



# Nominal comparability is not enough: (In-)equivalence of construct validity of cross-national measures of educational attainment in the European Social Survey

Silke L. Schneider\*

Nuffield College, New Road, Oxford OX1 1NF, UK

Received 5 August 2008; received in revised form 9 March 2010; accepted 15 March 2010

## Abstract

Educational attainment is a core social background variable covered in each and every survey of individuals. Since educational institutions and qualifications are difficult to compare across countries, cross-national surveys pose a particular challenge to the measurement of educational attainment. This study performs a comparative construct validation of a number of cross-national measures of education using the European Social Survey. The measures comprise two versions of the International Standard Classification of Education (ISCED), the education scheme developed in the project 'Comparative Analysis of Social Mobility in Industrial Nations' (CASMIN) and *hypothetical* as well as *actual years of education*. The first ISCED measure corresponds to the well-known main ISCED levels. The second one, the European Survey Version of ISCED (ES-ISCED) developed for this study, represents an effort to reflect different types of education within levels of education by considering ISCED sub-dimensions, most importantly 'programme orientation'. Using linear regression models, it is shown how much explanatory power educational attainment loses when different cross-national variables are used, as compared to country-specific educational attainment variables (CSEVs), and how these losses vary across measures and countries. The dependent variable used for the construct validation is social status as measured by the International Socio-Economic Index (ISEI). Results suggest that harmonisation always entails some loss of explanatory power for at least a few countries. However, there are clear performance differences between the comparable measures in terms of both the average *amount* of losses as well as the *distribution* of losses across countries. The use of actual *years of education* as well as the levels-only ISCED strongly attenuates the education-social status association on average, but also to very different degrees across countries. CASMIN and ES-ISCED fare considerably better: they show the lowest losses of explanatory power and the lowest variation of losses across countries. Hypothetical *years of education* lie in between. Some practical implications are then proposed, e.g. on how to implement cross-national measures of educational attainment in international surveys.

© 2010 International Sociological Association Research Committee 28 on Social Stratification and Mobility. Published by Elsevier Ltd. All rights reserved.

**Keywords:** Measurement; Educational attainment; Comparative research; Education; Data quality

## 1. Introduction

Over the last decades, more and more international data sets including more and more countries have become available to researchers. Examples are academically-driven public opinion surveys (cf.

\* Fax: +44 1865 278 621.

E-mail address: [Silke.Schneider@nuffield.ox.ac.uk](mailto:Silke.Schneider@nuffield.ox.ac.uk).

Heath, Fisher, & Smith, 2005) such as the European Social Survey (ESS; since 2002; <http://www.europeansocialsurvey.org>), public administration-driven official surveys such as the EU Statistics on Income and Living Conditions (EU-SILC, since 2004) co-ordinated by the Statistical Office of the European Communities (EUROSTAT), and achievement studies such as the Programme of International Student Achievement (PISA, since 2000; <http://www.pisa.oecd.org>) and the upcoming Programme for the International Assessment of Adult Competencies (PIAAC, <http://www.oecd.org/els/employment/piaac>, see also Schleicher, 2008) co-ordinated by the Organisation for Economic Co-operation and Development (OECD).

This ongoing development gave rise to a previously unequalled popularity of cross-nationally comparative social research. Cross-nationally comparable measurement is one of the most important challenges for quantitative (variable based) comparative social research (Przeworski & Teune, 1970), which intends to push comparability to the highest achievable level. The comparable measurement of social background variables is however a neglected area, and “instruments allowing the compatible measurement of demographic and socio-economic variables are badly needed” (Wolf & Hoffmeyer-Zlotnik, 2003, p. 2).

Educational attainment is, like age and sex, a core social background variable and thus one of the individuals’ socio-economic characteristics recorded in virtually all social surveys. Accordingly, measures of educational attainment are used in many individual-level empirical studies either as a main (predictor or outcome) or as a control variable. Reliable, valid and *internationally harmonised* measures are however particularly difficult to achieve: Educational systems were historically shaped in different ways in different countries, so that they have developed specific institutional peculiarities. Despite the wide utilisation of educational attainment measures and the difficulties harmonising them, validation studies of different types of measures and, more specifically, different cross-national measures, are scarce.

The aim of this paper is to evaluate the consequences of using different cross-national education variables in terms of construct validity. This study will address two questions: (1) Which of the comparable measures displays the highest predictive power relative to the CSEV? and (2) Which of the comparable measures shows least variation across countries in terms of loss of relative explanatory power? The first question refers to the construct validity of different measures *within* a specific country. The second ques-

tion refers to the ‘equivalence of construct validity’ of measures across countries: A cross-national educational attainment measure needs to be *equally valid* in each country.

This evaluation entails a comparison of the predictive power of different measures of educational attainment (country-specific educational attainment variables (CSEVs), two versions of coding the International Standard Classification of Education (ISCED), the CASMIN education scheme as well as *hypothetical* and *actual years of education*) using data from the European Social Survey (ESS). The criterion (predicted) variable used for this validation is social status as measured by the International Socio-Economic Index (ISEI; Ganzeboom, de Graaf, & Treiman, 1992; Ganzeboom & Treiman, 1996). Social status was chosen as the criterion because it is known to be closely associated with educational attainment. The association between educational attainment and social status can thus be expected to be very sensitive with respect to the quality of measurement of educational attainment. Social status as measured by the ISEI is also closely related to many other socio-economic variables, like social class membership, occupational prestige and income (Ganzeboom et al., 1992).

## 2. Cross-national measures of educational attainment

Conceptually, educational attainment is conceived of in a variety of ways: as a direct measure of educational qualifications awarded following some validation of learning, as an indicator of social position, of general basic and/or instrumental skills, and of socialisation in terms of exposure to beliefs and values prevalent in the educational system. This variety corresponds to the existence of a variety of measures of educational attainment developed in different user communities. There are no validated and well established standards for the measurement of educational attainment.

Following Blau and Duncan (1967), social researchers often resort to years of schooling (or measures derived thereof) as a proxy variable for educational attainment (e.g. Eikemo, Huisman, Bambra, & Kunst, 2008; Kunovich & Slomczynski, 2007; Scheepers, Grotenhuis, & Slik, 2002; Treiman, Ganzeboom, & Rijken, 2003; Treiman & Yip, 1989). ‘Age at leaving full-time education’ (e.g. Weakliem, 2002) leads to very similar information, but in the comparative case does not take the different starting ages of compulsory education in different countries into account. Both measures capture the individual’s

time investment in education. However, although time invested in education correlates with the amount of skills and competences acquired, *years of education* ignore that more able individuals often learn faster and navigate the educational system more efficiently. These measures also often restrict the concept of education to general education in regular schooling, thus ignoring vocational training and higher education. Also, this information is not always collected in surveys. To address these problems, a closely related measure can be derived from country-specific education categories by assigning respondents the number of years it *usually* takes to complete the respective level of schooling ('hypothetical' years of education).

More rarely, scaling approaches are used in order to convert country-specific education categories to a common metric using some criterion variable (Smith & Garnier, 1987; Sørensen, 1983; Treiman & Terrell, 1975). Although scaled education measures retain the amount of variation inherent in the nationally specific measures, they borrow their metric from the criterion variable and are no direct measures of educational attainment any more: they rather describe the 'value' of education expressed in units of the criterion. The interpretation and theoretical meaning of such measures is therefore rather complex.<sup>1</sup>

These two approaches (years of education and scaling) share the advantage that education can be parsimoniously included in statistical analyses as a linear variable. However, at the same time these measures are unidimensional and do not allow the distinction of different types of education, for example primary and secondary education, or vocational and general education. Moreover, it is difficult to draw policy conclusions from results achieved with these measures since they don't relate to educational institutions or programmes (such as upper secondary vocational training, or university preparation). Finally, (quasi-)continuous measures cannot operationalise a credentialist model of returns to education, i.e. disregard the signalling value contained in educational certificates (for a comparison of linear, level-specific and credentialist models of the returns to education for the United States, see Goodman, 1979).

