06] $k$ = 63 | 1 | .02 [.01, .03] | .03 [.01, .06] |
| 3. SES: parental education | .23 [.21, .26] $k$ = 71 | .13 [.08; .18] $k$ = 31 | 1 | .00 [.00, .00] |
| 4. SES: parental income | .15 [.09, .20] $k$ = 11 | .14 [.04, .23] $k$ = 14 | .38 [.34, .41] $k$ = 11 | 1 |

*Note.* $I^2$ ranges between .95 and .99, $Q$ = 49271 ($df$ = 195), $p$ < .000. [a] Correlations obtained from empirical studies, $k$ = number of studies.

**Subgroup analyses**

Table 3 shows the results from the subgroup analyses for national student performance, teaching quality, tracking, grade level, and program measure. There were no significant differences in parameter estimates between subgroups for national student performance ($\chi$2(5) = 3.16, $p$ = .675), but these differences were present for subgroups of teaching quality ($\chi$2(5) = 13.39, $p$ < .05), tracking ($\chi$2(5) = 11.50, $p$ < .05), grade level ($\chi$2(5) = 12.43, $p$ < .05), and program measure ($\chi$2(5) = 38.10, $p$ < .05).

To discover which effects differed across subgroups, we constrained the direct effects to be equal across subgroups, one by one. The results indicate that teaching quality seems to moderate the relationship between parental income and shadow education use; a relatively small and insignificant effect in countries with relatively high-quality teaching ($\beta$ = .08, 95% CI [−.04, .21]); and a relatively large and significant positive effect in countries with relatively low-quality teaching ($\beta$ = .23, CI [.20, .26]). The opposite is true for the relationship between parental education and shadow education, which is a relationship that is positive and significant in countries with relatively high-quality teaching ($\beta$ = .12, CI [.03, .21]), and not significant in countries with relatively low-quality teaching ($\beta$ = −.01, CI [−.06, .03]).

Concerning tracking, none of the direct effects differed significantly across subgroups. Grade level did, however, have a moderating effect, mainly on the relationship between SES and the use of shadow education. Concerning the lower grades, the relationship between SES and shadow education was not significantly different from zero, both for parental income ($\beta$ = .06, CI [−.13, .27]) and parental education ($\beta$ = .10, CI [−.02, 21]). Such relationships seemed to be present in the upper grades, for parental income ($\beta$ = .16, CI [.08, .23]) and for parental education ($\beta$ = .10, CI [.06, .15]). Program measure seemed to affect the relationship between

the use of shadow education and achievement. This relationship was only significantly different from zero for studies using a specific measure for shadow education ($\beta$ = −.13, CI [−.20, -.04]), and not significantly different from zero for studies using a general measure of shadow education ($\beta$ = .05, CI [−.01, .11]).

**Supplementary analyses**

The three-level model revealed significant between-country variation in effect sizes, primarily for the relationship between parental income and shadow education use (62%) and the relationship between parental education and shadow education use (60%). To further investigate such between-country variation, we examined whether adopting the continuous measures for the moderators altered our results significantly. This proved not to be the case, corroborating the findings obtained from the subgroup analyses. We repeated both the MASEM and three-level analyses using semi-partial correlations. Semi-partial correlations revealed patterns akin to the bivariate correlations, at least for the three-level model. For predictors of shadow education use, similar to the estimates obtained from both MASEM and three-level analysis, semi-partial correlations revealed that parental education significantly predicted shadow education use ($r_{sp}$ = .10, 95% CI [.06, .19]). The pooled correlation coefficients obtained from the three-level model were near-identical to the estimates from Stage 1 of MASEM, indicating these estimates are likely reliable and robust.

Table 3. *Standardized parameter estimates from stage 2 with 95% confidence intervals*

