EDUCATION OBTAINED AND OCCUPATION HELD IN FOUR NATIONS

EDUCATION OBTAINED AND OCCUPATION HELD IN FOUR INDUSTRIAL NATIONS

By

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TABLE OF CONTENTS

APPENDIXES

LIST OF TABLES

ABSTRACT

This dissertation examines the strength of association between education and occupation, and the relative occupational advantages of particular types of education, in four nations. Comparisons of the strength of associaton were intended as a partial test of a hypothesis put forward by Featherman, et al. (1975), that mobility processes in Western societies are essentially alike. Comparisons of the relative standing of particular forms of education were designed to test a series of hypotheses derived from Turner's classic distinction between sponsored and contest mobility. Pairwise comparisons between Canada and the other three nations showed that, on the strength of association between education and occupation, only English males differed significantly from Canadians: for the English education and occupation were less strongly linked. Hypotheses derived from Turner were largely confirmed. University degrees were of higher relative standing in England than in Canada and in Canada than in the United States. A selective secondary school program offered greater advantage over a non-selective program in either England or West Germany than an academic high school program offered over a vocational program in Canada. A literature search has revealed no previous multi-nation comparisons of the strength of association in occupation by

education tables, and no multi-nation test of the hypotheses derived from Turner.

The tests have been made through Goodman's multiplicative Row-Column model, which has not been applied to occupation by education tables in the previously published literature. Standard errors and goodness-of-fit tests were obtained from the stratified multi-stage samples employed through jackknifing, which provides more useful results than those obtained by authors who have treated the stratified multi-stage samples employed in national mobility studies as if they were simple random samples.

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CHAPTER ONE

THEORETICAL BACKGROUND

Overview of the Study

The study reported here examines the relationship between education obtained and occupation held in Canada, England, the Federal Republic of Germany and the United States. It draws its hypotheses from two sources. One is Turner's (1960) classic paper on sponsored and contest mobility. Although his concepts were set forth in 1960, no multi-nation test of their utility in understanding the relationship between education and occupation has yet appeared in the literature. Here his ideas have been used to define hypotheses about the occupational effects of university training, and of particular forms of secondary training, in the four nations. The second source lies in the research tradition of comparative mobility, in which nations have often appeared to be much alike. Featherman *et al*. (1975) suggested that mobility processes in (at least) Western industrial nations are much alike. As a special case, this study tests the hypothesis that the strength of the link between education obtained and occupation held in Canada is similar to the strength of the link in England, the Federal Republic of Germany, and the United

States. While the link between education and occupation has been assessed in numerous comparative studies, this study applies a methodology not previously employed. The study is also distinctive in testing the hypothesis for women as well as men.

Particular interest has been felt in learning about Canada by comparison. While Canada has often been compared to the United States, it has usually been left out of multi-national studies. This study allows it to be placed among three other nations in terms of its degree of sponsorship and contest mobility, and in terms of the strength of association between education and occupation.

The data sets employed have been:

for Canada - the Canadian Mobility Study (1973);

for England - the Oxford Mobility Study (1972);

for West Germany - SUPERFILE, a cumulative file of national samples taken from 1976 to 1984; and

for the U. S. - the NORC General Social Survey cumulative file, from which data from 1975 to 1983 have been used.

Occupational unit groups from the other data sets have been recoded into the categories of the Canadian Mobility Study (Pineo, Porter and McRoberts, 1977). Using this common occupational code, the impact of education on occupation has been examined.

The heart of the study consists of comparisons between Canada and the United States, Canada and England, and Canada and the Federal Rebublic of Germany. They have been carried out using Analysis of Association (ANOAS) models developed by Leo Goodman (1979b), Erling Andersen (1980) and Clifford Clogg (1982a, 1982b). One contribution of the study is its test of the effectiveness of the models used in handling occupation by education tables. A further methodological contribution stems from the use of Fay's (1985) jackknifed X^2 and L^2 tests to obtain meaningful significance levels from multi-stage samples: at the moment of writing, no examples of the use of Fay's tests have appeared in the sociological literature, although unpublished work has employed them. This is also the first research to report standard errors which take account of the complex sample design of the Canadian Mobility Study.

GENERAL THEORETICAL CONTEXT

The relationship between education obtained and occupation held has been a focus of lively sociological debate. Among the diverse theoretical positions which have been espoused, four major streams of thought will be distinguished. The first two offer functionalist and credentialist explanations for the link between education and employment. The third and fourth are culturally based and neo-Marxist explanations for the link between parental social position and the education of their children. While placing scholars within these broad categories blurs what, for some purposes, are important distinctions, this classification will provide a useful basis for reviewing prominent themes in a diverse literature.

Functionalist Approaches

Under the rubric of functionalism quite varied theoretical positions have been advanced (Ciancan, 1968; Davis, 1959; Firth, 1955). Ciancan (1968) distinguishes three major senses of the term. In one sense functionalism has been taken to mean simply the analysis of social phenomena as systems, in which the inter-related constituent parts affect one another. Using the term in this sense, Davis (1959) and Levy (1968) have argued that functional analysis is simply the normal procedure of science, and Fallding (1963) has argued that sociology in general is functionalist. Another form of functional analysis, associated with Radcliffe-Brown (1935), defines a function as the contribution that a part of a social system makes to the maintenance of the whole. All important parts of a social system are expected to be functional, in this sense. Thus a society may be analyzed in terms of the ways in which its component parts buttress each other. A third form of functionalism treats the constituents of a social system as being in homeostatic balance. By analogy with physiological homeostasis, it is held that the social organism, while it does change and develop, is kept in a state of equilibrium by the ways in which constituent parts respond to one another. From this viewpoint, change in one part of a social system may be required to keep the system as a whole in equilibrium. Major structural changes may be viewed as shifts from one state of equilibrium to another (Parsons, 1961). Although numerous writers have adopted functionalism in the first sense, it is sufficiently encompassing that some writers have suggested that it ought not to be referred to by any specialized term (Davis, 1959; Ciancan, 1968). On this view, the term functionalism should be used only for more distinctive approaches.

Distinctively functionalist concepts, from functionalism in the second and third senses, have found their way into theories of the relationship between education and occupation. In their functional theory of stratification Davis and Moore (1945) argue that particular social positions are of greater functional importance than others, in the sense that they make more important contributions to the preservation or survival of society. Talented people must be attracted to functionally important positions, and since talent is scarce and training for important positions may be arduous, societies must build rewards into such positions to ensure the necessary training is taken.

This theory drew vigorous critical response, which has been reviewed by Huaco (1966). One criticism, pursued very vigourously by Huaco, is that it is impossible to define functional importance clearly for a sufficient range of occupations for the theory to be tested. Although some partial efforts have been made, for example by examining changes in the prestige of military personnel during periods of differing international tension (Abrahamson, 1973), such tests focus on the same position at different times, and do nothing to define the importance of the bulk of occupations.

