



MEASURING AND ANALYSING ECONOMIC, CULTURAL, AND SOCIAL STATUS IN LARGE-SCALE ASSESSMENT TO INFORM POLICIES IN ASIA-PACIFIC



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Measuring and analysing economic, cultural, and social status in large-scale assessments

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Introduction

Monitoring equity in education is a key concern of policy-makers in Asia-Pacific and beyond (see, for example, OECD, 2018; UNESCO Institute for Statistics [UIS], 2018), and it is also a key concern of Sustainable Development Goal 4 in Education (United Nations, 2015, 2018, 2021). Equity in education is typically expressed in the relationship of learning outcomes (for example, in a learning area such as reading and mathematics), access and participation, and individuals' or groups' economic, cultural, and social background indicators (Bruneforth & Bacher, 2012). Observed differences in educational outcomes between students with different economic, cultural, and social background have, therefore, become a focus of policymakers and are also a long-standing concern of educational research.

To evaluate the extent to which equity in education is achieved, it is necessary to assess learning outcomes, define achievement levels and set pre-defined standards, as well as to theorise, define and operationalise economic, cultural, and social background indicators. Such educational data provide a sound basis for investigating relationships between educational outcomes and background indicators, and allow to identify characteristics of disadvantaged learners, analyse performance gaps between different groups of learners and patterns of progress over time – providing essential information that can be used to develop strategies for improving equity in education.

International, regional, and national large-scale assessments provide such comprehensive data aimed at informing the development of policies and strategies to improve and ensure equity in education. To be effective, it is therefore essential that economic, cultural, and social background indicators in large-scale assessments are of good quality.

Limitations of economic, cultural, and social status indicators in large-scale assessments

Indicators of students' economic, cultural, and social status (ECSS) are an important component of large-scale assessments. However, there are observed theoretical and analytical limitations in existing economic, cultural, and social status indicators for the purpose of monitoring equity in education (Harwell, 2018; Osses Vargas et al., 2023a; D. Rutkowski & Rutkowski, 2013).

Theoretical limitations relate to inconsistencies in how the economic, cultural, and social status construct is defined and operationalised. Often the meaning of the construct is taken for granted, and different terminology is used synonymously for the same construct – for example, socioeconomic status, socioeconomic position, social status, or wealth (Blakemore et al., 2006; Bornstein & Bradley, 2003; Bradley & Corwyn, 2002;

Broer et al., 2019; Côté, 2011; Diemer et al., 2013; Ensminger & Fothergill, 2003; Harwell, 2018; Loignon & Woehr, 2018; Marks, 1999; Marks & O'Connell, 2021; O'Connell, 2019; Sirin, 2005).

Analytical limitations relate to the empirical evidence supporting the quality of economic, cultural, and social status indicators used in large-scale assessments – for example, how well they capture the economic, cultural, and social reality of a given context and the extent to which they enable reasonable international comparisons (Avvisati, 2020; Brese & Mirazchyski, 2013; Harwell, 2018; Lee & von Davier, 2020; Pokropek et al., 2017; D. Rutkowski & Rutkowski, 2013; L. Rutkowski & Rutkowski, 2010, 2017; Sandoval-Hernandez et al., 2019). Recent research (Osses Vargas et al., 2023a, 2022, 2023b) also shows that different components of economic, cultural, and social status can have a differential relationship with students' academic achievement, leading to differing observations about how equitable education systems are.

Limitations in defining and operationalising ECSS indicators

A clear theoretical definition of the economic, cultural, and social status construct and a clear rationale to justify the chosen indicators are often limited in published documentation such as contextual frameworks, technical reports or results reports (see, for example, Hooper et al., 2017; Mullis et al., 2017; Mullis & Martin, 2017; OECD, 2019a, 2020; UNICEF & SEAMEO, 2017, 2020). Some large-scale assessments use a theory-based approach to develop indicators of economic, cultural, and social status – such as PISA, in recent years. Others large-scale assessments – such as SEA-PLM or TIMSS, are more pragmatic and rely upon a rationale routed in simply describing the indicators used to collect information for “their” status construct (Harwell & LeBeau, 2010). In many cases pre-eminence is given to practical considerations such as data availability, accessibility or available evidence concerning strength of relationship with outcomes, with theoretical elaboration playing a minor role.