| | *Differences between educational systems* | | | | | | *Differences between studies* | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *NP* | *TQ* | | *TR* | | *GL* | | *PM* | |
| *Categories* | High | Low | High | Low | Yes | No | Lower | Upper | General | Specific |
| *Change in model fit* | NSD | $\chi2(5) = 13.39$, $p < .05$ | | $\chi2(5) = 11.50$, $p < .05$ | | $\chi2(5) = 12.43$, $p < .05$ | | $\chi2(5) = 38.10$, $p < .05$ | |
| $\beta_{12}$ | -.02 [-.07, .03] | NPD | | NPD | | -.04 [-.10, .02] | .06 [-.00, .12] | .05 [-.01, .11] | -.13 [-.20, -.04] |
| $\beta_{24}$ | .10 [-.01, .21] | .08 [-.04, .21] | .23 [.20, .26] | NPD | | .06 [-.13, .27] | .16 [.08, .23] | NPD | |
| $\beta_{23}$ | .09 [.02, .16] | .12 [.03, .21] | -.01 [-.06, .03] | NPD | | .10 [-.02, .21] | .10 [.06, .15] | NPD | |
| $\beta_{14}$ | .07 [.01, .14] | .22 [.18, .26] | .17 [.11, .24] | NPD | | .09 [-.01, .19] | .06 [-.01, .14] | NPD | |
| $\beta_{13}$ | .21 [.17, .25] | NPD | | NPD | | NPD | | .16 [.12, .20] | .30 [.23, .40] |
| $\psi_{12}$ | .38 [.34, .41] | NPD | | NPD | | .41[.39, .43] | .33 [.29, .38] | .37 [.34, .41] | .40 [.39, .43] |
| IE1 | -.00 [-.01, .01] | .03 [.00, .05] | -.00 [-.00, .02] | .02 [.00, .04] | .01 [-.00, .03] | .02 [-.00, .05] | .01 [.00, .03] | .01 [.00, .03] | .06 [-.02, .01] |
| IE2 | .00 [-.01, .00] | .00 [.18, .26] | .04 [.02, .06] | .00 [-.00, .02] | .02 [-.01, .06] | .00 [-.01, .04] | .01 [-.00, .02] | .02 [.00, .02] | .00 [-.02, .03] |

*Note*. Parameter estimate [lower bound, upper bound], NSD = No significant differences in parameter estimates between subgroups for national student performance; $\chi2(5) = 3.16$, $p = .675$, NPD = Parameter estimates do not differ significantly, $\beta_{12}$ = *Shadow education (SE) on achievement,* $\beta_{24}$ = *SES (income) on SE,* $\beta_{23}$ = *SES (education) on SE,* $\beta_{14}$ = *SES (income) on achievement,* $\beta_{13}$ = *SES (education) on achievement,* $\psi_{12}$ = *Covariance between SES (income) and SES (education), IE1 = Indirect effect SES (education) on achievement through SE, IE2 = Indirect effect SES (income) on achievement through SE,* NP = National student performance , TQ = Teaching quality, TR = Tracking, GL = Grade level, PM = Program measure.

## SUMMARY OF FINDINGS

As shown in Table 3, we used MASEM to examine effect sizes, representing associations between parental education, parental income, shadow education use, and achievement. Furthermore, we examined moderating effects of indicators of institutional structure and quality, controlling for differences in characteristics of the empirical studies in our analysis. For research question one, the extent to which a student's social background is associated with shadow education use, the studies in our sample show a significant positive relationship between SES and shadow education usage, more strongly for parental education than for income. For research question two, the extent to which the use of shadow education mediates the relationship between SES and achievement, outcomes show high levels of heterogeneity within and between studies, and non-significant meta-analytical results. Thus, our data provided neither support for a relationship between shadow education use and achievement, nor for (partial) mediation of the relationship between SES and achievement through the use of shadow education. Our third research question further scrutinized the heterogeneity across institutional structures and quality. Here, we found that the positive relationship between parental education and shadow education use is more pronounced among samples of students in upper secondary education and in countries with relatively high-quality teaching. Parental education is related to the use of shadow education in educational systems with greater or fewer levels of tracking and regardless of the average performance of students in those systems.

## DISCUSSION OF FINDINGS

This study provides a cross-national exploration of linkages between SES, the use of shadow education, and achievement. We examined indications of high-SES families using shadow education as a form of concerted cultivation to improve school achievement (Bodovski & Farkas, 2008; Crozier et al., 2011). While research on these relationships has been carried out predominantly in East Asian societies (Matsuoka, 2019), we adopted a cross-national perspective on this issue. In doing so, our study responds to recent calls to investigate how different educational systems may affect parenting practices (Matsuoka, 2019). We built on the idea that shadow education forms a channel through which college-educated parents and not necessarily those with high income—attempt to structure their children's daily lives in the direction of higher education credentials to secure intergenerational transmission of social status.

We found a robust relationship between parental background and shadow education use across nations and studies. A positive relationship between parental income and the use of shadow education can be straightforwardly explained by the costs attached to participation in shadow education, and higher participation rates among children from higher educated parents have often been explained because of higher income levels of those parents (Entrich & Lauterbach, 2019). Yet, our findings indicate that more than income differences between higher and lower-educated families, parental education itself increases the likelihood of investment in shadow education. This finding offers an additional indication of investment in shadow education as a competitive strategy by families in their pursuit of social reproduction through education (see Fitzmaurice et al., 2020; Guerrero, 2020; Holloway & Kirby, 2020).

