Introducing the Australian Socioeconomic Index 2006 (AUSEI06)

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Introduction

This paper introduces a new occupational status scale, the Australian Socioeconomic Index 2006 (AUSEI06). AUSEI06 is the latest in the series of ANU scales that for more than 40 years have provided researchers with a means of assigning sociologically meaningful occupational status scores to data coded in accordance with the official occupational classifications of the Australian Bureau of Statistics (ABS). The scales continue to be widely used in fields as diverse as sociology, economics, education, and health. However, the release of a new occupational classification by the ABS has changed the manner in which much new Australian data on occupations will be coded, necessitating an update of the most recent ANU scale.

The ANU scales: An historical overview

Over time, the ANU scale has evolved, reflecting conceptual and methodological advances in the field of social stratification (Table 1, Column 1). The initial scale, ANU1, was a nominal prestige scale. Prestige scales measure the social standing or desirability of occupations. They are typically generated from the normative judgements of panels of experts or population samples on the prestige of selected occupations. For the ANU1 scale, one hundred grouped occupations were further collapsed into 16 broad categories and then ordered to form a prestige scale in broad accordance with research on occupational prestige in Australia and the United States (Broom et al., 1965; Broom and Jones, 1969).
An inherent problem with the method used to generate prestige scores is that only subsets of occupations can be judged by study participants. The ANU2, ANU3, and ANU3_2 scales (Broom et al., 1977; Jones, 1989; McMillan and Jones, 2000) were based upon an approach pioneered by Duncan (1961) for generalising prestige scores to all occupations. Regression techniques were used to link the prestige ratings of a subset of occupations to the education, income, or other socioeconomic characteristics of their incumbents. The resultant regression weights were used to compute a continuous socioeconomic index that covered all occupations, including those not covered in the initial prestige studies.

The most recent scale (ANU4, see Jones and McMillan, 2001), is based upon the methodology developed for the International Socioeconomic Index (Ganzeboom et al., 1992; Ganzeboom and Treiman, 1996). Rather than using prestige as the criterion for weighting education and income as in the Duncan approach, optimal scaling procedures are used, assigning scores to occupations in such a way as to maximise the role of occupation as an intervening variable between education and income. Conceptually, occupations are viewed as the means of converting a person’s human capital (education) into material rewards (income). This remains the state-of-the art approach for the continuous scaling of occupations and has been used to generate national SEIs in countries such as New Zealand as well (Davis et al., 1997, 2003).
Official occupational classifications

In addition to conceptual and methodological advances, ANU scale updates have been necessitated by periodic revisions of the occupational classificatory scheme of the Australian Bureau of Statistics (ABS), which have changed the manner in which much occupational data in Australia are coded (Table 1, column 2). The scale reported in this paper was developed in response to the release of a new occupational classification, the Australian and New Zealand Standard Classification of Occupations (ANZSCO) (ABS, 2006). ANZSCO was released in 2006, replacing the second edition of the Australian Standard Classification of Occupations (ASCO) (ABS, 1997), with which the most recent ANU scale was designed for use.

A new naming convention: Introducing the AUSEI06 scale

A further, purely cosmetic change has been implemented with this iteration of the ANU scale. The naming convention has been revised in order to better reflect the nature of the scale: the Australian (AU) Socioeconomic Index (SEI) 2006 (06) or AUSEI06 (Table 1, column 3). It is anticipated that the name of any future iteration of this scale will vary only in the last two digits, to indicate the year of the census upon which the updated scale is based.

Conceptual model

AUSEI06 is based upon the approach used to develop the International Socio-economic Index (ISEI) (Ganzeboom et al., 1992; Ganzeboom and Treiman, 1996).
Ganzeboom and colleagues conceptualise occupation as the social engine that converts educational inputs into monetary outputs, or, to put it another way, they conceptualise these relationships in terms of a simple casual chain whereby educational effects on earnings are mediated, as far as possible, by occupational attainment. In path analytic terms, the indirect effect of education on earnings is constrained to its practical maximum and its direct effect to its practical minimum. An age correction is added to take into account historical increases in average levels of educational attainment across age cohorts and a lifecycle effect whereby older persons tend to have higher occupational status and income. The basic model is represented diagrammatically in Figure 1.

[Figure 1 about here]

Data

Data from the 2006 Census of Population and Housing were used to generate the AUSEI06. We commissioned the ABS to produce a customised data file containing individual-level data on persons aged from 21 to 64 who were in the labour force. Information on occupation, as well as age, sex, education, labour force status, income, and hours worked were requested. Occupation in the 2006 Census was coded to the 6-digit (occupation) level of ANZSCO. Due to confidentiality constraints, however, we were constrained to work at the 4-digit (unit group) level and to further condense the 358 unit groups so that each group contained as close to one per cent of the Australian labour force as possible. Our aggregated classification contained 117 groups plus we
distinguished unemployed persons as group 118. The other variables requested from the ABS are described in Table 2.

