A NEW INTERNATIONAL SOCIO-ECONOMIC INDEX [ISEI] OF OCCUPATIONAL STATUS FOR THE INTERNATIONAL STANDARD CLASSIFICATION OF OCCUPATION 2008 [ISCO-08] CONSTRUCTED WITH DATA FROM THE ISSP 2002-2007; With an analysis of quality of occupational measurement in ISSP.

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Summary

A socio-economic index of occupational status scales occupations by the average level of education and average earnings of job holders. In this paper I report on a project to construct a new International Socio-Economic Index [ISEI-08] of occupational status, using data from pooled ISSP waves 2002-2007 on almost 200.000 men and women in 42 countries. Construction of such an new index is called for, since international projects such as PIAAC and PISA (and likely ISSP some time soon) will adopt the new 2008 version of ISCO as their coding standard. It turns out that a reasonable approximation of this classification can be obtained using conversion of the occupation data in ISSP. It also turns out that ISSP, with its broad international coverage and detailed country specific measurement of education and earnings constitutes a fine database for estimating a new ISEI.

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ISCO-08

- Recently, ILO has lauched a new version of the International Standard Classification of Occupations, referred to as ISCO-08. Although the ILO has decided on the ISCO-structure in late 2007, no manual is available yet.
- The revision has been announced as a "minor" revision. While the general logic (and major group (one-digit) structure) of the classification has remained largely the same, there are many changes in details such as the organization of sub-major and minor groups, and some new occupations have been added. There is no one-to-one correspondence between ISCO-08 and ISCO-88.
- Survey researchers will have to learn about how to use the new classification soon, as it will be applied in official statistics and census data (at least in the EU) as of 2011. For this reason, two major international social research projects, PIAAC (successor to IALS) and PISA have decided to use ISCO-08 in their upcoming rounds.
- Social researchers are usually not interested in occupational classifications *per se*, but in derived occupational status measures, such a SIOPS (prestige), ISEI (socio-economis status) and EGP/ESEC (classes). Such derivations are currently available for ISCO-68 and ISCO-88 and are heavily used by the research community. Development of new versions of these status measures would require the availability of data coded in the new classification (or even double coded), either to construct the measure (ISEI), or for validation (all three measures). Such databases must be large scale, detailed, cross-nationally comparable and have adequate information on criterion variables, in paricular education and earnings.
- Such data do not exist as of yet, nor will they be available soon. For projects like ISSP and ESS, which might produce such data, the non-availability of derived status measures might actually prevent them from moving to the new classification.

Creating ISEI-08

- A way out of this stalemate is to use ISCO-88 data as a substitute, recode these as best as possible into ISCO-08 and then use this database as a source for creating an ISEI-08 measure, as well as parallel measures for SIOPS and EGP/ESEC for ISCO-08.
- While it is not possible to convert ISCO-88 into ISCO-08 without distortion and loss of information, this substitute strategy actually goes a long way. The substitution is helped by information that ILO provides on its website on the many-to-many mappings between ISCO-88 and ISCO-08.
- A larger problem than loss / distortion of information is in fact that ISCO-08 presents some occupations that are truly new and do not have a parallel in ISCO-88. The most important instance is the new sub-major group 9400 (Food Preparation Assistants). Many other examples occur at the minor group and unit group level. Some of these occupations occur for the first time (Web Designer), but quite a few others (Bicycle Repairman, Gas Station Attendant, Shop Keeper) have actually counterparts in ISCO-68! As we have ISEI codes available for ISCO-68, we can use this to plug in a value in ISEI-08.
- Figure 1 displays the basic logic used to justify the ISEI concept and the way it is estimated from empirical data. The idea is that education affects income (mostly) via occupation. Occupational status is thus conceptualized as the property of occupations that converts educational qualifications into income. As a consequence, ISEI scores are estimated as an optimal scaling of detailed occupation groups as a mediating variable, that arises if the direct effect of education on income is minimized.

