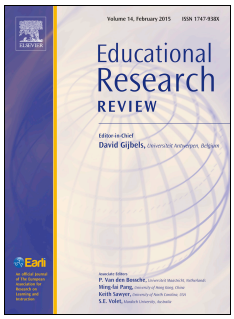
Socio-economic status and academic performance in higher education : a systematic review



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Socio-economic Status and Academic Performance in Higher Education: A Systematic Review

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Socio-economic Status and Academic Performance in Higher Education: A Systematic Review

Abstract

Previous educational research has extensively investigated the relationship between socio-economic status (SES) and academic performance. In higher education, however, this relationship still deserves a comprehensive examination. To attend to this need, a mixed-methods systematic literature review of 42 studies is carried out. In the first part, a summative content analysis is performed to analyze how SES and academic performance are measured. In the second part, a meta-analysis is conducted to determine the effect size of the relationship between SES and academic performance in higher education. Findings suggest that SES is measured through education, occupation, income, home resources, and neighborhood resources. Academic performance in higher education is measured in terms of achievement, competencies, and persistence. Furthermore, the meta-analysis reveals a positive yet weak relationship between SES and academic performance in higher education. Prior academic achievement, university experience, and working status are stronger related to academic performance than SES.

Keywords: Socio-economic status, academic performance, higher education, meta-analysis.

1. Introduction

Over the past years, the student population applying to and entering university has become more diverse in terms of social, cultural and economic capital, age, nationality (Morlaix & Suchaut, 2014), previous prior education, and academic achievement (Anderton, Evans, & Chivers, 2016). Moreover, in many countries, social changes have also contributed to changes in higher education systems; thus, although there is still a long way to go, participation from students from low social and economic backgrounds in higher education is increasing (Hansen & Mastekaasa, 2006). In order to achieve a better understanding of these changes in higher education systems, several researchers have explored the relationship between socio-economic status (SES) and academic performance, finding a weak to moderate relationship (e.g., Richardson, Abraham, & Bond, 2012; Sackett et al., 2012; Westrick, Le, Robbins, Radunzel, & Schmidt, 2015).

Given the increasing participation of students from a low SES background and the weak to moderate relation between SES and academic performance, one could wonder whether we still need to study the relationship between SES and academic performance in higher education. However, both practical and conceptual reasons exist that warrant the continued attention. Firstly, the common trend in the literature has been to use SES as a covariate instead of establishing, in a more comprehensive way, its influence on students' experiences and outcomes (McKenzie & Schweitzer, 2001; Walpole, 2003). By doing the latter, the higher education sector can gain a deeper understanding on how SES and academic performance are related, which might be necessary in order to deal appropriately with the increased diversity in the student population. Secondly, recent meta-analyses in higher education (Richardson et al., 2012; Schneider & Preckel, 2017; Westrick et al., 2015) have focused primarily on calculating the

effect size of the relationship between SES and academic performance, possibly ignoring the influence of several other students' and institutional characteristics on this relationship. Thirdly, based on analytic schemes such as the Astin's input-environment-output model (I-E-O), it could be argued that the relationship between SES and academic performance in higher education changes when additional variables are taken into account. As such, it seems inadequate to explore students' academic performance as a single-factor phenomenon (De Clercq, Galand, Dupont, & Frenay, 2013).

Although review studies on the relationship between SES and academic performance in primary and secondary schools are available (e.g., Sirin, 2005), it cannot be assumed that these results are generalizable to the context of higher education. By carrying out a systematic review, this study seeks to fill the gap that exists in the extensive literature devoted to examining the relationship between SES and academic performance in higher education. This article begins presenting several issues pertaining to the definition of SES and academic performance and then describes previous research in the literature regarding their relationship. Next, the methodology of this study is outlined in detail, explaining how both summative content analysis and meta-analysis are carried out. Subsequently, the answers to the research questions addressed in this research are presented. The article concludes with the discussion and implications of the key findings of this systematic literature review.

2. Theoretical framework

2.1. Conceptualizing and Measuring Socio-Economic Status (SES)

The understanding of students' socio-economic conditions became a major concern for educational researchers when low academic performance at school was observed in students whose parents had low income, low educational level, and were employed at low-status jobs

(Cowan et al., 2012). Although SES can be considered as one of the most commonly used variables in educational research (Sirin, 2005), it has been conceptualized in different ways in the literature. For instance, Chapin (as cited in White, 1982) defined SES in 1928 as: "the position that an individual or family occupies with reference to the prevailing average of standards of cultural possessions, effective income, material possessions, and participation in group activity in the community" (p. 99). Mueller and Parcel (1981) defined SES as the position of an individual, family, or group on a hierarchy based on economic, power, and prestige dimensions. More recently, SES has been defined as the amount of economic, social, and cultural resources available to one student (Cowan et al., 2012; De Clercq, Galand, & Frenay, 2016).

The different dimensions of SES have been operationalized using either single indicators, multiple indicators analyzed separately, or several indicators combined in a composite score (Australian Bureau of Statistics, 2011; Cowan et al., 2012; Shavers, 2007). Moreover, the indicators of SES can be observed at several levels, namely, individual, family, or area (Australian Bureau of Statistics, 2011; Krieger, Williams, & Moss, 1997). At the individual level, education, occupation, and income have been used as indicators for SES in previous educational research (Cowan et al., 2012; Sackett et al., 2009; Van Ewijk & Sleegers, 2010). Education, occupation, and income can consistently capture students' socio-economic conditions regardless of the time in which they are observed (Erola, Jalonen, & Lehti, 2016). In addition, these measurements are easy to interpret and communicate (Cowan et al., 2012). At the family level, home resources have been suggested as the fourth indicator of SES (Sirin, 2005). Home resources refer to possessions such as cars, books, computers, and musical instruments (De Clercq et al., 2016; Pedrosa, Dachs, Maia, Andrade, & Carvalho, 2007). Finally, at the area level, neighborhood resources have been reported as the fifth indicator of SES (Australian

Bureau of Statistics, 2011; Cowan et al., 2012; Shavers, 2007). Interestingly, financial and social resources not coming exclusively from the family can also be related to students' academic performance (Cowan et al., 2012). Such is the case, for example, with neighborhood characteristics and resources like the degree of urbanization (Hansen & Mastekaasa, 2006), and the number of parks and libraries in the area where students live (Cowan et al., 2012).

How *education, occupation, income,* and *home resources* interact in the measurement of SES, however, is rather complex. In particular, *education* has been the most commonly used indicator to assess SES (Australian Bureau of Statistics, 2011; Shavers, 2007) because of its relationship with other aspects of socio-economic status (Galobardes, Shaw, Lawlor, Lynch, & Smith, 2006; Erola et al., 2016). In fact, higher levels of education are related to subsequent benefits on a person's life, such as a better job, working conditions, and higher-income (Shavers, 2007). Similarly, *occupation* is also commonly used as an indicator of SES mainly because of its relationship with *education* and *income* (Ganzeboom, De Graaf & Treiman, 1992; Erola et al., 2016). *Income* represents the amount of social and economic resources a student can have (Australian Bureau of Statistics, 2011; Galobardes et al. 2006; Sirin, 2005). *Home resources,* then, can also indicate whether student's home situation is adequate for learning (Van Ewijk & Sleegers, 2010).

To sum up, SES is a broad concept that encompasses two primary dimensions: prestige and resources (Krieger et al., 1997). The first dimension determines the hierarchical position of an individual in society (Mueller & Parcel, 1981), while the second dimension determines the economic, social, and cultural resources which an individual has access to (Cowan et al., 2012; De Clercq et al., 2016). In addition, education, occupation, income, and home resources have been widely used as measurements to assess SES.

2.2. Measuring academic performance in higher education

When searching the definition of students' academic performance in higher education, it is evident the lack of consensus in the educational literature. Terms such as *performance, achievement,* and *success* are used interchangeably among educational researchers without a specific reason (e.g., Casillas et al., 2012; Rochford, Conolly, & Drennan, 2009; Tracey, Allen, & Robbins, 2012). Also, an operationalization (e.g., Grade Point Average) rather than a conceptual definition is mostly reported when defining academic performance in higher education. Despite this lack of consensus, *academic achievement*, *competencies,* and *persistence* have been used as separate, although interrelated, measurements to assess students' academic performance in higher education. Simply looking at academic achievement does not necessarily encompass or represent students' acquisition of competencies nor their persistence (York, Gibson, & Rankin, 2015).

Academic achievement can be defined as the attainment of either medium- or long-term educational goals (Yusuf, 2002). In this respect, Li, Chen, and Duanmu (2010) have pointed out that prior academic achievement is strongly related to students' academic performance at university. As a matter of fact, a considerable number of studies has reported the explanatory role of prior academic achievement in academic performance at university (e.g. Betts, Elder, Hartley, & Blurton, 2008; Byrne & Flood, 2008; Casillas et al., 2012; McKenzie & Schweitzer, 2001; Pike & Saupe, 2002; Roberts, 2007). Furthermore, a competency is a "performance capacity to do as well as to know which is judged by some level or standard of performance" (Shavelson, 2010, p. 44). In particular, higher education aims at developing both specific and generic competencies (Sadler, 2013). Undoubtedly, a deeper understanding of academic performance in higher education requires the assessment of both generic and specific students'

competencies (Blömeke, Zlatkin-Troitschanskaia, Kuhn, & Fege, 2013). Consequently, the assessment of competencies is rising in many countries at different stages of the higher education learning process (Zlatkin-Troitschanskaia, Shavelson, & Kuhn, 2015). Finally, Tinto's theory of departure (1993) indicates that students persist when they are integrated into both the academic and social systems of the university. Persistence can be understood as the students' academic progression towards degree completion regardless of institutional transfers, academic programs, or institutional contexts (York et al., 2015). Dropout has usually been suggested as an indicator of persistence in higher education (Hilton, 1982; Tinto, 1975, 1993).

2.3.The relationship between SES and academic performance

One of the most crucial turning points in educational research during the 20th century was the publication of a 1966 report by Coleman and colleagues entitled Equality of Educational Opportunity (EEO). The report showed that high school characteristics were unrelated to academic performance in the USA, but students' socio-economic conditions were. Consequently, many educational researchers have carried out studies aimed at understanding Coleman's main findings.

On the one hand, several authors have postulated theoretical frameworks, such as Astin's Student Involvement (1999) or Bourdieu's social capital theory (1986), which could explain how SES and academic performance are related. Regarding Bourdieu's social capital theory (1986), Dika and Singh (2002) critically reviewed the literature (published between 1986 and 2001) that relates social capital to educational outcomes and identified several problems with the conceptualization and measurement of social capital as a predictor of academic performance. In particular, sources of social capital are often confused with the resources and opportunities coming from it; thus, there is not a clear distinction between possession and activation of the

social capital (Dika & Singh, 2002). Additionally, the selection of cross-sectional data has made it difficult to determine how social resources and educational outcomes are related (Dika & Singh, 2002). Consequently, it cannot be entirely accepted that social capital explains how SES is related to academic performance (Jæger, 2011; Sullivan, 2001).

