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A Standard International Socio-Economic Index of Occupational Status

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In this paper we present an International Socio-Economic Index of occupational status (ISEI), derived from the International Standard Classification of Occupa-

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tions (ISCO), using comparably coded data on education, occupation, and income for 73,901 full-time employed men from 16 countries. We use an optimal scaling procedure, assigning scores to each of 271 distinct occupation categories in such a way as to maximize the role of occupation as an intervening variable between education and income (in contrast to taking prestige as the criterion for weighting education and income, as in the Duncan scale). We compare the resulting scale to two existing internationally standardized measures of occupational status, Treiman's international prestige scale (SIOPS) and Goldthorpe's class categories (EGP), and also with several locally developed SEI scales. The performance of the new ISEI scale compares favorably with these alternatives, both for the data sets used to construct the scale and for five additional data sets.

In sociological research the positions of occupations in the stratification system have mainly been measured in three ways: (a) by prestige ratings, (b) by sociologically derived class categories, and (c) by socio-economic status scores. For two of these three measures there now exists an international standard. Standard International Occupational Prestige Scale (SIOPS) scores, coded on the (revised) International Standard Classification of Occupations (ISCO), were constructed by Treiman (1977) by averaging the results of prestige evaluations carried out in approximately 60 countries. An internationally comparable occupational class scheme, commonly known as the EGP categories, initially developed by Goldthorpe (Goldthorpe, Payne, and Llewellyn, 1978; Goldthorpe, 1980), is presented in the work of Erikson and Goldthorpe (Erikson, Goldthorpe, and Portocarero, 1979, 1982, 1983; Erikson and Goldthorpe, 1987a, 1987b, 1988). The connection between ISCO occupational categories (and additional information on self-employment and supervisory status) and the EGP categories is established by Ganzeboom, Luijkx, and Treiman (1989). In this paper we complement these two measures with an International Socio-Economic Index of occupational status (ISEI), once again coded on the ISCO occupational categories.[1]

The classification or scaling of occupations into sociologically meaningful variables has a long and intricate history of debate (Hodge and Siegel, 1968; Haug, 1977; Hodge, 1981). In order to elucidate our approach, we review some points of this discussion that have dealt with the usefulness and method of construction of socio-economic indices for occupations, introduced for Canada by Blishen (1958) and for the United States by Duncan (1961) about 30 years ago. First, we consider the use of continuous approaches to occupational stratification versus categorical (class) ap-

[1] Kelley (Kelley and Klein, 1981, pp. 220–221) has devised a "Cross-cultural canonical scale" of occupational status, based on the average over 14 countries of canonical scores relating current occupation, on the one hand, to education, income, and father's occupation. This scale, however, is neither well documented nor widely used, nor is it applicable to detailed occupational titles.

proaches. Then we compare the logic of socio-economic indices of occupational status with the logic of their main contender for continuous measurement—occupational prestige.

Categorical versus Continuous Approaches to Occupational Stratification

Stratification researchers divide into those who favor a class approach and those who favor a hierarchical approach to occupational stratification (Goldthorpe, 1983) or, as we would rather put it, those who favor a *categorical* approach and those who favor a *continuous* approach. The main claims here are the following. Those who favor a categorical approach defend a point of view in which members of society are divided into a limited number of discrete categories (classes). This approach covers positions as diverse as a Marxist dichotomy of capitalists and workers (Braverman, 1974; Szymanski, 1983); revised Marxist categories (Wright and Perrone, 1977; Wright, 1985; Wright, How, and Cho, 1989) in which a larger number of categories is distinguished, but which are still based on relationships of ownership and authority; Weberian categories, which distinguish positions in the labor market and in addition take into account skill levels and sectoral differences (Goldthorpe, 1980); and those inspired by Warner's (Warner, Meeker, and Eels, 1949/1960) approach to class, in which a central concern is to find how many 'layers' members of society distinguish among themselves (e.g., Coleman and Neugarten, 1971).

These approaches differ among themselves in many interesting ways. What they have in common is the assumption of discontinuity of social categories. They assume that there exists a number of clearly distinguishable social categories whose members differ from members of other categories (*external heterogeneity*) and are relatively similar to other members of the same category (*internal homogeneity*). The various categorical schemes differ widely with respect to the criteria by which heterogeneity and homogeneity are defined. However, given agreement regarding the criteria, the appropriateness of categorical definitions of stratification is amenable to empirical testing. Categorical schemes can be compared both to other categorical schemes and to the continuous approaches discussed below. In statistical terms, the adequacy of categorical definitions of stratification can be established by showing that the variance of criterion variables (e.g., income, social mobility, political preferences) is largely explained by the categories and that there is no significant or meaningful within-category variation. This strategy was utilized by, for example, Wright and Perrone (1977) to introduce the Wright class scheme and argue its superiority over other measures of occupational stratification.

Continuous approaches to occupational stratification differ from categorical approaches in two respects. First, they allow for an unlimited number of graded distinctions between occupational groups. Second, continuous approaches generally assume that substantively significant differences between occupational groups can be captured in one dimension and can therefore be represented in statistical models by a single parameter.[2] In principle, therefore, continuous approaches are more powerful than categorical approaches, since they summarize many detailed distinctions with a single number.

Categorical approaches have their strengths as well. In recent literature, the system of class categories introduced by Goldthorpe and his co-workers—generally referred to as the EGP scheme—has proven to be a powerful tool, in particular for the analysis of intergenerational occupational mobility. In earlier work we have employed this class scheme in both its 10 category and its 6 category version and have found strong evidence of external heterogeneity between the EGP classes (Luijkx and Ganzeboom, 1989; Ganzeboom *et al.,* 1989). The categories of the EGP class scheme are generally well separated on a 'mobility dimension,' derived with Goodman's (1979) association models. With a single exception,[3] each category differs in the likelihood of mobility from and mobility to the other categories. This implies that the EGP categories tap distinctions that are important for one of the most important consequences of social stratification. Hence one is well advised to take the distinctions implied by the EGP categories into account when constructing new measures of occupational stratification.

The major claim of those favoring categorical approaches is that stratification processes—in particular, intergenerational mobility patterns—are multidimensional in nature. One form of multidimensionality—the tendency for a disproportionate fraction of the population to remain in the same occupational class as their fathers—is well established. With respect to the representation of "inheritance" or "immobility," categorical approaches have a clear advantage over continuous approaches, in particular when these tendencies differ between categories—as they actually do (Featherman and Hauser, 1978, pp. 187–189; Ganzeboom *et al.,* 1989). Loglinear analyses of intergenerational occupational mobility measured in EGP categories have established that immobility is particularly high for the propertied categories, which are found at the top (large proprietors and independent professionals), the middle (small proprietors), and the

[2] In principle, of course, continuous approaches may be multidimensional. For example, one might scale occupations in two dimensions, with respect to cultural and economic status (De Graaf, Ganzeboom, and Kalmijn, 1989). However, in this paper we will maintain a strong version of the continuous approach and discuss only one-dimensional solutions.

[3] The one exception is the position of farmers, whose pattern of outflow mobility is similar to that of unskilled workers. That is, the destinations of occupationally mobile sons of farmers are similar to those of occupationally mobile sons of unskilled workers. However, the origins of occupationally mobile men who become farmers are markedly different—higher, one is tempted to say—than the origins of those who move into unskilled labor (Ganzeboom, Luijkx, and Treiman, 1989, p. 50).

bottom (farmers) of the occupational hierarchy. Continuous measures of stratification necessarily deal with immobility as if it is just another variety of mobility, with zero difference between origins and destinations. It seems unlikely that a unidimensional continuous representation of occupations can ever cope with immobility patterns as they are actually observed in intergenerational mobility tables.

In addition to 'inheritance,' proponents of categorical approaches point to other aspects of mobility that are not captured by a single dimension, in particular the asymmetry involving farming noted above (Erikson and Goldthorpe, 1987a; Domański and Sawiński, 1987) and "affinities" between pairs of occupational categories (Erikson and Goldthorpe, 1987a). But here the claims are much more controversial, since in multidimensional analyses of mobility tables socio-economic status almost always emerges as the dominant dimension and additional dimensions are not only weak but inconsistent from data set to data set (see additional discussion of this point below).

Despite the evidence of multidimensionality in intergenerational mobility derived through categorical methods, there remain several good reasons to pursue continuous approaches to occupational stratification.

First, there is some evidence that existing categorical schemes fail to adequately capture variability between occupations. For example, it has been shown for Ireland that some of the EGP categories are internally heterogeneous with respect to intergenerational mobility chances (Hout and Jackson, 1986). This result may be more general; that is, in other countries as well the EGP scheme may fail to meet the criterion of internal homogeneity if put to the proper statistical tests. One way to perform such tests is to contrast the categorical scheme with a competing continuous measure. We will conduct such internal homogeneity tests below, which turn on whether a continuous status measure explains variance over and above the variance explained by the discrete class categories.

A second motivation for developing a new continuous measure of occupational status stems from our judgment about the state of the art in stratification research. Even given the advances that have been made in the analysis of categorical data, it remains true today that continuous measures are more amenable to multivariate analysis than are categorical measures and yield more readily interpretable, informative, and realistic models and parameters. Categorical treatments generally use a multitude of parameters to characterize a single bivariate distribution, whereas continuous treatments generally describe the same bivariate distribution with a single parameter. There is certainly information lost in this compression.[4]

[4] The inadequacy of continuous approaches in dealing with immobility, discussed above, probably is the main form of loss. Another is that continuous approaches do not perfectly fit marginal distributions and may therefore, to some extent, confound distributional differences with association patterns.

However, we think that the potential losses from using continuous measures are often outweighed by the greater power of multivariate analysis possible through continuous approaches, in the study of both intergenerational mobility and other topics. Loglinear analyses of discrete class categories have resulted in detailed knowledge about the relationship between the classes of fathers and sons (Featherman and Hauser, 1978; Goldthorpe, 1980), the classes of spouses (Hout, 1982), and between origin and destination classes in the career mobility process (Hope, 1981). However, how these relationships intertwine with educational attainment, age and cohort differences, gender and ethnicity, income attainment, and other aspects of the stratification process are questions still to be answered in this line of analysis (Treiman and Ganzeboom, 1990; Ganzeboom, Treiman, and Ultee, 1991). At present, the main way to introduce multivariate designs into categorical data analysis is to slice up the sample according to a third criterion (e.g., Semyonov and Roberts, 1989)—a strategy that necessarily introduces only crude controls and is certain to run out of data very quickly.

A third reason to favor continuous measures draws upon the first and second reasons and stems from prior analyses of intergenerational occupational mobility tables (Hauser, 1984; Luijkx and Ganzeboom, 1989; Ganzeboom *et al.*, 1989). These analyses show that the multitude of potentially important parameters in loglinear analysis of mobility tables can be reduced effectively to as few as one or two parameters that vary across tables, if one introduces the concept of distance-in-mobility between classes and restricts the parameters to be estimated likewise. That is, as we noted above, EGP occupational class categories can be scaled on one dimension and intergenerational mobility between them can be described by one parameter, without losing much information. In fact, the scores for occupational categories that best describe the mobility process closely resemble existing socio-economic scales for occupations, such as that of Duncan (1961). We think that this result generalizes very well over all existing exploratory analyses of intergenerational occupational mobility process, whether they have been conducted with multidimensional scaling (Laumann and Guttman, 1966; Blau and Duncan, 1967; Horan, 1974; Pohoski, 1983), canonical analysis (Klatzky and Hodge, 1971; Duncan-Jones, 1972; Bonacich and Kirby, 1975; Featherman, Jones, and Hauser, 1975; Domański and Sawiński, 1987),[5] or logmultiplicative analysis (Luijkx and Ganzeboom, 1989; Ganzeboom *et al.*, 1989). Likewise, others (Hope,

[5] In an analysis of intergenerational mobility tables from nine countries, Domański and Sawiński (1987) find a strong mobility barrier between farm and non-farm occupations, which is consistent with the asymmetry involving farming occupations noted above. However, they also find a socioeconomic hierarchy of mobility distances for all occupations with farm occupations below non-farm occupations.

1982; Hout, 1984) have introduced a priori metric constraints on loglinear parameters, using information about the socio-economic status of occupations, and have been able to compress the number of parameters in a similar way. Although such parsimonious models of bivariate discrete distributions do not simply translate into regression models of multivariate continuous distributions, they suggest that such regression models may be fair approximations. In sum, these results suggest that SEI scales account very well for what drives the intergenerational occupational mobility process—in particular for those who are mobile.

SEI and Occupational Prestige

Our final set of reasons for constructing an internationally comparable SEI scale concerns the relation between the socioeconomic status and prestige of occupations. SEI and prestige scales are similar in their continuous and unidimensional approach to occupational stratification, but differ in the way in which they are constructed and—historically more as a consequence than as a prior consideration—in the way they are conceptualized. Prestige scales involve evaluative judgments, either by a sample of the population at large or by a subsample of experts or well-informed members of a society (student samples have been particularly popular). Prestige judgments have been elicited in a variety of ways, the common content of which has been summarized by Goldthorpe and Hope (1972, 1974) as "the general desirability of occupations." SEI scales, by contrast, do not involve such subjective judgments by the members of a society but are constructed as a weighted sum of the average education and average income of occupational groups, sometimes corrected for the influence of age.

Historically, the two measures are closely related. Duncan (1961) developed his SEI measure in order to generalize the outcome of the 1947 NORC occupational prestige survey (NORC, 1947, 1948) to all detailed occupational titles in the 1950 US Census classification. His method was to regress prestige ratings of a limited set of occupational titles on the age-specific average education and age-specific average income of matching U.S. Census occupational categories.[6] He then used the resulting regression equation to produce SEI scores for Census occupation categories as a linear transformation of their average education and income. Others have followed this methodology (Blishen, 1967; Broom, Duncan-Jones, Jones, and McDonnell, 1977; Stevens and Featherman, 1981; Klaassen and Luijkx, 1987). In consequence, many authors have treated SEI scores as equivalent to or an approximation of prestige scores. Duncan himself was not very clear on this point, as Hodge (1981) observed. But

[6] To be precise, Duncan did not use means as a measure of central tendency, but the percentage above a fixed cutting point. This is not important for the discussion here.

Duncan computed SEI scores not only for the occupations for which the prestige scores were unknown, but also for the limited set for which prestige was known; that is, his procedure purged the prestige scores entirely and replaced them by SEI scores. For that reason alone, the two kinds of scores are conceptually distinct. One is well advised to derive an interpretation for SEI scores from the way they are actually constructed rather than from their connection with prestige.