Although the functional importance of positions has not been widely viewed as a satisfactory explanation for why some are more highly regarded or highly rewarded than others, the notion that societal needs may be the explanation for a link between education and occupation has persisted. Particular arrangements have been seen as functional for society, not in the sense that they help to preserve it, but in the broader sense that they are economically adaptive. One set of beliefs as to how education and occupation are linked in modern societies has been referred to as technological functionalism. Clark (1962) held that, since in a complex society with sophisticated technology, advanced education is required to handle many positions, advanced education must be rewarded and that the need for such training has led to the major increase in tertiary education seen in the United States. Related views have been expressed by Bell (1973), Jaffe and Froomkin (1968), and Blau and Duncan (1967), who write

> Technological progress has created a need for advanced knowledge and skills on the part of a large proportion of

> the labor force, not merely a small professional elite. Under these conditions society cannot any longer afford the waste of human resources a rigid class structure entails. Universalistic principles have penetrated deep into the fabric of modern society and given rise to high rates of occupational mobility in response to this need. (p. 431)

Status Attainment

As the status attainment literature, stemming from Blau and Duncan, has been the major source of empirical estimates of the influence of education on occupation, its links with functional theory should be examined closely. Blau and Duncan do not systematically state a theory which corresponds to their model, and some writers have held that status attainment research is atheoretical (Coser, 1975). A sharply divergent view has come from Horan (1978). Horan argues that any approach is theory-laden, and that the Blau-Duncan approach is consistent with, and he believes, based on functionalist notions about the integration of societies. The dependent variable is a measure of the social standing of occupations. It is ultimately based on the ratings given to them in sample surveys. Such ratings are useful because they have been found to be stable over time and across varied population groups (Treiman, 1977). Using such a dependent variable, Horan points out, is entirely consistent with Parsons (1940), who states

> There is, in any given society an actual system of ranking...But this implies in some sense an integrated set of standards according to which the evaluations are or are supposed to be made. (p. 844)

Horan argues further that the nature of the model reflects the affinity between functionalism, with its notions of an integrated society, and neoclassical models of the economic order. To interpret the coefficients of the model it is necessary to assume that the population under study exists in a homogeneous market.

Murphy (1979), writing at about the same time as Horan, also places status attainment research within the functionalist tradition. He points out that attention to the gradual movement of society towards universalism, as reflected in the quotation above, is an indication that Blau and Duncan were working within a framework of social evolution associated with Parsons (1964).[1]

While Horan and Murphy show links between status attainment research and functional theory, it cannot be assumed that any given writer in this research tradition is wed to notions of an essentially integrated society, or to a notion of social change as gradual evolution from one state of equilibrium to another. Kerckhoff, who has done much work in this tradition, argued (Kerckhoff, 1976) that previous work ought to be supplemented by more thorough examination of blocks to attainment, for example those due to race. Later research in status attainment has often compared the experiences of the sexes or of ethnic groups. For illustrations see, for example, Acker (1980), Boyd (1982), Duncan, *et al.* (1972), Featherman and Hauser (1978), and Boyd, *et al.* (1985).

Challenges to the Macrosociological Approach

Whatever their links to functional theory, early status attainment writers, like the functionalist writers considered above, worked at a macrosociological level. With time, suggestions arose that the macrosociological focus was insufficient. One argument has been that more needs to be known about what happens within organizations. There movement from one position to another may be based on sheer seniority, the politics of the firm, demonstrated ability, or simply whether other people move out or retire as well as the basic characteristics dealt with in functional approaches. This view has generated a number of organizational studies, reviewed by Baron (1984). For a strong illustration of the importance of pre-existing vacancies see White (1970).

In a similar way, it has been argued that we need to learn more about how people actually get jobs. Granovetter (1982) reviews a set of studies on this question, which suggest that a key factor is the assistance provided by acquaintances. Thus whether a particular set of qualifications will be translated into a job offer may well depend on whether acquaintances tell a person about openings or suggest that he or she be considered for an opening.

Another line of criticism has been based on a belief that the labour market is segmented. Theories of this kind have been reviewed by Clairmont, _et al._ (1983), who, in the midst of diverse opinion as to how many sectors should be identified, where dividing lines should be placed, and how sectors differ, nonetheless are able to identify common themes among theorists. Among these are the belief that opportunities for advancement are lower in the disadvantaged sector(s) and that internal job ladders and systematic training are more common in the advantaged. Some theorists have also suggested that returns to training will differ across sectors.

As Clairmont, _et al._ point out, segmentation has sometimes been viewed as compatible with the analysis of status attainment. If the equations are made more complex, or additional equations are employed, it is possible to take account of market segmentation. See, for example, Denton (1984). The same can be said, on principle, about many of the effects of organizations. Given appropriate data, it is possible to define status attainment models encompassing the effects of say, working in firms where advancement takes place on the basis of seniority or where minimum qualifications are required for positions but additional qualifications will make no difference, and the like. While the large national data sets often used in status attainment studies do not contain such details, if available they could be used. It should of course be recognized that it may be very difficult, in practice, to disentangle the effects of an individual's characteristics from those of the context in which that individual works (Jencks, 1980). It should also be recognized that the more contextual elements are included the farther the analysis moves from its early linkages to macrosociological functional theory.

The Credentialist Viewpoint

A fundamental challenge to functionalist views has come from writers who have argued that whatever the statistical association between education and occupational standing, it does not exist because of the needs of society in general, or of specific jobs in particular. Berg (1971) refers to several studies, mostly of blue collar workers, in which such criteria as piecework earnings, absenteeism, supervisor's ratings and turnover failed to show any superiority of more educated employees. Collins (1979) refers to studies which suggest that most skills can be learned on the job and that in conditions of technological change companies have been able to retrain their work forces in three months or less.

Having concluded that education was not straightforwardly related to productivity, these writers have tried to explain why there is an association between education and the jobs people obtain. Berg (1971) interviewed managers in eleven companies and was told that more educated employees were more trainable and more promotable. College educated employees were held to show more persistence and poise. Thus beliefs of managers, whether correct or not, created an advantage for better educated workers.

Collins (1979) offers an explanation based on the competition of status groups. He argues that the professions have often insisted on university because "high standards" were seen as good for the profession. Within organizations much of what counts for promotion is political and those with similar tastes and interests, formed through common educational experiences, tend to have affinities. Ethnic groups have attempted to secure or to advance their positions through education.

Two manifestations of the importance of status groups in the U. S. are the wide variety of post-secondary institutions founded by religious bodies, and the desire of communities for their own post-secondary institutions. The presence of so many institutions makes it relatively easy to obtain admission somewhere. Since credentials often assist in personal advancement, status competition leads to increasing numbers with university credentials, and to credential inflation, in which higher and higher credentials are needed to obtain a given type of work. On the belief that credential competition is economically unproductive, Collins argues that it ought to be made illegal to use credentials as a basis for hiring.

Challenges to Credentialist Writers

Challenges to the credentialist approach have largely focussed on the quality of the evidence credentialist writers have presented in support of their case. One line of criticism is possible on the grounds that the evidence for a lack of relationship between education and productivity is weak. Berg (1971) acknowledges that better measures of worker performance than he has presented would be preferable but chooses to work with what is available to him. Unfortunately, it is not easy to define the productivity of individual workers, particularly in situations in which they work in teams, or work in fields in which much of what they hope to achieve is difficult to measure, as for example in teaching. Since this is so, it could be argued, a strong conclusion that education does not affect productivity ought to be based on very sophisticated measurement of productivity, and strong measures should be available for a wide variety of occupations. Such results have not been presented. It is also true that at the weak level of measurement at which it has been necessary to work there are studies which yield different results. See, for example, Wolfle and Smith (1956), Weisbrod and Karpoff (1968) and Wise (1979). More fundamentally, even if the evidence for specific occupations was stronger, it would not imply that differences in education between occupations were unrelated to performance (Grubb, 1971).

In the absence of strong data, assumptions have been made about the qualifications required for particular jobs, and the qualifications of those holding them have been compared to the assumed requirements. Berg (1971) compared the ratings of General Educational Development required for jobs, as estimated by the U. S. Employment Service, to the education incumbents had obtained. Others using this approach have included Burris (1983), Berg, _et al._ (1978), and Rumberger (1981). But GED ratings do not correspond to particular levels of education completed, and as Berg acknowledges, whether the population appears to be more educated than necessary depends on how these categories are translated into years completed.

Other scholars have been able to show that, in the U. S., over the last several decades the educational levels of those found in particular occupations have risen, sometimes rapidly (Clogg and Schockey, 1984; Dresch, 1975; Folger and Nam, 1967; Rodriguez, 1978; Smith, 1986). The difficulty in deciding whether this implies over-education is that to draw conclusions from such data we must make assumptions about the stability of job characteristics within categories, about the stability of what is learned to obtain particular credentials, and about the adequacy of the education held by those in each occupation in the initial years of comparison. Another complexity in the evidence that overeducation has occurred lies in data that suggest that the decline in the relative earnings of college educated Americans, which occurred in the late 1960s and early 1970s, and which was taken as evidence of an oversupply, has been reversed and that their relative earnings have returned to earlier levels (Smith, 1986).