On the other hand, several meta-analytic studies on different educational settings have been conducted. Focusing on elementary and secondary levels, the main objectives of these meta-analyses (e.g., Sirin, 2005; Van Ewijk & Sleegers, 2010; White, 1982) have been (1) to determine the effect size of the relationship between SES and academic performance; and (2) to identify which factors could moderate the relationship between SES and academic performance. Regarding the first objective, findings show a positive, albeit moderate, relationship between SES and academic performance. Average correlations of 0.343 (S.D.= 0.204; White, 1982), 0.299 (S.D.= 0.169; Sirin, 2005) and 0.32 (S.E.= 0.016; Van Ewijk & Sleegers, 2010) have been found. With respect to the second objective, results suggest that methodological factors such as the unit of analysis (Sirin, 2005; White, 1982), the definition of SES (White, 1982), the source of the SES data, the range of the SES, and the type of SES-performance measure (Sirin, 2005), moderate the relationship between SES and academic performance.

Zooming in on higher education, one of the objectives of these meta-analyses (e.g., Richardson et al., 2012; Schneider & Preckel, 2017; Westrick et al.,2015) has been to explore the effect size of the relationship between SES and academic performance. Richardson et al. (2012) found a small correlation between SES and academic performance (r= 0.11, 95% CI [.08, .15]). Similarly, Westrick et. al. (2015) reported that SES is weakly related to first-year GPA (r= 0.24, 95% CI [.24, .25]) and second-year retention at university (r= 0.10, 95% CI [.09, .11]). Finally, SES was ranked in the 68th place among 105 variables associated with academic performance in

higher education (Schneider & Preckel, 2017). A concluding remark of this body of research is that there is a weak to moderate relationship between SES and academic performance in higher education. However, a more comprehensive exploration of this relationship is still missing in the educational literature.

2.4. Mediators of the relationship between SES and academic performance

Several theories have been proposed to explain how students grow and change during their university studies (Long, 2012). A well-known example within this body of literature is Astin's theory of involvement. Students' involvement refers to the extent to which a student invest energy into his or her university experience. The greater the student's involvement, the greater the students' learning and development (Astin, 1984; 1999). One analytic scheme drawn from Astin's theory of involvement is the I-E-O (input-environment-output) model (Astin, 1993). The I-E-O model suggests that students' educational outcomes are defined by the students' inputs (e.g., demographic characteristics, prior academic achievement), the environmental elements (e.g., university organizations, peer relations), and the interaction among students' inputs and environmental elements (Astin, 1993).

Most of the predictive studies in higher education lack of a theoretical foundation, being more empirical-based than theory-driven. Nevertheless, the I-E-O model seems to be a suitable approach to analyze the literature in higher education regarding the prediction of academic performance for two reasons. First, the I-E-O model allows investigating the direct and indirect influence (via environmental characteristics) of students' inputs on students' educational outcomes. Second, the I-E-O model recognizes the longitudinal nature of students' retention process and provides a framework to investigate it (Kelly, 1996).

Starting from the I-E-O model, predictive studies in higher education can be classified into two types. The first type of predictive studies, which is probably the most frequent one in higher education, has examined the academic performance as an input-output process, a common approach in the educational field. A review of the literature on the input-output analysis of the schools was carried out by Glasman and Biniaminov (1981). The authors concluded that inputs can be categorized as either student or school type, while outputs can be classified as cognitive and non-cognitive. Furthermore, a causal model including both direct and indirect effects of inputs on outputs was also proposed by Glasman and Biniaminov (1981). The second type of predictive studies in higher education has investigated academic performance as an input-environment-output process. A similar analytic scheme in the school level is the context, input, process, output model proposed by Scheerens (1990). In brief, context refers to the school environment as well as policy measures at a higher administrative level. Input relates to available resources, teachers' qualifications, and students' characteristics. Process groups variables such as curriculum, school organization, and school climate. Output is generally defined in terms of students' achievement.

Furthermore, the I-E-O model can frame the analysis of the mediators of the relationship between SES and academic performance in higher education. First, several "input-output" studies in higher education (e.g., Crawford, 2014; Stratton & Wetzel, 2011; Warburton, Bugarin, & Nuñez, 2001) have shown that (1) prior academic achievement is strongly related to academic performance in university and (2) prior academic achievement might decrease the strength of the SES-academic performance relationship. Although it has been amply documented that SES determines prior academic achievement, Marks (2017) has suggested that the influence of prior academic achievement on students' outcomes is not solely explained by their SES at previous

stages of life. Therefore, the first mediator investigated in this study is prior academic achievement.

Second, the "input-process-output" studies in higher education have suggested that university experience (Gerken & Volkwein, 2000; Smith, 2016; Walpole, 2003) does influence the relationship between SES and academic performance. University experience refers to how a student connects to the academic environment of the university (Astin, 1999). More specifically, perception of the learning environment, peer support, and institutional commitment could define university experience (Astin, 1999; De Clercq et al., 2013). Thus, the second mediator investigated in this study is university experience.

Third, although Astin (1999) suggested that holding a part-time job on campus could have a beneficial influence on students' retention, the explanatory role of working status has usually been investigated separately from the university experience. In this respect, the general trend in the literature has been to analyze the influence of worked hours on students' academic performance (e.g., Nonis & Hudson, 2006; Rochford et al., 2009; Stinebrickner & Stinebrickner, 2003). Nevertheless, the reasons why students decide to work when attending university are diverse; so, it can be argued that not only low SES students would work during their studies (Yanbarisova, 2015). Hence, the third mediator investigated in this study is working status.

3. Present Study

Past educational research has contributed to the understanding of the relationship between SES and academic performance. However, recent meta-analyses in higher education (Richardson et al., 2012; Schneider & Preckel, 2017; Westrick et al., 2015) are limited, mainly for two reasons. Firstly, both SES and academic performance were operationalized in these

studies using only one indicator, which narrows the understanding on how additional measures to assess such complex terms are related. Secondly, these meta-analyses did not explore how SES is first related to several students' characteristics and, subsequently, related to academic performance. This systematic review focuses on investigating the relationship between socio-economic status and academic performance in higher education in a more comprehensive way. The first objective of this study is to analyze different measures of SES and academic performance in higher education. Thus, the first research question addressed in this study is: *How are SES and academic performance in higher education measured?* The second objective of this study is to determine the mediating role of several factors on the relationship between SES and academic performance in higher education. Therefore, the second research questions of this study are: (*a) What is the relationship between SES and academic performance in higher education?* And (b) *Is the relationship between SES and academic performance in higher education mediated by* (*i) prior academic achievement, (ii) university experience, and (iii) working status?* To answer these research questions, a mixed-methods research synthesis of the selected studies is carried out (Heyvaert, Maes, & Onghena, 2013). A mixed-methods approach makes it possible to integrate both qualitative analyses (e.g., for this study, summative content analysis) and quantitative analyses (e.g., for this study, meta-analysis) of the results of the studies in order to obtain conclusions about the current state of the art of the literature (Heyvaert et al., 2013).

4. Method

This systematic review proceeded in three phases. In the first phase, an extensive literature search within several scientific databases was performed. Next, relevant literature retrieved from these databases was selected according to several criteria for inclusion. In the

second phase, the quality of the selected studies was critically appraised. Finally, the primary studies were analyzed following the guidelines of Aveyard (2014) and performing both summative content analysis and meta-analysis.

4.1. Literature search and literature selection

In this systematic review, four databases were consulted: ERIC, Scopus, SSCI, and PsycArticles, using combinations of the following search terms: "higher education", "academic performance", "academic achievement", and "academic outcomes". The initial search yielded 28,414 non-unique studies, as shown in Table 1. The selection of the literature was based on eight criteria for inclusion. As reported by Gamoran and Long (2007), the citations of Coleman's report increased again by the end of the '90s and achieved an average of 55 citations per year from 2000, which represents a new interest for studying academic performance since then. Thus, studies published after 2000 (Criterion 1) were considered for subsequent analysis. Second, only empirical studies, which explore academic performance in higher education, were included in this analysis (Criterion 2). Studies focusing on specific subgroups of students (i.e., students with disabilities; online learners) were excluded from this analysis (Criterion 3). As this systematic literature review was focused on variables related to SES, studies about learning styles were not included (Criterion 4). Similarly, studies regarding age differences (Criterion 5), gender differences (Criterion 6), and ethnic differences (Criterion 7) were not included in this analysis. Finally, only studies that explicitly report the relationship between SES and academic performance were selected for further analysis (Criterion 8).

The selection process of the initial 28,414 studies was carried out in six steps. In step 1, duplicate studies were eliminated using the EndNote software, leaving 24,246 studies. In step 2, studies published before 2000 were excluded, leaving 9,928 studies. Next, in step 3, studies

without a date, a wrong date, or those that were not written in English or Spanish were eliminated, leaving 9,658 studies. As expected, a summative content analysis requires a full understanding of the reviewed studies. Therefore, in step 4, the title and the abstract of the remaining studies were screened using the first seven criteria for exclusion presented above. As a result of this fourth step, 208 studies were retained for further analysis. In step 5, a total of 202 studies were scanned/read diagonally as six full texts articles could not be retrieved. This fifth step, using the same exclusion criteria, led to a further reduction of the number of studies to a total of 100. In the final step, the full texts of these 100 studies were read in depth, and 69 additional studies were excluded using criterion 8 presented above. As a result of the selection process, 31 studies remained. As any systematic review is a challenging and time-consuming task, 18 months passed between the first literature search and the writing of the first draft of this study. Hence an update of the literature search was carried out on May 2017. In total, 1,652 new hits were retrieved, and after using the previously mentioned selection criteria, six additional studies were selected. Finally, a back-tracing process of the 37 selected studies was performed to identify and select additional relevant studies. The outcome of this process was the selection of ten further studies. As a result of the selection process, a total of 47 primary studies were considered for critical appraisal.

4.2. Critical appraisal

The quality of the selected primary studies (n = 47) was evaluated using the checklists of the National Institute for Health and Clinical Excellence (2009). The main criteria for the quality appraisal were (a) a clear statement of the aims of the research, (b) an appropriate research design, (c) a well-described and appropriate sampling strategy, data collection, and analysis method; and (d) a clear description of the research findings. Each study was rated as either high,

medium quality, or low quality. After this critical appraisal, five studies were excluded because of low quality, leaving 42 studies for analysis. Appendix A shows the results of the critical appraisal process.

4.3. Analysis of the literature

The analysis of the literature was conducted under the guidelines proposed by Aveyard (2014). First, the main characteristics of the selected studies were summarized (see Appendix B). Then, every study was reread to identify and codify relevant information. Consequently, all the studies were coded assigning the following themes: operationalizations of SES (theme 1); operationalizations of academic performance (theme 2); relationship between SES and academic performance (theme 3); prior academic achievement (theme 4), university experience (theme 5), and working status (theme 6). The first research question was answered by summative content analysis. The second research questions were answered using both summative content analysis and meta-analysis.