If SEI scores were simply an (imperfect) approximation of occupational prestige and prestige scores were a better measure of the concept of occupational status, one would expect correlations of criterion variables with SEI to be generally lower than the corresponding correlations with prestige. However, the reverse has often shown to be true: SEI is in general a better representation of occupational status in the sense that it is better predicted by antecedent variables and has stronger effects on consequent variables in the status attainment model (Featherman *et al.*, 1975; Featherman and Hauser, 1976; Hauser and Featherman, 1977; Treiman, 1977, p. 210; Treas and Tyree, 1979). This is hardly surprising (but still important) for the main antecedent of occupational status, education, and its main consequence, income, because SEI scores are devised to maximize the connections with income and education (Treiman, 1977). However, the same result holds for a number of other criteria that are not implicated in the construction of SEI scales, of which the most important one is intergenerational occupational mobility. Systematic comparisons of the ability of prestige and SEI scales to capture the association between father's and son's occupation were made by Featherman and Hauser (1976, p. 405), who conclude that "prestige scores are 'error prone' estimates of the socioeconomic attributes of occupations" (rather than the other way around).

Conceptually, there are advantages of prestige over SEI scales (Hodge, 1981). The main one is that prestige has a much firmer, although not unequivocally established, theoretical status. Its most straightforward interpretation has always been that of a reward dimension (Treiman, 1977, p. 17) similar to and sometimes compensating for income. Prestige, then, is the approval and respect members of society give to incumbents of occupations as rewards for their valuable services to society (Davis and Moore, 1945; Treiman, 1977, pp. 16–22). More encompassing interpretations point to the resource value of occupational prestige as well: occupational prestige serves as an indicator of those resources that are converted into privilege and exclusion in human interaction and distributive processes. Both interpretations square well with the judgmental procedures that are used to construct measures of occupational prestige.

The interpretation of SEI measures is less clear. We have already discarded the interpretation of SEI as an indirect and therefore imperfect measure of prestige. Our preferred way to think about SEI is that it measures the attributes of occupations that convert a person's main resource (education) into a person's main reward (income). A simple model of the stratification process looks like this:

EDUCATION ⟶ OCCUPATION ⟶ INCOME

Occupation can be regarded as an intermediate position—similar to a latent variable—that converts education into income. In this interpretation, SEI is not so much a consequence of true occupational status as an approximation to it. In this sense, SEI relates to prestige more as a cause than as a consequence or as a parallel measure. This is consistent with existing theories of occupational prestige (Treiman, 1977, pp. 5–22), which argue that prestige is awarded on the basis of power resources and that education (cultural resources) and income (economic resources) are the main forms of power in modern societies.

Although the differences in conception between occupational prestige and SEI are to some extent unresolved, there is hardly any ambiguity on the operational level. In addition to a number of small differences between the two measures (Duncan, 1961, pp. 122–127), there is one major difference between the two ways of scaling occupational status and that is with respect to farmers. In most prestige studies, farmers come out with a grading somewhere in the middle. Since farmers tend to have both low (money) income and low education, they consistently appear at the low end of SEI scales. This difference in the scaling of farmers in prestige and SEI scales is probably largely responsible for the greater discriminating power of SEI as both an independent and a dependent variable in status attainment models. Farmers tend to occupy extreme positions on a number of variables but, in particular, with respect to intergenerational mobility. Farmers are highly immobile, but if they move out of agriculture, either between or within generations, they are most likely to end up at the lowest status ranks of the manual labor force. This is not only true in less developed societies, where farmers form a considerable part of the labor force, but also in advanced societies, in which their share has shrunk to only a few percentage points (Ganzeboom *et al.*, 1989). As a consequence, SEI measures give a better representation of intergenerational status attainment processes than do prestige measures.[7]

[7] Why there is such a difference between the position of farmers in prestige and SEI scales is actually hard to explain. Featherman, Jones, and Hauser (1975) suggest several possibilities. On the one hand, the population at large may be unaware of the uncomfortable and undesirable position of the agricultural labor force and base their prestige judgments on erroneous conceptions of life on the farm. On the other hand, sociologists may underestimate the comfort and desirability of farm positions, in particular by not taking income in kind into account and, in addition, may not distinguish adequately between large and small farmers. The former possibility is more appealing to us and squares better with the results from analyses of intergenerational occupational mobility: farmers are better scaled at the lower end of an occupational status scale than in the middle.

There is one additional observation to be made on occupational prestige, which has direct relevance for the procedure we use to construct SEI scores. In income attainment models, if one regresses income on education and occupational prestige (and appropriate control variables), it is not unusual to observe that education is a better predictor of income than is occupational prestige. For example, in our international data file (introduced below), the standardized effect of education on (personal) income is 0.34, whereas the effect of occupational prestige on (personal) income is 0.22. This outcome strikes us as highly implausible, since it implies that, although in modern societies income is mainly distributed on the basis of the job performed, a non-job attribute is more important for the outcome than a job attribute. It is true that there are instances in which better educated persons are more highly remunerated than those with less education even when they do exactly the same work (for example, where salary increases are related to educational credentials); but such instances are relatively uncommon. In addition, part of the direct effect of education on income may be due to the fact that occupational classifications used in surveys often are too coarse to capture the tendency of the best educated people to be assigned the most demanding and remunerative jobs within occupational categories; but, again, it seems unlikely that such internal heterogeneity would outweigh the effect of between-occupation variability on income. A more likely interpretation is that prestige measures misclassify occupations with respect to their earning power.

METHODS

SEI as an Intervening Variable

The particular construction of SEI we utilize is a consequence of our interpretation of occupation as an intervening mechanism between education and income. This is also what Duncan had in mind when he defended the method by which he constructed his SEI measure:

> We have, therefore, the following sequence: a man qualifies himself for occupational life by obtaining an education; as a consequence of his pursuing his occupation, he obtains income. *Occupation, therefore, is the intervening activity linking income to education*" (Duncan, 1961, pp. 116–117, italics added).

Duncan, therefore, chose average education and average income as the variables from which to construct his SEI score; but he derived relative weights for education and income so as to maximize their joint correlation with prestige. By contrast, our operational procedure is a direct consequence of the concept of occupation as the engine that converts education into income: we scale occupations in such a way that it captures as much as possible of the (indirect) influence of education on income (earnings). SEI is defined as the intervening variable between education and income

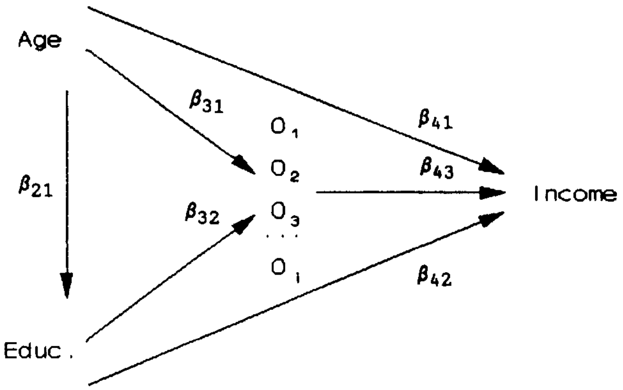

FIG. 1. The basic status attainment model with occupation as an intervening variable.

that *maximizes the indirect effect of education on income and minimizes the direct effect.*

Technically, the problem can be phrased with the help of the elementary status attainment model depicted in Fig. 1. Education influences occupation (β_{32}), occupation influences income (β_{43}), and there is also a direct effect of education on income (β_{42}). Occupations enter this system in the form of a large set of dummy variables, represented as O_1. . .O_i, which represent detailed occupational categories. The SEI score is then derived as that scaling of the detailed occupational categories that minimizes the direct effect of education on income (β_{42}) and maximizes the indirect effect of education on income through occupation ($\beta_{32}*\beta_{43}$).

The system is, in fact, somewhat complicated since age confounds all these relationships: older people tend to have less education (β_{21}) (a cohort effect) and higher income (β_{41}) and occupational status (β_{31}) (life-cycle effects). The main effect of age is to suppress the relationships between education, on the one hand, and occupational status and income, on the other hand. For example, again using our international data set, the correlation between education and income is 0.39 but the total effect of education on income, controlled for age, is 0.43. Age should therefore be controlled to properly specify the effect of education on income. Duncan did this by computing age-specific income and education measures for occupational groups, but we are able to control for the effect of age by introducing age explicitly into estimation procedure.

Technically, the estimation of scale scores for occupational categories where occupation is treated as a variable that intervenes between education and income, controlling for the effects of age on all three variables, is an exercise in optimal scaling techniques. The solution cannot be derived in one step, but has to be computed by a (simple) iterative algorithm, Step 1: - Initialize the education and income weights at any reasonable starting point (e.g., .5 and .5) and construct a starting point.

Step 2: - Regress INC on AGE and SEI (*) ---> β_{41}, β_{43}

- Regress SEI on EDU and AGE ---> β_{31}, β_{32}

- Regress EDU on AGE ---> β_{21}

Step 3: - Compute SEI'= β_{43}*(INC-β_{41}*AGE) + β_{32}*EDU + β_{31}*AGE

- Standardize SEI'

- Compute scores as means of SEI' for $O_1..O_i$

- Compute SEI" using the new scaling

Step 4: - Regress INC on AGE, EDU and SEI" ---> β_{42}

- If minimum on β_{42}, step out

- Go back to step 2 and substitute SEI" for SEI.

AGE: age; INC: income, EDU: education; SEI, SEI', SEI": estimated socioeconomic index of occupational status. All variables need to be standardized with mean 0 and standard deviation 1.00.

(*) EDU is not included in this regression!

FIG. 2. Algorithm for estimating an optimally scaled occupation variable, SEI, for the model in Fig. 1.

which involves a series of regression equations. The algorithm involved is outlined in Fig. 2 and further described in Appendix C.[8]

Although novel in interpretation and construction, this procedure does not lead to large changes in the actual SEI derived relative to the procedures used by others. It is apparent from the algorithm in Fig. 2 (Step 3) that an optimally scaled intervening variable still implies a weighted sum of mean education and mean income for each occupational group, taking into account the influence of age. Since the mean income and mean education of occupational categories are usually highly correlated (in our data set: 0.83), the resulting SEI scores will hardly differ from the ones that would have been arrived at using prestige as a criterion variable. The advantages of our procedure over the older one are simply that (a) the logical relationship with prestige is completely eliminated[9] and (b) it gives a clearer interpretation to SEI.

Data

In developing the International SEI (ISEI) scores, we have taken advantage of our ongoing project to compare stratification and mobility data from a large number of countries for as many data sources as are accessible to us (see Ganzeboom *et al.*, 1989; Treiman and Yip, 1989). In order to

[8] The algorithm was developed by Jan de Leeuw, Professor of Social Statistics, University of California at Los Angeles. It attains its goal by minimizing the total sum-of-squares for the simultaneous model with the direct effect of education on income omitted.

[9] As a consequence, prestige and SEI are independent measures of occupational status, something we hope to exploit in future analyses of status attainment models.

develop closely comparable data, we have recoded detailed occupational data, where available from the source files, into the International Standard Classification of Occupations (ILO, 1968; Treiman, 1977, Appendix A). This classification is the natural starting point for devising the ISEI. The advantages of the ISCO classification over other possible choices are twofold. First, the ISCO classification is the international standard classification. This implies that it contains a fair cross section of job titles used in national occupational classifications. As a matter of fact, many national classifications have been developed starting from the ISCO classification.[10] A second fortunate feature of the ISCO is that some cross-national studies (in particular the Eight Nation Political Action Study, Barnes, *et al.,* 1979) have used the commendable strategy of employing it as their standard way of coding occupations.

To construct the ISEI, we have created a stacked file of data from 31 data sets,[11] covering 16 nations for various years from 1968 to 1982. The data sources are listed in Appendix A. These data sets cover a wide variety of nations around the world, ranging from severely underdeveloped countries (India) to the most developed (United States), and from East-European state-socialist polities (Hungary) to autocratic South American states (Brazil). The data sets chosen represent the most important and highest quality data sets on intergenerational occupational mobility that were available to us when we constructed the scale.

The ISCO occupational titles in this file are supplemented with data on self-employment and supervisory status for respondents and their fathers. These last two variables are important for deriving the EGP class categories that we have constructed to analyze occupational class mobility (Ganzeboom *et al.*, 1989). Additional variables include all basic variables of the status attainment model (education of father and respondent, sex, age, marital status, and personal and/or household income) in comparably defined forms. The stacked file contains both the original detailed occupational and educational titles and their translations into ISCO and standard educational categories. This has greatly facilitated checking the precise matching of titles.

The development of ISEI scores of itself does not require the use of intergenerational occupational mobility data. Since only income, education, and age of the respondent are needed to develop the optimal scale, we could have turned to data that lack information on the father. We

[10] This is, for example, true of the Netherlands' classification (Netherlands CBS, 1971), which is essentially a four-digit expansion of the three-digit ISCO. In other countries, in particular the Federal Republic of Germany, the three digit ISCO is actually used as the national standard classification.

[11] A copy of the International Stratification and Mobility File, as well as recent upgrades, can be obtained from the first author.

have used these data sets simply because construction of a stacked file is part of our ongoing cross-national comparison of status attainment; the construction of the ISEI scale is a byproduct. However, there is a particular advantage to the data sets used here, namely that they permit an interesting and independent validation of the scale, a comparison of its performance in modeling intergenerational occupational mobility with the performance of competing alternatives. If the ISEI is a superior way to measure occupational status from the standpoint of mobility or status attainment analysis, one would expect that the intergenerational associations derived from use of the ISEI will be higher than through use of a prestige scale or the EGP class categories. Using the stacked file with the comparably coded intergenerational occupational mobility data it contains makes such comparisons directly obtainable. Other comparisons we make to test the validity of the scale and its advantages and disadvantages relative to its competitors involve fresh data (i.e., data not used for construction of the scale) from five countries that include indigenous (locally developed) SEI scales. These additional data sets are introduced below.

Age Groups and Women

In constructing the ISEI we have restricted our sample to men aged 21–64 and, where information was available, to those active in the labor force for 30 h per week or more or working 'full time.' This yields a pooled sample of 73,901.

The restriction to those employed full time was to avoid confounding earnings differences between occupations with differences in the amount of time incumbents worked. The age restriction was introduced for two reasons: first, because many of our data sets contain similar age restrictions, which means that data on younger and older men are available for only a small subset of our 16 nations; and, second, to minimize distortion introduced by the inclusion of those in "stop-gap" jobs and "retirement" jobs, who often have lower incomes than those employed on a regular basis. We doubt, however, that the age restriction has much impact on our results.