Using ISSP as a database for estimating ISEI-08

- ISSP provides an excellent database for estimating ISEI scores, as it has detailed occupation coding (but see below), good measurement of education and personal income, is of large scale and cross-nationally very varied.
- To estimate a new ISEI score I pooled the data from modules 2002-2007 from ISSP, covering almost 200.000 cases with complete information on occupation, education and personal income in 42 countries.

- The ISCO-88 codes in these data were transferred as closely as possible into ISCO-08 codes with a many-to-one transformation, that was constructed with the help of the many-to-many correspondence tables on the ILO website.
- The basic procedures then follow the ones used for creating ISEI for ISCO-68 and ISCO-88. They involve (A) standardizing education and personal income between datafiles, (B) defining a detailed ISCO-08 code that contains groups of N=21 or more, (C) with this dataset, estimating an optimal scaling that minimizes the direct effect of education on earnings, and – by consequence – maximizing the indirect effect of education on earnings via occupation; (D) the estimated scale scores are expressed in a 10-90 metric and generalized to the smaller groups that were merged with similar ones in step B.

Validation

- Although the procedure is aimed at creating an ISEI score for ISCO-08, it effectively also amounts to estimating a new ISEI score for ISCO-88. The difference between the two versions is only in the database on which it is estimated. The new version is estimated from 200.000 working men and women in 42 ISSP countries surveyed in 2002-2007, while the former versions derived from some 70.000 full-time employed men in databases on social mobility collected in 17 countries between 1962 and 1988. Note that the database now covers men and women, while previously only men were taken into account.
- It is possible to validate the new scale by comparing it to the old one, using the same data. The two scales correlate 0.92 in the ISSP data and 0.91 in the ESS Round 1 2 3 4 data.In ESS a very informative validation model can be estimated that uses both scales to examine how occupations of respondent and spouse transmit education into *household* income (Figure 1). Since this is a two-sided model on a relatively large dataset (N=48.000) that allows for equality constraints between the spouse's and respondent's side, this model gives very precise estimates.
- The results are fairly favorable to the newly constructed ISEI-08, as is directly expressed by the measurement coeffients (0.98 for the new scale, 0.94 for the old scale). The improvement by 4% is entirely due to the higher quality of the ISSP database relative to the database used earlier! One way to interpret these numbers is that any regression or correlation coeffient will be increased by 4% if the new scale is used and not the old one.

- The measurement coefficient of 0.98 is significantly different from 1.00, which means that the old ISEI picks up some information that is not covered by the new scale.

The quality of occupation codes in ISSP 2002-2007

- The analysis reported on in the previous paragraph is testimony to relative high quality of the occupational information in the ISSP *on average*. This does not imply that the occupation is alright in each and every ISSP country in every round.
- One dimension to look at before going to a formal validation analysis, is how ISCO coding is actually practiced is ISSP. ISSP specifications call for a coding in full four-digit details, which can be either done by direct coding into ISCO, or by converting a national detailed code into ISCO. Table 1 shows how many details are actually used by the countries. In total ISCO-88 allows for over 600 categories, of which 556 (number not shown in the table) are actually used in the total database. The record is held here by Germany, that passes the 260 mark several times. A fair amount of countries uses somewhere between 150 and 250 titles. A somewhat reduced number is used by Brazil, Cyprus and Philippines. The Philippines began to put in some more detail in 2005. Two countries use only three digits (and 70-80 categories): France and Finland. Finally, two countries submit data with only one digit: South-Africa and Venezuela.
- There is no straightforward connection between number of digits used and quality of coding. Whether additional digits help to measure occupational status, depends quite a bit on where and how the digits are omitted. The most problematic instance no doubt is in the case of farmers, which ISCO-88 allows to code as 1311 (a four digit code grouped with other 'General Managers') or as 6000 (a separate major group), but there are other instances in which large status differences occur within major or sub-major groups (Nurses and Doctors are another instance). However this may be, the crude codes provided by South-Africa and Venezuela are clearly sub-standard and one wonders why these data have been accepted by ISSP.
- Note that no country has used only 2 digits to code occupations, although that is actually a reasonable alternative to using only one.
- One obvious coefficient to look at for validation is that of occupational homogamy: how are spouses' occupations correlated? If occupations are badly measured, this will show up as a low correlation. Unfortunately, this logic is ultimately not compelling: there might be

country specific levels of occupational homogamy and this might be heavily influenced by the prevalence of farming in a country and how farm occupations are processed.