CSEVs can also be harmonised using an international categorical framework such as the CASMIN scheme or

ISCED. Both are briefly described in the following sections.

### 2.1. The CASMIN education scheme

The most influential categorical measure of educational attainment in academic cross-national research is a scientifically motivated classification of educational credentials, the 'CASMIN Educational Classification' (e.g. Brauns, Scherer, & Steinmann, 2003; König, Lüttinger, & Müller, 1988). It is implemented by output-harmonising country-specific measures and was used in a number of seminal cross-national studies on social stratification and mobility (e.g. Breen, Luijkx, Müller, & Pollak, 2009; Erikson & Goldthorpe, 1992; Shavit, Arum, & Gamoran, 2007; Shavit & Blossfeld, 1993; Shavit & Müller, 1998).

The CASMIN education scheme classifies qualifications that are functionally equivalent across countries together. Functional equivalence here refers to the *selectivity effects* of different qualifications for social class reproduction. It is two-dimensionally structured by the following criteria (König et al., 1988, p. 55): 1. The vertical distinction of levels of education, which is proxied by the costs, length and quality of the educational experience, intellectual abilities required and value of the resulting certificate in the labour market; and 2. the horizontal distinction between 'general' and 'vocational' education.

The original CASMIN scheme contains eight categories:

- 1a. Inadequately completed general elementary education;
- 1b. General elementary education (non-selective, compulsory);
- 1c. Basic vocational qualification or general elementary education and basic vocational qualification;
- 2a. Intermediate vocational qualification or intermediate general education plus basic vocational qualification;
- 2b. Intermediate general qualification (or selective education requiring a longer education than 1b);
- 2c. Full maturity certificate;
- 3a. Lower tertiary certificate (building on 2c but shorter and more practically oriented than 3b); and
- 3b. Higher tertiary certificate (traditional university degree and above).

<sup>1</sup> This is also the case for latent variable models of educational attainment (see Schröder & Ganzeboom, 2009), which are not discussed here since they require more independent measures of educational attainment than available in most data sources, making this approach unfeasible for most users.

## 2.2. The International Standard Classification of Education

ISCED was introduced by the UNESCO in 1976 and revised in 1997 (OECD, 1999; Smyth, 2008; UNESCO, 2006 [1997], 1999). It is implemented by ex-ante output harmonisation in a wide range of (especially official) cross-national surveys, e.g. in the ESS, EU-LFS, EU-SILC and the PISA studies. Some studies using ISCED-related measures are Saar, Unt, and Kogan (2008), Domanski and Przybysz (2007), von dem Knesebeck, Verde, and Dragano (2006) and Müller (2005). ISCED 97 is a multidimensional classification for harmonising national educational *programmes* into a cross-national framework for levels and fields of education (the latter will not be discussed here). The link between the unit of classification in ISCED, the educational programme, and individuals' educational attainment can be established via the successful *completion* of an educational programme and/or achievement of the respective certificate. ISCED 97 distinguishes seven levels of education:

0: Pre-primary education (excluding child care);

1: Primary education (often the first 6 years of formal schooling);

2: Lower secondary education (the end of which often coincides with the end of full-time compulsory schooling after around 9 years of schooling);

3: Upper secondary education (e.g. for university entrance certificates);

4: Post-secondary non-tertiary education;

5: First stage of tertiary education (university and vocational college education below the PhD level);

6: Second stage of tertiary education (PhD).

Level 4 was not available in ISCED 76. Moreover, ISCED 97 levels 5 and 6 were distributed over three levels in ISCED 76, which do not overlap with the revised categories (4: tertiary qualifications without academic degree; 5: first university degree or equivalent; 6: post-graduate university degree or equivalent). In contrast to ISCED 76, ISCED 97 uses several complementary dimensions within levels:

*Programme orientation:* At levels 2, 3 and 4, there is a distinction between vocational or technical (v), pre-vocational or pre-technical (p) and general (g) programmes. Vocational programmes prepare for specific (classes of) occupations.

*Cumulative duration:* At level 5, *short* (up to 3 years), *medium* (3 to less than 5 years), *long* (5 to less than 6 years) and *very long* (more than 6 years) programmes are differentiated.

*Position in the national degree and qualification structure:* Again at level 5, *first*, *second* and *third* and *further* qualifications are distinguished.

*Programme destination:* At levels 2–5 there is a distinction between type A programmes leading to ever more advanced theoretically based programmes that in the end give access to doctoral programmes (ISCED level 6); type B programmes leading to more advanced vocational programmes up to vocational tertiary education (5B), and type C programmes not giving access to a specific higher ISCED level.

In its entirety, ISCED 97 thus provides a large number of internationally comparable categories. Mapping tables are available to link national educational programmes to these categories (Eurostat, 2005; OECD, 1999; UNESCO Institute for Statistics, 2009). Depending on the purpose of the data, specific complementary dimensions can be implemented or ignored, allowing for purpose-built education variables in principle.

## 2.3. Previous evaluations of cross-national measures of educational attainment

Since data including the revised ISCED were not available until recently, the construct validity of ISCED 97 relative to alternative measures has not yet been thoroughly evaluated (for an evaluation of ISCED 97 in the EU LFS, see Schneider 2008). Kerckhoff and colleagues published two articles concerning the evaluation of ISCED 76 and the CASMIN educational scheme for a small number of countries, namely Great Britain, Germany, the Netherlands, Sweden and the United States on the one hand (Kerckhoff & Dylan, 1999) and Great Britain, the Netherlands and the United States on the other (Kerckhoff, Ezell, & Brown, 2002). Braun and Müller (1997) performed a similar evaluation for the United States, Germany, Poland and Hungary, covering CASMIN, years of schooling and a very basic three-category scheme.<sup>2</sup>

The methodological rationale of these studies is that there are two sources of variation in the association between educational attainment and any other variable over countries: Firstly, the 'true' association between educational attainment and the other variable may differ over countries. Secondly, different measures of educational attainment reflect the 'true' level of educational

<sup>2</sup> Although instructive, single-country studies comparing different measures of educational attainment (e.g. Goodman, 1979; Frazis, 2002; Müller & Klein, 2008) will not be discussed here.

attainment to different degrees. Therefore, the strength of the association between educational attainment and the other variable (or, equivalently, the explanatory power of educational attainment) will also depend on which measure of educational attainment is used. A higher association indicates a higher degree of construct validity of the respective measure of educational attainment. In contrast, the aggregation of various different levels of attainment in one broad category leads to unobserved heterogeneity that attenuates the observed strength of association and indicates a low level of construct validity.

The important point is now that cross-nationally comparable measurement requires ‘cross-national equivalence of construct validity’: If a cross-national measure of educational attainment has a high degree of construct validity in one country, but a low degree of construct validity in another country, the results will not be comparable even if the content of the education categories looks highly equivalent, i.e. nominally comparable, across countries. The explanation for lacking equivalence of construct validity is that the degree of unobserved heterogeneity within broad education categories may differ substantially across countries. (This reasoning can also be applied to numerous other categorical measures, such as ethnic or social class background.)