The omission of women is of much greater concern to us. Not only do women make up a significant part of the labor force in many countries, but they dominate certain occupations: pre-primary teachers, nurses, maids, and midwives are nearly always women, and primary teachers, cleaners, and typists are mainly women in virtually every country. Hence, SEI scores for these occupations are likely to be poorly estimated from data on the few men in such occupations. In principle, inclusion of women in our estimation procedure would not create great difficulty, although an adjustment would need to be made for the fact that women systematically earn less than men in the same occupation, even controlling for educational attainment (Treiman and Roos, 1983). The problem is only that the majority of the larger data sets at our disposal (USA73, JAP75, UKD72, BRA73, NIR78, IRE73) have excluded women by design. We have therefore limited our analysis to men.

Nevertheless, we provide SEI scores for characteristically female occupations, which are estimated from the educations and incomes of the relatively rare men in these jobs. Given the worldwide tendency for women to be paid less than men for the same work, the exclusion of women implies an upward shift in the occupational status of typically female jobs. In combination with the possibility that the men in these occupations may have jobs that are unrepresentative of those of the typical (female) incumbent (i.e., perform different tasks from those of their female colleagues), this may account for the fact that some of these occupations show unexpected (high) scores. This does not necessarily imply that the obtained values are invalid for analysis of the occupational status attainment of women, since one might well argue that such scores are exactly the ones needed to bring out discrimination against women. However, a further difficulty with our procedure, for which there is no solution, is that the scores for characteristically female occupations are estimated from relatively sparse data, even though the categories are often aggregated with similar categories in order to satisfy the criterion of at least 20 cases per occupation (see below).[12]

Devising the Occupational Unit Groups

Our aim in devising an ISEI measure is to construct an occupational status variable that captures income and educational differences between occupational categories as defined by the International Standard Classification of Occupations (ISCO). The ISCO consists of four hierarchically organized digits.[13] There are effectively seven main groups, distinguished by the first digit:

(0/1000)	Professional, technical, and related workers
(2000)	Administrative and managerial workers
(3000)	Clerical and related workers
(4000)	Sales workers

[12] Given the databases available, we doubt whether it is possible to devise a valid scale based on data for both males and female. We have attempted to create separate estimates for female-dominated occupations using only the data sets in which women are represented, but judged the results to be even more detrimental to the validity of the scale than the exclusion of data for women.

[13] We adopt the convention that a one-digit occupational title is expressed by one digit plus 000, a two-digit occupational title by two digits plus 00, and a three-digit occupational title by three digits plus 0.

(5000)	Service workers[14]
(6000)	Agricultural, animal husbandry and forestry workers, fishermen and hunters
(7/8/9000)	Production and related workers, transport equipment operators, and laborers

Within these main groups, the second, third, and fourth digit serve to distinguish more detailed categories. A two-digit score distinguishes 83 'minor' groups, a three-digit score distinguishes 284 'unit' groups, and a four-digit score enumerates 1506 occupational titles (ILO, 1968, p. 1). The four-digit version of the ISCO is far too detailed for our purposes: most national occupational classifications have only a few hundred occupational titles and much less detail than the four-digit ISCO. Our starting point was therefore the 284 occupational 'unit' groups in the three-digit scheme. However, for some of these unit groups there were not enough cases to warrant separate analysis. We have taken $N = 20$ as our cutting point: ISCO categories in our pooled file that contained fewer than 20 men aged 21–64 were joined with a neighboring category if they were sufficiently similar or, occasionally, with a similar category elsewhere in the classification (see Appendix B, last column).[15] In other cases we have been able to add detail to the three-digit ISCO categories by making more precise distinctions. In general, we have followed the four-digit enhanced ISCO classification created by Treiman for his comparative prestige study (Treiman, 1977: Appendix A).[16] All in all, we have estimated SEI scores for 271 separate occupational categories. If a four-digit result could be estimated, the three digit result was derived by averaging over the corresponding occupations at the four digit level;[17] otherwise it was estimated on the three-digit code itself. Scores for two-digit categories were derived by averaging over the results for the corresponding three-digit categories. The scores are shown in Appendix B.

Standardized Education and Income

Having derived the occupational groups that are the basic units to be scaled, we next had to obtain measures for education and income that

[14] We have modified this category to include ISCO major group 10000, members of the military forces. In our scheme they have been situated at 5830–5834, adjacent to police.

[15] In a few instances, where valid combination with other categories was not possible, we have estimated ISEI scores for categories with slightly fewer than 20 incumbents: (2195) Union Officials, Party Officials, (6001) Farm Foremen, and (7610) Tanners and Fellmongers.

[16] However, we have not always followed the category codes in Treiman (1977), but have sometimes created new ones in order to remove ambiguity between occupational titles on a three digit and on a four-digit level.

[17] The average is weighted by the number of incumbents in each category in our pooled file of 73,901 cases.

are comparable between countries and, within countries, between years. A number of considerations are of relevance here.

Education. The first problem is the incomparability of the educational classifications across countries. Educational stratification measures are of two basic types: the *amount* of education completed (the number of years of schooling, school leaving age, etc.); and the *type* of education completed (kind of schooling or curriculum). It is not always possible to convert type of schooling into years of school completed, since in non-comprehensive educational systems it may very well be that two students who leave school at the same age have entirely different levels of qualification. We therefore experimented with a variety of scaling procedures, including years of school completed (sometimes recoded from type of school completed or qualifications obtained), and, where available, a local rank order of type of education, scaled proportionally to occupational attainment (Treiman and Terrell, 1975). In practice, however, the difference between type and years of schooling turned out to be not a very serious problem in these data. In particular, the rank order of educational categories coded by years completed or coded into a hierarchy of educational qualifications is very similar in virtually all countries analyzed here (the only notable exception being Great Britain). Hence, for our purposes years of schooling is a reasonable approximation to the level of education. We have therefore used years of schooling as the common metric for educational categories in each country.

However, this of itself does not eliminate the incomparability of educational credentials between countries and time periods. The fundamental problem here is that the relationship between educational attainment, measured in years of schooling, and occupational attainment interacts with the mean level of education. Throughout the world a similar level of education is needed to qualify for many high status professions: one needs 17–20 years of education to become a medical doctor, a dentist, or a lawyer, and this is true in India as well as in the United States. The same, however, is not true for low status jobs. Whereas the average farmer in the United States can boast more than eight years of education, many farmers in India and the Philippines have no schooling at all. In such societies, eight years of education would qualify one for a relatively high status clerical job. Since we assume that farmers in the United States, India, and the Philippines have a similar position in the occupational hierarchy, we need to equate their educational attainment across societies without, however, neglecting the actual world wide equality of educational attainment among incumbents of the high status professions. The conceptually most straightforward way to do this is to convert educational scores into percentile rankings. Educational attainment is then interpreted as a *relative good* (Hirsch, 1976; Thurow, 1975). In this conceptualization, the members of a society are assumed to form a single queue with respect to their educational credentials, whatever these may be. Those first in line are hired for the most demanding and rewarding jobs, those next in line for the next most demanding and rewarding jobs, and so on. For our estimation procedure it is further necessary to convert the derived rankings into *z*-scores with mean zero and standard deviation one within each data set, in order to give education and income comparable scales.

Income. We have followed a slightly different procedure to make incomes comparable between societies. Two steps were taken: incomes were divided by their (within-dataset) means and the results was subjected to a logarithmic transformation. These steps remove the effect of scale units (e.g., dollars and guilders) from the variable and scale earners with respect to their relative share of total income in a way appropriate for a ratio variable: those who earn twice the mean income deviate to the same extent from the mean as those who earn half the mean income. However, after this transformation we are still left with the effects of income inequality, which varies greatly from country to country.[18] Since we assume that occupations are similar around the world in their relative earning power, we have removed the effect of the amount of income inequality (and equated the variance of income and education) by converting the log incomes to *z*-scores, with mean zero and standard deviation one within each data set.

There are three other difficulties with the income measure that required attention. First, although earnings would have been the preferable indicator, hardly any of the data sets distinguish between income and earnings. In order to come as close to earnings as possible, we have used personal income measures and, as noted above, have restricted our sample to men employed full time. Second, three of the data files (PHI68, ITA75p, and UKD74p) contain only household income and not the preferable personal income measure; in one file (IND71), there are measures for both, but the personal income has many more missing values and is less closely connected to occupation than is household income. In all these cases we have substituted household income for the personal income measure. Unfortunately, data to correct family income measures for the number of persons contributing to it were not available. Third, in many data sets the income variable contains a number of extremely low and extremely high values, which would be likely to distort our estimates. These can be coding errors, but more likely they result from true fluctuation of income, which can very widely for an individual even over short periods of time.

[18] Although we have no direct information on the ratio of the average earnings of top earners to those of average earners, we do know that in some Latin American and African countries the top 10% of the population controls more than half the total income while, at the other extreme, in some Eastern European countries the top 10% controls less than 20% of the total income (Taylor and Jodice, 1983, pp. 134–135).

In order to eliminate the influence of these extreme scores, we have recoded these outliers to boundaries of -3.7 and 3.7 (z-scores).

RESULTS

The optimal scaling algorithm shown in Fig. 2 converges at $\beta_{43} = .466$ in step 2, and $\beta_{32} = .582$ in step 3. The first coefficient is the partial weight for standardized income and the second for standardized education. The somewhat stronger contribution of education than of income to SEI is consistent with other SEI scales constructed with different procedures (e.g., Bills, Godfrey, and Haller, 1985, for Brazil; Blishen, 1967, for Canada; and Stevens and Featherman, 1981, for the United States). β_{41} (the effect of age on income) is estimated at .079, and β_{31} (the effect of age on SEI) is estimated at .142. Elaborating step 3 in the algorithm in Fig. 2 results in an age correction of $(.466 * -.079) + .142 = .105$. Since age is standardized in this procedure, this coefficient represents the ISEI inflation (measured as a normal deviate) for a one standard deviation reduction in the mean age of occupational incumbents. Given a standard deviation of 11.7 years for age and 15.3 for ISEI, this means that each successive 10 year cohort needs a 1.7 higher ISEI score in order to get the same income for a given educational level. β_{42} (the direct effect of education on income) is .226, in contrast to β_{43} (the effect of SEI on income in step 4), which is .353. Thus the solution satisfies the criterion that occupation should matter more for income determination than does education. The resulting scale is given in full detail in Appendix B, expressed in a metric ranging between 90 (1220:Judges) and 10 (jointly occupied by 5312:Cook's Helper and 6290:Agricultural Worker n.e.c.).

In order to apply the ISEI scale for comparative purposes, we urge researchers to code or convert their data into the (enhanced) ISCO[19] and then apply the recoding scheme of Appendix B. For data with little detail (say, less than 100 occupational categories), we advise matching the original titles to one or several categories in Appendix B and deriving the appropriate ISEI score directly. To facilitate this, the ISCO version of Appendix B includes ISEI scores for such categories as Managers (2100, 2190), Professionals (1900, 1960), Clerical Workers (3000), Skilled Manual Workers (9950), and other generic terms that are often found in occupational classifications.

VALIDATION

In order to establish the validity of the constructed ISEI scores, we need to compare the newly constructed scores with alternative measures of occupational position. Ideally, one would want to compare the per-

[19] Conversion schemes from many existing national occupational classifications into the ISCO may be obtained from the first author.

TABLE 1
Selected Relationships for Different Scalings of Occupations (Standardized Coefficients)

	ISEI	SIOPS	EGP10
A. Correlations between measures			
ISEI	1		
SIOPS	.763	1	
EGP10 (scaled with ISEI means)	.900	.681	1
B. Correlations with criterion variables			
Father's occupation–Education	.408	.247	.398
Father's occupation–Occupation	.405	.293	.386
Education–Occupation	.563	.416	.462
Occupation–Income	.477	.364	.458
C. Partial regression coefficients			
Father's occupation–Education	.388	.246	.378
Father's occupation–Occupation	.208	.194	.204
Education–Occupation	.510	.402	.486
Occupation–Income	.353	.220	.326
Education–Income	.226	.336	.251

Note. The regression models are defined as EDU = *f*(AGE,FOCC), OCC = *f*(AGE,EDU,FOCC), *ln*(INC) = *f*(AGE,EDU,OCC), with all variables standardized within data sets. EGP10 has been scored as (1 = 71) (2 = 58) (3 = 48) (4 = 50) (5 = 40) (7 = 44) (8 = 35) (9 = 31) (10 = 19) (11 = 27). The values were obtained by averaging ISEI scores within each of the 10 categories. Source: International Stratification and Mobility File, N = 73,901.

formance of the various scales using fresh data, that is, data not used for construction of any of the scales. However, we first illustrate some of the properties of the ISEI using the data set from which we derived the scale. The difference from Treiman's international prestige scale can be inspected after standardizing the two measures (since the two scales have somewhat different ranges and variances). Not unexpectedly, the scales are similar. However, as their moderate intercorrelation in Table 1 (.76) implies, the newly created ISEI score and Treiman's prestige score are far from identical. The expected differences between ISEI and SIOPS with respect to farm occupations are indeed large, as expected, but are not the largest differences. For the following two-digit ISCO categories we find relatively higher SIOPS than ISEI scores (>.5):

ISCO code	Title	ISEI score	SIOPS score
0700	Lower Medical Professionals	.35	.89
6100	Farmers	−.67	.40
7000	Production Supervisors and General Foremen	−.55	.13
8200	Stone Cutters and Carvers	−.68	−.05
8400	Machinery Fitters Machine Assemblers and Precision Instrument Makers (Except Electrical)	−.47	.11

Differences of similar size, but of opposite direction, are observed for

ISCO code	Title	ISEI score	SIOPS score
0800	Statisticians, Mathematicians, Systems Analysts, and Related Technicians	1.56	.88
0900	Economists	2.52	1.59
3300	Bookkeepers, Cashiers, and Related Workers	.67	.10
3500	Transport and Communication Supervisors	.63	.06
3800	Telephone and Telegraph Operators	1.44	.65
3900	Clerical and Related Workers n.e.c	.49	−.14
4000	Managers (Wholesale and Retail Trade)	.78	.39
4300	Technical Salesmen, Commercial Travellers, and Manufacturers' Agents	1.15	.61
4400	Insurance, Real Estate, Securities and Business Services Salesmen, and Auctioneers	1.20	.57
4500	Salesmen, Shop Assistants, and Related Workers	.09	−.81
4900	Sales Workers n.e.c.	−.60	−2.20
5100	Working Proprietors (Catering and Lodging Services)	−.42	−.10
5400	Maids and Related Housekeeping Service Workers n.e.c.	−1.00	−1.60
5800	Protective Service Workers	.58	−.24
5900	Service Workers n.e.c.	−.04	−.63
6400	Fishermen, Hunters, and Related Workers	−.32	−.98
7600	Tanners, Fellmongers, and Pelt Dressers	−.17	−1.34
7800	Tobacco Preparers and Tobacco Product Makers	.03	−.50
9700	Material-Handling and Related Equipment Operators, Dockers and Freight Handlers	−.67	−1.19

It is difficult to give a substantive interpretation to these differences, which suggests that they mainly reflect error in the construction of one or the other scale, or both. The only systematic differences is the tendency for sales occupations to score better on the ISEI than on the prestige scale, which may reflect their higher economic than cultural status.