- The logic of the ISEI construction allows for a better check of the quality of occupational measurement in separate ISSP studies. This emerges when we analyze the degree to which occupations mediate the relationship between education and earnings. Theoretically, occupation should mediate this relationship to a high degree, if not perfectly. Inasfar occupations are badly measured, the mediation will diminish.
- It may be important to stress that this validation criterium is not dependent upon the quality of the measurement of education or income, the two other variables in the model. If these (or either one) are badly measured, this will diminish the correlation between education and earnings, but not the degree to which this correlation is mediated by occupational status!
- Table 2 shows the crucial numbers to calculate the mediating role of occupation, as measured by the new ISEI-08 scale. Table 2a ranks the ISSP countries by size of mediation, Table 2b ranks the same data by country. Color denotes the size of the mediating effect, with yellow and green reserved for the higher (good) scores, and orange and red for the lower (bad) scores.
- On average (XNAT), occupations of spouses correlate 0.42; respondent's occupation is strongly correlated with education (0.57), and has a modest effects on income (0.29), with a remaining direct effect of 0.21 for education on income. These numbers are used as benchmark to separate good from bad scores.
- The clear winner in this league of ISSP nations by some distance is Norway. It records a relatively strong correlation between education and income and almost all of it is mediated by occupation. Heya Norway! Straight green scores are also obtained by Cyprus, France, Germany and Argentina.
- If we turn to the bottom of this league of nations, two stand out as very problematic. Venezuela and Russia report unbelievable low effects of occupation on income (below 0.10). The results for Philippines, Dominican Republic and Canada are also discouraging, while Bulgaria displays the odd combination of an extremely strong occupational homogamy pattern but a very minute effect of occupation on income. If we were to believe the Bulgarian results, the conclusion would be that in this country higher educational qualifications are fairly rewarding, but the labor market plays no role in this. One wonders how such a situation can come about. One possibility is that in Bulgaria

(and maybe some other countries with similar results – Slovenia get closest) occupation is coded using educational information, thus creating a bias in the occupation coding.

A general discussion of ISCO-08 and a preliminary version of ISEI-08 constructed using ISSP data can be found on: http://home.fsw.vu.nl/hbg.ganzeboom/isco08/index.htm.

References

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Figure 1: Elementary income attainment model, without and with representation of occupation via optimal scaling.