Several authors have acknowledged that there is no comprehensive theory that can be used to define and operationalise economic, cultural, and social status (see, for example, Caro & Cortés, 2012; Willms & Tramonte, 2019). As a consequence, there is no commonly accepted universal definition of the economic, cultural, and social status construct, and research studies across different fields have used multiple, inconsistent definitions (Blakemore et al., 2006; Bornstein & Bradley, 2003; Bradley & Corwyn, 2002; Broer et al., 2019; Côté, 2011; Diemer et al., 2013; Ensminger & Fothergill, 2003; Harwell, 2018; Loignon & Woehr, 2018; Marks, 1999; Marks & O'Connell, 2021; O'Connell, 2019; Sirin, 2005).

There is, however, broad agreement in the literature, and in most large-scale assessments, on three essential components of economic, cultural, and social status – that is economic, cultural and social components, and its operationalisation through key indicators of education, occupation and income (American Psychological Association [APA] Task Force on Socioeconomic Status, 2007; Bollen et al., 2001; Ferguson et al.,

2007; Grusky, 2008; Hauser, 1994; Mueller & Parcel, 1981; Willms & Tramonte, 2019). Although there are some commonalities, large-scale assessments differ on how these components are operationalised.

Table 1 in the Appendix presents examples of the economic, cultural, and social status construct used in some international and regional large-scale assessments relevant for the Asia-Pacific region. To illustrate the above-mentioned inconsistencies, the table provides information on the terms used to refer to the economic, cultural, and social status construct, its definition and the indicators used in its operationalisation.

As can be seen in Table 1, the terms used to refer to the economic, cultural, and social status construct are varied within and between large-scale assessments. Table 1 also shows that most large-scale assessments include indicators of parents' occupation and educational attainment, and indicators related to household possessions, facilities, or infrastructure. However, these indicators vary. While in some large-scale assessments – for example, in PISA, parents' occupation is operationalised using the International Socio-Economic Index of occupational status – ISEI (Ganzeboom, 2010; Ganzeboom et al., 1992) in TIMSS, PIRLS and SEA-PLM the indicator is operationalised using a categorical variable. All large-scale assessments presented in Table 1 collect information about parents' educational attainment using the International Standard Classification of Education, ISCED (UNESCO Institute for Statistics [UIS], 2012). However, how the information is treated in the construction of the indicator of economic, cultural, and social status varies between assessments. PISA and SEA-PLM convert the information into years of education necessary to attain each qualification, and TIMSS, PIRLS and PILNA transform the information into a categorical variable with five categories.

Such inconsistencies in the operationalisation of the economic, cultural, and social status construct limit comparability of findings between large-scale assessments (UIS, 2018). They also limit the usability of these findings to monitor and address policy issues of equity in education. For example, a recent study undertaken by the GEM Centre (Osses Vargas et al., 2022) shows that judgement about relationship between performance and equity of education systems depends on which ECSS indicator is used in the analysis. The change of ECSS indicators can lead, for example, from classifying an education system as being of similar equity as the OECD average when using the PISA's Economic, Cultural, and Social Status index to be more equitable than the OECD average when using an indicator equivalent to the TIMSS Home for Education Resources scale estimated with PISA 2018 data. In the Asia-Pacific region, this change in judgement is observed for the Philippines, Singapore, Thailand, and Malaysia (Osses Vargas et al., 2022).

Inconsistencies in operationalising the economic, cultural, and social status construct not only occur between different large-scale assessments; they can also occur between cycles of the same large-scale assessment. The change in the indicators used for operationalising the economic, cultural, and social status construct between cycles of the same large-scale assessment may reflect economic, cultural, or social developments that occur over time. They may also reflect a better understanding on how to operationalise

the construct. Regardless of the reasons for change, indicators need to be statistically adjusted to allow for meaningful comparisons of findings over time (see, for example, OECD, 2014, 2017).

Limitations in constructing ECSS indicators

The accuracy and consistency of economic, cultural, and social status indicators used in large-scale assessments – usually referred to as socioeconomic status in these contexts – have long been under scrutiny (Avvisati, 2020; Brese & Mirazchiyski, 2013; Harwell, 2018; Lee & von Davier, 2020; Pokropek et al., 2017; D. Rutkowski & Rutkowski, 2013; L. Rutkowski & Rutkowski, 2010, 2017; Sandoval-Hernandez et al., 2019). The evidence indicates substantive threats to interpreting economic, cultural, and social status indicators used in international large-scale assessments as reliable indicators of the economic, cultural, and social context of students in all participating countries and as providing comparable information across different countries.