A similar comparison between the continuous measures and the EGP categories is not directly possible, since the latter variable is categorized and the EGP classes are not uniquely mapped onto the two-digit ISCO. However, one would expect the association between the continuous measures and the EGP categories to be high, and indeed it is. The 10 EGP10[20] categories explain over 75% of the variance in the SIOPS prestige scores and 81% of the variance in ISEI scores. To make a direct comparison with the ISEI score, we have averaged the ISEI scores over the 10 EGP categories. The result is used to compute the correlations and regressions

[20] EGP10 is a 10 category version of the EGP classification. Note, however, that we have found it convenient to reorder the classification used by Erikson, Goldthorpe, and Portocarero (1979) by coding self-employed farmers as 11, instead of 6, and that our category codes run from 1 to 11, with the omission of 6. In other work (e.g., Ganzeboom, Luijkx, and Treiman, 1989) and below, we also make use of more aggregated three and six category versions of EGP (EGP6 and EGP3).

in the third column of Table 1. Not surprisingly, the (reordered) scaled EGP categories are very close to the ISEI measure (r = .90) and less close to the SIOPS measure (r = .68).

The correlations and selected regression coefficients in the lower two panels of Table 1 pertain to relationships in the elementary status attainment model (defined in the note to the table): age, father's occupation, education, occupation, and income are included, and father's occupation and father's education are assumed to have no influence on income.

At first impression, the results are very similar for all three measures,—indeed, in one instance we need the third digit of these standardized coefficients to see any difference. As expected, the similarity is greatest between the ISEI and the scaled EGP categories; the relationships estimated using the prestige measures, SIOPS, are lower across the board.[21] This reinforces our assertion that prestige is better interpreted as a consequence of the dimensions used to construct occupational socio-economic status measures than as a parallel to them.

Closer examination suggests that the ISEI scale outperforms both of the other two measures, albeit by a small margin. In Table 1, panel B, all the correlations with the criterion variables are higher for the ISEI than for the other two scales. The two bottom rows in panel B measure relationships that have been used in the optimizing procedure. Hence, in these rows the difference between the values in the first and the other columns can be expected to be wider than for the upper two rows. To what extent the differences between ISEI and the other measures is due to overfitting peculiarities in the data set used to construct the ISEI can only be estimated with fresh data (see below). However, the upper two correlations, which were not optimized, are also larger when estimated using the ISEI than when estimated using the EGP, albeit not much; both are substantially larger than the correlations estimated using the SIOPS prestige measure. The same situation holds for the standardized partial regression coefficients in panel C, where the last four coefficients may be contaminated by the optimization procedure. The first row of regression coefficients is not implicated in the optimization procedure. Here again, ISEI is highly superior to the SIOPS[22] and slightly superior to the EGP, as scaled by mean ISEI scores. It should be recalled, however, that the

[21] The only relationship for which SIOPS shows a higher coefficient is the direct effect of education on income (Table 1, Panel C, bottom row), but this is the one that should be as low as possible. Observe that the corresponding correlation in panel B is the lowest in the row. The coefficients for the direct effect of education and income differ slightly from those reported above for the optimization procedure because of the inclusion of other predictor variables.

[22] The performance of SIOPS is in particular unsatisfactory when father's occupation is involved. This probably is due to the fact that there are so many more farmers in the father's generation than in the respondent's generation.

EGP encompasses information not only on type of work (aggregated to occupations) but on whether the occupational incumbent is self-employed and how many workers he supervises. Hence, it is logically possible for the EGP categories to perform better than the ISEI scale, which does not contain this additional information. In our judgment, it is better to treat self-employment and supervisory status as separate variables—as we do below. One reason for separating occupational status from self-employment and supervisory status is that the three variables may behave differently depending on the outcome being predicted. For example, supervisors may earn substantially more than non-supervisors in the same occupation, but a father's supervisory status may have little impact on his son's educational attainment.

Tables 2–4 give additional tests of the validity of the ISEI scale, this time using fresh data from five countries: the 1973 Australian Mobility Survey, a 1972 Brazilian political survey, the 1984 Canadian Election Study, the 1985 Netherlands National Labour Market Survey, and the 1962 US Occupational Change in a Generation study (information on the surveys is given in the second panel of Appendix A). Each of these files (none of which was used to develop the ISEI scale) includes an indigenous SEI scale: for Australia, the ANU-II code, developed by Broom *et al.* (1977); for Brazil, an SEI score developed by Do Valle Silva (1974); for Canada, the scale developed by Blishen (1967); for the Netherlands, the SEI80 score developed by Klaassen and Luijkx (1987); and for the United States, Duncan's (1961) SEI scale adapted for the 1960 US Census categories.

Table 2 estimates the elementary status attainment model for each of these five fresh data files, once using the local SEI measure (L) and once using the newly constructed ISEI measure (I). Given the fact that the ISEI measure is likely to miss some of the local variance[23] and that the data had to undergo an additional conversion into ISCO before the ISEI scale could be applied, one would expect coefficients based on the ISEI scale to be weaker than those based on the local SEI measures. However, the reverse is the case for 11 of the 20 relevant coefficients. The explained variance for the ISEI measure is higher than the variance explained by the local SEI measures in four of the five equations for educational attainment, and one of these differences is substantial. Four of the five correlations between father's and son's occupational status are higher using the ISEI measure than using the local SEI scale, and three of these

[23] Locally important occupational distinctions are not always preserved in the ISCO, which has the effect of understating locally important between-occupation variance in the ISEI. But the reverse is not true. Even when the ISCO makes finer distinctions than does a local classification, these distinctions cannot affect the ISEI scores precisely because they are not captured in the local data.

TABLE 2
The Elementary Status Attainment Model Estimated with the ISEI and with Indigenous SEI Scales (Fresh Data from Five Countries; Men Aged 21–64)

	AUS73		BRA72		CAN84		NET85		USA62	
	(L)	(I)	(L)	(I)	(L)	(I)	(L)	(I)	(L)	(I)
N	2392		381		874		1311		7361	
Years of education										
Age	−.179	−.169	−.185	−.175	−.112	−.121	−.064	−.067	−.184	−.186
Father's education	.211	.159	.261	.283	.348	.334	.205	.196	.225	.230
Father's occupation	.146	.274	.366	.352	.113	.126	.204	.224	.308	.306
adj. R^2	.118	.166	.365	.364	.198	.200	.109	.117	.265	.267
Intergenerational occupational mobility										
Correlation	.261	.357	.500	.507	.277	.373	.221	.267	.398	.384
Occupation										
Age	−.008	−.033	.136	.098	.218	.154	.062	.074	.174	.149
Education	.361	.311	.523	.490	.486	.539	.457	.500	.552	.547
Father's occupation	.195	.253	.136	.251	.169	.222	.109	.133	.174	.164
adj. R^2	.192	.218	.436	.411	.304	.395	.248	.309	.394	.381
Ln(Income)										
Age	−.079	−.065	−.012	.026	.282	.308	.278	.276	.143	.148
Education	.115	.133	.209	.289	.169	.187	.251	.233	.217	.259
Occupation	.443	.400	.617	.516	.306	.239	.291	.296	.343	.280
adj. R^2	.264	.233	.581	.520	.248	.218	.310	.308	.257	.233

Note. (L), Results for *l*ocal SEI scale. (I), Results for *i*nternational SEI scale. Sources: See Appendix A.

differences are substantial. For three of the five occupational attainment equations, the variance explained by the ISEI is larger, and two of these differences are substantial. However,—for reasons that are not clear—for none of the five income determination equations is the ISEI superior in terms of explained variance. Taken over all, these results tell us that the constructed ISEI scale is highly satisfactory and can be used as a valid occupational status scale in individual countries as well as for cross-national comparisons.

A final way of evaluating the ISEI is to compare it with the EGP categories using fresh data. We carry out two such comparisons, one predicting years of school completed from father's occupation (Table 3) and the other predicting income from respondent's occupation and relevant controls (Table 4).

In order to make a comparison between categorically treated EGP variables and the ISEI scale, we compare variance components of four models. Model A predicts the criterion variable using 10 dummy variables for the EGP class categories and appropriate control variables (father's education and age for the education equation, and respondent's education and age for the income equation). Model B adds the ISEI scale to the set of predictors, and the comparison of B and A tests directly (on one degree of freedom) whether the EGP categories are internally homogeneous with respect to the criterion variables, insofar as the heterogeneity is picked up by ISEI. Model C replaces the 10 EGP categories with the single ISEI measure. It is likely that this substitution will cost some explained variance, but the gain of nine degrees of freedom may compensate for this. Finally, it is to be remembered that the EGP categories are formed not only from the aggregation of detailed occupational categories, but also take into account self-employment and supervisory status.[24] Whereas these two variables enter the EGP categories in a non-additive way, Model D treats each of them as an additive component in the model. Conceptually, Model D is therefore a parsimonious version (5 degrees of freedom) of Model B (12 degrees of freedom), but technically D is not strictly nested within B because of the way EGP is constructed. Comparison of the models is accomplished with a standard F test, for which the ingredients are the explained sum-of-squares, the residual-mean-squares,[25] and the degrees of freedom.

Table 3 gives the relevant figures for the determination of respondent's education by father's occupation, net of father's education and the re-

[24] Self-employment is coded as a binary variable. Supervisory status is coded as a simple three level scale, depending on whether the respondent has no subordinates, a few, or many. See the discussion of the construction of EGP10 scores in Ganzeboom, Luijkx, and Treiman (1989).

[25] We have taken the residual mean square of Model D, in general the best fitting model.

TABLE 3

Comparison of the ISEI with the EGP10 Occupational Class Categories for Fathers as Predictors of Son's Educational Attainment (Fresh Data from Five Countries, Men Aged 21–64)

		AUS73	BRA72	CAN84	NET85	USA62
	N	2553	381	1233	1776	10549
	MSE	2.26	12.6	14.5	10.08	9.42
	d.f.	SS	SS	SS	SS	SS
Model						
A: Age, father's education, father's EGP10	11	1273	3193	6012	2864	41740
B: Age, father's education, father's EGP10, father's ISEI	12	1305	3249	6013	2934	42372
C: Age, father's education, father's ISEI	3	1208	3100	5632	2383	39978
D: Age, father's education, father's ISEI, father's self-employment, father's supervising status	5	1296	3657	5851	2548	40820
Model comparisons (F-statistics)						
B–A	1,N-1	14.2	4.44	.07~	6.9	67.1
B–C	9,N-9	4.77	1.31~	2.92~	6.7	28.2
B–D	7,N-7	.56~	*x*	1.60~	5.5	23.5
D–C	2,N-2	19.5	22.1	7.55	8.2	44.7

Note. N, total degrees of freedom (listwise deletion of missing values); MSE, mean square error Model D; d.f., model degrees of freedom; SS, explained sum of squares. F-statistics are significant at the .05 level, unless indicated by ~. *x*, test cannot be computed.

TABLE 4

Comparison of the ISEI with the EGP10 Occupational Class Categories as Predictors of Income (Fresh Data from Five Countries, Men Aged 21–64)

		AUS73	BRA72	CAN84	NET85	USA62
	N	2391	381	873	1311	7361
	MSE	.135	.455	.354	.078	.304
	d.f.	SS	SS	SS	SS	SS
Model						
A: Age, education, EGP10	11	113.7	273.3	105.9	51.5	796.9
B: Age, education, father's EGP10, ISEI	12	123.5	274.4	108.1	52.5	812.8
C: Age, education, ISEI	3	104.7	245.7	90.3	47.3	701.8
D: Age, education, ISEI, self-employment, supervising status	5	124.3	298.2	102.5	59.3	768.0
Model comparisons (F-statistics)						
B–A	1,N-1	72.5	2.41~	6.21	12.8	52.3
B–C	9,N-9	15.4	7.01	5.59	7.4	40.5
B–D	7,N-7	*x*	*x*	2.26~	*x*	21.1
D–C	2,N-2	72.5	57.7	17.2	76.9	109

Note. d.f., degrees of freedom model; *N*, total degrees of freedom (listwise deletion of missing values); MSE, mean square error Model D. F-statistics are significant at the .05 level, unless indicated by ~. *x*, test cannot be computed (see text).

spondent's age. The comparison of Models A and B shows that in four of the five datasets father's ISEI explains significant additional variance over father's EGP category. The comparison of Models B and C shows that in three of the five datasets ISEI can replace EGP without loss of information. For the third comparison, between Models B and D, the pattern of sum of squares shows a somewhat surprising result for Brazil: the explained sum of squares is higher for Model D than for Model B, which means that the additive Model D (with fewer predicting variables) is more informative than Model B with the EGP class categories, irrespective of the degrees of freedom consumed. This means that Model D is clearly superior to Model B in the case of Brazil, as it is for statistical reasons in two of the four remaining cases. Comparison of Models D and C shows, on the other hand, that father's self-employment and supervising status contribute significantly to the educational attainment of the respondent in all five cases. The conclusion, therefore, is that Model D, with three additive variables (ISEI, Self-employment, Supervising Status), is to be preferred over all other models.

The same comparisons are shown for the determination of income Table 4. ISEI contributes significantly to the determination of income in three of the five cases. The EGP class distinctions cannot be replaced by ISEI alone, however, in three of the five cases. The surprising result here is that the simple model D, with ISEI, self-employment and supervising status, explains more variance than the more complicated model B, irrespective of degrees of freedom, for three of the five cases, and in one other case the test statistic for the D-B comparison is insignificant. This suggests that for income determination Model D is strongly to be preferred over the other models. Consistent with this, the final comparison (D–C) shows that supervising status and self-employment contribute substantially to the determination of income, a result that reconfirms a finding of Robinson and Kelley (1979).