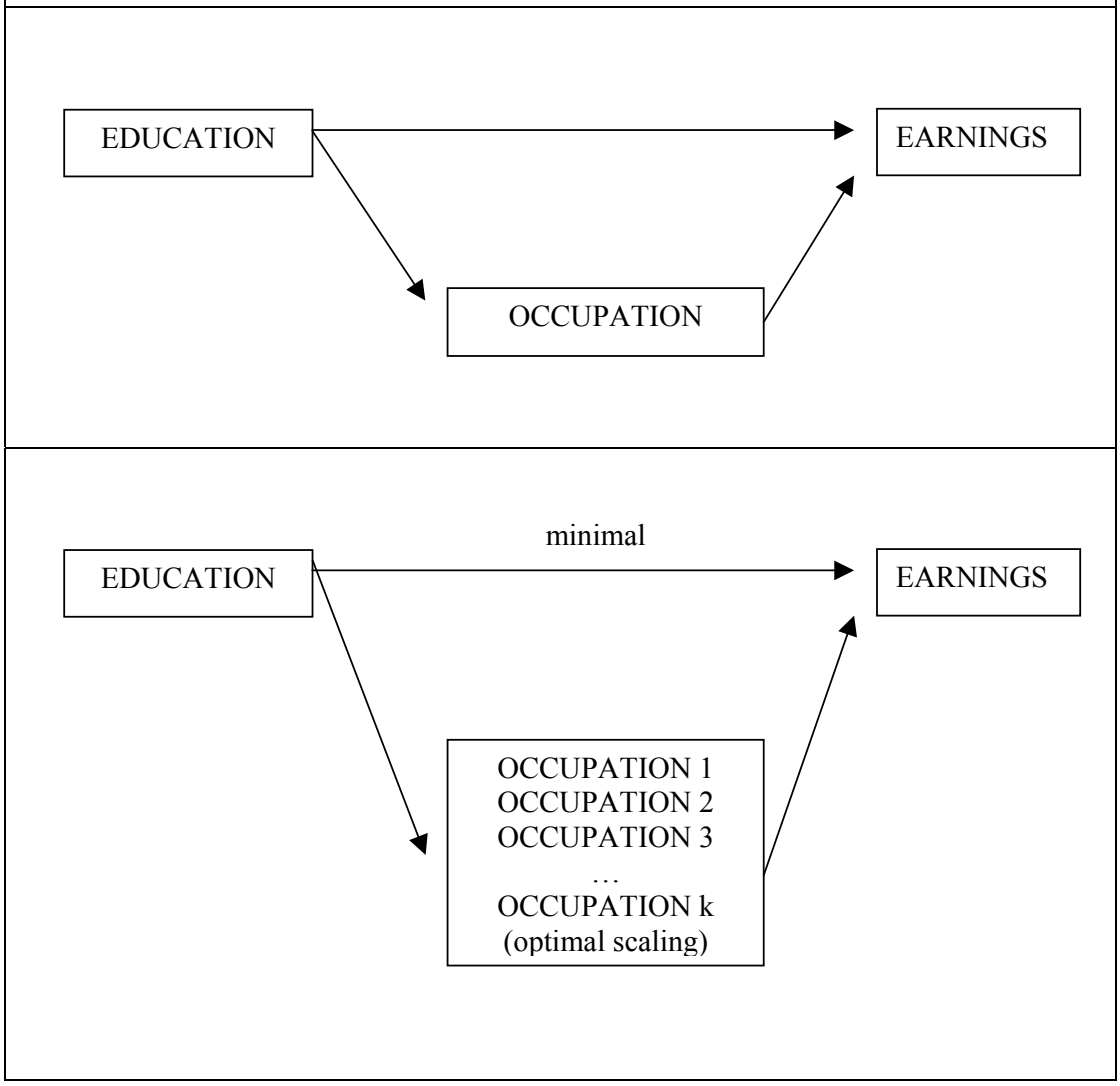

Figure 2: Validation of the ISEI-08 scale on ESS, Round 1 2 3 4

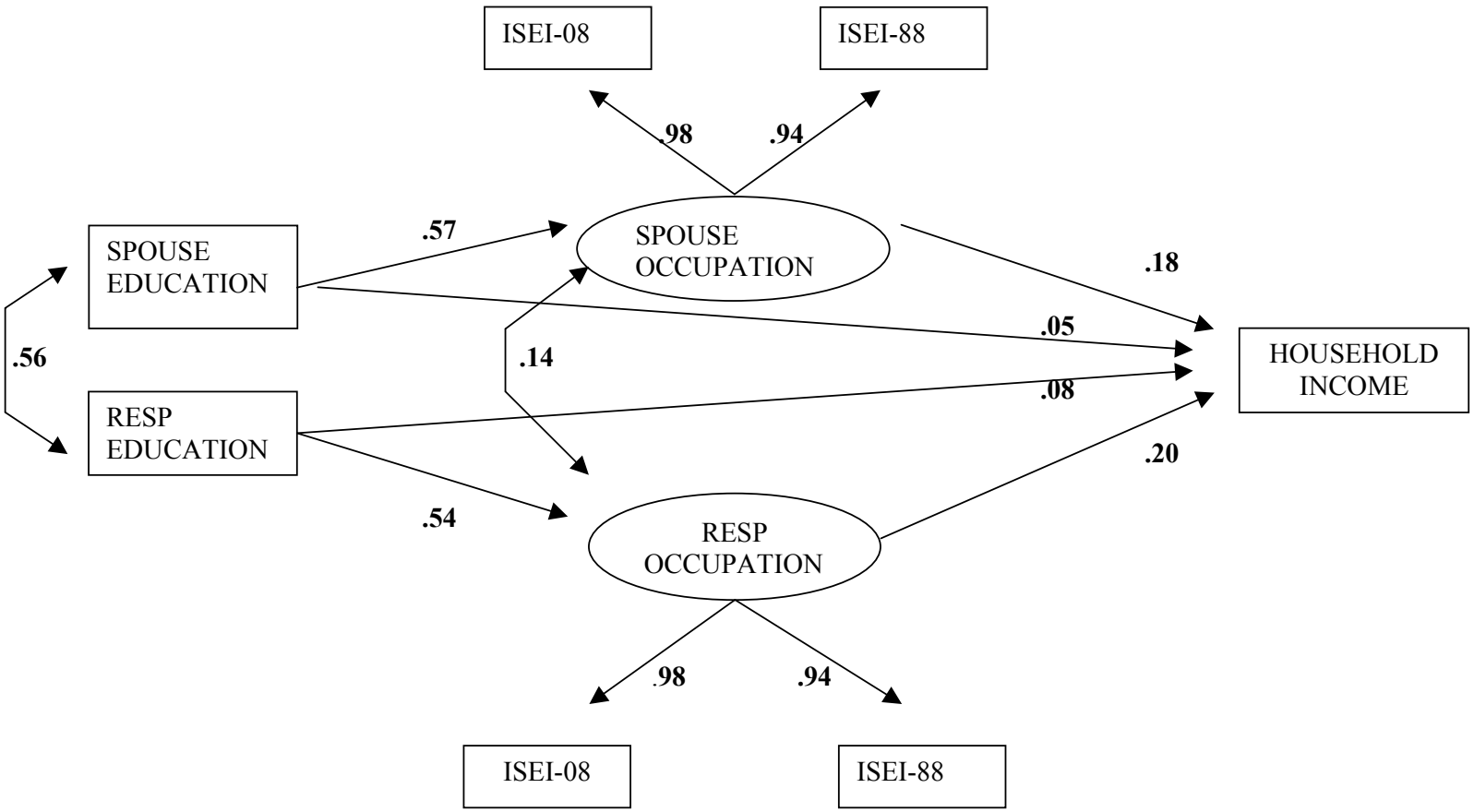

Table 1: Number of ISCO-88 categories used to code respondent's occupation in each ISSP round

	year						
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	
ARG	0	0	0	0	0	229	
AUS	190	233	222	222	234	250	
AUT	228	219	222	0	0	126	
BEF	202	0	201	196	0	184	
BRA	134	0	134	0	0	0	
BUL	181	195	249	249	0	238	
CAN	0	205	208	48	48	0	Changed!
CHL	164	148	200	0	177	169	
CRO	0	0	0	0	203	203	
CYP	112	0	108	142	0	162	
CZR	244	231	219	213	220	199	
DEN	196	235	176	193	192	0	
DOM	0	0	0	56	146	135	
ENG	202	168	161	179	167	83	
FIN	89	93	91	90	90	743	3 digits
FRA	95	87	93	89	99	99	3 digits
GER	255	235	247	262	266	269	
HUN	204	192	202	214	198	176	
IRE	173	201	203	188	187	225	
ISR	82	181	197	188	188	188	
JAP	153	132	165	147	175	163	
KOR	0	209	200	213	247	226	
LAT	169	168	182	201	176	176	
MEX	165	0	191	199	0	202	
NET	174	0	206	146	157	147	
NIR	148	0	0	0	0	0	
NOR	215	229	215	212	205	186	
NZE	164	172	188	196	204	181	
PHI	81	84	85	163	151	119	Changed
POL	220	209	212	0	206	206	
POR	185	221	221	243	243	0	
RUS	222	301	163	239	303	297	
SAF	0	10	10	9	10	10	1 digit
SLN	205	207	183	173	178	180	
SLO	217	167	208	0	0	224	
SPA	255	172	150	195	214	0	
SWE	184	205	204	203	196	214	
SWI	199	197	242	241	233	233	
TAI	217	241	258	256	249	245	
URU	0	192	197	0	173	193	
USA	180	161	173	193	193	180	
VEN	0	9	9	0	8	0	1 digit