For the evaluation of ISCED 76, Kerckhoff and Dylan (1999) used data from the International Adult Literacy Survey (IALS) for Great Britain and the United States. They compared the  $R^2$ s resulting from the regression of occupational prestige scores (Treiman, 1977) and cognitive test scores on education measured in three ways: Using standard ISCED 76 categories as implemented by the national teams, as recommended by the OECD, and using the CSEV. The CSEV was used as a benchmark. The authors summarise the results as follows (Kerckhoff and Dylan, 1999, p. 770):

1. “Relatively minor changes in the classification of the indigenous credentials into standard categories (in this case ISCED categories) can alter the associations between educational attainment and both occupational prestige and cognitive skill.
2. Both constructions of standard categories underestimate the associations between educational attainment and two important outcomes (occupational prestige and cognitive skill).
3. Underestimation is much greater in one country (Great Britain) than in another (the United States).
4. The different underestimates lead to misleading impressions of the relative importance of educational

attainment in the two countries by making the differences look larger than they actually are”.

The comparison of CASMIN and ISCED 76 in Kerckhoff et al. (2002) shows that in Great Britain and the Netherlands, CASMIN performs better than ISCED 76. In the United States in turn, ISCED 76 works better. Thus the reclassifications imposed by either international framework are not equally adequate in all countries. In sum, “the important conclusion to be reached is that the way in which the standard categories are constructed from the indigenous categories *can* make a major difference in the kinds of results that are produced in comparative research” (Kerckhoff & Dylan 1999, p. 769, *italics original*). It is also noted that neither CASMIN nor ISCED 76 offer enough categories to adequately represent all important distinctions in educational credentials.

Braun and Müller (1997) use a wider set of criterion variables (including e.g. gender attitudes and income) to evaluate CASMIN, ‘years of schooling’ and a basic three-category scheme, again comparing the explanatory power ( $R^2$ s) of the cross-national and the ‘indigenous’ education dummies. In all countries but the United States, ‘years of schooling’ had (sometimes considerably) less explanatory power than the country-specific education categories, regardless of the criterion variable chosen. Using CASMIN resulted in less – but still sometimes undesirable – loss of predictive power. The minimal three-category scheme showed the weakest performance of all measures.

These results are worrying and instructive at the same time. However, the results reached by Kerckhoff and colleagues using ISCED 76 might differ from those that would be achieved with ISCED 97 today: the major revision of ISCED undertaken in 1997 may have changed the performance of the measure. Therefore, these studies need updating. Moreover, as the IALS data only included the major occupational categories of the International Standard Classification of Occupations (ISCO 88), the measures of occupational status and prestige used in both studies are very crude. This might have influenced the results, probably by underestimating the effects of harmonisation. Furthermore, although *years of education* is often used in cross-national research, only the study by Braun and Müller (1997) has evaluated the predictive power of this measure. Finally, we still lack knowledge about the effects of using comparable education measures in a wider range of countries. It would therefore be useful to check the performance of *years of education*, CASMIN and ISCED 97 in large and recent cross-national surveys.

### 3. Educational attainment in the ESS

The ESS (for the most recent technical report, see Jowell, 2009) is a biennial repeated cross-sectional survey carried out in more than 30 mostly European countries.<sup>3</sup> Its main focus are peoples' attitudes and values and their (aggregate) changes over time. It contains a number of variables capturing the social background of respondents as well as their partners and parents, which in principle makes it attractive for comparative social stratification and mobility research.

For this study, data from the first three rounds (collected in 2002/2003, 2004/2005 and 2006/2007) are analysed. The ESS includes three measures of educational attainment: Actual (full-time equivalent) years of education,<sup>4</sup> highest level of education in a country-specific format (the CSEVs), and a simplified version of ISCED 97 derived from the CSEVs ('*edulvl*').

There are two issues with the supposedly comparable variable '*edulvl*' in the ESS. Firstly, harmonisation into ISCED was not entirely successful: Prior analyses showed that in many countries and ESS rounds, re-coding into *edulvl* performed by the country teams did not comply with the ISCED definitions and mappings, leading to substantial inconsistencies across time and countries (Kolsrud & Skjåk, 2005; Schneider, 2007, 2009). The supposedly comparable variable '*edulvl*' was therefore corrected for misclassifications by the author. Furthermore, the country-specific variables often do not distinguish PhDs from other university degrees as required by ISCED 97. Since PhDs are rather rare and in order to keep as many countries as possible in the analyses, a six-category version of ISCED is used here, aggregating ISCED levels 5 and 6.

Secondly, the simplified ISCED variable in the ESS only distinguishes the main ISCED levels of education, but none of the sub-dimensions 'programme orientation', 'destination', 'duration' or 'position in the national qualification structure'. The scientific advisors

to the ESS (see Erikson & Jonsson, 2001) had suggested though that programme orientation should be reflected: this sub-dimension plays a prominent role in many theoretical approaches involving education because of the fundamental differences in selectivity and skills conveyed between general/academic and technical/vocational education programmes. Furthermore, there may be pronounced differences in the effects of bachelor-level and master-level university qualifications, a distinction that can be made within ISCED level 5 using the sub-dimensions 'programme duration' and 'position in the national qualification structure'. In fact many countries make these distinctions in their country-specific variables so that a more information-rich version of ISCED 97 could possibly be achieved by recoding the CSEVs from scratch.

A close look at the distribution of the corrected ISCED variable showed that it was indeed too undifferentiated at the upper secondary and tertiary levels (see chapter 6 in Schneider, 2009), with up to 78% of cases accumulating in ISCED level 3 and up to 62% in level 5. The seven main ISCED 97 levels thus on the one hand do not well reflect the diversity of country-specific credentials at the most common levels of education. On the other hand, the levels-only ISCED 97 distinguishes between levels which are not common in the European context nowadays (levels 0 and 1). Prima facie, the levels-only ISCED 97 thus looks neither efficient nor sufficiently differentiated.

Therefore, three alternative cross-national educational attainment variables were derived from the CSEVs: *hypothetical years of education* (see Section 2),<sup>5</sup> CASMIN as described in Section 2.1,<sup>6</sup> and a "differently simplified" version of ISCED 97 reflecting the aforementioned distinctions: The new 'European Survey Version of ISCED 97' (ES-ISCED), described next.

### 4. A European Survey Version of ISCED 97

ES-ISCED builds on the concepts and mappings of country-specific to international categories provided by ISCED 97, but incorporates a crucial idea underlying the CASMIN scheme, namely the differentiation of types of qualifications *within* levels of education. The advantage

<sup>3</sup> These are Austria (AT), Belgium (BE), Bulgaria (BG), Croatia (HR), the Czech Republic (CZ), Cyprus (CY), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Greece (EL), Hungary (HU), Iceland (IS), Ireland (IE), Israel (IL), Italy (IT), Latvia (LV), Lithuania (LT), Luxembourg (LU), the Netherlands (NL), Norway (NO), Poland (PL), Portugal (PT), Romania (RO), Russia (RU), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE), Switzerland (CH), Turkey (TR), the Ukraine (UA) and the United Kingdom (UK). Not all countries participated in every round of the survey.

<sup>4</sup> Questionnaire item F7, round 3: About how many years of education have you completed, whether full-time or part-time? Please report these in full-time equivalents and include compulsory years of schooling.

<sup>5</sup> There are however no clear-cut rules on how to derive 'virtual years of education' from country-specific categories. Details on the strategy used here can be found in Schneider (2009).

<sup>6</sup> Although the scheme was updated by Brauns and Steinmann (1999), the original 8-category version will be used here because the CSEVs in the ESS do not allow coding into the more detailed scheme in most countries.

Table 1  
The European Survey version of ISCED (ES-ISCED).