ON THE COST OF BEING CRUDE

Having at our disposal a large data set with detailed occupational codes for fathers and sons and several ways of aggregating these codes into the kind of gross classifications often employed in mobility analysis makes it possible to estimate the cost of aggregation; that is, the amount of information lost when detailed distinctions between occupation categories are ignored. Table 5 shows five correlations involving occupation variables, estimated at each of five levels of aggregation: the ISEI and three versions of the EGP categories ranging from the 10 category version to a 3 category distinction between nonmanual, manual, and farm occupations. The level of attenuation is estimated as the ratio of the correlation computed using the aggregated classification to the correlation computed using the ISEI scale. The occupational mobility correlations (first column) use the oc-

TABLE 5
Selected Correlations Involving Occupational Status under Varying Levels of Aggregation

	Father's occupation–occupation	Father's education—father's occupation	Father's occupation—education	Education–occupation	Occupation–income	Estimated attenuation
ISEI	.405	.515	.408	.563	.477	1.00
EGP10	.386	.497	.398	.534	.458	.965
EGP6	.379	.482	.390	.530	.435	.943
EGP3	.353	.413	.364	.470	.380	.850

Note. Source: International Stratification and Mobility File, $N = 73{,}901$. For scaling of EGP10, see Table 1. EGP6 collapses the following categories: (1 + 2) (3) (4 + 5) (7 + 8) (9) (10 + 11). EGP3, collapses the following categories: (1 + 2 + 3 + 4 + 5) (7 + 8 + 9) (10 + 11).

cupational classification twice, so for this column we have taken the square root of the ratio. The estimated attenuation factor (last column) is calculated as the average of the five computed attenuations. The first two coefficients (for aggregations into 10 and 6 categories) are around .96 and .94, respectively, which is very acceptable: it suggests that the EGP, disaggregated to 6 categories or more and recoded with ISEI means, captures most of the variance in the ISEI. However, the attenuation coefficient for the 3 category EGP classification is estimated at .85, which is considerably lower. The inverse of these coefficients can be used in correction-for-attenuation designs in future research.

The estimated attenuation coefficients warrant the conclusion that not much information is lost when analyzing data containing six or more EGP categories, scored with ISEI means (at least when they contain distinctions similar to those that define the EGP categories). Together with the results in the validation section, this suggests that the EGP categories are not only externally heterogeneous (i.e., differ from one another with respect to their average values on other variables), but also reasonably internally homogeneous (i.e., do not contain substantial within-category variability that can be tapped by further disaggregation into the detailed ISCO groups).

CONCLUSIONS

In this paper we have constructed an International Socio-Economic Index (ISEI) of occupational status, similar to the national socio-economic indices developed by Duncan (1961) and others. Our method of construction was to derive that scaling of occupations which optimally explains the relationship between education and income and hence satisfies Duncan's definition of occupation as "the intervening activity linking income to education." Technically, this involves a weighting of the standardized education and standardized income of occupational groups, controlled for age effects, which is conceptually clearer but in practice similar to the procedure used by Duncan and others. We have succeeded in constructing an ISEI score for 271 detailed occupational categories within the framework of the International Standard Classification of Occupations (ISCO), modified and refined by additional distinctions. The data used to estimate the scale was a pooled sample of 73,901 men aged 21–64 active in the labor force for 30 hours per week or more, extracted from 31 data sets from 16 countries. The resulting scale not only gives an adequate representation of the elementary status attainment model for these data (at least as good as, and in some cases superior to, locally developed SEI scales) but it compares favorably with competing cross-nationally valid scales, the SIOPS international prestige scale, and (by a smaller margin) the EGP occupational class categories. Additional results suggest that the constructed index can also be used to scale more limited occupational categories without much loss of information. The constructed index promises to be a useful tool for estimating status attainment models and we invite researchers in the field to apply this measure in their comparative research.

APPENDIX A

Data Sources

(The Number of Cases Used in the Analysis (Men Aged 21–64) Is Given in Brackets)

31 Data Sets Used to Construct the ISEI Scale

Barnes, Samuel H.; Kaase, Max; *et al.*: POLITICAL ACTION: AN EIGHT NATION STUDY, 1973–1976 [machine-readable data file] ICPSR ed. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor] (ICPSR 7777). (AUT74p [452], ENG74p [377], FIN75p [388], GER75p [635], ITA75p [413], NET74p [350], SWI76p [392], USA74p [432])

CBS (Centraal Bureau voor de Statistiek): LIFE [SITUATION] SURVEY, NETHERLANDS 1977, Amsterdam, Netherlands: Steinmetz Archive [distributor] STEINMETZ:PO328. (NET77 [1252])

Featherman, David L.; Hauser, Robert M.: OCCUPATIONAL CHANGES IN A GENERATION, 1973 [machine-readable data file] Washington, DC: U.S. Bureau of the Census [producer]; Madison, WI: Data and Program Library Service. University of Wisconsin [distributor] (SB-001-002-USA-DPLS-1962-1). (USA73 [20058])

Halsey, A. H.; Goldthorpe, J. H.; Payne, C.; Heath, A. F.: OXFORD SOCIAL MOBILITY INQUIRY, 1972, Colchester, Essex: University of Essex. Economic and Social Research Center [distributor], ESRC:1097 (ENG72 [6993])

Heinen, A.; Maas, A.: NPAO LABOUR MARKET SURVEY, 1982 [machine-readable data file] Amsterdam, Netherlands: Steinmetz Archive [distributor] (PO748). (NET82 [599])

Jackson, John E.; Iutaka, S.; Hutchinson, Bertram, DETERMINANTS OF OCCUPATIONAL MOBILITY IN NORTHERN IRELAND AND THE IRISH REPUBLIC Colchester, Essex: University of Essex. Economic and Social Research Center [distributor]. (IRE73 [1811], NIR73 [1881])

IBGE (Instituto Brasileiro de Estatistica): PESQUISA NACIONAL POR AMOSTRA DE DOMICILIOS, 1973 (PNAD) [machine-readable data file] English translation ed. prepared by Archibald O. Haller and Jonathan Kelley. Madison, WI: Data and Program Library Service. University of Wisconsin [distributor]. (BRA73 [6697])

IBGE (Instituto Brasileiro de Estatistica): PESQUISA NACIONAL POR AMOSTRA DE DOMICILIOS, 1982 (PNAD) [machine-readable data file] English translation ed. prepared by Archibald O. Haller and Jonathan Kelley. Madison, WI: Data and Program Library Service. University of Wisconsin [distributor]. (BRA82 [8742])

Kolosi, Tamas: A STRATIFICATION MODEL STUDY—CENTRAL FILE OF INDIVIDUALS IN ENGLISH, 1981–1982 [machine-readable data file]. Budapest: Social Research Informatics Society (in Hungarian, Tarsadalomkutatasi Informatikai Tarsulas, or TARKI) [distributor] (A97). (HUN82 [4745])

Population Institute, University of the Philippines: PHILIPPINE NATIONAL DEMOGRAPHIC SURVEY, 1968 [machine-readable data file] Manila, Philippines: Population Institute. University of the Philippines [producer]; Los Angeles, CA: Institute for Sociel Science Research. University of California [distributor]. ISSR:M234. (PHI68 [6752])

Population Institute. University of the Philippines: NATIONAL DEMOGRAPHIC SURVEY, 1973 [machine-readable data file] Manila, Philippines: Population Institute. University of the Philippines [producer]; Los Angeles, CA: Institute for Social Science Research. University of California [distributor]. (PHI73 [2504])

Grichting, Wolfgang L.: VALUE SYSTEM IN TAIWAN, 1970 [machine-readable data file] ICPSR ed. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor] (ICPSR 7223). (TAI70)

Tominaga, Ken'ichi: SOCIAL STATUS AND MOBILITY SURVEY, 1975 [machine-readable data file] Los Angeles, CA: Institute for Social Science Research. University of California [distributor]. (JAP75 [2271])

Rose, Richard, NORTHERN IRELAND LOYALTY STUDY, 1968 ICPSR ed. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], ICPSR:7237 (NIR68 [430])

Ultee, Wout C.; Sixma, Herman: NATIONAL PRESTIGE SURVEY, 1982 [machine-readable data file] Amsterdam, Netherlands: Steinmetz Archive [distributor] (PO83). (NET82u [309])

Verba, Sidney; Nie, Norman H.; Kim, Jae-On: POLITICAL PARTICIPATION AND EQUALITY IN SEVEN NATIONS, 1966–1971 ICPSR ed. [machine-readable data file] Ann Arbor; MI: Inter-university Consortium for Political and Social Research [distributor] (ICPSR 7768). (IND71n [1309])

ZUMA (Zentrum für Umfragen, Methoden, und Analysen): ZUMA-STANDARDDEMOGRAPHIE (ZEITREIHE), 1976–1981) [machine-readable data file] Cologne, Germany: Zentralarchiv für Empirische Sozialforschung [distributor] (ZA1233). (GER76z [503], GER77z [377], GER78 [440], GER78z [405], GER79z [441], GER80a [706], GER80z [421])

Five Data Sets Used to Validate the Scale

Blau, Peter; Duncan, Otis Dudley: OCCUPATIONAL CHANGES IN A GENERATION, 1962 [machine-readable data file] Washington, DC: US Bureau of the Census [producer]; Madison, WI: Data and Program Library Service. University of Wisconsin [distributor] (SB-001-002-USA-DPLS-1962-1). (USA62)

Broom, Leonard; Duncan-Jones, Paul; Jones, Frank L.; McDonnell, Patrick; Williams, Trevor: SOCIAL MOBILITY IN AUSTRALIA PROJECT, 1973 [machine-readable data file] Canberra, Australia: Social Science Data Archives. Australian National University [distributor] (SSDA 8). (AUS73)

Converse, Philip E.; McDonough; *et al.*: REPRESENTATION AND DEVELOPMENT IN BRAZIL, 1972–1973. Part I: Mass sample [machine-readable data file] ICPSR ed. Ann

Arbor, MI: Inter-university Consortium for Political and Social Research [distributor] (ICPSR 7712). (BRA72) [regional sample]
Lambert, Ronald D.; *et al.*: CANADIAN NATIONAL ELECTION STUDY, 1984 [machine-readable data file] ICPSR ed. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor] (ICPSR 8544). (CAN84)
OSA (Organisatie voor Strategisch Arbeidsmarktonderzoek): NATIONAL LABOUR MARKET SURVEY, NETHERLANDS 1985 [machine-readable data file] Tilburg, Netherlands: Instituut voor Arbeidsmarktvraagstukken [producer and distributor]. (NET85)

APPENDIX B

ISEI Scores for 345 ISCO Occupation Categories

The International Socio-Economic Index of Occupational Status for Major, Minor, Unit Groups (and Selected Titles) of the International Standard Classification of Occupations (Enhanced)[26]

	Major group	Minor group	Unit group	Title	*N*
0/1000 PROFESSIONAL, TECHNICAL AND RELATED WORKERS	67				
0100 PHYSICAL SCIENTISTS AND RELATED TECHNICIANS		62			
0100 Chemists			73		109
0120 Physicists			79		j
0130 Physical Scientists n.e.c. (incl. Astronomer, Meterologist, Scientist n.f.s., Geologist)			79		52
0140 Physical Science Technicians (incl. Chemical Laboratory Assistant)			47		135
0200 ARCHITECTS AND ENGINEERS[27]		71			
0210 Architects, Town Planners (incl. Landscape Architect)			77		190
0220 Civil Engineers (incl. General Engineer, Construction Engineer)			73		182
0230 Electrical, Electronics Engineers (incl. Telecommunications Engineer)			69		267
0240 Mechanical Engineers (incl. Ship Construction Engineer, Automotive Engineer, Heating, Ventilation and Refrigeration Engineer)			68		248
0250 Chemical Engineers			73		42
0260 Metallurgists			70		20
0270 Mining Engineers (incl. Petroleum and Natural Gas Engineer)			65		j
0280 Industrial Engineers (incl. Technologist, Planning Engineer, Production Engineer)			65		190
0290 Engineers n.e.c. (incl. Engineer n.f.s., Agricultural Engineer, Traffic Planner)			76		179
0300 ENGINEERING TECHNICIANS[28]		53			
0310 Surveyors			58		83
0320 Draughtsmen			53		318
0330 Civil Engineering Technicians (incl. Quantity Surveyor, Clerk of Works)			50		61
0340 Electrical and Electronics Engineering Technicians			48		144

APPENDIX B—*Continued*

	Major group	Minor group	Unit group	Title	*N*
0350 Mechanical Engineering Technicians			52		42
0360 Chemical Engineering Technicians			57		22
0370 Metallurgical Technicians			56		j
0380 Mining Technicians			56		j
0390 Engineering Technicians n.e.c. (incl. Engineer's Aide, Surveyor Assistant, Laboratory Assistant)			56		261
0400 AIRCRAFT AND SHIPS' OFFICERS		59			
0410 Aircraft Pilots, Navigators, Flight Engineers			71		44
0420 Ships' Deck Officers and Pilots (incl. Small Boat Captain, Deck Officer, Merchant Marine Officer, Navigator)			53		96
0430 Ships' Engineers			53		j
0500 LIFE SCIENTISTS AND RELATED TECHNICIANS		65			
0510 Biologists, Zoologists and Related Scientists			77		40
0520 Bacteriologists, Pharmacologists and Related Scientists (incl. Biochemist, Physiologist, Medical Pathologist, Animal Scientist)			77		j
0530 Agronomists and Related Scientists (incl. Agricultural Agent, Agricultural Consultant, Horticulturist, Silviculturist)			77		46
0540 Life Science Technicians			52		
0541 Agricultural Technican				59	25
0549 Medical and Related Technician (incl. Biological Analyst, Medical Laboratory Technician, Technical Hospital Assistant)				49	59
0600 MEDICAL, DENTAL, AND VETERINARY PROFESSIONALS[29]		85			
0610 Medical Doctors (incl. Chief Physician, Hospital Physician, Medical Practitioner, Specialized Physician, Surgeon)			88		249
0630 Dentists			86		87
0650 Veterinarians			84		30
0670 Pharmacists			81		94
0700 ASSISTANT MEDICAL PROFESSIONALS AND RELATED WORKERS[30]		49			
0710 Professional Nurses (incl. Head Nurse, Nurse n.f.s., Specialized Nurse)			42		105