4.3.1. Summative content analysis

A summative content analysis goes beyond quantifying the occurrence of words and content within texts; it aims at analyzing and interpreting that content (Hsieh & Shannon, 2005). To address the first research question, a summative content analysis of the first two themes listed above was carried out. Therefore, the operationalizations of SES (theme 1) were categorized as parents' educational level, income, parents' occupation, home resources, or neighborhood resources. Similarly, the operationalizations of academic performance (theme 2) were categorized as achievement, persistence, or competencies.

To answer the first part of the second research question, the relationship between SES and academic performance in higher education (theme 3) was classified in three categories:

significant and positive; significant and negative; and not significant. Those categories were chosen as they are the three possible basic ways in which two variables are correlated. Subsequently, to answer the second part of the second research question, the mediating role of prior academic achievement (theme 4), university experience (theme 5), and working status (theme 6) was explored following the rationale explained next. The interest was to determine the effect size and the significance level of the relationships indicated with numbers in Figure 1. That is, the relationship between SES and academic performance (1), once the mediator was also introduced in the same explanatory model; and, next, the relationship between the mediator and academic performance (2). As such, a larger and significant relationship between the mediator and academic performance would suggest mediation. It is imperative to notice, however, that not all the analyzed references provided information on the relationship between SES and the mediator (3). Consequently, this third relationship could not be included in the analysis, so it was not possible to distinguish between complete and partial mediation.

4.3.2. Statistical meta-analysis

Hunter and Schmidt (1990) define a meta-analysis as the quantitative summary and analysis of different effect sizes retrieved from several various studies. To further extend the answer of the second research question a meta-analysis was carried out to calculate the average effect size of (a) the relationship between SES and academic performance and (b) the relationship between the investigated mediators and academic performance.

Metric from expressing effect sizes. The effect size (ES) selected for this study was the Pearson's correlation coefficient (r). Most of the included studies reported a standardized regression coefficient, which was converted into an r-value using the guidelines proposed by Peterson and Brown (2005). Although alternative methods to transform standardized regression

coefficients into either partial or semi-partial correlations exist (Aloe & Becker, 2012; Aloe & Thompson, 2013; Fernández-Castilla et al., 2019), there was no enough information in the primary studies to carry out such conversions. In four studies (Birch & Miller, 2006; Delaney, Harmon, & Redmond, 2011; Guimarães & Sampaio, 2013; Win & Miller, 2005) the unstandardized regression coefficient was first converted into a standardized coefficient using the standard deviation of both the predicted and the predictor variable as suggested by Bowman (2012). In six studies (Arulampalam & Smith, 2004; Hansen & Mastekaasa, 2006; Smith, 2016; Walpole, 2003; Yanbarisova, 2015; Yao, Zhimin, & Peng, 2015) the reported odds ratio were converted into an r-value following the procedure proposed by Borenstein, Hedges, Higgins, and Rothstein (2009). In one study (Waqas, Abbasi, & Idrees, 2013) the reported t-value was first converted into a standard mean difference (d-value) and, then, this d-value was converted into an r-value also following the procedure suggested by Borenstein et al. (2009).

In total, 13 studies were left out of the meta-analysis as it is explained next. The standardized regression coefficient of four articles (Loehr, Almarode, Tai, & Sadler, 2012; Morlaix & Suchaut, 2014; Pedrosa et al., 2007; Rodríguez, Ariza, & Ramos, 2014) could not be calculated due to insufficient information. It is essential to notice that the inclusion of unstandardized regression coefficients could dramatically increase the average effect size. Similarly, in two of the analyzed studies (Frischenschlager, Haidinger, & Mitteraurer, 2005; Stratton & Wetzel, 2011), it was not possible to convert the reported odds ratio due to lacking information. In five of the articles (Anderton et al., 2016; Gerken & Volkwein, 2000; Ifenthaler & Widanapathirana, 2014; Nguyen, 2016; Zheng, Saunders, Shelley, Mack, & Whalen, 2002) the effect size was not reported for being not significant. Finally, in two of the articles

(Bahamón & Reyes, 2014; Triventi, 2014), the relationship between SES and academic performance was described but not reported through a specific effect size.

Statistical independence. One crucial methodological aspect when performing a meta-analysis is to warrant that effect sizes are independent among them. To achieve such independence, the average effect size was calculated in studies with more than one effect size. Therefore, the sample on which it was based contributed only with one effect size to the analysis (Sirin, 2005). One article (De Clercq et al., 2013) reported two different effect sizes coming from two different data sets. Both effect sizes were included in the meta-analysis.

Combining effect sizes across studies. Another major important consideration when conducting a meta-analysis is to decide how to transform the different effect sizes retrieved from the examined studies so that a meaningful and valid aggrupation can be made. In the case of this study, the effect sizes were converted using Fisher's transformation recommended by Hedges and Olkin (1985). Fisher's transformation is a variance stabilizing transformation so that the *r-value* becomes independent from the population *p-value* (Aloe & Becker, 2012; Bowman, 2012).

Homogeneity analysis. The homogeneity among the effect sizes was analyzed using the Hedge's Q test of homogeneity. This test is based on chi-square statistics with k-1 degrees of freedom, where k is the number of investigated effect sizes. A significant result suggests that effect sizes across the studies are heterogeneous, so further exploration of the existence of possible mediators should be conducted.

Publication bias. A common fact in scientific literature is the publication bias. Publication bias means that only statistically significant results or results which are supporting the expected relationship are published (Rothstein, Sutton, & Borenstein, 2005). In this study, publication bias was assessed using the funnel plot. To evaluate the funnel plot symmetry, the Egger's

regression test (Egger, Smith, Schneider, & Minder, 1997) was performed. Results indicated that there was no publication bias in the examined studies of this meta-analysis ($z = .7910$, $p = 0.4289$).

Analysis of the mediators. Similar to the summative content analysis, the existence of mediators was analyzed by contrasting the effect size of the relationships indicated with numbers in Figure 1. The average effect size between SES and academic performance (1) was compared to the average effect size between the presumed mediator and academic performance (2). As such, a larger and significant average effect size between the mediator and academic performance would suggest mediation.

5. Results

The results of this systematic literature review are presented in accordance with the research questions. Sections 5.1 and 5.2 are based on the results derived from the summative content analysis. Section 5.3 is based on the results of both summative content analysis and meta-analysis.

5.1. Measuring SES

Table 2 presents the classification of the operationalizations of SES into five major measurements: parents' educational level, income, parents' occupation, home resources, and neighborhood resources. Table 2 also provides information regarding the type of measure (i.e., single or composite score) and the type of scale (i.e., categorical or continuous) of each one of the examined operationalizations. It is important to notice that a study can appear more than once in Table 2, as it might have reported several indicators to assess SES. The classification of the operationalizations of SES is described in detail in the following sections.

5.1.1. Parents' Educational level. This category (*n*= 25) comprises operationalizations that assessed parents' educational level as a single indicator (*n*= 21) or within a composite score (*n*= 4). With regard to "*single indicator"* (*n*= 21), the use of categorical scales *(n*= 19*)* was identified to assess parents' educational level in three possible ways: (a) the highest level of parental education (*n*= 4); (b) a dichotomous variable which indicated whether parents have attended college (*n*= 3); and using several categories going from no educational level to university degree to measure (c) both parents' level (*n*= 9); (d) only mother level (*n*= 2); and (e) only father level. Additionally, continuous scales (*n*= 2) were employed to measure years of parents' education in two different ways. Firstly, Rothstein (2014) used the average number of years of education of students' parents. Secondly, Delaney et al. (2011) converted the qualifications reported by the parents into years of education by estimating the number of years which are required to obtain those degrees. Consequently, this variable ranges from 8 (time necessary to complete primary school) to 19 (time necessary to complete a Ph.D.).

Regarding "*within composite scores"* (*n*= 4), parents' educational level was assessed through both categorical (*n*= 3) and continuous scales. On the categorical scales (*n*= 3), De Clercq et al. (2016), and Rodríguez et al. (2014) reported the use of the highest level of parents' education (*n*= 2). In addition, Gouvias, Katsis, and Limakopoulou (2012) measured parental education using the International Standard Classification of Education (ISCED). The ISCED is a classification of education programs by levels and areas of knowledge proposed in 1997 by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) and then revised in 2011. The main goal behind this classification is the need to compare internationally different educational systems (Schneider, 2013). More specifically, there are nine ISCED levels from Early childhood education to Doctoral or equivalent level. On the continuous scales, Walpole

(2003) recoded parents' educational level into a continuous SES variable using the Occupational Prestige and socioeconomic scores proposed by Nakao and Treas (1994). In particular, Nakao and Treas (1994) suggested the following prediction equation to calculate a socio-economic index (SEI): SEI= 9.24 + 0.64 (Education) + 0.31 (Income).

5.1.2. Parents' Occupation. This category (*n*= 10) includes operationalizations of parents' occupation as a single indicator (*n*= 7) or within composite scores (*n*= 3). Regarding *"single indicator"* (*n*= 7), the use of categorical scales (*n*= 7) was identified to assess parents' occupation in three possible ways: (a) as a dichotomous variable to indicate whether parents worked; (b) as a dichotomous variable to indicate whether parents' occupation required a higher education degree; (c) as several scales going from unskilled worker/unemployed to managerial/professional (*n*= 4). In addition, Smith (2016) reported the use of the Standard Occupational Classification scale 2000 (SOC 2000). The SOC 2000 is a classification system of the occupational structure of the United States, proposed by The Bureau of Labor Statistics. The SOC 2000 allows the comparison among paid occupations, based on the type of work, required skills, education, and training. More specifically, the SOC 2000 includes occupations from the public, private, and military sectors (Bureau of Labor Statistics, 2006).

Regarding *"within composite scores"* (*n*= 3), Rodríguez et al. (2014) used nominal categories which described parents' occupation. In addition, Gouvias et al. (2012) reported the use of seven categories going from unemployed until professionals, managers, and business owners. Finally, Walpole (2003) used the Occupational Prestige and socioeconomic scores, proposed by Nakao and Treas (1994), to recode parents' occupation into a continuous SES variable.

5.1.3. Income. This category (*n*= 20) sorts operationalizations that measured income as a single indicator (*n*= 17) or within a composite score (*n*= 3). Regarding the *"single indicator"* (*n*= 17), the use of categorical scales *(n*= 16*)* was identified to measure income with: (a) several categories to discriminate between low and high income (*n*= 9); (b) dichotomous scales to determine whether students have financial aid (*n*= 4) or received subsidized lunches (*n*= 2); and (c) quartiles to classify university tuition fees. Also, Hansen and Mastekaasa (2006) proposed a continuous scale between 0 and 1 to determine the relative position of a student´s family within the distribution of all family incomes (i.e., a score of 0.52 indicates that 52% of the families have less income).