ES-ISCED	ISCED 97	g/v	Dur. (years)	Description of the qualifications included in the category
I	0, 1	g		No formal qualification or only primary education
II	2, 3C < 2 years	g/v	8–10	Lower secondary schooling completed, including vocational training that is not considered as completion of upper secondary education
IIIb	3B, 3C ≥ 2 years	v	II + 2–3	Upper secondary vocational qualifications not preparing for ISCED 5A
IIIa	3A	v	II + 2–5	Upper secondary vocational qualifications giving access ISCED 5A
	3A	g	II + 2–3	Upper secondary general qualification preparing for ISCED 5A
	4A	v + g	II + 4–5	Two upper secondary qualifications (3A (g) plus 3B/C (v) or the other way round)
IV	5B, 4B, 4C	v	III + 1–2	Post-secondary/advanced vocational education below bachelor's degree level (master crafts qualification, higher technicians, foremen, absolutorium, etc.)
V1	5Am		IIIa + 3–4	Medium duration higher education at university or polytechnic college (bachelor's degree level)
V2	5A1		IIIa + 4–6	Long higher education at university or polytechnic college (master's degree level) below PhD
	6		V1 + 3–6	PhD, doctorate

of ES-ISCED over CASMIN is that it can be derived from ISCED levels and sub-dimensions and is thus available for most countries in the world, whereas CASMIN has only been documented for a select group of countries. At the same time, ES-ISCED offers a more efficient simplification of ISCED 97 than the levels-only version by collapsing 'small' levels of the classification, and differentiating 'large' ones. Because of what are 'small' and 'large' categories differs across world regions of different levels of development, this new scheme is mostly suitable for European and probably other developed countries.

In ES-ISCED, ISCED levels 0 and 1 are summarised in one category (I). Category II corresponds to completion of ISCED level 2 (including qualifications from short vocational upper secondary programmes classified as 3C short). The various combinations of ISCED sub-dimensions within ISCED level 3 are simplified to a dichotomy: IIIa indicates academically selective university entrance certificates, whereas IIIb indicates vocational qualifications preparing for direct labour market entry or further vocational training. If a country has different types of upper secondary vocational qualifications, those that do not give access to ISCED 5A (3B and 3C voc) are classified in IIIb, and those that do (3A voc) in IIIa. ISCED level 4 is absorbed into the adjacent levels: ISCED 4A is relatively rare and more or less equivalent to 3A. ISCED 4B and 4C are also rare and functionally equivalent with what is classified as ISCED 5B in other countries: A cross-nationally consistent distinction of tertiary and post-secondary non-tertiary vocational education is highly difficult. Therefore 4B, 4C and 5B are aggregated into a new category IV labelled "advanced vocational education". ISCED level 6 finally is so small that it is not efficient to reserve an extra category for it

in a survey with sample sizes like those in the ESS. It is more fruitful to distinguish between lower (bachelor's degree-level) and higher (master's degree- and PhD-level) university qualifications instead. Table 1 shows an overview of ES-ISCED. A detailed description of the categories and detailed mappings for the ESS are provided in Schneider (2009, Section 6.3).

Using data from the first three ESS rounds, ES-ISCED can only be coded for 16 countries, and CASMIN for 15 countries. The country-specific variables of the other countries lack some differentiations necessary for the construction of ES-ISCED and/or CASMIN, usually within ISCED levels 3 and/or 5, as this was not required for the construction of the ex-ante specified levels-only ISCED 97 in the ESS—a negative side-effect of the ex-ante harmonisation strategy.

## 5. Predictive validity of different measures of education

What is the effect of reclassifying country-specific educational attainment variables into the levels-only ISCED 97, ES-ISCED and CASMIN in terms of predictive power within and across countries? And how do *actual* and *hypothetical years of education* compare with the CSEVs on the one hand and the categorical comparable variables on the other?<sup>7</sup> In order to answer these questions, a strategy similar to the one used by Kerckhoff and Dylan (1999), Kerckhoff et al. (2002) and Braun and Müller (1997) (see Section 2.3) is followed, compar-

<sup>7</sup> Since the procedure of 'effect-proportional scaling' ensures that the correlation between the scored education variable and the criterion is maximised, scaled education measures are excluded from this evaluation.

ing the associations of different educational attainment measures with one criterion variable, here occupational status (measured with the International Socio-Economic Index (ISEI), Ganzeboom et al., 1992).<sup>8</sup>

The fact that ISEI scores are a quasi-continuous measure means that firstly, simple OLS regressions and  $R^2$ s can be used; secondly, the interpretation is relatively straightforward; and thirdly, sample sizes are less of a problem than with a categorical criterion variable. Separately for each country and ESS round, ISEI scores are regressed on six measures of education<sup>9</sup>:

1. The CSEV included in the ESS is regarded as the most valid (but incomparable) measure for each country and thus used as a benchmark (model 1)<sup>10</sup>;
2. The corrected levels-only ISCED 97 with six categories (model 2);
3. The CASMIN education scheme with eight categories (model 3);
4. ES-ISCED with seven categories as proposed above (model 4);
5. *Hypothetical years of education*, denoted as ‘h-Years’ (model 5);
6. *Actual years of education*, denoted as ‘a-Years’ (model 6).

Table 2 shows the case numbers entering the regression analysis in each country per ESS round, the number of categories in the CSEVs ( $k$ ) and the  $R^2$ s from regressing ISEI scores on the six educational attainment measures. Whereas for model 1 absolute adjusted  $R^2$ s are reported, for all other models adjusted  $R^2$ s in percent

of the adjusted  $R^2$  in model 1 are shown. This is to take into account the possibility that the amount of change of explanatory power might be influenced by the absolute level of association.

Firstly, the explanatory power of the CSEVs is examined to get some idea of the validity of the CSEVs in different countries. Since the CSEVs serve as a benchmark for the subsequent analyses, the results for countries with a dubious CSEV need to be interpreted with caution. Secondly, the adjusted  $R^2$ s resulting from the regressions of ISEI scores on educational attainment are compared across measures of education within countries in order to assess the amount of change in predictive power introduced by harmonising country-specific education variables or using *years of education* instead of the CSEV. This constitutes an assessment of the *construct validity* of different comparable education measures *within* countries. Finally, it will be evaluated if the changes in explanatory power of different educational attainment measures differ *across* countries. This constitutes an assessment of the *equivalence of construct validity* of cross-national education measures.

### 5.1. Performance of CSEVs

The average variance in ISEI scores explained by the country-specific education variables amounts to 42%. There is a large degree of variation across countries, with  $R^2$ s ranging from 22 to 58%. Relatively high  $R^2$ s in model 1 mean that firstly, there is a high association between educational attainment and occupational status in a country, and secondly, that ISEI scores and educational attainment were measured with a high degree of discriminatory power. Relatively low  $R^2$ s using the country-specific variable in turn do *not* necessarily mean that education is less important for occupational attainment in the respective country. It could equally well mean that the country-specific variable has a low degree of content validity because it does not differentiate all relevant education categories, or that occupational status was not well coded in ISCO 88. The number of response categories in the country-specific variable (column  $k$ ) can be used as an – admittedly crude – proxy of the quality of the CSEV. Particularly worrying are the CSEVs for Austria, Bulgaria, Cyprus, Finland, Greece, Ireland, Iceland, Italy (2002), Slovenia, Turkey, the Ukraine and the UK (2004)—all being no more or even less detailed than the intended seven-level ISCED variable. Their rather low associations with ISEI-scores are to some degree due to measurement error since the variables do not well represent the full range of educational qualifications in the respective countries. For example, vocational qualifica-

<sup>8</sup> The measured association is of course also sensitive to the quality of the measurement of the ISEI scores. Here, this quality can be assumed to be rather high, as the scores are derived from the full four-digit ISCO 88 codes for all countries. Moreover, since the dependent and control variables are the same across models, changes in  $R^2$ s across education measures can entirely be attributed to differences between measures of educational attainment.

<sup>9</sup> The sample is restricted to respondents aged 25–64 that are economically active (including the unemployed), for whom data on current or last occupation, educational attainment (CSEV and years of education), age and sex are not missing. Age and sex are controlled for. With the exception of *years of education*, the education variables are included in the models as dummy variables, i.e. no *a priori* assumption on ordinality or linearity of the relationship between educational attainment and occupational status is made.