0720 Nursing Personnel n.e.c. (incl. Uncertified Nurse, Practical Nurse, Assistant Nurse, Nurse Trainee)		39		52
0730 Professional Midwife		52		j
0740 Midwifery Personnel n.e.c.		39		j
0750 Optometrists and Opticians (incl. Opthalmic and Dispensing Optician)		58		j
0760 Physiotherapists and Occupational Therapists (incl. Masseur)		58		j
0770 Medical X-Ray Technicians (incl. Radiological Analysist, Medical Equipment Operator n.f.s.)		58		j
0780 Medical Practice Assistants[31] (0620 Medical Assistants, 0640 Dental Assistants, (incl. Dental Hygienist), 0660 Veterinary Assistants, 0680 Pharmaceutical Assistants, 0690 Dietitians and Public Health Nutritionists)		52		21
0790 Medical, Dental, Veterinarian and Related Workers n.e.c. (incl. Chiropractor, Herbalist, Sanitary Officer, Osteopath, Chiropodist, Public Health Inspector, Orthopedic Technician)		58		102
0800 STATISTICIANS, MATHEMATICIANS, SYSTEMS ANALYSTS, AND RELATED TECHNICIANS	67			
0810 Statisticians		71		53
0820 Mathematicians, Actuaries (incl. Operations Research Analyst)		71		j
0830 Systems Analyst (incl. Project Adviser)		71		j
0840 Statistical and Mathematical Technicians (incl. Computer Programmer, Work Planner)		64		66
0900 ECONOMISTS (incl. Market Research Analyst)	80			73
1100 ACCOUNTANTS	69			
1101 Professional Accountant (incl. Registered Accountant)			75	89
1109 Accountant n.f.s. (incl. Auditor, Tax Advisor)			68	393
1200 JURISTS	85			
1210 Lawyers (incl. Attorney, Public Prosecutor, Trial Lawyer)		85		206
1220 Judges		90		33
1290 Jurists n.e.c. (incl. Notary, Notary Public, Legal Advisor, Patent Lawyer, Non-Trial Lawyer)		82		25
1300 TEACHERS	71			
1310 University and Higher Education Teachers (incl. University Professor, University Administrator)		78		236

APPENDIX B—*Continued*

	Major group	Minor group	Unit group	Title	*N*
1320 Secondary Education Teachers (incl. High School Teacher, Middle School Teacher			71		555
1330 Primary Education Teachers (incl. Elementary School Teacher, Teacher n.f.s.)			69		549
1340 Pre-Primary Education Teachers (incl. Kindergarten Teacher)			65		j
1350 Special Education Teachers (incl. Teacher of the Blind, Teacher of the Deaf, Teacher of the Mentally Handicapped)			65		j
1390 Teachers n.e.c. (incl. Vocational Teacher, Factory Instructor, Private Teacher)			65		220
1400 WORKERS IN RELIGION		55			
1410 Ministers of Religion and Related Members of Religious Orders (incl. Clergy n.f.s., Vicar, Priest, Missionary)			55		205
1490 Workers in Religion n.e.c. (incl. Religious Worker n.f.s., Faith Healer)			55		j
1500 AUTHORS, JOURNALISTS, AND RELATED WRITERS		66			
1510 Authors and Critics (incl. Writer)			66		j
1590 Authors, Journalists and Related Writers n.e.c. (incl. Advertising Writer, Public Relations Man, Technical Writer, Continuity and Script Editor, Book Editor, Newspaper Editor, Reporter)			66		125
1600 SCULPTORS, PAINTERS, PHOTOGRAPHERS, AND RELATED CREATIVE ARTISTS		55			
1610 Sculptors, Painters, and Related Artists (incl. Artist n.f.s., Creative Artist n.f.s., Artist-Teacher, Cartoonist)			57		86
1620 Commercial Artists and Designers			55		35
1621 Designers (incl. Scene Designer, Interior Designer, Industrial Products Designer)				60	80
1629 Commercial Artist n.f.s. (incl. Decorator-Designer, Ads Designer, Window Display Artist)				44	35
1630 Photographers and Cameramen (incl. TV Cameraman, Motion Picture Camera Operator, Technical Photographer)			50		63
1700 COMPOSERS AND PERFORMING ARTISTS		59			
1710 Composers, Musicians and Singers (incl. Music Teacher, Conductor)			54		56
1720 Choreographers and Dancers			64		j

1730 Actors and Stage Directors			64		26
1740 Producers, Performing Arts (incl. Show Producer, Film Maker, Television Director)			64		j
1750 Circus Performers (incl. Clown, Magician, Acrobat)			54		j
1790 Performing Artists n.e.c. (incl. Radio–TV Announcer, Entertainer n.e.c.)			64		21
1800 ATHLETES, SPORTSMEN, AND RELATED WORKERS (incl. Professional Athlete, Coach, Sports Official, Team Manager, Sports Instructor, Trainer)		55			61
1900 PROFESSIONAL, TECHNICAL, AND RELATED WORKERS N.E.C.		65			
1910 Librarians, Archivists, and Curators			59		24
1920 Sociologists, Anthropologists, and Related Workers (incl. Archeologist, Historian, Geographer, Political Scientist, Social Scientist n.f.s., Psychologist)			72		37
1930 Social Workers (incl. Group Worker, Youth Worker, Delinquency Worker, Social Welfare Worker, Welfare Occupations n.f.s.)			54		112
1940 Personnel and Occupational Specialists (incl. Job. Counselor, Occupational Analyst)			59		126
1950 Philologists, Translators, and Interpreters			54		j
1960 Professionals n.f.s.[32]			82		154
1990 Other Professional, Technical, and Related Workers (incl. Technician n.e.c., Diviner, Fingerprint Expert, Expert n.f.s., Astrologer)			61		323
2000 ADMINISTRATIVE AND MANAGERIAL WORKERS	67				
2000 LEGISLATIVE OFFICIALS AND GOVERNMENT ADMINISTRATORS		72			
2010 Heads of Government Jurisdictions (incl. District Head, City Head, Large City Head, Village Head)			72		89
2020 Members of Legislative bodies (incl. Member of Parliament, Member Local Council)			73		28
2030 High Administrative Officials			72		
2033 Senior Civil Servant Central Government (incl. Government Minister, Ambassador, Diplomat, Minister of the Crown (ENG), High Civil Servant)				81	56
2035 Senior Civil Servant Local Government (incl. Department Head Provincial Government, Department Head Local Government)				60	45
2100 MANAGERS[33]		67			
2110 GENERAL MANAGERS[34]		66			
2111 Head of Large Firm (incl. Member Board of Directors, Banker, Company Director, General Manager n.f.s.)				69	623

APPENDIX B—*Continued*

	Major group	Minor group	Unit group	Title	*N*
2112 Head of Firm				65	171
2116 Building Contractor				47	80
2120 Production Managers (except farm) (incl. Factory Manager, Engineering Manager, Mining Manager, Industrial Manager)			67		167
2190 Managers n.e.c.			67		
2191 Branch Manager				65	27
2192 Department Manager				67	38
2195 Political Party Official, Union Official				59	15
2199 Manager n.f.s. n.e.c. (incl. Businessman, Business Executive, Business Administrator, Sales Manager except Wholesale and Retail Trade, Personnel Manager)				67	974
3000 CLERICAL AND RELATED WORKERS	49				
3000 CLERICAL SUPERVISORS (incl. Office Manager, Office Supervisor)		60			115
3100 GOVERNMENT EXECUTIVE OFFICIALS		58			
3102 Government Inspector (incl. Customs Inspector, Public Inspector)				48	65
3104 Tax Collector				53	44
3109 Middle Rank Civil Servant (incl. Civil Servant n.f.s., Government Executive, Public Official, Public Administrator)				59	549
3200 STENOGRAPHERS, TYPISTS, AND CARD- AND TAPE-PUNCHING MACHINE OPERATORS		54			
3210 Stenographers, Typists, and Teletypists			55		
3211 Secretary (incl. Head Secretary)				58	52
3219 Typist, Stenographer				48	38
3220 Card- and Tape-Punching Machine Operators (incl. Keypunch Operator)			48		j
3300 BOOKKEEPERS, CASHIERS, AND RELATED WORKERS		54			
3310 Bookkeepers and Cashiers			54		
3311 Cashier (incl. Office Cashier, Head Cashier)				58	93
3313 Bank Teller, Cashier, Post Office Clerk (incl. Cash Register Operator)				47	128
3315 Ticket Seller				46	37
3319 Bookkeepers n.f.s. (incl. General Bookkeeper, Accounting Technician, Accounting Clerk, General Business Assistant)				56	487

3390 Bookkeepers, Cashiers and Related Workers n.e.c. (incl. Bill Collector, Finance Clerk, Wage Clerk, Calculator)			44		52
3400 COMPUTING MACHINE OPERATORS		51			
3410 Bookkeeping Machine Operators (incl. Office Machine Operator)			50		94
3420 Automatic Data-Processing Machine Operators (incl. Computor Operator, Data Equipment Operator)			54		30
3500 TRANSPORT AND COMMUNICATIONS SUPERVISORS		49			
3510 Railway Station Masters			56		j
3520 Postmasters			56		38
3590 Transport and Communications Supervisors n.e.c. (incl. Traffic Inspector, Dispatcher, Expeditor, Air Traffic Controller)			48		199
3600 TRANSPORT CONDUCTORS (incl. Railroad Conductor, Bus Conductor, Streetcar Conductor, Fare Collector)		37			131
3700 MAIL DISTRIBUTION CLERKS		36			
3701 Office Boy, Messenger				34	67
3709 Mail Distribution Clerk (incl. Mail Carrier, Postman, Mail Sorter, Postal Clerk)				37	322
3800 TELEPHONE AND TELEGRAPH OPERATORS		43			
3801 Telegraph Operator[35] (incl. Radio Operator, Telegraphist)				63	72
3809 Telephone Operator				43	26
3900 CLERICAL AND RELATED WORKERS N.E.C.		48			
3910 Stock Clerks			35		668
3920 Material and Production Planning Clerks (incl. Planning Clerk)			45		45
3930 Correspondence and Reporting Clerks (incl. Office Clerk, Personnel Clerk, Specialized Clerk, Government Office Clerk, Law Clerk, Insurance Clerk, Middle Level Clerk (NET))			58		1122
3940 Receptionists and Travel Agency Clerks (incl. Doctor's or Dentist's Receptionist)			51		68
3950 Library and Filing Clerks (incl. Library Assistant, Archival Clerk)			51		j
3990 Clerks n.e.c. (incl. Proofreader, Meter Reader, Xerox Machine Operator, Lower Level Clerk (NET))			45		1400
4000 SALES WORKERS	51				
4000 MANAGERS, WHOLESALE AND RETAIL TRADE		54			3101
4100 WORKING PROPRIETORS, WHOLESALE AND RETAIL TRADE		53			
4101 Large Shop Owner[36]				64	350

APPENDIX B—*Continued*

	Major group	Minor group	Unit group	Title	*N*
4103 Automobile Dealer (incl. Garage Operator (ENG))				52	20
4106 Wholesale Distributor (incl. Merchant, Broker n.e.c.)				60	308
4109 Small Shop Keeper, Shop Keeper n.f.s.				47	952
4200 SALES SUPERVISORS AND BUYERS		54			
4210 Sales Supervisors (incl. Sales Manager, Manager Shop Department)			57		233
4220 Buyers (incl. Agricultural Buyer, Purchasing Agent)			52		305
4300 TECHNICAL SALESMEN, COMMERCIAL TRAVELLERS, AND MANUFACTURERS' AGENTS		58			
4310 Technical Salesmen and Service Advisors (incl. Sales Engineer)			55		51
4320 Commercial Travellers and Manufacturers Agents (incl. Travelling Salesmen)			58		543
4400 INSURANCE, REAL ESTATE, SECURITIES AND BUSINESS SERVICES SALESMEN, AND AUCTIONEERS		59			
4410 Insurance, Real Estate and Securities Salesmen			59		
4411 Real Estate Agent, Insurance Agent				61	166
4412 Stock Broker				64	26
4419 Insurance, Real Estate and Securities Salesmen n.f.s.				58	415
4420 Business Services Salesmen (incl. Advertising Salesman, Sales Promotor)			60		41
4430 Auctioneers (incl. Insurance Claims Investor, Appraiser)			56		42
4500 SALESMEN, SHOP ASSISTANTS, AND RELATED WORKERS		42			
4510 Salesmen, Shop Assistants and Demonstrators			45		
4512 Gas Station Attendant (incl. Parking Attendant)				17	80
4514 Sales Demonstrator (incl. Fashion Model)				41	30
4519 Shop Assistant n.f.s. (incl. Sales Clerk)				46	1648
4520 Street Vendors, Canvassers and Newsvendors (incl. Peddler, Routeman, Newspaper Seller, Roundsman, Deliveryman, Stall Owner, Huckster, Lottery Vendor, Market Trader, Telephone Solicitor)			35		642
4900 SALES WORKERS N.E.C. (incl. Refreshment Seller, Pawn Broker, Money Lender)		35			j

5000 SERVICE WORKERS	38				
5000 MANAGERS, CATERING AND LODGING SERVICES (incl. Bar Manager, Hotel Manager, Apartment Manager, Canteen Manager, Ship's Purser)		41			53
5100 WORKING PROPRIETORS, CATERING AND LODGING SERVICES		48			
5101 Working Proprietor, Catering-Lodging n.f.s. (incl. Publican (ENG), Lunch-room Operator, Coffeeshop Operator, Hotel Operator)				48	87
5109 Restaurant Owner (incl. Restaurateur)				49	32
5200 HOUSEKEEPING AND RELATED SERVICE SUPERVISORS (incl. House-keeper, Ship Steward, Butler)		33			42
5300 COOKS, WAITERS, BARTENDERS, AND RELATED WORKERS		29			
5310 Cooks			27		
5311 Cooks n.f.s. (incl. Master Cook)				30	267
5312 Cook's Helper (incl. Kitchen Hand)				10	45
5320 Waiters, Bartenders, and Related Workers			30		
5321 Bartender (incl. Soda Fountain Clerk, Canteen Assistant)				28	119
5329 Waiter (incl. Head Waiter, Wine Waiter)				32	144
5400 MAIDS AND RELATED HOUSEKEEPING SERVICE WORKERS N.E.C. (incl. Maid, Nursemaid, Chambermaid, Hotel Concierge, Domestic Servant, Com-panion)		24			81
5500 BUILDING CARETAKERS, CHARWORKERS, CLEANERS, AND RELATED WORKERS		25			
5510 Building Caretakers (incl. Janitor, Concierge Apartment House, Sexton, Verger)			26		722
5520 Charworkers, Cleaners, and Related Workers (incl. Charworker, Office Cleaner, Window Washer, Chimney Sweep)			22		109
5600 LAUNDERERS, DRY-CLEANERS, AND PRESSERS (incl. Clothes Washer)		24			72
5700 HAIRDRESSERS, BARBERS, BEAUTICIANS, AND RELATED WORKERS (incl. Bathhouse Attendant, Manicurist, Make-Up Man)		32			178
5800 PROTECTIVE SERVICE WORKERS		48			
5810 Fire-Fighters (incl. Fireman, Fire Brigade Officer)			44		163
5820 Policemen and Detectives			54		
5821 Police Officer (incl. High Police Official)				75	32
5829 Policeman n.f.s. (incl. Policeman, Police Agent, Constable, Police Officer[37])				53	558
5830 Members of the Armed Forces			60		