Concerning *"within composite scores"* (*n*= 3), continuous scales were used by Rodríguez et al. (2014) to combine tuition fees and monthly income into a composite score. Similar to the parents' educational level and occupation, parental income was also re-coded by Walpole (2003) using the Occupational Prestige and socioeconomic scores proposed by Nakao and Treas (1994).

5.1.4. Home resources. This category (*n*= 8) contains operationalizations of home resources as a single indicator (*n*= 6) or within a composite score (*n*= 2). Regarding *"single indicator"* (*n*= 6), categorical scales *(n*= 4) were selected to determine whether students have computer and internet connection (*n*= 3); and books related to schoolwork. In addition, continuous scales (*n*= 2) were used to calculate household crowding. Harb and El-Shaarawi (2007) defined household crowding as the ratio between the number of family members and the number of rooms in the house. Concerning *"within composite scores"* (*n*= 2), continuous scales were used to include the number of possessions as an indicator of home resources.

5.1.5. Neighborhood resources. This category (*n*= 9) presents operationalizations of socio-economic conditions at area level. The use of both single indicators (*n*= 3) and composite scores

(*n*= 6) was identified in the examined primary studies. Among the *"single indicators"* (*n*= 3), categorical scales (*n*= 3) were used to assess students' stratum (*n*= 2) and degree of urbanization. In particular, students' stratum refers to the six categories used by the Colombian government to classify households based on their physical characteristics and surroundings. The main reason behind this classification is to establish the price of public services hierarchically in each area (The World Bank, 2012).

Regarding *"composite scores"* (*n*= 6), the link of students' postal codes to several indices aimed at classifying areas based on socio-economic advantages and disadvantages was reported in the analyzed primary studies. These indices were the Socio-Economic Indices for Areas (SEIFA) created by the Australian Bureau of Statistics. In particular, the Index of Economic Resources (Birch & Miller, 2006; Win & Miller, 2005); the Index of Education and Occupation (Win & Miller, 2005); and the Index of Relative Socioeconomic Advantage and Disadvantage (Puddey & Mercer, 2014) were identified in the examined references. Additionally, Thiele, Singleton, Pope, and Stanistreet (2014) used indices suggested by the Higher Education Funding Council for England (HEFCE). More specifically, the Index of Multiple Deprivation (IMD) was employed to rank area deprivation in five quintiles (where quintile one included the most deprived areas, and quintile five included the least deprived areas). Finally, Shulruf, Hattie, and Tumen (2008) reported the use of the school decile, which is the New Zealand system aimed at classifying schools in ten categories according to their students' socio-economic conditions. Such a classification makes it possible to determine, for instance, whether schools are receiving students coming from low-SES areas.

5.1.6. Model for measuring SES. Figure 2 shows the model to assess SES resulting from the summative content analysis carried out in section 5.1. Education, occupation, income, home

resources, and neighborhood resources are the five major measurements to assess SES. Moreover, such as measurements can be assessed in different possible levels, namely, individual, family, or area level.

5.2.Measuring academic performance in higher education

Tables 3a and 3b present the classification of the operationalizations to assess academic performance in higher education into three measurements: achievement, competencies, and persistence, both at university and before university. Tables 3a and 3b also display information regarding the level of measurement (i.e., categorical or continuous) as well as the scale used in each of the examined references. Again, studies can appear more than once in Tables 3a and 3b, as they might have used several indicators to assess academic performance. The classification of the operationalizations of academic performance in higher education is explained in the upcoming sections.

5.2.1. Academic performance at university. This category includes operationalizations which assessed academic performance at university (*n*= 55). Operationalizations conforming this category were grouped in three subcategories: academic achievement (*n*= 43); competencies (*n*= 6), and persistence (*n*= 6). Regarding the subcategory *academic achievement (n*= 43*)*, the operationalizations identified in the analyzed studies were Grade Point Average (GPA; *n*= 32); single grades (*n*= 4); number of credits (*n*= 6) and the relative achievement index. More specifically, three different types of GPA were identified in the examined references. The average at the end of the first year (*n*= 16), the current average when the study was conducted (*n*= 8), and the final average upon graduation (*n*= 8). Although both categorical (*n*= 8) and continuous (*n*= 24) scales were used to assess GPA, the most frequently used scales to measure GPA were continuous from 0 to 4 (*n*= 15) and from 0 to 100 (*n*= 5). In addition, the use of a

single grade was identified as grades in subject areas (*n*= 3) and grades in a first-year test. In the case of the number of credits (*n*= 6), Rodríguez and Ruiz (2011) proposed an original indicator, the *degree progression index*, which is the relationship between the actual number of credits, and the expected number of credits that a student must take. Moreover, Triventi (2014) suggested that ECTS credits are a concise way to measure students' academic achievement because they represent not only how many exams a student completed satisfactorily but also their importance. Finally, the *relative achievement index* was proposed by Pedrosa et al. (2007) to compare students' performance at the entrance and exit of all courses. Differences in both the grading system and the number of students among the courses were the main reasons for creating this index, instead of using the actual numerical value of the grades.

In the subcategory *competencies (n= 6),* Bahamón and Reyes (2014) and Rodríguez et al. (2014) used the SABER PRO test, which is a standardized test taken by the students at the end of the university level in Colombia to determine both their generic competencies (e.g., quantitative reasoning, critical reading) and specific competencies within each field of study. Similarly, students' proficiency in English was assessed through several standardized tests such as the College English Test (CET) and the internal Post-Entrance Literacy Assessment (PELA). In addition, Morlaix and Suchaut (2014) reported the use of the Diplôme Approfondi de Langue Française (DALF) test to evaluate the first-year students' written comprehension. Finally, Puddey and Mercer (2014) reported the use of the Graduate Medical School Assessment Test (GAMSAT) to assess the level of preparation for undertaking Medicine studies at the graduate level at Australian, British, and Irish universities.

Regarding the subcategory *persistence (n= 6)*, all the analyzed operationalizations were related to completion status. As such, the operationalizations grouped in this subcategory were

dropout (*n*= 2), final degree classification (*n*= 2), attending graduate school, and graduation rate. In particular, the UK undergraduate degree classification was sorted in this subcategory.

5.2.2. Academic performance before university. This category includes operationalizations which assessed academic performance before the university (*n*= 43). In this case, the analyzed operationalizations were also grouped in three subcategories: prior academic achievement (*n*= 20), competencies (*n*= 15), and persistence (*n*= 8).

In the subcategory *prior academic achievement* (*n*= 20), academic performance before university was measured using HSGPA *(n*= 14*),* single grades (*n*= 3), and subject area exams (*n*= 3). HSGPA was calculated through both categorical (*n*= 4) and continuous (*n*= 10) scales. In particular, the continuous scale going from 0 to 4 (*n*= 4) was the most frequently reported in the analyzed studies. Regarding single grades, grades in specific subjects such as science, mathematics, and English (*n*= 2) and biology, chemistry, and physics were reported in the examined primary studies. Furthermore, subject area exams such as the NCEA qualification system in New Zealand (Shulruf et al., 2008), the Leaving Certificate in Ireland (Delaney et al., 2011), and the SABER 11 test in Colombia (Bahamón & Reyes, 2014) were identified in the examined studies.

In the subcategory *competencies* (*n*= 15) several entrance exams to university were identified in the analyzed studies. These exams were the SAT (formerly known as Scholastic Assessment Test; *n*= 9) and the American College Testing (ACT; *n*= 3) in the USA. These entrance exams are of importance because they indicate students' academic preparation for university. Remarkably, in three of the investigated references (Gouvias et al., 2012; Guimarães & Sampaio, 2013; Nguyen, 2016), subject area exams were used as *entrance exams* to the university.

Within the subcategory *persistence* (*n*= 8), the operationalizations of academic performance before university were grouped as admission ranks *(n*= 5*)* and grade retention (*n*= 3). In relation to admission ranks, the Tertiary Entrance Rank (TER) and the Australian Tertiary Admission Rank (ATAR) were identified in the analyzed studies. ATAR ranks students' previous academic achievement in high school, and it is mostly used as an admission criterion for university in Australia (Li & Dockery, 2014). It is important to notice that ATAR replaced TER in 2010. Regarding *grade retention* (*n*= 3), the operationalizations identified in the analyzed studies were repeated years at high school (*n*= 2) and the number of class repetitions.

5.2.3. Model for measuring academic performance in higher education. Figure 3 proposes a model to measure academic performance in higher education drawn from the summative content analysis conducted in section 5.2. Achievement, competencies, and persistence are the three measurements to assess academic performance in higher education. Furthermore, those measurements can be assessed both at university and before university.

5.3.The relationship between SES and academic performance in higher education

Table 4 provides information on the relationship between SES and academic performance in higher education, as well as the mediators identified in the analyzed primary studies. Such information was analyzed through both summative content analysis and meta-analysis. This section presents first the results for the SES-academic performance relationship. Next, the results for the investigated mediators are given.

The summative content analysis showed that there are three types of relationship between SES and academic performance in higher education, namely, positive (*n*= 25), negative (*n*= 6), and no significant (*n*= 12). The positive relationship indicated that the better the socio-economic conditions, the better the academic performance in higher education. However, a closer revision

of the *negative relationship* (*n*= 6) revealed interesting information. Pedrosa et al. (2007) indicated that students who came from public schools had a better academic performance than their counterparts coming from private schools. Those students with less favorable socio-economic conditions were able to develop certain "educational resilience", which was described by the Pedrosa et al. (2007) as the process of transforming early disadvantages in life into better academic performance in higher education. In addition, students who either (a) were scholarship holders (Morlaix & Suchaut, 2014), or (b) lived in a crowded house (Harb & El-Shaarawi, 2007), or (c) came from high schools with high proportion of free/reduced lunches (Black et al. 2015), also had low academic performance in university. Finally, Arulampalam et al. (2004) suggested that students who had higher scores in biology, chemistry, and physics in high school also had fewer chances of dropping out during university.

The meta-analysis revealed that the average effect size of the relationship between SES and academic performance in higher education was weak and significant (ES = .06, Se = .013, CI = [.03; .08], $p < .001$). The Q test of homogeneity for this average effect size was significant (Q = 460.30, df = 22, $p < .001$). Figure 4 shows the forest plot with the average effect size of the relationship between SES and academic performance in higher education.

5.3.1. Prior academic achievement

The mediating role of prior academic achievement was investigated based on the information presented in Table 4 and following the rationale explained in section 4.3.1. Therefore, it was possible to compare the relationship between SES and academic performance with the relationship between prior academic achievement and academic performance.