As shown in Table 1, combining different economic, cultural, and social status indicators in a composite index is a common practice in large-scale assessments. Most of these composite indicators are constructed with the same set of single indicators for all participating countries (for example, parents' occupation and education, and household possessions).

Having the same set of indicators for all participating countries assumes that the chosen set provides accurate information about students' economic, cultural, and social status for all countries. This is a strong assumption (D. Rutkowski & Rutkowski, 2013; L. Rutkowski & Rutkowski, 2019). It may be the case that in specific contexts, different – or additional indicators are needed to better reflect students' economic, cultural, and social status. For example, to acknowledge that wealth may be reflected by the possession of different assets in different countries, PISA allows some variation between countries in the items included in the home possessions scale (OECD, 2017, 2020).

Economic, cultural, and social status indicators constructed in large scale assessments are often used to compare results across countries and over time – both within and between countries. For this purpose, the construction of economic, cultural, and social status indicators can follow alternative approaches: a national index or an international index.

The national index approach is used in SEA-PLM Socioeconomic index and PILNA household wealth scale. The aggregated indicator is unique for each country, as it is derived from a statistical model that allows for different model specifications to best reflect the structure of the data within each country. In this case, indicators within the composite can have a different contribution to the composite indicator of economic, cultural, and social status in each country.

The international index approach is used in PISA, TIMSS, PIRLS, where the composite indicator is derived from a single statistical model fitted to all countries. In this case, the

model specifies that all indicators within the composite contribute equally to the composite indicator of economic, cultural, and social status in all participating countries.

Using the national index approach, direct comparisons between countries are not possible, because the index is derived from different statistical models for each country. To compare results between countries, national distributions are often divided into groups of equal size (for example, quartiles) and comparisons are made for individuals within the same group. Cross-national comparisons are limited by the fact that people in the same group living in different countries can face different economic, cultural, and living conditions – that is, have a different absolute score in the composite index (Gwatkin et al., 2007).

The international index approach may be less representative of the reality of each country but, under certain conditions, enables direct cross-national comparisons. The international index approach supposes that the measured attribute has the same meaning across countries. If this assumption holds, individuals with the same value on the indicators that form the composite should consistently obtain the same value in the composite score, regardless of their country of residence (Millsap, 2011). Reporting the extent to which composite indicators of economic, cultural, and social status used in large-scale assessments are comparable between countries is not a standard practice in technical reports. The only large-scale assessment that includes published information about this is PISA (OECD, 2017, 2020).

Balancing the need for establishing international comparability with that of accurately reflecting the specificities of different contexts is an on-going challenge for comparative large-scale assessments. With a greater number of low- and lower-middle income countries undertaking national assessments and joining international and regional large-scale assessments, the issue of the impact of the quality of economic, cultural, and social status indicators on the effectiveness of analyses about the relationship between economic, cultural, and social status and education outcomes has become even more significant (Lietz et al., 2017).

How can we improve economic, cultural, and social status indicators in large-scale assessments?

In our research on economic, cultural, and social status indicators we have developed a framework for evaluating the quality of economic, cultural, and social status indicators (Osses Vargas et al., 2023a). The framework emphasises **three quality attributes** that are considered essential for developing good indicators of economic, cultural, and social status:

1. A sound theoretical and conceptual underpinning of the economic, cultural, and social status construct and a measurement model that is consistent with that underpinning.

2. Empirical evidence that supports the adequacy of interpretations made from indicators (for example, by indicating psychometric and statistical properties in form of technical documentation).
3. Published documentation that provides accessible information to allow an appropriate use of indicators (Osse Vargas et al., 2023a).

These quality attributes combine theoretical and analytical considerations for economic, cultural, and social status indicators (Osse Vargas et al., 2023a, 2022, 2023b, 2023c).

Theoretical considerations

Economic, cultural, and social status is an abstract construct that is not directly observable. To measure a latent construct such as economic, cultural, and social status, we need to define and operationalise the construct – that means we must develop a sound theoretical and conceptual underpinning and apply a measurement model that is consistent with this underpinning.