APPENDIX B—*Continued*

	Major group	Minor group	Unit group	Title	*N*
5831 Armed Forces Officer				83	28
5832 Non-Commissioned Officer (incl. Army Personnel n.f.s., Soldier n.f.s., Member Self Defence Force (JAP))				58	383
5890 Protective Service Workers n.e.c. (incl. Watchman, Guard, Prison Guard, Bailiff, Museum Guard)			35		599
5900 SERVICE WORKERS N.E.C.		40			
5910 Guides			39		j
5920 Undertakers and Embalmers (incl. Funeral Director)			58		24
5990 Other Service Workers			39		
5991 Other Service Workers n.e.c. (incl. Entertainment Attendant, Usher, Croupier, Bookmaker)				44	285
5992 Elevator Operator and Related Workers (incl. Hotel Bell Boy, Doorkeeper, Bell Captain, Shoeshiner)				37	62
5996 Airline Stewardess				44	j
5999 Medical Attendant (incl. Hospital Orderly)				28	109
6000 AGRICULTURAL, ANIMAL HUSBANDRY AND FORESTRY WORKERS, FISHERMEN AND HUNTERS	25				
6000 FARM MANAGERS AND SUPERVISORS		46			
6001 Farm Foreman				32	14
6009 Farm Manager n.f.s.				49	88
6100 FARMERS		26			
6110 General Farmers			26		
6111 Large Farmer[38]				49	j
6112 Small Farmer[39]				18	57
6113 Tenant Farmer (incl. Share Cropper, Collective Farmer)				27	1303
6119 General Farmer n.e.c., Farmer n.f.s.				26	7755
6120 Specialized Farmers (incl. Crop Farmer, Fruit Farmer, Livestock Farmer, Nursery Farmer, Wheat Farmer, Vegetable Grower, Sugarcane Grower, Poultry Farmer, Pig Farmer, Dairy Farmer, Bulbgrower, Mushroom Grower)			29		851

6200 AGRICULTURAL AND ANIMAL HUSBANDRY WORKERS		17			
6210 General Farm Workers (incl. Farm Hand, Migrant Worker, Family Farm Worker)			16		1959
6220 Field Crop and Vegetable Farm Workers (incl. Hoeman (BRA))			16		747
6230 Orchard, Vineyard and Related Tree and Shrub Crop Workers (incl. Palmwine Harvester, Fruit Farm Worker, Rubber Tapper)			16		j
6240 Livestock Workers			20		275
6250 Dairy Farm Workers (incl. Milker)			20		j
6260 Poultry Farm Workers			20		j
6270 Nursery Workers and Gardeners			21		266
6280 Farm Machine Operators (incl. Tractor Driver)			28		250
6290 Agricultural and Animal Husbandry Workers n.e.c. (incl. Apiary Worker, Groundsman, Picker, Gatherer)			10		23
6300 FORESTRY WORKERS		25			
6310 Loggers (incl. Lumberjack, Treefeller, Timber Cutter, Raftsman)			19		108
6320 Forestry Workers (Except Logging) (incl. Forester, Tree Surgeon, Timber Cruiser)			32		119
6400 FISHERMEN, HUNTERS AND RELATED WORKERS		30			
6410 Fishermen (incl. Deep Sea Fisherman, Inland and Coastal Water Fisherman)			30		521
6490 Fishermen, Hunters and Related Workers n.e.c. (incl. Whaler, Hunter, Oyster-farm Worker, Trapper)			32		124
7/8/9000 PRODUCTION AND RELATED WORKERS, TRANSPORT EQUIPMENT OPERATORS AND LABORERS	34				
7000 PRODUCTION SUPERVISORS AND GENERAL FOREMEN (incl. Strawboss)		44			1049
7100 MINERS, QUARRYMEN, WELL DRILLERS, AND RELATED WORKERS		32			
7110 Miners and Quarrymen			32		
7112 Quarry Worker				29	32
7119 Miner n.f.s. (incl. Prospector, Blaster, Shot-Firer)				32	387
7120 Mineral and Stone Treaters (incl. Sand-Gravel Worker, Stonecutter)			26		j
7130 Well Drillers, Borers and Related Workers (incl. Oil Field Worker, Artesian Well Driller, Gas Well Sounder)			31		j
7200 METAL PROCESSERS		34			
7210 Metal Smelting, Converting and Refining Furnacemen (incl. Metal Foundry Worker, Oventender Metal)			34		77

APPENDIX B—*Continued*

	Major group	Minor group	Unit group	Title	*N*
7220 Metal Rolling-Mill Operators			31		60
7230 Metal Melters and Reheaters			31		j
7240 Metal Casters			31		j
7250 Metal Moulders and Coremakers			34		69
7260 Metal Annealers, Temperers and Case-Hardeners			34		30
7270 Metal Drawers and Extruders (incl. Wiredrawer, Pipe and Tube Drawer)			34		j
7280 Metal Platers and Coaters (incl. Galvanizer, Electroplater, Hot-Dip Plater)			34		36
7290 Metal Processers n.e.c. (incl. Steel Mill Worker n.f.s., Casting Finisher, Metal Cleaner)			37		72
7300 WOOD PREPARATION WORKERS AND PAPER MAKERS		26			
7310 Wood Treaters (incl. Wood Worker n.e.c.)			24		j
7320 Sawyers, Plywood Makers and Related Wood-Processing Workers (incl. Veneermaker, Saw Mill Worker, Lumber Grader)			24		182
7330 Paper Pulp Preparers			36		j
7340 Paper Makers (incl. Paper Miller)			36		32
7400 CHEMICAL PROCESSORS AND RELATED WORKERS		36			
7410 Crushers, Grinders, and Mixers			36		21
7420 Cookers, Roasters, and Related Heat-Treaters			36		j
7430 Filter and Separator Operators			36		j
7440 Still and Reactor Workers			36		j
7450 Petroleum Refining Workers			36		j
7490 Chemical Processors and Related Workers n.e.c. (incl. Chemical Worker)			36		173
7500 SPINNERS, WEAVERS, KNITTERS, DYERS, AND RELATED WORKERS		34			
7510 Fiber Preparers			35		j
7520 Spinners and Winders (incl. Thread Twister, Reeler)			35		50
7530 Weaving- and Knitting-Machine Setters and Pattern-Card Preparers (incl. Machine Loom Operator)			30		23
7540 Weavers and Related Workers (incl. Cloth Grader, Tapestry Maker, Hand Weaver, Carpet Weaver, Net Maker)			34		100

7550 Knitters (incl. Knitting Machine Operator)		31	22
7560 Bleachers, Dyers, and Textile Product Finishers		31	49
7590 Spinners, Weavers, Knitters, Dyers, and Related Workers n.e.c. (incl. Textile Mill Worker)		37	90
7600 TANNERS, FELLMONGERS, AND PELT DRESSERS	32		
7610 Tanners and Fellmongers		32	15
7620 Pelt Dressers		32	j
7700 FOOD AND BEVERAGE PROCESSERS	32		
7710 Grain Millers and Related Workers (incl. Grain Polisher, Spice Miller, Rice Miller)		22	48
7720 Sugar Processers and Refiners (incl. Sugar Boiler)		22	j
7730 Butchers and Meat Preparers (incl. Packing House Butcher, Jerkymaker, Slaughterer, Sausage Maker)		32	222
7740 Food Preservers (incl. Cannery Worker, Meat and Fish Smoker)		28	35
7750 Dairy Product Processers (incl. Butter-Cheese Maker, Ice-Cream Maker)		33	j
7760 Bakers, Pastrycooks, and Confectionary Makers (incl. Candymaker, Macaroni Maker, Chocolate Maker)		33	201
7770 Tea, Coffee, and Cocoa Preparers		33	j
7780 Brewers, Wine, and Beverage Makers		33	j
7790 Food and Beverage Processers n.e.c. (incl. Fish Butcher, Noodle Maker, Tofu Maker (JAP), Vegetable Oil Maker)		36	158
7800 TOBACCO PREPARERS AND TOBACCO PRODUCT MAKERS	37		
7810 Tobacco Preparers		37	j
7820 Cigar Makers		37	j
7830 Cigarette Makers		37	j
7890 Tobacco Preparers and Tobacco Product Makers n.e.c (incl. Tobacco Factory Worker)		37	33
7900 TAILORS, DRESSMAKERS, SEWERS, UPHOLSTERERS, AND RELATED WORKERS	40		
7910 Tailors and Dressmakers		46	216
7920 Fur Tailors and Related Workers		43	j
7930 Milliners and Hat Makers		43	j
7940 Patternmakers and Cutters (incl. Garment Cutter, Glove Maker)		43	21

APPENDIX B—*Continued*

	Major group	Minor group	Unit group	Title	*N*
7950 Sewers and Embroiderers (incl. Sewing Machine Operator, Seamstress)			23		32
7960 Upholsterers and Related Workers (incl. Vehicle Upholsterer, Mattress Maker)			30		55
7990 Tailors, Dressmakers, Sewers, Upholsterers, and Related Workers n.e.c. (incl. Apparel Maker, Textile Products Assembler)			37		40
8000 SHOEMAKERS AND LEATHER GOODS MAKERS		33			
8010 Shoemakers and Shoe Repairers (incl. Footwear Maker, Bootmaker)			33		112
8020 Shoe Cutters, Lasters, Sewers, and Related Workers (incl. Shoe Factory Worker)			32		62
8030 Leather Goods Workers (incl. Saddle and Harness Maker, Leather Worker n.e.c.)			32		j
8100 CABINETMAKERS AND RELATED WOODWORKERS		35			
8110 Cabinetmakers (incl. Furniture Maker)			36		311
8120 Woodworking Machine Operators			32		j
8190 Cabinetmakers and Related Woodworkers n.e.c. (incl. Cooper, Wood Vehicle Builder, Woodcarver, Veneer Applier, Furniture Finisher, Smoking-Pipe Maker, Boat Builder)			32		99
8200 STONE CUTTERS AND CARVERS (incl. Tombstone Carver, Stonecutter, Stone Polisher, Marble Worker, Stone Grader)		29			45
8300 BLACKSMITHS, TOOLMAKERS, AND MACHINE-TOOL OPERATORS		40			
8310 Blacksmiths, Hammersmiths, and Forging-Press Operators			37		
8311 Forging Press Operator (incl. Stamping Machine Operator)				34	122
8319 Blacksmith, Smith n.f.s.				45	47
8320 Toolmakers, Metal Patternmakers, and Metal Markers			41		
8321 Metal Patternmaker				44	35
8329 Tool and Die Maker n.f.s.				41	268
8330 Machine-Tool Setter-Operators			36		
8331 Turner n.f.s.				39	147
8339 Machine Tool Setter n.f.s.				35	253
8340 Machine Tool Operators			39		295
8350 Metal Grinders, Polishers, and Tool Sharpeners (incl. Polishing Machine Operator, Filer)			28		86

8390 Blacksmiths, Toolmakers, and Machine-Tool Operators n.e.c. (incl. Locksmith)		43		668
8400 MACHINERY FITTERS, MACHINE ASSEMBLERS, AND PRECISION INSTRUMENT MAKERS (EXCEPT ELECTRICAL)	35			
8410 Machinery Fitters and Machine Assemblers (incl. Aircraft Assembler, Millwright, Engine Fitter)		36		1024
8420 Watch, Clock, and Precision Instrument Makers (incl. Dental Mechanic, Instrument Maker, Fine Fitter)		39		88
8430 Motor Vehicle Mechanics (incl. Auto Repairman)		31		799
8440 Aircraft Engine Mechanics		44		76
8490 Machinery Fitters, Machine Assemblers, and Precision Instrument Makers (except Electrical) n.e.c.		36		
8491 Machinery Fitter n.e.c., n.f.s. (incl. Unskilled Garage Worker, Oiler, Greaser, Lubricator, Bicycle Repairman, Mechanic's Helper)			26	55
8493 Assembly Line Worker, Metal Products (incl. Automobile Assembler, Bicycle Assembler)			28	203
8499 Mechanic, Repairman n.e.c. (incl. Rail Equipment Mechanic, Business Machine Repairer, General Repairman)			37	1508
8500 ELECTRICAL FITTERS AND RELATED ELECTRICAL AND ELECTRONICS WORKERS	41			
8510 Electrical Fitters		39		201
8520 Electronics Fitters		41		77
8530 Electrical and Electronic Equipment Assemblers (incl. Radio-TV Assembler)		40		101
8540 Radio and Television Repairmen		43		113
8550 Electrical Wiremen (incl. General Electrician, Electric Installer, Electric Repairman)		40		725
8560 Telephone and Telegraph Installers		43		125
8570 Electric Lineman and Cable Joiners (incl. Power Lineman)		41		287
8590 Electrical Fitters and Related Electrical and Electronics Workers n.e.c.		46		40
8600 BROADCASTING STATION AND SOUND EQUIPMENT OPERATORS AND CINEMA PROJECTIONISTS	46			
8610 Broadcasting Station Operators		46		j
8620 Sound Equipment Operators and Cinema Projectionists		46		j
8700 PLUMBERS, WELDERS, SHEET METAL AND STRUCTURAL METAL PREPARERS AND ERECTORS	35			
8710 Plumbers and Pipe Fitters (incl. Gas Fitter, Heating Fitter)		36		531

APPENDIX B—*Continued*

	Major group	Minor group	Unit group	Title	*N*
8720 Welders and Flame Cutters (incl. Solderer)			33		565
8730 Sheet Metal Workers			36		
8731 Copper-Tin Smith				32	128
8732 Boilermaker				37	30
8733 Vehicle Body Builder, Auto Body Worker				41	46
8739 Sheet Metal Worker n.f.s				37	128
8740 Structural Metal Preparers and Erectors (incl. Structural Steel Worker, Shipwright, Riveter)			33		129
8800 JEWELRY AND PRECIOUS METAL WORKERS (incl. Goldsmith, Silversmith, Diamond Worker, Jewel Engraver, Gem Cutter)		43			47
8900 GLASS FORMERS, POTTERS, AND RELATED WORKERS		29			
8910 Glass Formers, Cutters, Grinders, and Finishers (incl. Lens Grinder, Glass Blower)			33		75
8920 Potters and Related Clay and Abrasive Formers (incl. Ceramic Former, Ceramist, Porcelain Former)			27		61
8930 Glass and Ceramics Kilnmen			25		j
8940 Glass Engravers and Etchers			25		j
8950 Glass and Ceramics Painters and Decorators (incl. Mirror Silverer)			25		j
8990 Glass Formers, Potters, and Related Workers n.e.c. (incl. Concrete Product Maker, Brick Maker)			25		63
9000 RUBBER AND PLASTICS PRODUCTS MAKERS		33			
9010 Rubber and Plastic Product Makers (except Tire Makers and Tire Vulcanizers)			33		185
9020 Tire Makers and Vulcanizers			33		j
9100 PAPER AND PAPERBOARD PRODUCTS MAKERS		34			51
9200 PRINTERS AND RELATED WORKERS		42			
9210 Compositors and Typesetters (incl. Printer n.f.s., Lineotypist)			41		173
9220 Printing Pressmen (incl. Worker in Print Factory)			41		99
9230 Stereotypers and Electrotypers			43		j
9240 Printing Engravers (Except Photoengraver)			43		j
9250 Photoengravers			43		j