The summative content analysis suggested that HSGPA (*n*= 15), entrance exams (*n*= 5), admission ranks (*n*= 3), failure at secondary school (*n*= 2), and type of high school diploma

were the mediators of the relationship between SES and academic performance in higher education. Regarding *HSGPA* (*n*= 15), high school grades were more strongly related to academic performance than SES. In such cases, the relationship between SES and academic performance was (a) positive (*n*= 9), (b) negative (*n*= 2), and (c) not significant (*n*= 4). Concerning *entrance exams* (*n*= 5), it was found that SAT scores (*n*= 4) and Leaving Certificate scores were more strongly related to academic performance than SES. Correspondingly, the reported relationship between SES and academic performance was (a) positive (*n*= 4) and (b) not significant. In addition, *failure at secondary school* (*n*= 2) was more strongly related to academic performance than SES. In such cases, the relationship between SES and academic performance was (a) negative and (b) not significant. Finally, Harb and El-Shaarawi (2007) indicated that receiving a scientific diploma in high school was stronger related to GPA than living in a crowded household.

The meta-analysis showed that the average effect size of the relationship between prior academic achievement and academic performance in higher education was positive and significant (ES = .29, Se = .07, CI = [.15; .42], $p < .001$). The Q test of homogeneity for this average effect size was significant (Q = 12088.23, df = 20, $p < .001$).

5.3.2. University experience

The mediating role of university experience was investigated based on the information presented in Table 4 and following the rationale explained in section 4.3.1. Thus, the relationship between SES and academic performance was compared to the relationship between university experience and academic performance.

The summative content analysis revealed that academic experience (*n*= 3) and institutional experience (*n*= 2) were the mediators of the relationship between SES and academic

performance in higher education. Regarding *academic experience* (*n*= 3), Bruinsma and Jansen (2007) indicated that students who had higher grades were also more satisfied with the teacher's ability to explain the topic, the teacher's ability to use the resources, and the teacher's openness to questions. Moreover, the higher the study load, the lower the grades in the course, while the higher the number of contact hours, the higher the grades. In this case, Bruinsma and Jansen (2007) also found a no significant relationship between SES and academic performance in higher education. Similarly, Walpole (2003) suggested that low-SES students who had worked on professors' research during university were more likely to enroll in graduate programs after university. In this case, the relationship between SES and academic performance was significant but weaker. Finally, Gerken and Wolkwein (2000) found that students' academic conscientiousness was more strongly related to their degree completion and GPA than parents' educational level. Regarding *institutional experience* (*n*= 2), Harb and El-Shaarawi (2007) found that students who had a positive attitude towards university also had a better academic performance. This influence was greater than the influence of SES on academic performance. Also, Wang, Kong, Shan, and Vong (2010) reported that students' sense of belonging was more strongly related to students' GPA than the father's education and family income.

The meta-analysis showed that the average effect size of the relationship between university experience and academic performance in higher education was positive and significant (ES = .13, Se = .02, CI = [.09; .16], $p < .001$). The Q test of homogeneity for this average effect size was not significant (Q = 2.4094, df = 5, p = .79).

5.3.3. Working status

The mediating role of working status was investigated based on the information presented in Table 4 and following the rationale explained in section 4.3.1. Hence, a comparison was made

between the relationship between SES and academic performance and the relationship between working status and academic performance.

The summative content analysis indicated that employed or not (n= 5), characteristics of work (n= 2) and reasons for working had a mediating role on the relationship between SES and academic performance in higher education. Regarding *employed or not* (n= 5), the influence of job on academic performance was stronger than the influence of SES. In such cases, the relationship between SES and academic performance was (a) positive (n= 3), (b) negative, and (c) not significant. With respect to *characteristics of work*, Yanbarisova (2015) found that students who were working full-time outside their academic fields showed worse academic performance than their counterparts. In this case, the relationship between SES and academic performance was no significant. In addition, Wang et al. (2010) indicated that jobs that provided students the opportunity to learn new stuff had a greater influence on their academic performance than father's education, father's occupation, and family income. Regarding *reasons for working*, Wang et al. (2010) also indicated that when the reason for working was acquiring working experience, the part-time jobs were more strongly related to students' GPA than father's education, father's occupation, and family income.

The meta-analysis showed that the average effect size of the relationship between working status and academic performance in higher education was negative and significant (ES = -.10, Se = .05, CI = [-.19; -.01], $p < .001$). The Q test of homogeneity for this average effect size was significant ($Q = 51.7643$, $df = 7$, $p < .001$).

To sum up, the summative content analysis suggested that the investigated mediators were more strongly related to academic performance than SES. Furthermore, the meta-analysis showed that the average effect sizes of the mediators were significant and larger than the effect

size of the SES-academic performance relationship. The mediator with the largest average effect size was prior academic achievement, followed by university experience, and working status.

6. Discussion

The objectives of this systematic literature review were (1) to analyze how SES and academic performance in higher education are measured; (2) to determine whether the relationship between SES and academic performance in higher education is mediated by a) prior academic achievement; b) university experience; and c) working status.

6.1. Conclusions and implications for practice

6.1.1. Measuring SES. The first conclusion of this study is that five major measurements should be considered when assessing SES: education, occupation, income, home resources, and neighborhoods resources. Findings of this systematic literature review also suggest specific ways to operationalize each one of the measurements of SES.

First, it was found that education is usually assessed through categorical variables that indicate the achieved academic degree going from no education until doctoral degree. In this respect, it is highly recommended to use the International Standard Classification of Education (ISCED) to operationalize education. ISCED establishes a unique scale which allows comparisons among different international contexts.

Second, results of this study showed that occupation is predominantly assessed using categorical scales. In this regard, a well-established classification to measure occupation is the Standard Occupation Classification (SOC). Such a classification is based upon the type of work, skills, and level of education. Even though the SOC was first proposed in the USA, national variants also exist in countries within Europe and Asia. Therefore, the SOC could be used not

only for international comparisons but also as a classification system for countries which have not created their classification.

Third, findings of this study indicated that income is mostly measured with intervals to categorize the amount of earned money. However, a more advisable way to operationalize income is through a multiple of the minimum wage paid in each country (i.e., one minimum wage, two minimum wage, etc.). As such, the minimum wage could be related to the type of work and level of education of a wage-earner. Besides, the use of the minimum wage would allow the comparison of socio-economic conditions across several different countries.

Fourth, although results from this study revealed that measures of home resources are related to the possessions available at home, it seems adequate to distinguish between material resources and cultural resources (Gouvias et al., 2012). Material resources are merely the items students have at home (i.e., personal computer, internet connection, an individual room), while cultural resources are items which might represent an intellectual added value to the students (i.e., books related to schoolwork or musical instruments).

Finally, this study revealed that neighborhood resources can be operationalized through indexes which rank areas according to their socio-economic advantages and disadvantages. Well-established examples of these indexes are the socio-economic indexes for area (SEIFA) proposed by the Australian Bureau of Statistics and the index of multiple deprivation (IMD) proposed by the UK government. Even though these indexes are created for specific national contexts, the methodology underlying their creation can be replicated to develop indexes within each country. However, it seems not convenient to use these indices directly to measure students' SES. What is recommended, instead, is to use area-based indicators such as SEIFA to achieve a better understanding of the social and economic conditions where students live

(Australian Bureau of Statistics, 2011). This suggestion is consistent with previous meta-analytic studies focusing on primary and secondary education (e.g., Sirin, 2005; White, 1982), where it has been recommended to avoid using aggregated indicators to assess SES at the individual level, as they can overestimate the effect of the relationship between SES and academic performance.

6.1.2. Measuring academic performance in higher education. The second conclusion of this study is that academic performance in higher education should be assessed considering three major measurements: academic achievement, competencies, and persistence. This study also identified several ways to operationalize such measures both at university and before university.

Regarding academic achievement, results from this study corroborate that first-year GPA is the most used operationalization of academic achievement at university. First-year GPA is considered a strong predictor of subsequent academic outcomes at university (Cliffordson, 2008; Gerken & Volkwein, 2000). When the interest is to compare GPA across different fields and institutions, it is necessary to take into account that the grading system does change between fields and institutions of higher education; furthermore, there could also be variations in the assessment process regardless of the use of the same grading scale (Hansen & Mastekaasa, 2006). In addition, findings of this study also reveal that HSGPA is the most common operationalization of prior academic achievement before university. HGSPA depends on the curriculum followed in each institution (Westrick et al., 2015), the quality and strictness of the scoring system as well as the student population in each institution. The selection of HSGPA as a predictor of academic performance increases the explained variance of GPA at university (Zheng et al., 2002). Furthermore, HSGPA seems to have a larger predictive validity than

entrance exams, regardless of the grading system used and the academic program (Cliffordson, 2008).

With reference to competencies, findings of this systematic literature review indicate that competencies have been operationalized through standardized tests outcomes both at university and before university. However, the difference across levels might lie on the purpose of such tests. In the case of academic performance at university, standardized tests aim to evaluate the acquisition of both generic and specific competencies pertaining to each study area. In the case of academic performance before the university, standardized tests are designed as entrance exams to estimate the students' academic preparation for their university studies.

Nevertheless, the use of achievement tests as entrance exams to university was also identified in the examined primary studies. This finding is somewhat problematic for several reasons. Firstly, achievement tests are designed to measure past accomplishment in learning instead of measuring the capacity for future accomplishment (Sidhu, 2005). Secondly, whereas a lot is known about the predictive validity of aptitude tests (e.g., SAT I), the predictive validity of achievement tests (e.g., SAT II) is still unclear in the literature (Cliffordson, 2008). Thirdly, Zwick (2012) has suggested that achievement tests might be indicating the degree to which wealthier students have access to either better information of the test (content hypothesis) or a better preparation for the test (coaching hypothesis). Therefore, achievement tests seem to be more related to students' SES than aptitude tests.

Finally, this study suggests that persistence in university can be measured in terms of students' degree completion. In addition, persistence before university can be assessed as the students' academic rank and students' grade repetition. An important conceptual distinction between persistence and retention should be acknowledged. Persistence is an individual

phenomenon, while retention is an institutional one; therefore, these terms should not be used interchangeably (Rearson, 2009).

6.1.3. The relationship between SES and academic performance in higher education.

The third conclusion of this study is that the relationship between SES and academic performance in higher education is weak. This result is coherent with previous meta-analyses in higher education, which have also reported a weak effect size (e.g., Richardson et al., 2012). A critical interpretation of the findings of this study could arise the question of the real importance of SES as a predictor of academic performance in higher education. To begin with, it could be the case that the influence of socio-economic conditions on students' performance is lower in higher education than in previous levels of education (the influence of SES on prior academic achievement has been well-established in the educational research). One can also argue that regardless of the hindrances that low-SES students face in entering university, those who are admitted share a similar educational experience than their wealthier counterparts (Smith, 2016). Therefore, the higher education system could have the same influence on any student despite his or her socio-economic conditions.

Furthermore, findings of this study indicate that the relationship between SES and academic performance in higher education is weak when other factors are considered. This fact urges educational research field to select more robust analyses techniques when investigating the academic performance in higher education. A mere bivariate analysis does not suffice anymore. In addition, regardless of the multiple theories in higher education which suggest that SES and academic performance are positively related, strong empirical evidence supporting these theoretical claims is still missing in the educational literature (Marks, 2017).