In Canada Harvey and his co-workers (Harvey and Charner, 1975; Harvey and Kalwa, 1983; Harvey, 1984) have presented evidence to suggest that the occupational returns to higher education declined in the late 1960s and early 1970s. Goyder (1980) analyzed cohort differences among respondents to the Canadian Mobility Study as well as data collected by Harvey and found that almost half of the decline in the occupational standing of university graduates in the Harvey data resulted from a decline in the number of years of university completed. The number of years completed accounted for the decrease in occupational standing of the most recent cohort of graduates in the CMS data. Goyder suggested that the low occupational standing of the very most recent graduates resulted in part from a methodological artifact. Those who had graduated most recently were less likely to have completed graduate or professional training than those who had graduated earlier. A further difficulty for the argument that over-education has occurred is found in data presented by Statistics Canada (1987), which has shown that between 1978 and 1984, although the proportion of young workers with degrees and community college diplomas was increasing, the average income of university and community college graduates went up at about the same rate as the average income in the labour force.

Although challenges to credentialist writers have been primarily focussed on the lack of clear supporting evidence, some other criticisms have been pursued. Questions have been raised concerning Collins' analysis of the influence of status groups by Meyer (1980), who points out that nations with little ethnic diversity are apt to develop their educational systems as rapidly as those with much diversity. He also points out that Collins' theories do not explain why status groups should compete through education.

Theories of Social Reproduction

Cultural Theories

A third theoretical approach has treated education as a kind of social transmission belt: education and occupation are linked because education is set up so as to transmit children into positions similar to those of their parents. One group of theorists has held that this occurs because of cultural differences in families of origin. Bernstein (1971) has suggested that working class and middle class children learn different ways of using language. While the working class child learns to use a restricted linguistic code, which tends to be concrete and emotionally expressive, the middle class child learns an elaborated code, which involves much more abstraction; thus, the middle class child has an advantage in the school, which allows him to return to the class position of his parents. Bourdieu and Passeron (1977), drawing partially on Bernstein's work, have theorized that the middle class child brings with him 'cultural capital', including linguistic skills, general knowledge and savoir-faire, which enables him to do better in the school and hence to rise further in the occupational world than the working class child. Those who do not do well in school accept their fate because, on the face of it, the competition appears fair.

A possible objection to Bourdieu and Passeron is that their analysis is essentially static. To this they could reply that they have tried to build a model of how the school conserves the social order, not a total model of all the school's influences. Another objection, raised by Murphy (1979) is that they have ignored factors other than the cultural. For more detailed comment on Bourdieu's theories, the interested reader may wish to consult DiMaggio (1979) or Eichelman (1979).

At a more empirical level, Halsey, et al. (1980) have shown that there is much divergence between the education of parents and of their children. In their Oxford Mobility Study data, the bulk of respondents who had been to grammar or technical schools came from families where the parents had not attended selective schools. Using several other family characteristics to capture more 'cultural capital' they were able to explain little of the variation in school success beyond the point of selection for one type of secondary school or another.

Neo-Marxist Theories

Another form of social reproduction theory is found in the work of the neo-Marxist scholars Bowles and Gintis (1976). Like other neo-Marxist scholars such as Baudelot and Establet (1971) and Escande (1973), these writers hold that under capitalism, a major function of the schools is to reproduce the established class system. To do so, schooling provides different things to children from different origins. According to Bowles and Gintis, the working class child learns discipline and obedience to fit into the world of regimented subordination he will meet at work (although such training may be resisted). The middle class child learns discipline and good working habits, but also to think independently and imaginatively enough to function in management or the professions. Thus the schools provide graduates with the habits and skills required to maintain the social relations of production.

In Bowles and Gintis the psychological means of social reproduction is discussed in some detail. They summarize studies, done in the Boston area, in which personality ratings from teachers were correlated with grades and in which supervisor and peer ratings of personality traits were correlated with supervisors' ratings of job performance. Broadly the same characteristics appeared to be predictive of performance in the two situations.

Three challenges to neo-Marxist analyses should be mentioned. As was the case for Bourdieu and Passeron, it can be pointed out that the analysis takes no account of the quite major imperfections of transmission. Another challenge has arisen when they have spoken of schools as reproducing the class structure in a Marxian sense of the expression. As Treanton (1974) points out in a trenchant critique of Baudelot and Establet (1971), there is much variation in the school success of children within the two major Marxian classes, particularly because children of different occupational groups have quite different levels of success. Thus some more recent neo-Marxist work has used more elaborate models of the class structure (Lindsey, 1981).

This criticism does not apply to Bowles and Gintis, because in their examination of the transmission of social positions they use data from status attainment studies, in which parental position is not measured in Marxist categories. But their psychological theory of how social position is transmitted has proved problematic. Bills (1983) reviews the findings of over 250 studies, done in the U. S. between 1950 and 1979, on the relationship between personality characteristics and success or rewards in school and in work settings. He concludes:

> There are far too many inconsistencies in the evidence to allow us to accept the theory as it stands....Patterns do not always (or even consistently) vary by heirarchical level, as the theory predicts they will....The general impression left by these findings is that there is a great deal of setting to setting variation, even within the various heirarchical levels we have identified...and that

we need to take far more cognizance of the specificity of behavior by situation (Mischel, 1973). (pp. 199-200)

A Summary of Possible Explanations

Perhaps it ought not to be expected that easy agreement would be reached on a topic of such complexity, particularly since strong data to test some of the basic theories are not available. It is perhaps some consolation to note that the debate in economics over the link between education and income shows no more conspicuous unanimity. Dore (1976b) distinguishes ten mechanisms through which the link between education and income might be produced. Rephrased for our purposes, his list includes the following possibilities:

1. Education creates useful knowledge.
2. Education creates abilities and attitudes which increase productivity.
3. Education socializes people to behave as they need to at particular occupational levels. This may be particularly true of elite education, which may create the attitudes necessary for command.
4. Both educational and occupational success result from parental wealth and social connections.
5. Both educational and occupational success are the outcome of personal characteristics which are not the result of education.
6. Educational credentials are used as a screening device by employers.
7. Using credentials is a convenient way of making hiring decisions that appear legitimate.
8. Using education as a criterion is simply an institutionalized way of doing things. It may have been rational once - now it is just how things are done.

9. Education is required because a professional body feels that it is in its self-interest to insist on high standards of education for its members.

10. There is a halo effect. Both the educated and others expect them to perform better.

Some of these items could easily be subdivided, but the the precise number of potential explanations for the link between education and jobs is less important than their sheer diversity. That existing data make it difficult to clarify how much truth is found in each is an indication of how much we have to learn.

Common Themes Among Theorists

While there is wide diversity in the explanations offered for the link between education and occupation, theorists do hold common ground. All take it as established that advanced education increases the likelihood of obtaining higher level positions, although they believe that it does so to different degrees and for different reasons. Functionalist explanations for the link between education and occupation, like both cultural and neo-Marxist explanations for the link between parental occupation and education, treat education and occupation as parts of an integrated system, although writers in these traditions do not take equally sanguine views of the system (Crowder, 1974; Murphy, 1979). The status attainment literature has from its inception been as cognizant of the influence of parents' education and occupation on the occupations on their children as the literature on social reproduction: the most basic model in the status attainment literature, that presented by Blau and Duncan (1967) incorporates such effects. Further, scholars within one tradition have often acknowledged elements from another in their own writing. Berg (1971), though emphasizing the lack of fit between education and job requirements, acknowledges that part of the reason for rising educational qualifications in the United States has been technological advance. In doing so he is expressing a view shared by many economists who have noted that employers may prefer relatively well educated personnel either because of technological requirements or because they believe education is an indicator of such valued traits as self-discipline and trainability (Blaug, 1975). This view may, in fact, be traced back at least to Adam Smith (Davis, 1981).