<sup>10</sup> Finland, Iceland and Slovenia used response categories that supposedly directly correspond to the cross-national variable (which, because of mis-classifications, was actually not the case in the two latter countries) and thus did not provide country-specific variables, as did Turkey. For these countries, the variable *edulvl* replaces the missing country-specific variables.

Table 2  
Comparative construct validation using ISEI scores.

Country	ESS round	N	k	Adj. R <sup>2</sup>	Relative adjusted R <sup>2</sup>				
				CSEV	ISCED	CASMIN	ES-ISCED	h-Years	a-Years
AT	1	1483	5	22.4	–	–	–	99.2	93.3
AT	2	1354	6	36.1	–	–	–	91.2	81.2
AT	3	1470	6	31.8	–	–	–	89.4	67.7
BE	1	1093	11	42.9	90.1	96.8	99.5	90.8	63.0
BE	2	1100	11	43.8	88.0	98.4	96.9	85.9	52.0
BE	3	1101	11	43.6	85.3	100.0	98.7	89.4	52.6
BG	3	806	6	53.0	100.0	–	–	86.8	96.8
CH	1	1359	15	32.5	84.9	94.2	92.9	93.5	61.7
CH	2	1448	15	32.5	69.3	93.8	93.5	96.7	61.0
CH	3	1206	13	48.9	77.3	94.2	98.3	97.8	72.8
CY	3	623	6	46.5	83.0	–	–	80.0	88.4
CZ	1	786	11	48.2	69.4	99.9	95.6	85.6	72.3
CZ	2	1721	11	51.3	69.2	96.9	96.3	86.8	80.1
DE	1	1841	17	42.3	56.4	96.4	93.0	90.7	75.0
DE	2	1756	17	44.3	70.8	95.5	97.1	96.9	72.0
DE	3	1788	18	44.9	68.6	94.0	93.8	91.9	66.5
DK	1	987	10	32.8	79.7	92.5	98.7	87.5	90.3
DK	2	967	9	41.6	79.5	97.0	100.2	85.3	67.6
DK	3	974	9	44.1	83.4	97.9	100.2	92.8	43.8
EE	2	1175	12	34.3	83.4	–	96.9	94.8	95.6
EE	3	876	15	33.7	79.0	87.4	96.1	92.4	91.2
ES	1	817	14	51.6	92.9	99.2	96.8	94.0	75.2
ES	2	832	17	39.5	84.4	97.1	97.5	92.9	77.0
ES	3	1092	17	44.1	82.8	98.8	97.2	86.7	69.6
FI	1	1237	6	35.1	94.6	–	–	80.5	96.7
FI	2	1247	6	37.4	92.4	–	–	88.8	97.8
FI	3	1145	6	38.5	95.1	–	–	87.4	83.0
FR	1	894	11	39.6	82.1	100.2	–	92.4	73.4
FR	2	1129	11	38.9	81.8	98.7	–	93.2	76.3
FR	3	1329	12	42.7	76.0	97.7	96.8	90.5	68.0
GR	1	1249	7	55.9	95.2	–	–	90.9	80.4
GR	2	1266	7	43.9	92.3	–	–	94.5	82.9
HU	1	1040	11	50.9	81.5	100.2	99.7	92.4	78.7
HU	2	980	14	57.9	78.4	97.0	98.9	91.4	69.5
HU	3	908	14	54.7	85.0	94.5	99.0	90.8	88.0
IE	1	1265	7	38.8	–	–	–	96.6	73.0
IE	2	1428	7	36.4	–	–	–	94.9	67.2
IE	3	1043	7	36.4	–	–	–	93.6	73.9
IL	1	1268	14	33.7	75.2	99.3	99.5	97.1	97.1
IS	2	319	6	29.2	72.8	–	–	76.8	54.1
IT	1	689	7	43.3	95.4	–	–	99.0	89.5
IT	2	803	8	46.2	95.9	–	–	97.1	84.1
LU	1	786	19	43.7	84.2	93.5	94.4	90.6	79.6
LU	2	1046	19	51.4	80.2	90.6	92.8	81.9	61.7
NL	1	1620	13	34.2	88.3	99.7	92.2	91.9	62.8
NL	2	1276	13	34.8	87.3	98.5	94.2	91.1	68.0
NL	3	1286	13	36.3	92.2	93.9	94.3	95.1	60.4
NO	1	1223	9	32.4	90.7	–	–	95.7	93.6
NO	2	1205	8	31.5	81.7	–	–	92.8	82.8
NO	3	1163	8	31.0	81.9	–	–	93.4	69.6
PL	1	1266	10	54.0	76.4	97.6	99.2	93.8	92.2
PL	2	1072	8	45.0	87.7	98.8	100.1	95.9	90.6
PL	3	1031	8	49.8	85.3	97.9	99.9	94.0	90.7
PT	1	870	8	44.4	96.2	–	–	97.7	95.5
PT	2	1053	8	46.3	97.1	–	–	96.3	96.5
PT	3	1236	10	53.2	96.0	–	–	96.0	91.9

Table 2 (Continued)

Country	ESS round	N	k	Adj. $R^2$	Relative adjusted $R^2$				
					CSEV	ISCED	CASMIN	ES-ISCED	<i>h</i> -Years <i>a</i> -Years
RU	3	1371	12	47.3		58.6	99.2	98.8	89.2 80.8
SE	1	1266	12	39.2		79.2	90.8	–	94.4 84.5
SE	2	1212	12	41.8		83.9	94.4	–	93.3 83.9
SE	3	1186	13	35.0		83.9	92.9	–	90.2 85.8
SI	1	914	7	52.9		83.7	–	100.0	93.0 85.9
SI	2	699	7	58.4		83.4	–	100.0	94.0 69.6
SI	3	844	7	52.7		80.7	–	100.0	92.3 81.8
SK	2	851	8	40.8		78.9	–	99.5	90.8 59.8
SK	3	1015	8	46.7		84.3	–	99.3	92.5 60.5
TR	2	657	6	49.0		100.1	–	–	88.7 88.8
UA	2	1134	7	43.8		57.1	–	–	96.0 73.4
UA	3	1120	7	45.9		59.6	–	–	93.7 46.5
UK	1	1303	8	32.1		79.3	–	–	96.6 75.5
UK	2	1070	7	33.7		–	–	–	94.7 54.9
UK	3	1473	7	25.8		68.6	–	–	91.6 74.9

Source: European Social Survey 2002–2007, own calculations. Respondents aged 25–64. Weighted using the design weight. Notes: N = number of valid cases; k = number of categories in the CSEV. Model 1: absolute adjusted  $R^2$ s resulting from regressing ISEI scores on the CSEVs. Models 2–6: relative adjusted  $R^2$ s from regressing ISEI scores on ISCED, CASMIN, ES-ISCED, hypothetical and actual years of education (relative to model 1).

tions are not always differentiated from general ones. For Italy, Portugal (2002 and 2004), Slovakia and the UK (2002 and 2006) it does not look much better, as only eight national categories are distinguished.

However, less detailed measures do not seem to be necessarily bad at predicting occupational status (see e.g. the rather high associations in Bulgaria, Cyprus, Greece and Slovenia with only six or seven categories) and very detailed measures not necessarily good (see e.g. the rather low association in Switzerland with 15 education categories in the first two rounds of the ESS. The substantive choice of categories is certainly more important than the sheer number of categories. In the case of Estonia, Israel and the Netherlands, it rather looks as if educational attainment is really less important for occupational status attainment than in most other countries: the respective country-specific variables are relatively detailed (13–15 categories), and still the  $R^2$  s from regressing ISEI on educational attainment are comparatively low. This could however also be explained by a potentially flawed measurement of occupational status in these countries.