However, a weak relationship between SES and academic performance in higher education does not imply that low-SES students should be ignored or that increasing their participation in university should be dismissed. How to efficiently attend low-SES students' educational needs remains a challenge for the higher education system. In this respect, findings of this systematic literature review might be transferred into three ways to properly deal with that challenge.

Firstly, it was found that prior academic achievement is stronger related to academic performance in university than SES. While this finding is not surprising, it does support the need for reinforcing the past performance of low-SES students through, for instance, academic preparation courses before university. An example of this type of programs is the enabling programs proposed by the Australian Government. Enabling programs are designed to provide disadvantaged students specific competencies (e.g., literacy, numeracy, communication, critical thinking) so that they can be prepared for university studies (Pitman et al., 2016). Moreover, enabling programs are effective pathways to higher education for almost half of the enrolled disadvantaged students (Hodges et al., 2013).

Secondly, findings from this study also revealed that the influence of university experience on academic performance is larger than the influence of SES. Defining factors of university experience such as classroom climate, quantity and quality of the instruction (Bruinsma & Jansen, 2007), sense of belonging and school integration (Wang et al., 2010), and peer support (De Clercq et al., 2013) would help low-SES students to adapt to their new academic settings in university. Interestingly, Devlin, Kift, Nelson, Smith, and McKay (2012) have proposed a set of teaching guidelines in order to foster the low-SES students' academic

performance. Far for being prescriptive, these guidelines can be understood as key practical advice for teachers whose students come from low socio-economic settings.

Thirdly, there was also evidence of the likely mediating role of working status in the SES-academic performance relationship. This finding supports the assumption that working during university studies might have a negative influence on students' performance. However, students who work part-time within their academic fields might have better academic performance than students who work outside their academic areas (Wang et al., 2010; Yanbarisova, 2015). Thus, working should allow low-SES students not only to overcome financial needs but also to extend their academic experience by increasing their body of knowledge while attending university. A concrete example of this type of job for low-SES students is serving as undergraduate teaching assistants (UTA).

6.2. Limitations

Although the results of this systematic literature review provide insights into the relationship between SES and academic performance in higher education, several limitations of the present study should be acknowledged. First, the number of studies which explore the relationship between SES and academic performance is quite low. Hence, all studies that aimed at predicting academic performance in higher education were considered. However, a precise definition of the relationship between SES and academic performance often lacked in the analyzed studies. Second, several additional variables which might also interact with SES were not always reported in the reviewed studies. Thus, variables such as students' cognitive factors could not be considered for the summative content analysis. Third, information about students' academic program was not always reported in the analyzed studies. Therefore, whether the relationship between SES and academic performance in higher education depends on students'

academic program could not be determined. Fourth, there was no information on the relationship between SES and the meta-analyzed mediators. Therefore, a complete analysis of the selected mediators could not be carried out. Finally, the Q test of homogeneity was not significant for the average effect size of university experience. This result might be suggesting that the resulting average effect size is less generalizable.

6.3. Implications for future research

Starting from the findings and limitations of this systematic review, discussed earlier, future research in higher education could benefit from focusing on several topics listed as follows. Firstly, it is interesting to note that using dimensional reduction techniques such as principal component analysis (PCA) leads to a composite score to assess SES. However, composite scores also represent a limitation to fully capture the underlying variance of SES indicators. How to construct composite scores to assess SES is an issue which requires further exploration.

Secondly, previous research at elementary and secondary educational level (e.g., Sirin, 2005; White, 1982) has shown the moderating role of methodological aspects, such as type of SES-achievement measure, on the relationship between SES and academic performance. However, exploring such moderating role remains a still unfinished task for the higher education field.

Thirdly, the criticism that standardized tests merely measure students' socio-economic conditions and not predict their future academic performance in higher education (Mattern, Shawn, & Williams, 2008) persists among some educational researchers. Therefore, further research could contribute to clarify the relationship between standardized test outcomes, SES, and academic performance at university.

Fourthly, when considering working status to predict academic performance, it seems essential to include additional characteristics such as type of work (part-time or full-time), correspondence with the academic field, and reasons for working. In fact, to include working status merely as a dichotomous variable in any predictive analysis of academic performance could be problematic (Wang et al.,2010). Therefore, to gain a better understanding of the working status' influence, both quantitative and qualitative research methods are highly recommended (Yanbarisova, 2015).

Fifthly, after undergraduate completion, low SES students are more likely to join the workforce instead of pursuing a postgraduate degree as it seems to be the case of high SES students (Walpole, 2003). However, an additional question worth exploring is what happens with the relationship between SES and academic performance of low SES students who do continue to the postgraduate educational level.

Finally, recent educational research (Musso & Cascallar, 2009; Musso, Kyndt, Cascallar, & Dochy, 2012, 2013; Kyndt, Musso, Cascallar, & Dochy, 2015; Cascallar, Musso, Kyndt, & Dochy, 2015) has used predictive systems based on neural network approaches to study academic performance in primary, secondary, and higher education. The improvement of the validity, the increase of the accuracy of the predictions and classifications, and the possibility to determine the predictive weight contribution of each of the variables in the models are the principal advantages of building predictive systems based on neural networks. Therefore, we would like to encourage the use of neural networks in order to gain a more exhaustive understanding of the relationship between SES and academic performance in higher education.

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Table 1

Overview of the literature search hits

Query	Search terms	ERIC (Ovid)	PsycArticles	Scopus	SSCI	
1	¨Higher Education¨ AND ¨Academic Achievement¨	13,668	429	988	345	*15,430*
	Update May 2017	333	17	110	80	*540*
2	¨Higher Education¨ AND ¨Academic Performance¨	9,535	287	752	553	*11,127*
	Update May 2017	264	9	186	145	*604*
3	¨Higher Education¨ AND ¨Academic Outcomes¨	0	1708	83	66	*1,857*
	Update May 2017	395[1]	78	20	15	*508*
Sub-total initial search		23,203	2424	1823	964	*28,414*
Sub-total update May 2017		992	104	316	240	*1,652*
Total		**24,195**	**2,528**	**2,139**	**1,204**	***30,066***

[1] This number of hits was obtained using the multi-field function and selecting references between 2000 and 2017.

Table 2

Operationalizations of SES

Measurement	Type of measurement	Scale	Operationalization	Reference(s)
Parents' Educational level (n=25)	As a single indicator (n=21)	Categorical (n=19)	Highest level of parental education (n=4)	Bruinsma & Jansen (2007); Ifenthaler & Widanapathirana (2014); Loehr et al. (2012); Tai et al. (2005)
			A dichotomous variable to determine whether parents have attended college (n=3)	Bonsaksen (2016); Nguyen (2016); Waqas et al. (2013)
			3 categories	Rodríguez & Ruiz (2011)
			4 categories	Stratton & Wetzel (2011)
			4 categories	De Clercq et al. (2013)
			4 categories (years of education)	Triventi (2014)
			5 categories	Beyene & Yimam (2016)
			5 categories	Frischenschlager et al. (2005)
			5 categories	Gerken & Volkwein (2000)
			5 categories	Harb & El-Shaarawi (2007)
			7 categories	Guimarães & Sampaio (2013)
			Only father education (8 categories)	Morlaix & Suchaut (2014)
			Only mother education (3 categories)	Wolniak & Engberg (2010)
			Only mother education (5 categories)	Black et al. (2015)
		Continuous (n=2)	Years of education (average)	Rothstein (2004)
			Years of education: going from 8 to 19	Delaney et al. (2011)
	Within a composite score (n=4)	Categorical (n=3)	Highest level of parental education (n=2)	De Clercq et al. (2016); Rodríguez et. al (2014)
			ISCED (International Standard Classification of Education)	Gouvias et al. (2012)
		Continuous	Occupational Prestige and Socioeconomic scores (Nakao & Treas, 1994).	Walpole (2003)

Table 2 (continued)

Measurement	Type of measurement	Scale	Operationalization	Reference(s)
Occupation (n=10)	As a single indicator (n=7)	Categorical (n=7)	Dichotomous variable to indicate whether parents work	Guimarães & Sampaio (2013)
			Dichotomous variable to indicate whether parents' occupation requires higher education	Bonsaksen (2016)
			4 categories	Yao et al. (2015)
			5 categories	Arulampalam et al. (2004)
			8 categories	Morlaix & Suchaut (2014)
			10 categories	Hansen & Mastekaasa (2006)
			The Standard Occupational Classification scale 2000	Smith (2016)
	Within a composite score (n=3)	Categorical (n=2)	7 categories	Gouvias et al. (2012)
			12 categories	Rodríguez et al. (2014)
		Continuous	Occupational prestige and socioeconomic scores (Nakao & Treas, 1994).	Walpole (2003)
Income (n=20)	As a single indicator (n= 17)	Categorical (n=16)	3 categories (high, middle and low) (n=3)	Frischenschlager et al. (2005); Wolniak & Engberg (2010); Yao et al. (2015)
			5 categories	Black et al. (2015)
			5 categories	Stratton & Wetzel (2011)
			5 categories (quintiles)	Bozick (2007)
			6 categories	Yanbarisova (2015)
			7 categories	Guimarães & Sampaio (2013)
			7 categories	Waqas et al. (2013)
			Financial aid (if the student has a scholarship or a loan) (n=4)	Black et al. (2015); Morlaix & Suchaut (2014); Stratton & Wetzel (2011); Triventi (2014)
			To receive subsidized lunches (n=2)	Black et al. (2015); Rothstein (2004)
			University tuition fees (quartiles)	Triventi (2014)
		Continuous	Parents' relative income going from 0 to 1	Hansen & Mastekaasa (2006)
	Within a composite score (n=3)	Continuous (n=3)	Monthly income	Rodríguez et. al (2014)
			Occupational prestige and socioeconomic scores (Nakao & Treas, 1994)	Walpole (2003)
			University tuition fees	Rodríguez et al. (2014)

Table 2 (continued)

Measurement	Type of measurement	Scale	Operationalization	Reference(s)
Home resources (n=8)	As a single indicator (n=6)	Categorical (n=4)	Computer at home and internet connection (n=3)	Gouvias et. al (2012); Guimarães & Sampaio (2013); Pedrosa et al. (2007)
			Possession of books related to schoolwork	Gouvias et al. (2012)
		Continuous (n=2)	Household crowding (n=2)	Harb & El-Shaarawi (2007); Gouvias et. al (2012)
	Within a composite score (n=2)	Continuous (n=2)	Number of possessions (car, books, musical instruments, computer) (n=2)	De Clercq et al. (2016), Pedrosa et al. (2007)
Neighborhood resources (n=9)	As a single indicator (n=3)	Categorical (n=3)	Students' stratum (n=2)	Bahamón & Reyes (2014); Rodríguez et al. (2014)
			Degree of urbanization	Hansen & Mastekaasa (2006)
	As a composite score (n=6)	Continuous (n=6)	Index of Economic Resources (IER) (n=2)	Birch & Miller (2006); Win & Miller (2005)
			Index of Education and Occupation (IEO)	Win & Miller (2005)
			Index of Multiple Deprivation (IMD)	Thiele et al. (2014)
			Index of Relative Socioeconomic Advantage and Disadvantage (IRSAD)	Puddey & Mercer (2014)
			School decile	Shulruf et al. (2008)