A further similarity among theorists lies in their concentration on generic aspects of industrial societies. Most theorists of the link between education and occupation have said little about how differing educational structures might vary in their influence (Archer, 1980). See Dore (1976b) for critical comment on lack of attention to international differences.

Although many have agreed that there are elements of truth in more than one theory, sociologists have done little to clarify the circumstances in which the varying theories are helpful. One attempt to do so has been presented by Jones (1985), who distinguishes what he calls technical rationality and employer rationality. In technical rationality, jobs are filled by matching the training of workers and the skill requirements of jobs. Under pure technical rationality, supply and demand for training would be in balance, and employers would hire those with the training they required. The association between education and occupations would be perfect. In employer rationality, employers manipulate the credentials required for jobs in the light of what is available in the labour market, increasing their standards when they can and lowering them when they must. When supply and demand are in balance, and the market functions perfectly, technical and employer rationality coincide.

For Canadian males, Jones was able to show that the association between education and occupation was far lower than would be expected under pure technical rationality, which he suggests is not likely to be realized in contemporary societies. By Deming adjustment of occupation-by-education tables for Canadian males, he showed that altering the supply of workers with particular credentials and the number of jobs in particular categories could sharply alter the correlation between education and occupation. He concluded that technical and employer rationality may operate simultaneously, but the extent of each is subject to skill market conditions.

THEORIES OF SIMILARITY AND DIFFERENCE AMONG NATIONS

Convergence

One reason theorists have concentrated on generic aspects of the influence of education may have been their awareness of studies showing similarities among industrial societies. They will also have been aware of theories which suggest that industrial societies ought to be much alike. In the period around 1960 much attention was given to theories predicting similarities. Kerr *et al.* (1960) suggested that there is something in the nature of industrialization, some "logic of industrialization" that causes nations to become more alike as they industrialize.

At about the same time as the "convergence hypothesis" arose, Lipset and Zetterberg (1959) summarized early work on father-son occupational mobility, in which attention was focussed on mobility between manual and non-manual work, and concluded that industrial societies appeared to be much alike. Six years later Svalastoga (1965) reported that the correlation between a son's occupational standing and his father's was in the neighbourhood of .40 for several nations.

Unfortunately, the theories developed did not state just what range of similarities in mobility processes ought to be expected, and what range of differences, if present, ought to be expected to disappear. Dunning and Hopper (1966) argued that the convergence thesis, as it stood, was not very helpful, since the "logic of industrialization" had not been shown to specify such matters. Goldthorpe (1964) argued that the Soviet Union and Western nations, if they had superficially similar stratification systems, differed fundamentally in that in Western nations the rewards and privileges of occupations depend largely on market forces, whereas in the Soviet Union they depend on the policies of the regime. Miller (1960) pointed out that industrial societies appeared to differ in the extent of long range mobility. An additional cautionary note was sounded by Jones (1969), who argued that Lipset and Zetterberg and Svalastoga had understated the differences among nations.

However, later studies of father-son mobility tables for industrial societies have usually found no or small differences. Featherman _et al._ (1975) found the U. S. and Australia to be alike except for the degree of occupational inheritance among farmers. McRoberts and Selbee (1981) concluded that Canada and the United States differed only slightly. Kerckhoff, _et al._ (1985) found only small differences between England and the United States. Erikson _et al_. (1979) found few clear differences among England, France and Sweden. Later studies by Erikson, _et al_. (1982, 1983), by Hope (1983) and by Breen (1987) showed that the major differences among these three countries were in the margins of the tables. There was, however, a palpable tendency for Sweden to show less occupational inheritance than the others. Hauser, using alternative models, concluded that, while there were statistically significant differences in occupational inheritance, a model involving no differences in levels of inheritance offered a preferable combination of goodness of fit and parsimony. Portocarrero (1983), using the same classification of occupations, but working with females, found no difference between France and Sweden. An exception to the usual finding of strong similarity among nations was reported by Breen and Whelan (1985) who found clearly lower father-to-son mobility in Dublin than in England, although it is not clear how large the difference would have been if data from all Ireland had been included.

Other writers, using broader selections of nations, often including nations from the Third World, have found differences in the association of a son's occupation with his father's, and have related these differences to such variables as political democracy, social democracy, level of economic development, and degree of industrialization (Cutright, 1968; Grusky and Hauser, 1984; Hazelrigg and Garnier, 1976; Hewitt, 1977; Lin and Yauger, 1975; McClendon, 1980). But even when using nations at different levels of development, differences sometimes appear to lie only in the marginals (Robinson, 1984b).

Similarities in the Link Between Occupation and Education

It remains to be seen how much similarity exists for the relationship between education and occupation. Boudon (1974), through mathematical modeling, has shown that similarities in the link between father's and son's occupations are compatible with widely varying links between education and occupation for the sons. Kerckhoff (1974), after examining education's role in the transmission of occupational status from one generation to the next in England and the U. S., concluded that the much more selective English school system chooses to advance the same people who would have been successful in the more open competition of the United States. But studies involving the nations of Eastern Europe have shown differences between them and the U. S. Meyer, et al. (1979) found that the influence of education was greater in Poland. They explained:

> The Polish nonagricultural sector is almost completely socialized and centralized. Rules of recruitment to occupational positions, which emphasize education, are strictly observed. Second, the Polish educational system is much more selective, so that each of the more advanced levels of education consists of a more thoroughly screened group (with correspondingly greater occupational advantages) than in the United States....Obviously, when schools are given different allocative powers in a society, their effects can be different. (pp. 983-84)

Earlier work by Safar (1971) yielded a path coefficient between education and occupational standing for Czechoslovakia that was considerably larger than that reported by Blau and Duncan (1967) for the United States. Another reason to think that

Eastern Europe differs from the West is provided by the evidence that Eastern European occupational status systems provide greater prestige to manual work than those in the West. (Haller and Bills, 1979). Thus Featherman, et al. (1975) appear to have been wise in hypothesizing, not that mobility processes are the same for all industrial societies, but that they are very much the same for capitalist industrial societies.

This study provides a test of one aspect of the hypothesis set out by Featherman, et al., namely, that the strength of the association between education and occupation will be the same for Canada as for three other nations. Although there is great diversity among theorists as to why education and occupation are linked, they have provided no reason to think that one Western industrial nation should display a stronger link than another. As has been argued above, similarity in one mobility process does not guarantee similarity in others, but at least the similarities in father-son mobility tables suggest that it is reasonable to test the hypothesis that there will be similarity in occupation-by-education tables as well. Although various path analyses have yielded coefficients for the association between education and occupational standing, a multi-national examination of the association in the occupation by education table has not yet appeared in the literature. Nor has there appeared a multi-national study in which females as well as males have been examined. The hypothesis of no difference will therefore be examined here.

Sponsored and Contest Mobility

Even if, with the relatively large samples to be used, the null hypothesis can be accepted, there is room for variation in the ways in which education exerts its influence.

One theorist who suggested that education need not be linked to occupation in the same way in all societies was Ralph Turner, who presented the distinction between contest and sponsored mobility. Turner's (1960) classic paper, which introduced the terms, has appeared in the Social Science Citation Index 128 times, from the beginning of the Index in 1966 to the present. The distinction has appeared routinely in textbooks of the sociology of education, and frequently in introductory textbooks. The terms have become staple elements of the sociological vocabulary. Oddly, in view of the widespread use of the terms, Kerckhoff and Everett, in 1986, were the first to empirically examine the usefulness of Turner's concepts in understanding the link between education and occupation.