## 5.2. Performance of cross-national variables

Comparing the different measures of educational attainment, the first observation is that no measure consistently reaches the explanatory power of the country-specific education variables. There are however clear differences between the different cross-national

measures of educational attainment. To facilitate the comparison of measures, Table 3 gives some summary statistics of the distribution of the  $R^2$  s produced by the different measures across countries and ESS rounds shown in Table 2. Mean and minimum relative explanatory power help in the assessment of construct validity of different measures, whereas the inter-quartile range (IQR) and standard deviation (S.D.) help judging the equivalence of construct validity of different measures across countries.

Harmonising the national education variables into the levels-only ISCED variable leads to a visible attenuation of the association between occupational status and education in nearly all countries. The attenuation is strongest for the Czech Republic, Germany, Iceland, Russia, Switzerland (2004) and the Ukraine. On average, the association between education and ISEI scores is attenuated by 17.5% when using ISCED instead of the CSEVs.

The rank-correlation between the  $R^2$  s from the country-specific variables and ISCED (6) is  $\rho = 0.82$ . Although this is of course a relatively high degree of association, it is not quite high enough for two measures of ‘the same thing’. The construct validity of the levels-only ISCED is thus pretty low. Comparing construct validity of ISCED across countries, we additionally find that the equivalence of construct validity is also low (IQR and S.D. are rather high by comparison with the other measures), which makes the measure unsuitable for cross-national comparisons. How do the other cross-

Table 3  
Summary statistics of relative  $R^2$ s for construct validation using ISEI scores.

Variable	Obs.	Mean	Min	IQR	S.D.
Country/ESS round combinations for which ISCED could be coded					
ISCED	64	82.5	56.4	10.5	10.2
<i>h</i> -Years	64	91.6	76.8	4.6	4.5
<i>a</i> -Years	64	77.1	43.8	20.6	13.6
Country/ESS round combinations for which CASMIN could be coded					
ISCED	37	80.0	56.4	8.6	8.3
CASMIN	37	96.4	87.4	4.6	3.1
<i>h</i> -Years	37	91.5	81.9	3.5	3.6
<i>a</i> -Years	37	73.9	43.8	17.5	12.5
Country/ESS round combinations for which ES-ISCED could be coded					
ISCED	38	80.0	56.4	8.6	8.2
ES-ISCED	38	97.3	92.2	3.8	2.5
<i>h</i> -Years	38	91.6	81.9	3.5	3.6
<i>a</i> -Years	38	73.3	43.8	19.0	13.1
Country/ESS round combinations for which all variables could be coded					
ISCED	32	79.6	56.4	9.7	8.9
CASMIN	32	96.5	87.4	4.6	3.0
ES-ISCED	32	96.9	92.2	4.7	2.6
<i>h</i> -Years	32	91.3	81.9	4.6	3.8
<i>a</i> -Years	32	72.9	43.8	17.5	13.0

national measures perform then? The explanatory power of the CASMIN education scheme lies much closer to the original CSEVs. In relative terms, the CASMIN scheme explains on average 96.4% of the variation in ISEI scores that the CSEVs explain, with the minimum being 87.4%. This loss of explanatory power refers to Estonia. Still, even in the Estonian case, CASMIN works much better than ISCED, which showed a relative adjusted  $R^2$  of only 79%. In fact, of all countries that could be considered here, there is not a single one in which ISCED has a higher explanatory power than CASMIN.

For all countries that could be included in model 4, ES-ISCED is also superior to the 6-level ISCED 97. The explanatory power of ES-ISCED is indeed very close or even identical to the explanatory power of the country-specific variables, even if a number of country-specific categories are aggregated (see e.g. Hungary, Israel and Spain). Compared to model 1, the average loss of explanatory power is 2.7%. The lowest relative  $R^2$  is 92.2%. Across all countries, ES-ISCED and CASMIN work similarly well, but ES-ISCED seems to work substantially better for Estonia. Turning to *years of education* (models 5 and 6), *actual* and *hypothetical years of education* perform very differently. *Hypothetical years of education* work much better than both the levels only ISCED and *actual years of education*. This measure also varies much less across countries in terms of how well it works than ISCED or *actual years of education*. However, *hypothetical years of education* do not reach the

degree of construct validity of CASMIN or ES-ISCED. *Actual years of education* perform very poorly with respect to both construct validity and equivalence of construct validity: Relative explanatory power is on average low (even lower than the levels only ISCED), and variation therein across countries is high (again exceeding ISCED).

## 6. Conclusions and recommendations

To summarise, the results of the regression analyses performed here support the findings of Kerckhoff and Dylan (1999), Kerckhoff et al. (2002) and Braun and Müller (1997): Firstly, the levels-only ISCED 97 and *actual years of education* generate quite different results from the country-specific variables. Both measures inadequately represent educational attainment in different countries since they do not capture the distinct value (or, in some countries, stigma) of vocational education. CASMIN and ES-ISCED are more differentiated in this respect, and consequently perform much better than the levels-only ISCED 97 and *actual years of education*. *Hypothetical years of education* are somewhere in between. Secondly, the deviations produced differ over measures of education. There is a lot of variation across countries in terms of the construct validity of ISCED and *actual years of education*, strongly negatively affecting comparability. Although the measurement quality of the country-specific variables is also sometimes unclear,

it is clear that neither measure is an acceptable cross-national measure of educational attainment. Variation in the amount of loss of explanatory power across countries is much less pronounced with those measures capturing differences within levels of education, CASMIN and ES-ISCED. *Hypothetical years of education* produce more consistent results across countries, too.

Compared to the work by Kerckhoff and colleagues, the results presented here are based on a larger number of countries, evaluate ISCED 97 rather than ISCED 76, compare a wider range of educational attainment measures, and use a more detailed occupational classification for the coding of social status.

But what follows from these results in practical terms? Firstly, for researchers using measures of educational attainment in their cross-national analyses, it is highly recommended to check results for sensitivity with respect to the specific measure of education used (possibly using different country samples) and to evaluate critically in how far the conclusions might change if more detailed measures of educational attainment were available. As the within-country comparisons of different measures show, this recommendation actually does not only apply to cross-national research. Although not yet ideal, *hypothetical years of education* can serve as a pragmatic measure of educational attainment that distorts cross-national differences only to a moderate degree. For many applications this would remain unsatisfactory though for theoretical reasons, i.e. lacking reflection of educational institutions and the signalling aspect of educational qualifications. There are also no clear rules on how to derive *hypothetical years of education*, leading to a lack of standardisation across studies.

Secondly, with respect to ISCED 97, this is a detailed international classification of educational programmes with rich documentation and mappings for most countries in the world. It has however not been implemented in the ESS in a way that reflects important distinctions in people's educational attainment in many European countries, because within ISCED levels, the ESS version neither distinguishes between vocational and general qualifications nor between qualifications with different destinations, or between different levels of tertiary qualifications.<sup>11</sup> The proposed alternative simplification of ISCED 97, ES-ISCED, fares much better with respect to both construct validity and equivalence thereof. This

shows that the way the 'common denominator' for constructing comparable education categories is chosen can have a major impact on the substantive results, and that ISCED 97 levels do not exhaust the possibilities for drawing meaningful comparisons.

However, as the country-specific variables in many countries were insufficient for coding into ES-ISCED (e.g. Sweden and the UK), there is no evidence yet of how well the ES-ISCED would work in the excluded countries. This would either have to be checked with higher quality national data sets, or improved country-specific variables in a future cross-national survey. Since ES-ISCED works well for countries with very differentiated and stratified educational systems like Germany, Hungary, the Netherlands and Switzerland (round 3) though, it is quite probable that it would also work well in the excluded countries.