9260 Bookbinders		39		29
9270 Photographic Darkroom Workers (incl. Photograph Developer)		43		60
9290 Printers and Related Workers n.e.c. (incl. Textile Printer)		46		80
9300 PAINTERS	32			
9310 Painters, Construction (incl. Building Painter)		32		561
9390 Painters n.e.c. (incl. Automobile Painter, Spray Painter, Sign Painter)		30		167
9400 PRODUCTION AND RELATED WORKERS N.E.C.	29			
9410 Musical Instrument Makers and Tuners		29		j
9420 Basketry Weaver and Brush Makers (incl. Bamboo Product Maker, Broom-maker)		29		j
9430 Non-Metallic Mineral Product Makers (incl. Cement Product Maker)		29		j
9490 Other Production and Related Workers		29		
9491 Other Production and Related Workers n.f.s. (incl. Taxidermist, Toymaker, Linoleummaker, Candle Maker, Ivory Carver, Charcoal Burner[40])			29	95
9499 Quality Inspector[41]			39	333
9500 BRICKLAYERS, CARPENTERS, AND OTHER CONSTRUCTION WORKERS	32			
9510 Bricklayers, Stonemasons, and Tile Setters (incl. Mason, Marble Setter, Mosaic Setter and Cutter, Paver)		32		1282
9520 Reinforced Concreters, Cement Finishers, and Terrazzo Workers		29		147
9530 Roofers (incl. Slater)		22		50
9540 Carpenters, Joiners, and Parquetry Workers		31		1136
9550 Plasterers (incl. Stucco Mason)		33		112
9560 Insulators		36		110
9570 Glaziers		30		32
9590 Construction Workers n.e.c.		31		
9594 Construction Worker n.e.c. (incl. Demolition Worker, Paperhanger, Scaffolder, Well Digger, Underwater Worker, Tatami Installer (JAP))			39	842
9595 Unskilled Construction Worker n.f.s. (incl. Construction Laborer, Hodcarrier)			24	492
9600 STATIONARY ENGINE AND RELATED EQUIPMENT OPERATORS	33			
9610 Power-Generating Machine Operators (incl. Electric Power Plant Operator, Power-Reactor Operator, Turbine Operator)		34		44
9690 Stationary Engine and Related Equipment Operators n.e.c. (incl. Stationary Engineer, Boiler-Fireman, Water Treatment Plant Operator, Pump Machinist, Sewage Plant Operator)		33		311

APPENDIX B—*Continued*

	Major group	Minor group	Unit group	Title	*N*
9700 MATERIAL-HANDLING AND RELATED EQUIPMENT OPERATORS, DOCKERS AND FREIGHT HANDLERS		31			
9710 Docker and Freight Handlers			31		
9711 Warehouseman 9713 Porter (incl. Railway Porter, Airport Porter)				32	434
9713 Porter (incl. Railway Porter, Airport Porter)				21	68
9714 Packer, Labeler (incl. Wrappers)				27	173
9719 Docker, Longshoreman, Stevedore				34	468
9720 Riggers and Cable Splicers			28		j
9730 Crane and Hoist Operators (incl. Drawbridge Tender)			29		310
9740 Earth-Moving and Related Machinery Operators (incl. Road Machine Operator, Dredge Operator, Paving Machine Operator)			30		358
9790 Material-Handling Equipment Operators n.e.c. (incl. Forklift Operator)			30		51
9800 TRANSPORT EQUIPMENT OPERATORS		36			
9810 Ships' Deck Ratings, Barge Crews and Boatmen (incl. Able Seaman, Sailor, Boatman, Deck Hand, Boatswain)			36		60
9820 Ship's Engine Room Ratings (incl. Ship's Engine Room Hand, Oiler, Greaser)			36		j
9830 Railway Engine Drivers and Fireman (incl. Train Moterman in Mine)			45		88
9840 Railway Brakemen, Signalmen, and Shunters (incl. Railway Switchman)			35		109
9850 Motor Vehicle Drivers			37		
9851 Bus, Tram Driver (incl. Subway Driver)				33	184
9852 Truck Driver (incl. Driver n.f.s.)				37	3440
9854 Truck Driver's Helper				18	21
9859 Car Driver, Taxi Driver (incl. Jeepney Driver (PHI))				33	101
9860 Animal and Animal-Drawn Vehicle Drivers (incl. Wagoneer)			20		54
9890 Transport Equipment Operators n.e.c. (incl. Pedal-Vehicle Driver, Railway Crossing Guard, Lock Operator (Canal and Port), Lighthouse Man)			35		101
9900 MANUAL WORKERS N.E.C.[42]		25			
9950 Skilled Worker n.e.c. (incl. Craftsman n.f.s., Independent Artisan)			43		134
9970 Semi-Skilled Workers n.e.c. (incl. Factory Worker n.f.s., Production Work Apprentice)			28		1922

9990 Laborers n.e.c.	23		
9991 Unskilled Factory Worker		24	192
9994 Railway Track Worker		28	60
9995 Street Sweeper, Garbage Collector		26	53
9997 Road Construction Worker n.e.c.		28	47
9999 Laborer n.e.c. (incl. Contract Laborer, Itinerant Worker)		22	2127

[26] The classification for Major Groups (first digit), Minor Groups (first two digits), and Unit Groups (first three digits) conforms to the ISCO classification (ILO, 1968), with some exceptions noted below. The selected Titles (four digits) are added, based on Treiman (1977, Appendix A), however with some alteration of the numbering. Illustrative titles in parentheses are taken from the originating survey classifications and ISCO documentation (ILO, 1968). The following abbreviations are used: incl., includes among others the following jobtitles; n.f.s., not further specified (for generic categories); n.e.c., not elsewhere classified. A total of 271 groups has been distinguished for estimating the ISEI scores at the levels of Unit Group and Title. These are denoted by the associated number of cases in column *N*. When a score for a Unit Group has been derived by joining it with a neighboring similar group, this has been denoted with a "j" in column *N*. ISEI scores for Minor and Major Groups have been derived by averaging over Unit Groups, weighting by the individuals in the aggregated categories.

[27] Note that the Minor Group title 'Architects and Engineers' excludes 'Related Technicians.' These are now in Minor Group 0300.

[28] The Minor Groups 0300 (Engineering Technicians) does not occur in ISCO and has been added.

[29] Note that the title of Minor Group 0600 (Medical, Dental, and Veterinary Professionals) has been changed to exclude Minor Group 0700 (Assisting Medical Professionals and Related Workers).

[30] The Minor Group 0700 (Assistant Medical Professionals and Related Workers) does not occur in ISCO. It contains assistant medical professionals that ISCO includes in the 0600–0700 range.

[31] Unit Group 0780 (Medical Practice Assistants) does not occur in ISCO and has been added.

[32] Unit Group 1960 (Professionals n.f.s.) was added for generic designations that cover a large number of different groups in ISCO 0100–1900.

[33] Excepted from 2100 (Managers) are Managers and Proprietors in Retail and Wholesale, Catering and Lodging Services, and Farming.

[34] Unit Group 2110 includes managers with over 10 subordinates or other indication of high authority (indications like 'senior' etc.).

[35] Radiotelegraphers are omitted for derivation of the score for Minor Group 3808 (Telephone and Telegraph Operators).

[36] Title 4101 (Large Shopowners) includes shops-owners with 10 subordinates or more, or another indication of large shop size.

[37] It is to be noted that 'police officer' is sometimes understood to be equivalent with 'high police official,' and sometimes with 'policeman.'

[38] Title 6111 (Large Farmer) includes farmers with 10 subordinates or more, or other indication of large farm size.

[39] Title 6112 includes only Small Farmers explicitly distinct from General Farmers (6119).

[40] Charcoal Burner was reclassified from Unit Group 7490 (Chemical Processors and Related Workers) into Unit Group 9490 (Other Production and Related Workers n.e.c.).

[41] Title 9499 (Quality Checker) is omitted for calculation of Unit Group score.

[42] The Unit Groups in Minor Group 9990 (Laborers n.e.c.) do not appear in ISCO and have been added, following Treiman (1977).

APPENDIX C

An Alternating Least Squares Algorithm to Minimize a Direct Effect in a Path Model

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Let us start by considering the saturated path model, as defined by Fig. 1, on the variables (A,E,O,I) = Age, Education, Occupation, Income).

$$\begin{aligned} I &= \beta_{41}A + \beta_{42}E + \beta_{43}O + \Delta_4 \\ O &= \beta_{31}A + \beta_{32}E + \Delta_3 \\ E &= \beta_{21}A + \Delta_2. \end{aligned}$$

We assume that the variables (A,E,I) are standardized, in the sense that they have mean zero and sum of squares equal to one. We do not know the values of the variable O; these are the unknowns of our optimal scaling problem.

Different numerical values assigned to the categories of O will change the correlations between O and the other variables, as well as the path coefficients and residual variances. There are many ways in which we can choose an aspect of the correlation matrix to maximize over the choice of quantifications for O. In PATHALS, discussed briefly by Gifi (1990), and more extensively in de Leeuw (1987), the quantifications are chosen in such a way that the total residual sum of squares is minimized. In the present analysis, we want to make the direct effect of E on I small, while making the indirect effect large. This can be formalized in several different ways. We have chosen to minimize the total residual sum of squares σ_N in a non-saturated path model in which the path corresponding to β_{42} is left out.

The total residual sum of squares of the non-saturated model without β_{42} is

$$\begin{aligned} \sigma_N = & \|I - (\beta_{41}A + \beta_{43}O)\|^2 + \\ & + \|O - (\beta_{31}A + \beta_{32}E)\|^2 + \\ & + \|E - (\beta_{21}A)\|^2. \end{aligned}$$

This quantity is minimized by using an *alternating least squares* algorithm. Start with initial estimates of the quantifications of O, with them as $\gamma^{(0)}$. Thus $O^{(0)} = H\gamma^{(0)}$, where H is the *dummy* corresponding with O. We choose $\gamma^{(0)}$ in such a way that $O^{(0)}$ is standardized, otherwise it is essentially arbitrary.

In the first step of the alternating least squares algorithm we compute the path coefficients by minimizing σ_N over the β_{st} for the current $O^{(0)}$.

This simply means carrying out the three regressions that define the path model: the regression of I on A and $O^{(0)}$, the regression of $O^{(0)}$ on A and E, and the regression of E on A. Collect the resulting five path coefficients in the vector $\beta^{(0)}$.

In the second step, we update our current estimate of O by minimizing σ_N over γ with β fixed at its current value $\beta^{(0)}$. The Optimal O is proportional to

$$z^{(0)} = H(H'H)^{-1}H' \, [\beta_{43}^{(0)} (I - \beta_{41}^{(0)}A) + \beta_{32}^{(0)} E + \beta_{31}^{(0)}A].$$

We find $O^{(1)}$ by normalizing $z^{(0)}$.

It follows from the general theory of alternating least squares (de Leeuw, Young, and Takane, 1976) that an algorithm that alternates these two steps iteratively will converge to a stationary value of the loss function σ_N, which implies that β_{42} will stabilize at some value.

The result is not strictly identical to minimizing the direct effect β_{42}, or to maximizing the indirect effect $\beta_{43}\beta_{32}$. In fact, it can be shown that

$$\sigma_n = \min_{\beta_{42}} \sigma_S + \hat{\beta}_{42}^2,$$

where $\hat{\beta}_{42}$ is the usual least squares estimate, and σ_S is the residual sum of squares of the saturated path model that includes β_{42}. Minimizing σ_N is thus strongly related to minimizing $\hat{\beta}_{42}$, but it is not identical. Choosing a different criterion would generally lead to a different solution for the quantifications of O, for the path coefficients, and for the residual sums of squares. However, it has been shown, by de Leeuw (1989), that under fairly general conditions the solutions will not be widely different.

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The burgers in this recipe, stuffed with cheese and a bit of butter, are moist and flavorful and, best of all, hold together and flip easily. SARAH COPELAND

ROMULO YANES FOR THE NEW YORK TIMES. FOOD STYLING: VIVIAN LUI.

TIME: 25 MINUTES
YIELD: 4 SERVINGS

- **1¼ pounds lean ground turkey**
- **1 teaspoon kosher salt**
- **½ teaspoon black pepper**
- **1 teaspoon dried parsley**
- **1 egg, lightly beaten**
- **1 tablespoon milk**
- **2 tablespoons unsalted butter, plus more for cooking**
- **5 (1-ounce) slices sharp Cheddar or horseradish Cheddar**
- **4 Hawaiian hamburger buns**
- **1 to 2 firm-ripe avocado, thinly sliced**
- **Mayonnaise or other burger toppings (pickles, lettuce, tomato, mustard), to taste**

1. Combine the turkey, salt, pepper and parsley in a large bowl and mix with a fork or clean hands to season evenly. Add the egg and milk, and stir to combine.

2. Divide the meat into four portions with damp hands and gently pack into four round patties, about ¾-inch thick. (It will feel very sticky because of the egg, which helps the burgers hold their shape as they cook.) Place burgers on a parchment-lined baking tray or plate. Cut the butter into slices and 1 slice of the cheese into 4 thin squares, about 1 inch across. (The butter and cheese should be the same size.) Press a piece of each into the center of each burger. Shape the meat around it to cover across the top. Refrigerate for 10 minutes while you prepare the griddle.

3. Heat a flat-top griddle or cast-iron skillet over medium-high. Add enough butter to just lightly coat the griddle or pan. Add the burgers to the griddle. Cook until browned and a thermometer inserted into the meat (not the cheese in the center) reaches 165 degrees, about 4 minutes per side. In the final 2 minutes of cooking, add the remaining 4 cheese slices to the burgers, to melt.

4. Remove the burgers from the heat and layer onto the buns with the avocado and any other toppings you desire. Serve warm.

For more recipes, visit NYT Cooking at nytcooking.com.

cheddar-stuffed turkey burger w/ avocado
NYT, date? (>4/26/21)