Turner (1960), in introducing the terms, explained them as follows:

> Under sponsored mobility elite recruits are chosen... Elite status is given on the basis of some criterion of supposed merit and cannot be taken by any amount of effort or strategy....Contest mobility is like a sporting event in which many compete for a few recognized prizes...

> Victory must be won solely by one's own efforts....The governing objective of contest mobility is to give elite status to those who earn it, while the goal of sponsored mobility is to make the best use of the talents in society by sorting persons into their proper niches. (pp. 856-857)

Although his paper is primarily focussed on mobility into elites, Turner makes clear that he believes that sponsored and contest mobility may apply at all levels of the stratification system. He explains:

> Statements about mobility are intended in general to apply to mobility from manual to middle-class levels, lower-middle to upper-middle class, and so on, as well as into the strictly elite groups. The simplified expressions avoid the repeated use of cumbersome and involved statements. (p.856)

In discussing the distinction, Turner described the United States as relying largely on contest mobility, and England as relying largely on sponsorship. England, true to the logic of sponsorship, had attempted to select those with potential for higher education relatively early.

Turner argued that early selection can offer three advantages. It allows those selected to receive thorough training, with little likelihood that they will have to unlearn firmly established but inappropriate behaviour. At the same time it reduces the likelihood of unrealistic aspirations in those who are not selected. Provided that the number selected is no greater than will be needed to provide an appropriate number of university graduates, the system is also efficient. Once the initial selection is made, those chosen go through a rigorous academic secondary schooling before entrance to university. Following the logic of sponsorship, few who have not been earlier selected will attend the university. Relatively few of those who have been selected will fail to graduate.

At the other extreme, Turner describes the United States as generally following the logic of the contest.

> In the sporting event there is special admiration for the slow starter who makes a dramatic finish, and many of the rules are designed to ensure that the race should not be declared over until it has run its full course. Contest mobility incorporates this disapproval of premature judgments. (p. 858)

> The logic of preparation for a contest prevails in United States schools and emphasizes keeping everyone in the running until the final stages. In primary and secondary schools, the assumption tends to be made that those who are learning satisfactorily need little special attention, while the less successful require help to be sure that they remain in the contest and may compete for the final stakes...In Western states the junior college offers many students a second chance to qualify for university and all state universities have some provision for sub-standard high school students to earn admission. The university itself is run like the true contest: standards are set competitively, students are forced to pass a series of trials each semester, and only a minority of entries achieve the prize of graduation. (p. 863)

In his discussion of the logic of sponsorship and of the contest, and his examination of differences between England and the United States, Turner identifies several differences which ought to be found between societies relying on alternate forms of mobility. First, in the two societies prevailing folk norms ought to support the two different forms of mobility. In sponsorship societies folk norms should emphasize the desirability of selecting the right niche for everyone as early as possible, so talent is not wasted and training is not given to those who will not use it. In contest societies folk norms should emphasize that opportunity to get ahead should be kept open for everyone as long as possible, and that success should be achieved only by one's own efforts. In line with its folk norms, the sponsorship society will segregate childen destined for different levels in society relatively early and will provide them with different forms of schooling. Competitive pressures will be reduced by early determination of who will rise. In the contest society there will be no early selection and those who will rise will face continuing pressure. It is likely, under a contest system, that many more will attempt university than will do so under a sponsorship system, because the rewards of completing it are supposed to be open to anyone. But because it is run as a contest, a smaller proportion of those who attempt it will succeed.

Halsey (1961), although he referred to the distinction between the folk norms of contest and sponsored mobility as "a brilliant hypothesis...a permanent addition to the analysis of stratification" (p. 450), raised questions about two features of Turner's analysis. While Turner suggested that under sponsored mobility those selected early would thus be freed from competitive struggle, Halsey pointed out that English grammar schools were very competitive. Halsey also argued that English independent schools, while selective and not very competitive, had little to do with mobility; rather, they largely served to differentiate those who would be returning to the elite status of their parents from those who neither came from nor were destined for the elite. At the other extreme, the secondary modern schools had little to do with mobility either, since few who attended them moved up very far in the world. Turner (1961) replied that while there was competition in the grammar schools, simply attending them conveyed some advantage, and that insofar as there was competition within them, it resulted largely from increased demand for university entrance rather than from design. In any case, it indicated only that England was not a perfect sponsorship society. It is a necessary part of a sponsorship system that those who are not selected for high status should be given training that will not result in their moving up very far, so that the situation of graduates of secondary modern schools is consistent with the sponsorship model. Turner readily agreed that schools might serve to differentiate students of different classes as well as to provide mobility but pointed out that his analysis had not been intended to deal with other functions of the educational system.

Relative Positions of the Four Nations

By several of the criteria Turner mentions England and the U. S. can readily be distinguished. Unfortunately, for want of well defined data, folk norms cannot be compared. Although Rhoades (1987) has shown that discussions of reforming the English secondary examination system during the 1960s and 1970s were dominated by sponsorship norms, there is no straightforward way to compare his results with any American data. Again, for want of data the extent of competitive pressures in English and American schools cannot be compared. In other respects the two nations can be shown to be distinct. English education was long distinguished from American by its highly developed system of selective secondary schools -- grammar, technical, direct grant and independent -- which took in children before they had reached their teens. While comprehensive schools began to be established in the 1940s, in 1972 only 1.6 per cent of the respondents to the Oxford Mobility Study reported attendance at a comprehensive school. Although the bulk of secondary pupils are now in comprehensive schools, the data come from the Oxford Mobility Study, so that the situation in 1972 is what is of concern. It might be noted as well that, after the shift to comprehensives in the 1970s, the bulk of comprehensives continued to divide their students into tracks at age eleven, and did not have mixed-ability classes (Ball, 1981). It could be argued that in societies that have not had selective secondary schools the same function has been served by streaming within what on the surface are unified schools (Cicourel and Kitsuse, 1963). But Turner (1961) argued that the academic stream in an American high school, by itself, conferred little advantage and might even be a disadvantage if the student did not go beyond high school.

Data presented by Kerckhoff and Everett (1986) are consistent with Turner. At minimum, in terms of the structural features identified by Turner the distinction between England and the United States appears to be straightforward. While streaming has been common in the U. S., there has been no massive development of selective secondary schools.

Also in keeping with Turner's models, the Americans have tended to keep children in school to a later age than the English. In England the proportion attending drops off sharply after the official minimum leaving age. In 1973, the year after the Oxford Mobility Study, 49.8 per cent of 16 year olds, 20.3 per cent of 17 year olds and 6.6 per cent of 18 year olds were attending an elementary or secondary school (Dept. of Education and Science, 1974, Table 5). By comparison, in the U. S. in 1970 93.4 per cent of 16 year olds, 85.8 per cent of 17 year olds and 38.9 per cent of 18 year olds were still enrolled below the tertiary level (U. S. Bureau of the Census, 1973, Tables 51 and 197).

The difference in enrolment for 18 year olds would be much greater if attendance at universities was taken into account: the American university system, consistent with Turner's ideas, is far larger. In the Oxford data, among males aged 25 to 64 in the labour force, 4.5 per cent had a partial or complete university degree, against 34.4 per cent in the NORC General Social Survey data. The proportion of partial degrees is much higher in the U. S. In the English data 4.6 respondents had a completed degree for every respondent with an incomplete degree. In the NORC data .68 held degrees for every one with an incomplete degree.

By these criteria it appears quite straightforward to say that England is closer to the sponsorship model and the U. S. is closer to the contest. Turner suggests that other nations can also be placed on a continuum from pure sponsorship to pure contest, but gives no indication of the appropriate placement for other nations.

It is not clear that it is best to think of a single continuum from sponsorship to contest. In principle, a society might well lie at one position by one criterion and another position by another. As will be seen, the variables in terms of which Turner distinguishes contest and sponsorship societies display a certain looseness of coupling. But it has nonetheless proved possible to place nations in relation to one another in the terms of Turner's analysis.