Thirdly, what would have to be done for improving the implementation of cross-national measures of educational attainment in cross-national surveys like the ESS? To start with, data should be collected using *more detailed* country-specific education variables that allow the reflection of ISCED complementary dimensions in the cross-national codes. In the ESS, this would require some national teams to increase the level of detail of the respective country-specific education variable, particularly asking for a distinction between vocational/technical and general/academic qualifications at ISCED levels 3 and 5, and also distinguishing short/lower level and long/higher level university degrees. If already at the stage of data collection a highly simplified country-specific education variable is used, as was done in a number of countries in the ESS (particularly Austria, Finland and the UK), there is a high risk of measurement error, the cross-national variable cannot be properly evaluated, and later adjustments are impossible. Qualifications that can be aggregated in some countries may need to be differentiated in others, making it necessary to differentiate them in all countries in cross-national surveys.

As a next step, the country-specific variables should be recoded into the *full* ISCED 97, including the complementary dimensions 'programme orientation', 'programme destination' and 'programme duration'. The levels-only version of ISCED 97 has proven to be insufficient for cross-national research: some of its categories are too heterogeneous in a number of countries, which decreases its explanatory power to different degrees in different countries, thereby seriously hampering cross-national comparability *despite* nominally comparable categories. It is also inflexible with respect to later recoding for more specific research needs, and

<sup>11</sup> Other cross-national surveys, e.g. the EU-SILC, use an equally simplified scheme. A detailed version of ISCED 97 is currently not used in any actual survey. Possible reasons are lacking documentation on how to implement ISCED 97 in social surveys and the complexity of the classification framework.

the pre-determination of a low level of detail has shown to induce a low level of detail already at the stage of data collection.

Only in a third step, the full ISCED 97 variable should be simplified according to researchers' needs for statistical analyses. The ES-ISCED is an example of how such a simplification could look like. Following such a 3-step procedure where data harmonisation and simplification are split into two distinct coding steps could improve the cross-national comparability and discriminatory power of the educational attainment measure in the ESS and other comparative surveys a lot.<sup>12</sup>

A further step for evaluating ISCED 97 and ES-ISCED would be to do similar analyses as those conducted in this paper with other criterion variables, e.g. social class attainment, social attitudes or health outcomes, which are known to be related to educational attainment. Schneider (2009, Section 7.4) performs the same analyses as those reported here using social class (using the EGP class scheme; Erikson, Goldthorpe, & Portocarero, 1979) as the criterion variable, with very similar results. The author has also done preliminary analyses using political interest, subjective health and anti-immigrant attitudes as dependent variables, which also support the conclusions drawn here. They therefore do not seem to apply to the analysis of social status only. It would also be important to do similar analyses with larger national data sets with more detailed country-specific education measures, particularly for those countries for which ES-ISCED could not be coded in the ESS and whose country-specific measures in the ESS were very crude. Again this is work already under way, using national labour force surveys from seven European countries. Finally it would be highly desirable to include other developed countries in similar analyses. As shown in this paper, substantive conclusions on cross-national similarities and differences in the education-occupation association based on flawed measures of educational attainment can be strongly misleading. Researchers often choose educational attainment measures because of their availability, dominant practice in their research community, and statistical properties rather than on theoretical grounds and validity for the research question at hand. There is therefore a mismatch in the theoretical importance of educational attainment and in the methodological rigour with which it is conceptualised, measured and analysed. Especially compared to the work on occupational classification and

measurement, the methodological tool-set for measuring educational attainment cross-nationally still hugely trails behind. Just because education is such a commonly used variable in social science research should not mean that we take its measurement for granted—on the contrary.

## Acknowledgements

I would like to thank Anthony Heath, Tak Wing Chan (both Department of Sociology, University of Oxford) and Martina Brandt (Soziologisches Institut, University of Zürich) for their comments on earlier drafts of this paper. I would also like to acknowledge the receipt of financial support from the Economic and Social Research Council (ESRC), the Department of Sociology and Nuffield College, Oxford, UK as well as the Studienstiftung des Deutschen Volkes during the course of the research presented here.

## References

- Blau, P. M., & Duncan, O. D. (1967). *The American occupational structure*. New York/London: Wiley.
- Braun, M., & Müller, W. (1997). Measurement of education in comparative research. *Comparative Social Research*, 16, 163–201.
- Brauns, H., Scherer, S., & Steinmann, S. (2003). The CASMIN educational classification in international comparative research. In J.H.P. Hoffmeyer-Zlotnik and C. Wolf (Eds.), *Advances in cross-national comparison: A European working book for demographic and socio-economic variables* (pp. 221–244). New York/London: Kluwer Academic/Plenum.
- Brauns, H., & Steinmann, S. (1999). Educational reform in France, West-Germany, and the United Kingdom. Updating the CASMIN educational classification. *ZUMA Nachrichten*, 44(23), 7–44.
- Breen, R., Luijckx, R., Müller, W., & Pollak, R. (2009). Nonpersistent inequality in educational attainment: Evidence from eight European countries. *American Journal of Sociology*, 114(5), 1475–1521.
- Domanski, H., & Przybysz, D. (2007). Educational homogamy in 22 European countries. *European Societies*, 9, 495–526.
- Eikemo, T. A., Huisman, M., Bambra, C., & Kunst, A. E. (2008). Health inequalities according to educational level in different welfare regimes: A comparison of 23 European countries. *Sociology of Health & Illness*, 30(4), 565–582.
- Erikson, R., & Goldthorpe, J. H. (1992). *The constant flux: A study of class mobility in industrial societies*. Oxford: Clarendon Press.
- Erikson, R., Goldthorpe, J. H., & Portocarero, L. (1979). Intergenerational class mobility in 3 Western European societies—England, France and Sweden. *British Journal of Sociology*, 30(4), 415–441.
- Erikson, R., & Jonsson, J. O. (2001). How to ascertain the socio-structural position of the individual in society. In R. Jowell, & the Central Co-ordinating Team (Eds.), *ESS questionnaire development report* (pp. 12–81). London: City University, [http://www.europeansocialsurvey.org/index.php?option=com\\_content&task=view&id=62&Itemid=96](http://www.europeansocialsurvey.org/index.php?option=com_content&task=view&id=62&Itemid=96)
- Eurostat. (2005). UOE-UNESCO-OECD-Eurostat data collection on education: Mapping of national education programmes to ISCED-97 for school/academic year 2002/2003,

<sup>12</sup> Such a strategy will be used in the ESS from round 5 onwards. More detail on these suggestions can be found in Schneider (2009).