The increasing use of shadow education has been hypothesized to be contingent on the rise of the schooled society (Byun et al., 2018). As educational credentials have become a prerequisite and decisive factor in individuals' careers in post-industrial societies (Baker, 2011; Katartzi, 2017; Mori & Baker, 2010), families respond with strategies targeted at securing optimal educational outcomes. Competitive mechanisms may come to the fore when approaching selective moments in students' school careers. We indeed found that high-SES students particularly make use of shadow education in upper secondary education when the transition to higher education is approaching. The use of shadow education during this stage of the school career may signal attempts of college-educated parents to gain access to higher education for their children, which is needed to secure intergenerational transmission of social status (Breen & Goldthorpe, 1997). According to the effectively maintained inequality hypothesis (Lucas, 2001), educational expansion would lead privileged families to seek competitive advantage by sending their children to higher-quality programs with restricted access. While this theory is usually applied to enrollment in regular education, our study suggests that the use of shadow education and the use of more intensive—and expensive—types of shadow education may equally follow the logic of effectively maintained inequality in education (see Entrich & Lauterbach, 2019).

We did not find universal effects of shadow education on achievement outcomes. We did find that differences in measurement and analysis can partly explain cross-study heterogeneity in achievement effect sizes. Hence, we echo the call for more conceptual clarity in shadow education research (Bray, 2010). The significant level of heterogeneity may also explain why we do not find a mediating role of shadow education in the relationship between the predictors and outcomes in our model, whereas previous work did establish such effects (Atalmis et al., 2016). As some scholars find a curvilinear relationship between shadow education and

achievement outcomes (Hof, 2014), future (fixed effects) meta-analyses could look at heterogeneous and nonlinear effects to investigate the currently inconclusive effects of shadow education on achievement.

Students' (declining or rising) academic achievement may trigger parental investments in shadow education (Byun et al., 2018). The studies in our meta-analysis showed that in some countries, such as Japan (Matsuoka, 2015) and South Korea (Byun, 2014), parents of high-performing students often resort to shadow education to raise their children's test scores for competitive reasons. In other countries, such as the United States, parents use shadow education as a strategy to remediate poor academic performance (Buchmann et al., 2010). Our study corroborates such cross-national differences yet lends further credence to the presence of a correlation between social origin and the tutoring decision across various societies. One possible explanation for such a result is that highly educated parents tend to invest in tutoring across various levels of student performance (Guerrero, 2020). Future meta-analyses could include longitudinal studies on the use of shadow education by students from different socioeconomic backgrounds during periods of higher or lower achievement in their school careers.

Whereas our findings indicate a relationship between the institutional context and shadow education use, we need to bear in mind that these variables may relate to, or function as a proxy for, other characteristics of nations or cultural contexts. Indeed, studies on shadow education stress that its function in countries with low per capita GDP (Byun et al., 2018), low teacher salaries, or poor schooling infrastructure (Bray et al., 2018), may be quite different than in countries that rank higher on such indicators (Park et al., 2016). To further explore whether and how the institutional context relates to the use of shadow education, it would be worthwhile to study a pool of countries that fall within a similar GDP range, or that have similar scores on school system performance indicators. One particularly relevant characteristic that we were not able to include in our model due to a lack of available data, is the prevalence of private schooling in a country. Private schools could provide an alternative way for parents to secure educational advantages, which may result in lower use of shadow education (Ryu & Kang, 2013). The use of shadow education would then depend on the extent to which public schools dominate a nation's educational landscape. Indeed, various researchers have called for further investigation of the interaction between shadow education and the schooling system (Addi-Raccah & Dana, 2015; Lee, 2007; Matsuoka, 2019). Such an approach can be particularly useful to study the repercussions of the growing use of shadow education for inequalities in educational opportunity.

## CONCLUSION

Exploring the use of shadow education across institutional contexts and among diverse groups of students can help us to map shadow education as an increasingly prominent institution in the educational landscape. Our study corroborates the relationship between SES and the use of shadow education, suggesting that privileged families across the globe use shadow education to ensure intergenerational transmission of social privilege through schooling. This social reproductive strategy raises concerns among educational practitioners and policy makers (Park et al., 2016), calling for further inquiry. Whereas quantitative studies such as ours contribute to sketching an overall picture based on large data sets, qualitative studies can provide a more in-depth, nuanced exploration of the motives, strategies, experiences, and considerations of families using shadow education. Applying diverse theoretical perspectives and research methods will help to further assemble the puzzle of shadow education (Bray, 2010). Educational research—particularly research concerned with inequality of educational opportunities—will need to take account of the increasingly prominent position of shadow education in the school careers of students across educational contexts and social strata.