Table 3a

Operationalizations of academic performance at university

Measurement	Operationalization		Type of scale	Scale	Reference(s)
Achievement (n=36)	GPA (n=32)	First year GPA (n=16)	Categorical (n=4)	3 categories (high, medium, low) (n=2)	Shulruf et al. (2008); Yao et al. (2015)
				4 categories	De Clercq et al. (2016)
				5 categories	Hansen & Mastekaasa (2006)
			Continuous (n=12)	From 0 to 4 (n=6)	Anderton et al. (2016); Black et al. (2015); Rothstein (2004); Sackett et al. (2009); Wolniak & Engberg (2010); Zheng et al. (2002)
				From 1 to 10	Bruinsma & Jansen (2007)
				From 0 to 20	Morlaix & Suchaut (2014)
				From 0 to 100 (n=4)	Birch & Miller (2006); De Clercq et al. (2013); De Clercq et al. (2016); Win & Miller (2005)
		GPA (n=8)	Categorical (n=2)	3 categories	Yao et al. (2015)
				3 categories	Yanbarisova (2015)
			Continuous (n=6)	From 0 to 4 (n=5)	Black et al. (2015); Bonsaksen (2016); Harb & El-Shaarawi (2007); Sackett et al. (2009); Wang et al. (2010)
				From 0 to 12	Rodríguez & Ruiz (2011)
		Final GPA (n=8)	Categorical (n=2)	3 categories	Yao et al. (2015)
				5 categories	Waqas et al. (2013)
			Continuous (n=6)	From 0 to 4 (n=4)	Black et al. (2015); Gerken & Volkwein (2000); Sackett et al. (2009); Zheng et al. (2002)
				From 0 to 7	Puddey & Mercer (2014)
				From 0 to 100	Thiele et al. (2014)
	Single grade (n=4)	Test at the end of the first year	Categorical	High or low performance	Frischenschlager et al. (2005)
		Introductory college chemistry	Continuous (n=3)	From 0 to 12	Rodríguez & Ruiz (2011)
		Introductory college chemistry		From 0 to 100	Tai et al. (2005)
		Introductory college biology		From 0 to 100	Loehr et al. (2012)

Table 3a (continued)

Operationalizations of academic performance at university

Measurement	Operationalization		Type of scale	Scale	Reference(s)
Achievement (n=7)	Number of credits (n=6)	Course credits (n=2)	Continuous (n=4)		Black et al. (2015); Gerken & Volkwein (2000)
		Study unit outcomes (n=2)			Ifenthaler & Widanapathirana (2014); Puddey & Mercer (2014)
		Degree progression index	Continuous	From 0 to 1	Rodríguez & Ruiz (2011)
		ECTS credits	Continuous		Triventi (2014)
	Relative achievement	Index to compare students' performance at the entrance and exit of all courses	Continuous	From -1 to 1	Pedrosa et al. (2007)
Competencies (n=6)	Standardized test (n=6)	SABER PRO (Colombia) (n=2)	Continuous (n=2)	From 1 to 300	Bahamón & Reyes (2014); Rodríguez et al. (2014)
		CET (College English Test) (China)	Continuous	The highest possible score is 710	Yao et al. (2015)
		DALF (France)	Continuous	From 0 to 100	Morlaix & Suchaut (2014)
		GAMSAT (Australia)	Continuous	From 0 to 100	Puddey & Mercer (2014)
		PELA (Australia)	Continuous	From 0 to 10	Anderton et al. (2016)
Persistence (n=6)	Completion status (n=6)	Dropout (n=2)	Categorical (n=2)	Yes/No	Arulampalam et al. (2004); Gerken & Volkwein (2000)
		Final degree classification (n=2)	Categorical (n=2)	British undergraduate degree classification	Smith (2016); Thiele et al. (2014)
		Attending graduate school	Categorical	Yes/No	Walpole (2003)
		Graduation rate	Continuous		Stratton & Wetzel (2011)

Table 3b

Operationalizations of academic performance before university

Measurement	Operationalization		Type of scale	Scale	Reference
Achievement (n=20)	HSGPA (n=14)		Categorical (n=4)	2 categories	Smith (2016)
				4 categories	Stratton & Wetzel (2011)
				4 categories	Triventi (2014)
				4 categories	Morlaix & Suchaut (2014)
			Continuous (n=10)	From 0 to 4 (n=4)	Gerken & Volkwein (2000); Rothstein (2004); Wolniak & Engberg (2010); Zheng et al. (2002)
				From 1 to 4	De Clercq et al. (2016)
				From 1 to 5 (1 is the best, 5 is the worst)	Frischenschlager et al. (2005)
				From 1 to 6	Hansen & Mastekaasa (2006)
				From 1 to 10	Bruisnma & Jansen (2007)
				From 1 to 20	Gouvias et al. (2012)
				UCAS tariff points	Thiele et al. (2014)
	Single grade (n=3)		Continuous (n=3)	HS grades in science, mathematics, and English courses (n=2)	Loerh et al. (2012); Tai et al. (2005)
				HS grades in biology, chemistry and physics courses	Arulampalam et al. (2004)
	Subject area exams (n=3)	Leaving Certificate (Ireland)	Continuous	From 0 to 600	Delaney et al. (2011)
		NCEA (New Zealand)	Continuous	From 0 to 80 credits (each NCEA level)	Shulruf et al. (2008)
		SABER 11 (Colombia)	Continuous	Before 2014: From 0 to 400 As of 2014: From 0 to 500	Bahamón & Reyes (2014)

Table 3b (continued)

Operationalizations of academic performance before university

Measurement	Operationalization		Type of scale	Scale	Reference
Competencies (n=15)	Aptitude exams (n=12)	SAT (USA) (n=9)	Continuous (n=9)	Before 2016: from 600 to 2400 As of 2016: from 400 to 1600	Black et. al. (2015); Gerken & Volkwein (2000); Loehr et al. (2012); Rothstein (2004); Sackett et.al. (2009); Stratton & Wetzel (2011); Tai et al. (2005); Walpole (2003); Wolniak & Engberg (2010)
		ACT (USA) (n=3)	Continuous (n=3)	From 1 to 36	Stratton & Wetzel (2011); Wolniak & Engberg (2010); Zheng et al. (2002)
	Subject area exams (n=3)	Vestibular (Brazil)	Continuous (n=3)		Guimarães & Sampaio (2013)
		Not specified (Greece)			Gouvias et al. (2012)
		Not specified (Vietnam)			Nguyen (2016)
Persistence (n=8)	Admission ranks (n=5)	High school rank (n=2)	Continuous (n=2)		Black et al. (2015); Zheng et al. (2002)
		Tertiary Entrance Rank (TER) (n=2)	Continuous (n=3)	From 0 to 99.95	Birch & Miller (2006); Win & Miller (2005)
		Australian Tertiary Admission Rank (ATAR)			Anderton et al. (2016)
	Grade retention (n=3)	Repeated years at high school	Categorical	Yes/No	De Clercq et al. (2013)
		Number of class repetitions	Continuous (n=2)		Frischenschlager et al. (2005)
		Repeated years at high school			Morlaix & Suchaut (2014)

Table 4

The relationship between SES and academic performance in higher education

Reference	N	SES-Academic performance relationship	Average effect size	Prior academic achievement (PAA) measure	PAA-AP relationship	Average effect size	University experience (UE) measure	UE-AP relationship	Average effect size	Working status (WS) measure	WS-AP relationship	Average effect size
Anderton et al. (2016)	414	Not significant		ATAR score	Positive							
Arulampalam et al. (2004)	51,810	Negative	-0.01	HSGPA	Negative	-0.02						
Bahamón & Reyes (2014)	68	Positive										
Beyene & Yimam (2016)	925	Positive	0.14	Entrance exam score	Positive	0.05	Academic experience (get at least four assessments)	Positive	0.12			
Birch & Miller (2006)	1,803	Negative	-0.04[+]	TER score	Positive	0.58						
Black et al. (2015)	23,792	Negative	-0.32[+]									
Bonsaksen (2016)	123	Not significant	0.02	Prior experience in higher education	Positive	0.26				Employed or not	Not significant	-0.04
Bozick (2007)	10,164	Positive	0.01							Employed or not	Negative	-0.13
Bruinsma & Jansen (2007)	62	Not significant	0.06	HSGPA	Positive	0.56	Academic experience (classroom climate, quantity and quality of the instruction)	Negative	-0.04	Employed or not	Not significant	0.07
De Clercq et al. (2013)	111	Positive	0.26	Failure at secondary school	Negative	-0.21						
De Clercq et al. (2013)	206	Not significant	0.15	Failure at secondary school	Negative	-0.19	Social experience (peer support)	Not significant	0.15			
De Clercq et al. (2016)	2178	Positive	0.12	HSGPA	Positive	0.37						
Delaney et al. (2011)	1,867	Not significant	-0.02	Entrance exam score	Positive	0.31						
Frischenschlager et al. (2005)	245	Not significant		HSGPA	Positive							
Gerken & Volkwein (2000)	-	Not significant		HSGPA	Positive		Academic experience	Positive				

Reference	N	SES-Academic performance relationship	Average effect size	Prior academic achievement (PAA) measure	PAA-AP relationship	Average effect size	University experience (UE) measure	UE-AP relationship	Average effect size	Working status (WS) measure	WS-AP relationship	Average effect size
Gouvias et al. (2012)	874	Positive	0.06	HSGPA	Positive	0.79						
Guimarães & Sampaio (2013)	54,877	Positive	0.09									
Hansen & Mastekaasa (2006)	56,792	Positive	0.02	HSGPA	Positive	0.36						
Harb & El-Shaarawi (2007)	296	Negative	-0.05	Science HS diploma	Positive	0.11	Institutional experience (positive attitude towards university)	Positive	0.17	Employed or not	Negative	-0.3
Ifenthaler & Widanapathirana (2014)	146,001	Not significant										
Loehr et al. (2012)	2,667	Positive		HSGPA	Positive							
Morlaix & Suchaut (2014)	543	Negative		HSGPA, not failure at secondary school	Positive							
Nguyen (2016)	616	Not significant										
Pedrosa et al. (2007)	6,701	Negative		HS school courses	Positive							
Puddey & Mercer (2014)	219	Positive	0.17+	GPA at entry of graduate program, GAMSAT score	Positive	0.25						
Rodríguez et al. (2014)	14,829	Positive								Employed or not	Negative	
Rodríguez & Ruiz (2011)	312	Not significant	-0.02							Employed or not	Negative	-0.22
Rothstein (2004)	14,102	Positive	0.07	HSGPA, SAT	Positive	0.71						
Sackett et al. (2009)	17,630	Positive	0.09	SAT	Positive (n=17,244)	0.37						
Shulruf et al. (2008)	1,880	Positive	0.01+									
Smith (2016)	23,793	Positive	0.03	HSGPA	Positive	0.34						
Stratton & Wetzel (2011)	5,823	Positive		HSGPA	Positive							
Tai et al. (2005)	1,333	Positive	0.12	HSGPA, SAT	Positive	0.17						

Reference	N	SES-Academic performance relationship	Average effect size	Prior academic achievement (PAA) measure	PAA-AP relationship	Average effect size	University experience (UE) measure	UE-AP relationship	Average effect size	Working status (WS) measure	WS-AP relationship	Average effect size
Thiele et al. (2014)	3,730	Positive	0.05+	UCAS points	Positive	0.003						
Triventi (2014)	1,834	Positive										
Walpole (2003)	6,470	Positive	0.01	GPA at entry of graduate program	Positive (n=1177)	0.09	Academic experience (work on research)	Positive (n=1177)	0.13			
Wang et al. (2010)	323	Positive	0.06				Institutional experience (sense of belonging and school integration)	Positive	0.12	Reasons for working and characteristics of work	Positive	0.06
Waqas et al. (2013)	267	Positive	0.05							Employed or not	Negative	-0.14
Win & Miller (2005)	1,803	Positive	0.03+	TER score	Positive	0.1						
Wolniak & Engberg (2010)	3,750	Positive		HSGPA, SAT	Positive	0.26						
Yanbarisova (2015)	1,988	Not significant	0.03							Characteristics of work	Negative	-0.01
Yao et al. (2015)	2,989	Positive	0.16									
Zheng et al. (2002)	1,166	Not significant		HSGPA	Positive							

(+) Effect sizes calculated from SES indicators at area level. Not considered in the analysis.