- [http://circa.europa.eu/Public/irc/dsis/edctcs/library?l=/public/unesco\\_collection/programmes\\_isc97/uoe2004\\_iscmapxls/\\_EN\\_1.0.&a=d](http://circa.europa.eu/Public/irc/dsis/edctcs/library?l=/public/unesco_collection/programmes_isc97/uoe2004_iscmapxls/_EN_1.0.&a=d).
- Frazis, H. (2002). Human capital, signaling, and the pattern of returns to education. *Oxford Economic Papers*, 54(2), 298–320.
- Ganzeboom, H. B. G., de Graaf, P. M., & Treiman, D. J. (1992). A Standard International Socio-Economic Index of occupational status. *Social Science Research*, 21(1), 1–56.
- Ganzeboom, H. B. G., & Treiman, D. J. (1996, September). Internationally comparable measures of occupational status for the 1988 International Standard Classification of Occupations. *Social Science Research*, 25(3), 201–239.
- Goodman, J. D. (1979). The economic returns of education: An assessment of alternative models. *Social Science Quarterly*, 60(2), 269–283.
- Heath, A. F., Fisher, S., & Smith, S. (2005). The globalization of public opinion research. *Annual Review of Political Science*, 8, 297–333.
- Jowell, R., & the Central Co-ordinating Team. (2009). *European Social Survey 2008/2009*. London: City University. <http://www.europeansocialsurvey.org>
- Kerckhoff, A. C., & Dylan, M. (1999). Problems with international measures of education. *Journal of Socio-Economics*, 28(6), 759–775.
- Kerckhoff, A. C., Ezell, E. D., & Brown, J. S. (2002, March). Toward an improved measure of educational attainment in social stratification research. *Social Science Research*, 31(1), 99–123.
- Kolsrud, K., & Skjåk, K. K. (2005). Harmonising background variables in the European Social Survey. In J. H. P. Hoffmeyer-Zlotnik, & J. A. Harkness (Eds.), *Methodological aspects in cross-national research. Vol. 11 of ZUMA Nachrichten Spezial* (pp. 163–182). Mannheim: ZUMA.
- Kunovich, S., & Slomczynski, K. M. (2007). Systems of distribution and a sense of equity: A multilevel analysis of meritocratic attitudes in post-industrial societies. *European Sociological Review*, 23(5), 649–663.
- König, W., Lüttinger, P., & Müller, W. (1988). A comparative analysis of the development and structure of educational systems. CASMIN Working Paper 12, Mannheim: University of Mannheim.
- Müller, W. (2005). Education and youth integration into European labour markets. *International Journal of Comparative Sociology*, 46(5–6), 461–485.
- Müller, W., & Klein, M. (2008). Schein oder Sein: Bildungsdisparitäten in der Europäischen Statistik. *Eine Illustration am Beispiel Deutschlands. Schmollers Jahrbuch*, 128(4), 511–543.
- OECD. (1999). Classifying educational programmes. *Manual for ISCED-97 implementation in OECD countries*, 1st ed. Paris: OECD, <http://www.oecd.org/dataoecd/41/42/1841854.pdf>.
- Przeworski, A., & Teune, H. (1970). *The logic of comparative social inquiry. Vol. 1 of comparative studies in behavioral science*. New York: Wiley-Interscience.
- Saar, E., Unt, M., & Kogan, I. (2008). Transition from educational system to labour market in the European Union: A comparison between new and old members. *International Journal of Comparative Sociology*, 49(1), 31–59.
- Scheepers, P., Grotenhuis, M. T., & Slik, F. V. D. (2002). Education, religiosity and moral attitudes: Explaining cross-national effect differences. *Sociology of Religion*, 63(2), 157–176.
- Schleicher, A. (2008). PIAAC: A new strategy for assessing adult competencies. *International Review of Education/Internationale Zeitschrift für Erziehungswissenschaft/Revue internationale l'Éducation*, 54(5), 627–650.
- Schneider, S. L. (2007). Measuring educational attainment in cross-national surveys: The case of the European Social Survey. Paper presented at the EDUC research group workshop of the EQUALSOC network, <http://www.nuffield.ox.ac.uk/users/Schneider/pdfs/schn07.pdf>.
- Schneider, S. L. (2009). Confusing credentials: The cross-nationally comparable measurement of educational attainment. DPhil thesis. Nuffield College, Oxford: University of Oxford, [ora.ouls.ox.ac.uk/objects/uuid%3A15c39d54-f896-425b-aaa8-93ba5bf03529](http://ora.ouls.ox.ac.uk/objects/uuid%3A15c39d54-f896-425b-aaa8-93ba5bf03529).
- Schneider, S.L. (Ed.). (2008). The International Standard Classification of Education (ISCED-97). An evaluation of content and criterion validity for 15 European countries. Mannheim: MZES, [http://www.mzes.uni-mannheim.de/buch\\_d.php?tit=isc97.html](http://www.mzes.uni-mannheim.de/buch_d.php?tit=isc97.html).
- Schröder, H. & Ganzeboom H. B.G. (2009). Measuring and Modelling Education Levels in European Societies. Paper contributed to the Meetings of the European Consortium for Sociological Research, December 12 2009, [http://home.fsw.vu.nl/hbg.ganzeboom/Pdf/2010-Schroeder-Ganzeboom-ESS\\_scalings\\_Nurnberg.pdf](http://home.fsw.vu.nl/hbg.ganzeboom/Pdf/2010-Schroeder-Ganzeboom-ESS_scalings_Nurnberg.pdf)
- Shavit, Y., Arum, R., & Gamoran, A. (Eds.). (2007). *Stratification in higher education: A comparative study. Studies in social inequality*. Stanford, CA: Stanford University Press.
- Shavit, Y., & Blossfeld, H. -P. (Eds.). (1993). *Persistent inequality: Changing educational attainment in thirteen countries. Social inequality series*. Westview, Boulder, CO: Oxford.
- Shavit, Y., & Müller, W. (Eds.). (1998). *From school to work: A comparative study of educational qualifications and occupational destinations*. Oxford: Clarendon Press.
- Smith, H. L., & Garnier, M. A. (1987). Scaling via models for the analysis of association: Social background and educational careers in France. *Sociological Methodology*, 17, 205–245.
- Smyth, J. A. (2008). The origins of the International Standard Classification of Education. *Peabody Journal of Education*, 83(1), 5–40.
- Sørensen, A. B. (1983). Processes of allocation to open and closed positions in social-structure. *Zeitschrift für Soziologie*, 12(3), 203–224.
- Treiman, D. J. (1977). *Occupational prestige in comparative perspective. Quantitative studies in social relations*. New York, London: Academic Press.
- Treiman, D. J., Ganzeboom, H. B. G., & Rijken, S. R. H. (2003). Educational expansion and educational achievement in comparative perspective. Tech. Re 007-03. Los Angeles: University of California, California Center for Population Research, <http://repositories.cdlib.org/ccpr/olwp/ccpr-007-03>.
- Treiman, D. J., & Terrell, K. (1975, November). The process of status attainment in the United States and Great Britain. *American Journal of Sociology*, 81(3), 563–583.
- Treiman, D. J., & Yip, K.-B. (1989). Educational and occupational attainment in 21 countries. In M. L. Kohn (Ed.), *Cross-national research in sociology* (pp. 373–394). Newbury Park: Sage.
- UNESCO. (1999, July). *Operational manual for ISCED 1997 (International Standard Classification of Education)*. 1st ed. Paris: UNESCO.
- UNESCO. (2006 [1997], May). *International Standard Classification of Education: ISCED 1997 (re-edition)*. Montreal: UNESCO-UIS, [http://www.uis.unesco.org/TEMPLATE/pdf/isc97/ISCED\\_A.pdf](http://www.uis.unesco.org/TEMPLATE/pdf/isc97/ISCED_A.pdf).
- UNESCO Institute for Statistics. (2009). *ISCED mappings*, [http://www.uis.unesco.org/ev\\_en.php?ID=7434\\_201&ID2=DO\\_TOPIC](http://www.uis.unesco.org/ev_en.php?ID=7434_201&ID2=DO_TOPIC).

- von dem Knesebeck, O., Verde, P. E., & Dragano, N. (2006). Education and health in 22 European countries. *Social Science & Medicine*, 63, 1344–1351.
- Weakliem, D. L. (2002). The effects of education on political opinions: An international study. *International Journal of Public Opinion Research*, 14(2), 141–157.
- Wolf, C., & Hoffmeyer-Zlotnik, J. H. P. (2003). Measuring demographic and socio-economic variables in cross-national research. In J.H.P. Hoffmeyer-Zlotnik and C. Wolf (Eds.), *Advances in cross-national comparison: A European working book for demographic*

*and socio-economic variables* (pp. 1–13). New York/London: Kluwer Academic/Plenum.

**Silke L. Schneider** earned a master's degree at the University of Cologne, Germany, in 2005, and has completed her DPhil at Nuffield College, Oxford, in 2009. She is currently a post-doctoral prize research fellow at Nuffield. She is interested in comparative social stratification and mobility research, particularly measurement comparability and intergenerational transmission of education. Other fields of interest are intergroup attitudes and the integration of immigrants.