Table 2a: Effects in the elementary income attainment model, by size of indirect effect.

	ISEI ←→ SISEI	EDUC → ISEI	EDUC → INC (partial)	ISEI → INC (partial)	Indirect effect EDUC → ISEI → INC
NOR	0.297	0.591	0.015	0.498	95%
SWE	0.360	0.523	0.070	0.435	77%
AUT	0.390	0.588	0.081	0.358	72%
FRA	0.430	0.572	0.113	0.488	71%
GER	0.439	0.655	0.111	0.359	68%
CYP	0.599	0.705	0.136	0.360	65%
JAP	0.351	0.463	0.103	0.419	65%
NIR	0.269	0.640	0.144	0.427	65%
NZE	0.311	0.421	0.070	0.292	64%
NET	0.242	0.541	0.120	0.376	63%
ARG	0.431	0.648	0.155	0.397	62%
DEN	0.360	0.541	0.139	0.413	62%
SWI	0.376	0.648	0.136	0.311	60%
CRO	0.355	0.684	0.219	0.369	54%
URU	0.452	0.648	0.218	0.378	53%
ISR	0.409	0.592	0.151	0.271	52%
POL	0.469	0.679	0.182	0.288	52%
SPA	0.530	0.605	0.204	0.355	51%
CZR	0.327	0.648	0.161	0.229	48%
IRE	0.359	0.558	0.210	0.347	48%
ENG	0.293	0.550	0.223	0.358	47%
CHL	0.454	0.612	0.266	0.364	46%
BRA	0.408	0.538	0.175	0.270	45%
BEF	0.354	0.609	0.200	0.257	44%
TAI	0.567	0.636	0.274	0.340	44%
USA	0.369	0.538	0.189	0.275	44%
XNAT	0.424	0.568	0.211	0.288	44%
AUS	0.342	0.506	0.182	0.275	43%
FIN	0.400	0.576	0.176	0.233	43%
LAT	0.339	0.603	0.194	0.241	43%
POR	0.493	0.669	0.338	0.360	42%
MEX	0.478	0.617	0.292	0.302	39%
HUN	0.428	0.665	0.250	0.225	37%
SAF	0.507	0.616	0.375	0.338	36%
SLN	0.450	0.693	0.332	0.243	34%
KOR	0.486	0.620	0.365	0.280	32%
SLO	0.389	0.614	0.258	0.199	32%
CAN	0.185	0.443	0.242	0.212	28%
DOM	0.317	0.524	0.303	0.213	27%
BUL	0.548	0.751	0.371	0.135	21%
PHI	0.323	0.427	0.358	0.187	18%
RUS	0.287	0.533	0.276	0.093	15%
VEN	0.237	0.431	0.363	0.017	2%

Table 2b: Effects in the elementary income attainment model, by country.

	ISEI ←→ SISEI	EDUC → ISEI	EDUC → INC (partial)	ISEI → INC (partial)	Indirect effect EDUC → ISEI → INC
ARG	0.431	0.648	0.155	0.397	62%
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