Prior to analysis, age was recoded to the midpoint of each category. Educational attainment was converted into years of education completed, ranging from eight years for a person who completed up to Year 8 to 17 years for a person with a university degree. Income was converted into hourly income. A standard problem in estimating status scores for the self-employed is income splitting, especially among marriage partners. Therefore we inflated the incomes reported by the self-employed by a factor of 75 per cent, to allow for the high probability of income-splitting with a marriage partner or another family member (about 75 percent of the labour force is married). Persons earning less than $6 per hour or more than $105 per hour were excluded. These floor and ceiling estimates were based upon unemployment benefits and the open-ended income category, respectively. Around four per cent of cases were thereby excluded. The income measure used in analysis was the natural log of the ratio of each person’s hourly earnings to average earnings in the sample as a whole, which represents how much better or worse than average a particular worker fared. All variables were transformed into z-scores prior to analysis, as recommended by Ganzeboom et al. (1992: 12).

Method
The model specified in Figure 1 cannot be used to estimate occupational scores in one step. Rather, an iterative scaling algorithm, first developed for the ISEI, is used to scale occupations in such a manner as to minimise the direct effect of education on income (β_{42}) (Ganzeboom et al., 1992: 10-19, Appendix C). This algorithm was also used to generate the ANU4 scale from 1996 Census data.

**Results**

We used ANU4 scores as our starting estimates for the iterative scaling mechanism. Three iterations were required for the regression estimates to stabilise. The path coefficients from education to occupation (β_{32}) and occupation to income (β_{43}) were 0.65 and 0.35 respectively.

A comparison of the beta values obtained for AUSEI06, its Australian precursor the ANU4, and the most recent versions of the ISEI and the New Zealand SEI (NZSEI96) are provided in Table 3. The AUSEI06 education path is roughly double that of the income path income, as was the case for ANU4. In the ISEI, the education path is also higher than the income path, although to a lesser degree. Somewhat surprisingly, given broad similarities between Australia and New Zealand, the education path is substantially lower than the income path in the NZSEI96. We can offer no explanation for this departure, but are reassured that the education and income weights for AUSEI06 are broadly consistent with the international scale and with a general pattern among national scales derived from a range of procedures (Ganzeboom et al., 1992: 19; Ganzeboom and Treiman, 1996: 204).
The scale was recalibrated using a square root transformation in order to modify its skewed distribution, and was rescaled to range from zero to one hundred. The final adjusted scale correlates highly with the unadjusted scale (0.98).

Medical practitioners are at the top of the scale and labourers are at the bottom of the scale. Very few occupational scores moved substantially between the ANU4 scale and AUSEI06, and the two scales are very highly correlated (0.98), suggesting they are virtually indistinguishable. This is an important result, suggesting ASCO (2nd ed.)/ANU4 data can be directly compared with ANZSCO/AUSEI06 data. There is no need to convert ANU4 scores into AUSEI06 scores for the purposes of over-time comparisons.

Wherever possible, we strongly urge primary researchers to code their data to the unit group (4-digit) or occupation (6-digit) level of ANZSCO in order to permit use of the full version of AUSEI06. In the past, some researchers have coded data to one of the more aggregated (ASCO) levels, either assuming finer distinctions are unimportant or as a cost-cutting measure. However, groupings become increasingly heterogeneous in terms of socioeconomic characteristics at the more aggregated levels. For example, Major Group 2 (Professionals) contains occupations as diverse as photographers (2113) and surgeons (2535). Such groups would be expected to have substantially different levels of human capital and to obtain substantially different monetary (and other) rewards. Unsurprisingly, Table 4 shows that each of the ANZSCO major groups is quite socioeconomically heterogeneous. While more sociologically
important distinctions are retained at the 2-digit level, others are still lost. For example, Sub-Major Group 25 (Health Professionals) includes surgeons (2535) and registered nurses (2544). There is less of a problem at the 3-digit (minor group) level, but it is unlikely to be any easier to code at this level of detail than at the 4- or 6-digit level. The ABS provides software to facilitate coding to the 6-digit (occupation) level (ABS, 2007).

Discussion

AUSEI06 is the latest in the series of ANU scales. The scales provide a simple means for researchers to convert data coded in accordance with the official occupational classifications of the ABS into occupational status scores. The release of a new occupational classification, ANZSCO, by the ABS prompted the development of AUSEI06.

In order to capture current stratification processes in Australia, AUSEI06 was developed using 2006 Census data. The scale can be applied to men and women, part-time and full-time workers, the self-employed, and employees.

AUSEI06 is available for download as an EXCEL spreadsheet, SAS syntax file, or SPSS syntax file <www.acer.edu.au/ausei>. While these files provide AUSEI06 scores for ANZSCO major, sub-major, minor, and unit group codes, primary
researchers are strongly urged to code occupational data to the more detailed ANZSCO unit group level in order to permit use of the full version of the scale.