Defining the construct based on theory is important to provide a rationale for its operationalisation into observable indicators and for specifying the relationship between these indicators (that is the measurement model). A well-understood definition and operationalisation of economic, cultural, and social status requires careful analysis of the conceptual distinctions intended by the terminology and the theoretical underpinnings of the construct. Documenting the theoretical and conceptual underpinning is important to provide evidence for evaluating the quality of an indicator and to assist with the interpretation of findings.

As indicated earlier and demonstrated in Table 1 in the Appendix, definition and operationalisation of the economic, cultural, and social status construct and indicators vary in large-scale assessments in the Asia-Pacific region. The published documentation provides varying levels of depth in the theoretical argument underpinning the economic, cultural, and social status construct and how it is measured (Osse Vargas et al., 2023b).

Analytical considerations

Latent variable modelling – which is used by most large-scale assessments in the Asia-Pacific region, is argued to be the preferred approach at least for three reasons. First, economic, cultural, and social status is a non-observable, hence latent construct. Second, economic, cultural, and social status is conceptualised as a multidimensional construct with three components, requiring integrating different sets of manifest and latent indicators into one model. Third, latent variable modelling acknowledges that indicators are measured with certain level of uncertainty. Other measurement approaches can lead to indicators that represent a good approximation of the latent construct only under certain conditions.

The types of analyses that include economic, cultural, and social status indicators can lead to variations in the level of aggregation needed for their construction. On some occasions, a single indicator is used, either as a stand-alone or as a composite of several component indicators – the so-called unitary approach to measurement (for example, the Socioeconomic index used in SEA-PLM). This approach is suitable for communicating the overall effect of economic, cultural, and social status on educational outcomes to broad audiences.

The component approach – where indicators for each component are kept separate, is suitable for investigating the relationship of economic, cultural, and social status components with the outcome of interest (see, for example, PISA reports from early cycles OECD, 2001, 2003; and the studies by Osses Vargas et al., 2023c; and Yang & Gustafsson, 2004). The component approach also allows the investigation of relationships between components and with other equity-related indicators. The analysis undertaken in PILNA 2021 for example, could be considered a component approach (Pacific Community, 2022).

Evidence from a recent study that looked at the PISA ESCS index and the TIMSS HER scale (Osses Vargas et al., 2023b) reveals possible inconsistencies between the theoretical underpinning of these indicators and their chosen measurement model.

Conclusion

While the relationship between students' economic, cultural, and social status and learning outcomes is a well-documented subject in educational research, definitions and operationalisations of indicators vary extensively, including across large-scale assessments in the Asia-Pacific region. The inconsistencies in defining, operationalising, and constructing economic, cultural, and social status indicators prevent the comparison of findings between different large-scale assessments, between countries and over time. This poses significant challenges for developing a comprehensive body of evidence of educational outcomes and equity-related factors, limiting the usability of findings to address important policy issues concerning equity in education.

To overcome these limitations in educational large-scale assessments, we need improved indicators of economic, cultural, and social status that have important quality attributes: a sound theoretical and conceptual underpinning and coherent measurement model; empirical evidence that supports the adequacy of interpretations made; and availability of supporting documentation to allow an appropriate use of indicators.

Such improved indicators of economic, cultural and social status will provide appropriate, contextualised, and reliable information about the relationship of students' economic, cultural, and social status and educational outcomes. This will enable more accurate and comparable monitoring of equity in education at national, regional, and global levels, and provide high-quality evidence that can be used to develop actions aimed at improving equity in education.

Further research is required to collect evidence on how improved indicators of economic, cultural, and social status work in practice and how they relate to educational outcomes. A wide discussion and exchange with representatives from international, regional, and national assessment organisations can help improve the measurement of indicators of economic, cultural, and social status and possibly lead to more consensus on how best to measure economic, cultural, and social status across studies.