Using the criteria just employed to compare England and the U. S., Canada appears to lie between them. For the last several decades Canada has largely followed the contest pattern of unified secondary schools, but there has been an important exception in the classical colleges of Quebec, whose diplomas were a prerequisite for entry into French language universities until the development of the CEGEP system in the late 1960s. Canada has tended to keep teenagers in school longer than

England. In 1971 63.3 per cent of 15-to-19 year olds were in school in Canada, not beyond secondary school[2] (Statistics Canada, 1977, Tables 1 and 4). In 1973 in England, 35.1 per cent of 15-to-18 year olds were attending (Dept. of Education and Science, 1974: Table 5). On the other hand, the U. S. has held its teenagers longer than Canada. The most directly comparable figures from official sources come from the 1980 U. S. Census and the 1981 Census of Canada. In 1981 68.6 per cent of Canadians aged 15 to 19 were enrolled in school compared to 75.4 per cent of Americans in 1980[3] (Statistics Canada, 1984, Table 1; U. S. Bureau of the Census, 1984, Tables 42 and 260).

Canada's university system has been neither as large as the American nor as small as the English. In the Canadian Mobility Study data, 14.8 per cent of those between 25 and 64 and in the labour force had partial or complete degrees. Comparable figures for England and the U. S., as we have seen, are 4.5 and 34.4 per cent. Among those who have attended university, the proportion with completed degrees lies between the proportions for the other nations. In the CMS data there were 1.9 respondents with a degree for each person with an incomplete one.

We may conclude, then, that in an analysis based on pairwise comparisons Canada may be treated as less a contest society than the United States, but more a contest society than

England.

The same criteria can be used to place Canada in relation to the Federal Republic of Germany. Germany has long had distinctive schools for children destined to different occupational strata. For most children full time school has ended at age 15, to be followed by an apprenticeship supplemented by classroom training. In the data from SUPERFILE, 60.4 per cent of those aged 25 to 64 in the labour force followed this pattern. As we have seen, Canadian teenagers remain in academic programs longer. Thus, at the secondary level, West Germany appears to be a straightforward sponsorship society.

At the university level, it is not so easily categorized. In the SUPERFILE data 8.6 per cent of those aged 25 to 64 and in the labour force report having completed university or equivalent training, a proportion similar to that found in Canada. By this criterion West Germany looks no more like a sponsorship nation than Canada does. In terms of completion rates, though, West Germany looks much more like a sponsorship society than Canada does. While SUPERFILE does not have a code for those with partial university training, it does have a code for the Abitur, the diploma required for university entrance but who have not completed university. Even though this code will include some people who have not attended university, 4.5 respondents have completed university for every one with only the Abitur. As we have seen, the Canadian ratio of completed to uncompleted degrees is much lower. Since West Germany appears to be a sponsorship society at the secondary level and by one criterion appears to be one at the tertiary, perhaps the best way to describe it is as a sponsorship society which has chosen to send relatively large numbers through its universities.

Hypotheses Derived From Turner

Since the other nations can be seen as either more fully contest or more fully sponsorship societies than Canada, it will be possible to see whether a nation's placement in Turner's scheme makes a difference to the way in which education and occupation are related.

In the first published study on this question, Kerckhoff and Everett (1986) derived a set of hypotheses as to how occupation and education ought to be linked in England and the U. S., and tested them with data on males aged 25-34. One hypothesis, which this study will extend to additional nations, and test with another methodology, was that the difference between selective and non-selective schools in a sponsorship nation, England, would be more useful in predicting occupational standing than the difference between college preparatory and other high school tracks in a contest nation, the United States. Their data supported this hypothesis. Kerckhoff and Everett offered two opposing hypotheses as to how the form of secondary schooling might affect the nature of later occupational training. As it turned out, in England those with selective secondary schooling were more apt than those with non-selective to train for nonmanual occupations. Those with non-selective schooling were more apt to train for manual occupations. In the United States those from the college preparatory track were more apt than others to train for non-manual occupations and those from other high school tracks were more apt to train for manual occupations. Consistent with one of the hypotheses set out by Kerckhoff and Everett, the difference between school types in England was greater than the difference between the college preparatory track and other tracks in the United States. Kerckhoff and Everett also suggested that those in contest societies would be expected to spend more years in school, and that the difference in years completed would rise with occupational level. While there were difficulties in operationalizing these hypotheses, the results presented supported them.[4]

As the data sets used here allow a different range of possibilities, and as the Kerckhoff and Everett paper appeared after much of the analysis had been completed, most of the hypotheses examined here are different, but a key point of departure in deriving them has been Turner's work. As Kerckhoff and Everett have shown, Turner believed that differences in educational institutions could affect the form of the relationship between education and occupation quite strongly. For example, he pointed out that a selective school may send its graduates into a particular range of the occupational structure. In England, he suggested:

> Generally the grammar schools are the vehicle for sponsored mobility throughout the middle ranges of the class system, modelled after the pattern of the "public" schools, which remain the agencies for sponsored mobility into the elite. (p. 865)

Given that sponsorship societies ordinarily make divisions early, often before the teens, and offer quite different forms of education from that point, it might be expected that the form of high school or the high school stream would be taken more seriously in such societies than in contest societies. As pointed out above, this possibility was tested by Kerckhoff and Everett (1986), and supported by data for England and the United States. Turner (1961) expressed the view that in the U. S. an academic high school program conferred no advantage in itself, and might be a disadvantage in job seeking unless further studies had been undertaken. It might thus be suggested that those with academic secondary training will have greater advantage over those with other forms of training in sponsorship than in contest societies. Following the placement of nations set out above, we might expect secondary school divisions to matter least in the United States, more in Canada and still more in the European nations. The data will allow differences between Canada and the two European nations to be tested.

A second major institutional difference with likely consequences for the relationship between education and occupation is the size of the university system. Writing in 1960, Turner noted the prospect of a surplus of university graduates in the U. S., with an accompanying possibility that they would have to compete for jobs. If job competition became a reality, then the link between university education and upper level employment would be looser than in a society in which the contest orientation had not led to such an expansion in the supply of graduates.

This being so, the varying sizes of university systems provide the basis for a hypothesis. If, as American credentialist writers have contended, the vast expansion of that country's post-secondary system has left many of its graduates over-educated, then graduates in the U. S. ought to do less well than those in Canada, with its smaller post-secondary system. In turn Canadian graduates ought not to do as well as those in England. The outcome to be predicted for a comparison between Canada and West Germany is ambiguous, because the proportion of graduates is similar to that of Canada, but the educational system appears to be predominantly one of sponsorship. It is ambiguous as well because, as will be discussed in Chapter Two, it may be preferable to compare West German degrees to Canadian graduate and professional degrees rather than to all Canadian degrees.

At lower levels, we might expect patterns related to those anticipated at the tertiary. The very large proportions who have graduated from American high schools may well have flooded the market for high school graduates more thoroughly than the market for university graduates has been flooded (Folger and Nam, 1967; Rodriguez, 1978). The situation may have been exacerbated by a tendency for university graduates to take positions that earlier would have gone to high school graduates. On either basis, it could be predicted that high school graduates will do less well in the United States than in Canada. (A straightforward comparison of this kind cannot be made with the European nations because of the different types of secondary school.)

Further expectations can be based on Turner's suggestion that dropout rates in midprogram will be higher in contest systems. While Turner does not comment on how employers might respond to this, it seems reasonable to suggest that employers in contest societies should pay more attention to the proportion of a program completed, if only because the large numbers with partially completed programs should draw attention to their qualifications. It will be impossible for employers to use attendance at selective schools as an indicator of ability, and they will be aware that it takes more ability or perseverance to handle the later parts of a program than the early complete programs. Thus, if progress within a program is measured by years completed, years completed should have more effect on occupation in a contest society. On this basis, their effect might be expected to be greater in the U. S. than in Canada. The data will permit a straightforward comparison of those with one, two and three years of university but no degrees. (In the English data there are too few with partial university for analysis, and the different types of secondary school make comparisons in terms of number of years completed difficult. For West Germany partially completed programs are not identified in the data.)