References


Figure 1: Path model for occupational scoring
Table 1: Historical overview of occupational scaling practices in Australia

<table>
<thead>
<tr>
<th>Originating scale</th>
<th>ABS classification</th>
<th>Australian scale&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research on occupational prestige in Australia and the United States.</td>
<td>CCLO</td>
<td>ANU1</td>
<td>Broom et al. (1965); Broom and Jones (1969)</td>
</tr>
<tr>
<td>Duncan SEI (Duncan, 1961)</td>
<td>CCLO</td>
<td>ANU2</td>
<td>Broom et al. (1977)</td>
</tr>
<tr>
<td>ASCO (1&lt;sup&gt;st&lt;/sup&gt; ed.)</td>
<td>ANU3</td>
<td></td>
<td>Jones (1989)</td>
</tr>
<tr>
<td>ASCO (2&lt;sup&gt;nd&lt;/sup&gt; ed.)</td>
<td>ANU3_2</td>
<td></td>
<td>McMillan and Jones (2000)</td>
</tr>
<tr>
<td>International SEI (Ganzeboom et al., 1992; Ganzeboom and Treiman, 1996)</td>
<td>ASCO (2&lt;sup&gt;nd&lt;/sup&gt; ed.)</td>
<td>ANU4</td>
<td>Jones and McMillan (2001)</td>
</tr>
<tr>
<td>ANZSCO</td>
<td>AUSEI06</td>
<td></td>
<td>Reported in this paper</td>
</tr>
</tbody>
</table>

Note: <sup>a</sup>Each of these scales is available for download. For the ANU scales, refer to [http://ipumsi.anu.edu.au/scales.phtml]. For AUSEI06, refer to [www.acer.edu.au/ausei].
### Table 2: Data specifications

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>21-29, 30-39, 40-49, 50-64</td>
</tr>
<tr>
<td>Sex</td>
<td>male, female</td>
</tr>
<tr>
<td>Educational attainment</td>
<td>degree or higher, diploma, certificate, and 5 groups with no post-school qualifications (Year 12, Year 11, Year 10, Year 9, Year 8 or below)</td>
</tr>
<tr>
<td>Labour force status</td>
<td>employed, independent, unemployed</td>
</tr>
<tr>
<td>Income</td>
<td>10 groups ranging from less than $7,799 p.a. to $104,000 p.a. or over</td>
</tr>
<tr>
<td>Hours worked per week</td>
<td>15 or fewer, 16-24, 25-34, 35-39, 40, 41 or more</td>
</tr>
<tr>
<td>Occupation</td>
<td>117 groups derived from ANZSCO unit groups, plus unemployed persons</td>
</tr>
</tbody>
</table>
Table 3: Comparison of beta values obtained for the Australian, International, and New Zealand Socioeconomic Indexes

<table>
<thead>
<tr>
<th></th>
<th>AUSEI06</th>
<th>ANU\textsuperscript{a}</th>
<th>ISEI for ISCO88\textsuperscript{b}</th>
<th>NZSEI96\textsuperscript{c}</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_{32}$ Education-Occupation</td>
<td>0.65</td>
<td>0.63</td>
<td>0.582</td>
<td>0.251</td>
</tr>
<tr>
<td>$\beta_{43}$ Occupation-Income</td>
<td>0.35</td>
<td>0.30</td>
<td>0.465</td>
<td>0.786</td>
</tr>
</tbody>
</table>

Sources: \textsuperscript{a}Jones and McMillan (2001: 549); \textsuperscript{b}Ganzeboom and Treiman (1996: 212); \textsuperscript{c}Davis et al. (2003: 47)
Table 4: AUSEI06 scores for ANZSCO major groups

<table>
<thead>
<tr>
<th>ANZSCO major group</th>
<th>Weighted AUSEI06 score</th>
<th>Range of AUSEI06 scores for constituent unit groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Managers</td>
<td>58.1</td>
<td>34.0 – 81.5</td>
</tr>
<tr>
<td>2 Professionals</td>
<td>81.6</td>
<td>66.2 – 100.0</td>
</tr>
<tr>
<td>3 Technicians and Trades Workers</td>
<td>35.9</td>
<td>17.7 – 63.6</td>
</tr>
<tr>
<td>4 Community and Personal Service Workers</td>
<td>41.7</td>
<td>29.4 – 82.3</td>
</tr>
<tr>
<td>5 Clerical and Administrative Workers</td>
<td>45.6</td>
<td>32.9 – 67.4</td>
</tr>
<tr>
<td>6 Sales Workers</td>
<td>34.8</td>
<td>27.8 – 56.3</td>
</tr>
<tr>
<td>7 Machinery Operators and Drivers</td>
<td>21.0</td>
<td>3.4 – 35.7</td>
</tr>
<tr>
<td>8 Labourers</td>
<td>18.5</td>
<td>0.0 – 28.1</td>
</tr>
</tbody>
</table>
In the development of the ANU4 scale, we demonstrated that the choice of starting estimates did not markedly affect results (Jones and McMillan, 2001: 547-548).