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Appendix

Table 1. Economic, cultural, and social status constructs used in large-scale assessments – some examples (Osse et al., forthcoming 2023)

Assessment	Terms used for the construct in published documentation*	Definition of the construct	Operationalisation
PISA	<ul style="list-style-type: none"> - Socioeconomic status - Socioeconomic background 	<p><u>PISA 2018</u>: “Socioeconomic status is a measure of students’ access to family resources (financial capital, social capital, cultural capital and human capital) and the social position of the student’s family/household” (OECD, 2019b, p. 52, 2019c, p. 2).</p>	<p>Economic, Social and Cultural Status index (OECD, 2020):</p> <ul style="list-style-type: none"> - Highest occupation status of parents (ISEI) - Highest educational attainment of parents (ISCED, transformed into years of education) - Household home possessions (list of 24 possessions, including 3 country-specific items) - Books in the home (3 categories)
TIMSS grade 8	<ul style="list-style-type: none"> - Family environment - Home context - Parents’ or caregivers’ socioeconomic status - Socioeconomic characteristics of the parents - Students’ socioeconomic environment 	<p><u>TIMSS 2019</u>: “Socioeconomic status is often indicated through proxy variables such as parental level of education, income, occupational class, and the number of books in the home. [The Home Educational Resources scale] expands upon the classic conception of socioeconomic status to include home resources with the potential to facilitate student learning” (Hooper et al., 2017, p. 63).</p>	<p>Home Educational Resources (HER) scale (Martin et al., 2020):</p> <ul style="list-style-type: none"> - Parents’ educational attainment (ISCED 2011, transformed into 5 categories) - Home study supports (2 resources) - Books in the home (5 categories)
TIMSS & PIRLS grade 4	<ul style="list-style-type: none"> - Family environment - Home context - Parents’ or caregivers’ socioeconomic status - Socioeconomic characteristics of the parents 	<p><u>TIMSS 2019</u>: “Socioeconomic status is often indicated through proxy variables such as parental level of education, income, occupational class, and the number of books in the home. [The Home Resources for Learning] expand upon the classic conception of socioeconomic status to include home resources with the potential to facilitate student learning” (Hooper et al., 2017, p. 63).</p> <p><u>PIRLS 2016</u>: “Home resources for learning encompass important socioeconomic characteristics of the parents,</p>	<p>Home Resources for Learning (HRL) scale (Martin et al., 2017, 2020):</p> <ul style="list-style-type: none"> - Parents’ occupation – 4 categories - Parents’ educational attainment (ISCED 2011, transformed into 5 categories) - Home study supports (2 resources) - Books in the home (5 categories) - Children’s books in the home (5 categories)

Assessment	Terms used for the construct in published documentation*	Definition of the construct	Operationalisation
	- Students' socioeconomic environment	such as their education level, together with home supports for learning and emphasis on educational activities" (Hooper et al., 2015, p. 37).	
SEA-PLM	- Socioeconomic status - Socioeconomic status of students' family - Socioeconomic status of the home - Students' socio-economic background - Background origins - Family resources - Home background	<u>SEA-PLM 2019</u> : "SES index was computed for each child by combining individual responses from the parent questionnaire about parental education, parental occupation and home possessions" (UNICEF & SEAMEO, 2020, p. 65).	Socioeconomic index (UNICEF & SEAMEO, 2020): <ul style="list-style-type: none"> - Parents' occupation – 8 categories - Highest educational attainment of parents (ISCED, transformed into years of education) - Home resources index (including home possessions, child meals per day, household infrastructure, source of lighting, presence of electricity and water, number of books in the home)
PILNA	- Student home environment - Parental education - Household wealth - Family and community support - Cultural capital and social capital	<u>PILNA 2021</u> : <ul style="list-style-type: none"> - Student home environment. This includes parental education, main source of income and occupation, home facilities and possessions, and educational resources. <ul style="list-style-type: none"> o Household wealth is frequently seen as an enabler of education. Conceptually, it enables support, materials, spare time, and other factors that might influence a student's learning. - Family and community support: This includes communication with parents, cultural capital and social capital, parental and family involvement in schooling, home support for study, and descriptive variables regarding types of communities. (Pacific Community, 2022)	Student home environment (Pacific Community, 2022): <ul style="list-style-type: none"> - Parental education Highest level of parental education (ISCED 2011, transformed into 5 categories) - University-level parental education - Scale for household wealth - list of home possessions and facilities (telephones, TVs, and cars, electricity, a flushing toilet and tap water)

* Published documentation includes respective contextual frameworks, technical reports, and results reports.

ISCED: International Standard Classification of Education (UNESCO Institute for Statistics [UIS], 2012).

ISEI: International Socioeconomic Index (Ganzeboom, 2010; Ganzeboom et al., 1992).