Desirability of Controls in the Analysis

Although Turner has made suggestions as to how different forms of education may affect social positions after graduation, he has not dealt with potential differences among sub-populations. But it has appeared very desirable to look at differences in the experience of the sexes, and of age cohorts. In a general sense this will make it possible, in effect, to test each hypothesis more than once, increasing the solidity of the conclusions, or obtaining greater awareness of complexities in the data. There are also substantive reasons for looking for differences among demographic categories.

A striking feature of Turner's paper is the absence of reference to the sexes: there is not even a masculine or feminine pronoun throughout its length. Whether Turner intended his results to be fully applicable to both males and females or whether he simply assumed that in discussing elites he was talking about males is unclear. But it is clear that there is potential for male-female differences to emerge. A status attainment analysis using Canadian Mobility Study data has suggested that women's occupations are more influenced by education than men's. (Boyd, 1982. But see Cuneo and Curtis, 1975. And see also American results from Featherman and Hauser, 1976; McClendon, 1976; and Treiman and Terrell, 1975b.)

When we move from the continuous variables of the status attainment approach to the categorical measures of ANOAS the sheer differences in marginal distributions easily lead to speculation that the sexes may differ. In each of the nations under study there are major differences in the occupational distributions of men and women. For the U. S. the index of dissimilarity has been near 60 in Census years for most of this century (Gross, 1968; Blau and Hendricks, 1979). In Canada, for the Census years 1891 to 1981, it has been in the range from the mid-60s to the low 80s (Arnold, 1985). From the data in SUPERFILE, covering the period from 1976 to 1984, a West German index can be calculated: it comes out at 72.3. Although she does not use the index of dissimilarity, preferring other measures, Hakim (1979) provides data which appear to suggest that occupational segregation in England is roughly comparable to that in the other nations under study. As the educational systems differ, it is less straightforward to compare differences in education, but it may be noted that each country has occupational training programs which are predominantly attended by one sex or the other. An obvious example for these four nations is nurses' training. The importance of seeing whether such differences as these result in different forms of linkage between education and occupation is underscored by the realization that in comparative mobility studies women have ordinarily been left out. For all of these reasons it is desirable to examine men and women separately. Later chapters will show differences between the sexes, which confirm the desirability of their separate analysis.

The use of age as a control is largely based on changes in the educational systems of the four countries. In England a major reorganization of the secondary system followed legislation passed in 1944. In all four countries there was a rapid growth in the university sector in the 1960s and/or the 1970s. It has been suggested above that university credentials will be given different weight when they are present with different frequencies. It has also become a common feature of the mobility literature to look for differences among cohorts, and thus it may be anticipated that results of such controls will be of interest.

A limitation on the analysis of age differences stems from the sample sizes, which will not allow more than two age categories without excessive collapsing of either occupational or educational categories. Thus it has not been possible to do a fine grained analysis of age differences, and, in particular, it has not been possible to see whether the very youngest members of the sample differ from those just older as a result of recent credential inflation. But tests for grosser differences could be and have been made.

Other controls to be applied are based on previously identified differences among sub-populations in the United States and Canada. In the U. S. there is evidence that the effect of education is different for blacks than for non-blacks, and there is evidence that the nature of the difference has changed over time (Duncan, et al., 1972; Featherman and Hauser, 1978). In Canada there is evidence that language has made a difference in mobility processes, although that difference has become smaller in recent cohorts (McRoberts, 1975). Boyd (1986) and Jones (1986) have presented evidence that nativity affects mobility in Canada and Boyd has presented evidence that the effect of education is lower for immigrants than for the native-born. Thus, to deal with the possibility that overall measures for these nations are misleading, it has been necessary to examine sub-populations.

Summary of Hypotheses

In brief, the hypotheses stated are as follows:

1. There is no difference in the strength of association between education and occupation between Canada and any of the other three nations.
2. Attending a selective secondary school in England or

West Germany will be of greater occupational advantage than taking an academic program in Canada.

3. A university degree will provide greater relative advantage in England than in Canada, and in Canada than in the United States.
4. A high school diploma will provide greater relative advantage in Canada than in the United States.
5. The number of years of university completed, for those with incomplete degrees, will be more sharply graded in its effects on occupation in the United States than in Canada.

In examining these hypotheses, the sexes will be studied separately. Differences by age will be tested for. In examining the U. S., account will be taken of differences between blacks and non-blacks, and in examining Canada account will be taken of differences among francophones in Quebec, immigrants and others.

Notes to Chapter One

1. Recently Knottnerus (1987) has argued that Blau and Duncan were working within the theoretical framework of mass society. He points out that they were essentially optimistic and saw society as stable, fluid and becoming more and more middle class. Although he recognizes that the elements of functionalism mentioned above are present in Blau and Duncan, he argues that they were working in a framework of mass society as distinct from functionalism. He does not discuss the possibility that the concept of mass society, as he discusses it, is a form of functionalism, or that the elements of the two might be wedded. But on either of these views there is no inconsistency in finding functional elements and aspects of mass society theory in Blau and Duncan, and no need to argue that they were working from one viewpoint as contrasted with the other.

2. In calculating the Canadian figure it was assumed that those with vocational or post-secondary training were currently enrolled in such programs. This procedure will lead to a slight underestimate of the difference between the two nations.

3. The difference between the nations is somewhat greater than the figures suggest, since the Canadian data include those involved in post-secondary non-university training and the American data do not.

4. One difficulty is that the Oxford Mobility Study, their source of English data, does not provide a direct measure of

years of education completed. It does indicate the age at which the respondent left secondary school, from which the number of years of primary and secondary schooling can be estimated, but it does not indicate the number of years completed at a later point, or the number of years of university completed by those who attended it. Kerckhoff and Everett chose to work with the number of years of primary and secondary education completed. While this may not distort the overall difference between nations greatly, it poses considerable difficulties in comparing the years completed by those in high-level occupations. A second difficulty is that the difference in years completed reflects not just the difference between sponsorship and contest societies, but also the organization of professional training. Many professionals in England do not have degrees. Solicitors, for example, train at the Inns of Court, not in universities. Many engineers have qualified by part-time study outside the universities. While teaching has long been prepared for in universities in the U. S., many English teachers have been trained outside of them, or in non-degree programs. An additional, though less fundamental difficulty in comparing years of education by occupational group in this study is that years of education would have to be estimated in the West German case. In view of these difficulties, the writer has chosen not to make the comparison.

CHAPTER TWO

CODING OF OCCUPATION AND EDUCATION

The Strategy of Pairwise Comparison

This chapter will set out the occupational and educational codes used in the study. These were chosen to make possible comparisons between Canada and the U. S., Canada and England, and Canada and the Federal Republic of Germany. While simultaneous comparison of several nations has been the standard strategy of multi-national mobility research, a strategy of pairwise comparisons between Canada and the other three nations makes possible a much fuller use of the data available.

Had the four nations been compared simultaneously, they would have required identical (or nearly identical) codes for education and occupation. But the most elaborate common code which could be constructed for education would have involved only (estimated) years of education completed and whether the respondent had completed university.[1] Since such a code would not indicate whether someone in the English or West German sample had attended a selective or non-selective school, the effects of school type could not have been examined. Further, omitting distinctive features of an educational system presented the danger that estimates of the strength of association between education and occupation would be biased downwards. One example of a key feature which would have had to be omitted is the West Germany apprenticeship system. More than half the West Germany sample had completed apprenticeships, so that omission of this form of training appeared to present major risks of downward bias.

A strategy of pairwise comparison has allowed a much greater range of distinctive features to be represented: school types and high school streams could be brought in, as well as various forms of vocational training. This has been possible because the Canadian codes for education are quite rich, and could be reorganized for pairwise comparison with the other three nations. The particular code schemes employed and the criteria used in defining them are discussed below.