Figure 1

Coceptual diagram for the analysis of the mediators

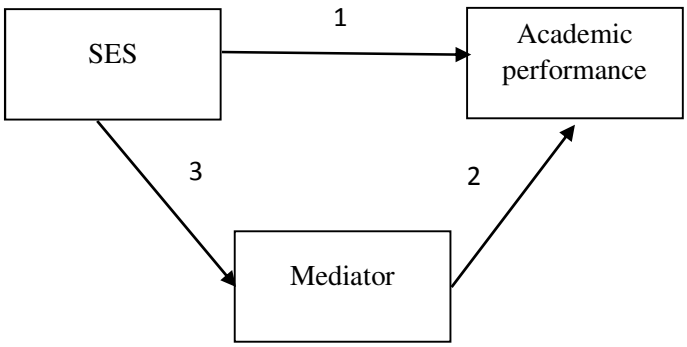


Figure 2

Authors' model for measuring SES

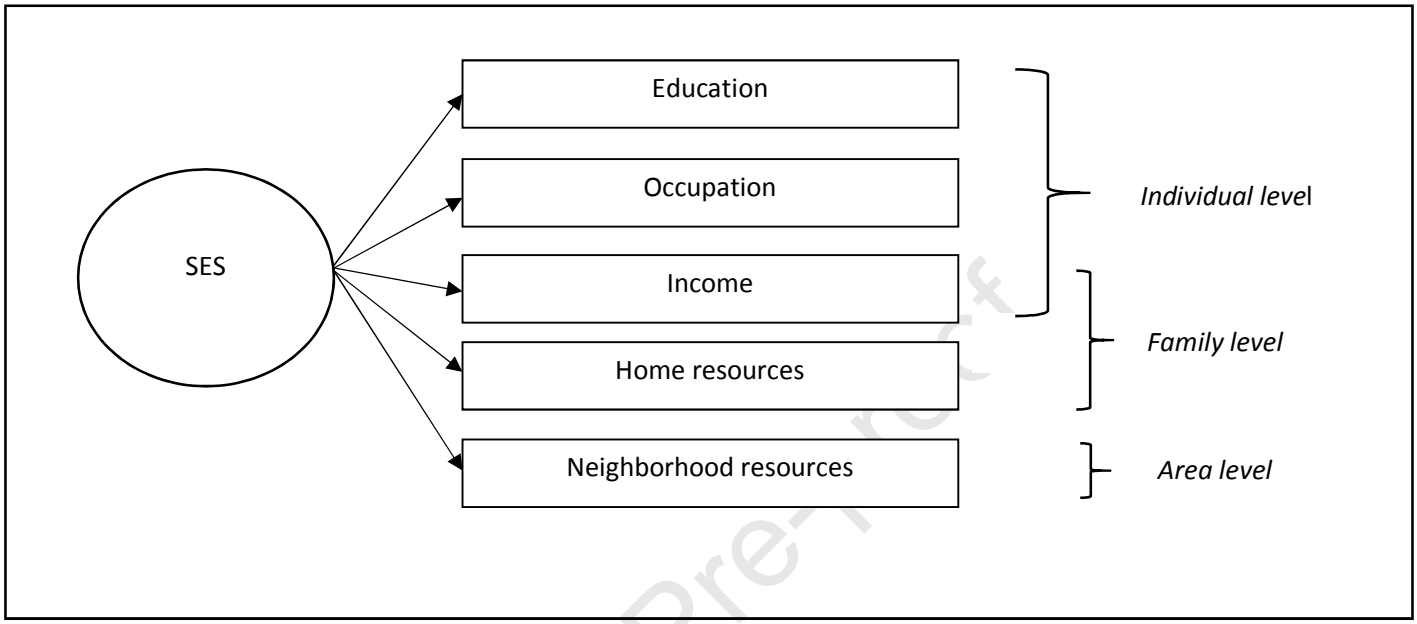


Figure 3

Authors' model for measuring academic performance in higher education

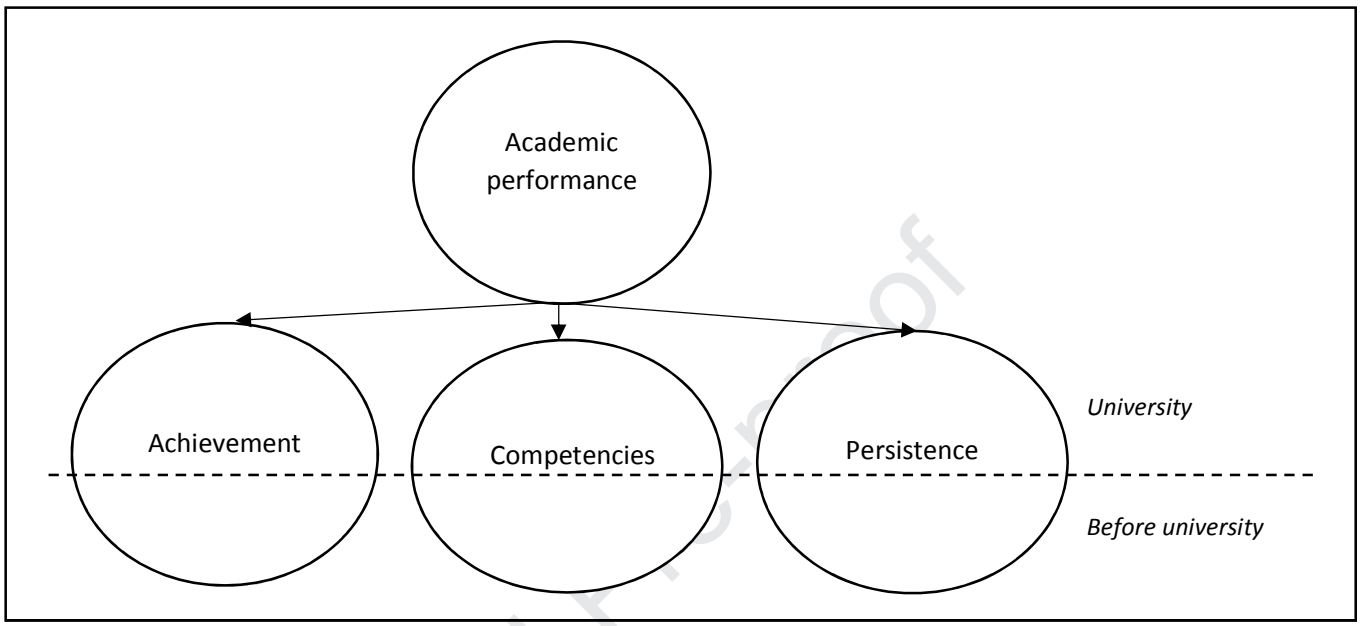
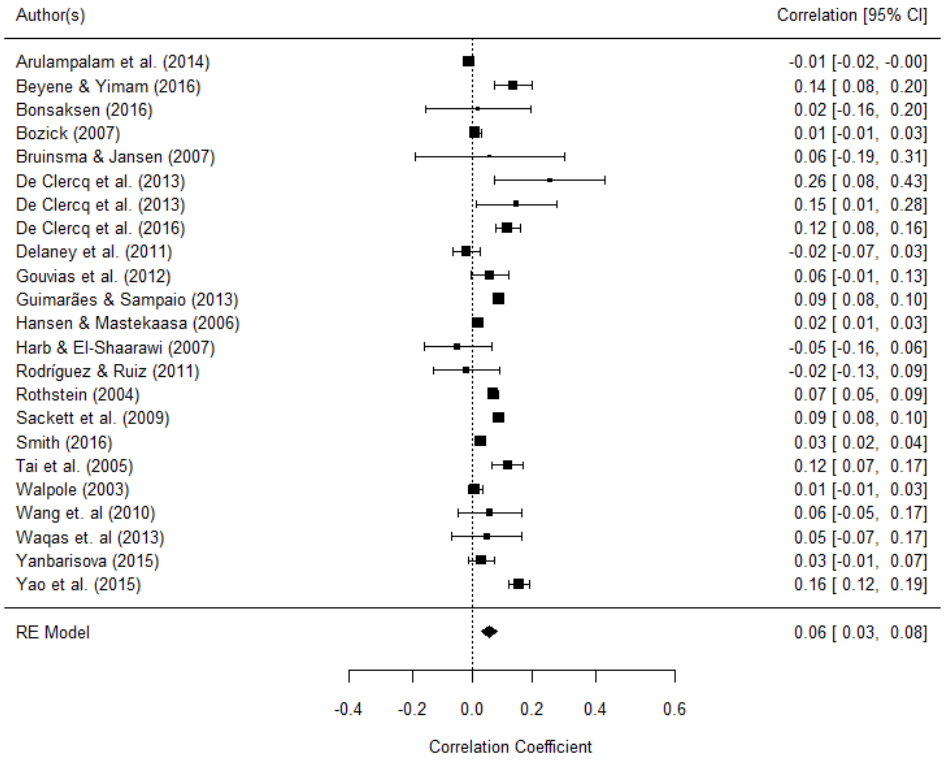


Figure 4

Forest plot of the relationship between SES and academic performance in higher education



Highlights

A strong theoretical framework to study the SES-academic performance relationship is still missing in the higher education literature.

The current study proposes operationalization of SES and academic performance that take their complexity into account.

The positive yet weak relationship between SES and academic performance in higher education is mediated by prior academic achievement, university experience, and working status.