OCCUPATIONAL CODES

While each nation requires a distinctive educational code, reflecting its own educational system, a common occupational code is a necessity. Without such a code it would be very difficult, if not impossible, to compare the impact of education across nations. Since Canada was to be the focal point of comparison, and as the study was viewed in part as an attempt to learn more about Canada through comparison, it was important that the occupational code be applicable to Canadian data without any serious reservations about its appropriateness.

When the decision on a code scheme had to be made, it would have been difficult to recode the Canadian occupational data because the Canadian Mobility Study tapes did not distinguish occupational unit groups, and the combination of occupational codes available failed to uniquely identify them. (A tape made available more recently by Statistics Canada does identify them.)

The CMS data contain both a measure of occupational standing and a categorical occupational code. An initial interest was felt in using a categorical coding scheme. As pointed out above, Turner suggested that a school may send its graduates into a particular range of occupations: his example was the English grammar school. When occupational training is included in the definition of education, as has been suggested should be done, it becomes readily apparent that particular types of education are linked to particular occupations. The overall strengh of the association between the two variables may depend considerably on how many such links exist, and on the numbers in the occupations affected. The realism of treating occupation as a continuous variable when it is studied in relation to education also depends on how influential such links may be. Since the bulk of comparative evidence on the effect of education on occupation has come through status attainment modelling, which uses a continuous measure for occupation, a categorical measure offered the opportunity to examine the importance of a form of association which has not received close attention in the previous literature.

A second reason for interest in a categorical scheme was methodological. Such a code would lend itself readily to analysis through Goodman's (1979b) multiplicative row-column model. As will be explained in the following chapter, this model and its extensions were in principle capable of providing all of the measures required for the study, in a unified framework. But a literature review showed that it had not yet been applied to occupation by education tables. It was therefore of some interest to see whether it could, in practice, be applied effectively with data of this kind.

On the other hand, it was also clear that a categorical code scheme would limit the forms of analysis that could applied. If occupation by education tables were to be examined after controlling for other variables, cell frequencies could dwindle quite rapidly. If causal modelling was to be attempted, it would have to be applied to a series of dichotomous dependent variables. The relatively small numbers in some occupational categories in some data sets would surely lead to imprecise results, or, if categories were combined, to results which might be less fully informative than might be hoped. But the hypotheses derived from Turner involved only two variables, and required no elaborate causal modelling. As was indicated in Chapter One, only a limited number of control variables appeared to be necessary. Thus the loss of capacity to involve additional variables was not seen as a serious drawback.

Code Schemes From Earlier Comparative Studies

Although a categorical code scheme appeared attractive, and one was present in the Canadian data set, there were also advantages to comparability with earlier multi-national studies. In deciding on the system of occupational coding, three methods employed in previous comparative studies were examined, before recoding the data from other nations into the categorical code of the Canadian Mobility Study. The Canadian code will be referred to interchangeably as the CMS code and the PPM code, after its originators (Pineo, Porter and McRoberts, 1977).

In previous comparative work reliance has been placed on measures of occupational standing, on the Hope-Goldthorpe categorical classification from the Oxford Mobility Study (Goldthorpe, 1980) and on the neo-Marxist categories devised by Erik Olin Wright (1980). In view of the advantages of comparability with previous research each was considered, but found to have important limitations.

Measures of occupational standing for Canada, England and the U. S. have been created in two ways. The more direct has been to ask samples of the adult population to rate occupations and to use the average ratings. The more complicated has been to regress average ratings from population samples on measures of income and education. Using the resulting equations, socio-economic index scores for occupations have been defined. Since direct ratings, from a national Canadian sample, are available for only about one fifth of the occupational unit groups of the CMS, only a socio-economic index can be used for Canada. For the U. S. both types of measure are available. For England only a measure based on direct ratings is available.

Since the English and West German data sets do not contain socio-economic indexes it is necessary to ask how well the Canadian socio-economic index approximates the direct ratings it was designed to predict. Blishen and McRoberts (1976) report that, for 102 occupations for which the necessary direct ratings are available, $r^2 = .762$. Unfortunately, Blishen and McRoberts present no data on the distribution of errors of prediction. Since the socio-economic index scores were created by multiple regression, they will be uncorrelated with the measure of education used in the construction of the scale, but it is not clear that they will be unrelated to the particular features of education which will be examined here. No general test of this concern is possible with existing data, but there is reason for suspicion on at least one point. A. A. Hunter (personal communication) has reported that the residuals suggest a lack of differentiation at the top of the scale. This possibility must be taken seriously because the hypotheses to be tested require comparison of the effects of university education. If the Canadian scores for occupations which are usually entered by those with university training have been held down by an artifact of the scoring procedure, comparison between nations will be biased.

That ceiling effects could be present is clear from the form of the prediction equation (Blishen and McRoberts, 1976):

$$y = 13.995 + .2640\, x_1 + .3619\, x_2 \text{, where}$$

y is the score assigned to an occupation by direct rating (Pineo and Porter, 1967),

x_1 is the percentage of males in an occupation with annual incomes of $6500 or more in 1971, and

x_2 is the percentage of males in an occupation with enough years of schooling to have completed secondary school in their province of residence in 1971.

In many professional and managerial occupations the vast bulk of incumbents exceed the threshold values, and so there might be concern that there would be little differentiation among such occupations. Unfortunately there is no standard method of detecting ceiling effects, and the number of occupations near the upper tail of the distribution is relatively small, hampering comparison of the socio-economic index and the direct ratings it is supposed to predict. But some useful comparisons can be made.

From the equation, it is clear that the highest possible score on the socio-economic index is 76.58. The highest score obtained is 75.28. Ten per cent of the occupations scaled by the index lie above 66.9. The upper decile thus covers a range of just under 8.3 scale units. As a base for comparison, the range from the tenth to the ninetieth percentile is 41.0. The range of the upper decile is thus 20.2 per cent of the interdecile range. In the direct ratings the upper decile covers a range of 18.6 scale units and the interdecile range is 45.7, so the comparable percentage is 40.7. Clearly there is less differentiation at the top among the socio-economic index scores than among the set of direct ratings they are supposed to predict.[2] A further comparison was done with a socio-economic index created by Blishen (1958) from 1951 Census data. In creating this index Blishen worked with mean incomes and mean years of education, which would not be expected to create ceiling effects in the way that the percentages used to create the 1971 index might. On the other hand, since the distribution of mean incomes of occupations has a long upper tail, it might be expected that the range of the upper decile would be quite broad. For the 1951 index the range of the upper decile was 19.5, compared to an interdecile range of 20.8. The former is 93.7 per cent of the latter. Thus the degree of differentiation at the top provided by a socio-economic index clearly varies with the way in which the defining variables are scored.

Among the measures examined, the 1971 socio-economic index, for which ceiling effects are of concern, shows the least differentiation. While it cannot be strictly proven that its method of construction creates ceiling effects, the data correspond to what would be found if it did.

Of course, it would be possible to deal with the apparent ceiling effects in the Canadian scale by collapsing it into a set of categories, and then to do the same with scales from the other nations. If the upper category for Canada extended far enough down the scale to pick up the range of occupations for which ceiling effects appeared troublesome, then comparison would be put on a more even footing. But in collapsing, direct comparability with most previous research which has involved measures of the social standing of occupations would be lost. The advantage of subtle distinctions among occupations would also be lost.

Among the data sets, only the Canadian and the American contain socio-economic indexes. But even for these two nations there are problems of comparability. As has been shown, there is reason to suspect that the Canadian index may not be a good approximation to direct ratings for the purposes of this research. If a socio-economic index cannot be interpreted in this way, it can still be interpreted as a weighted average of income and education measures. But the weighted average interpretation is particularly awkward for comparative purposes, since the weights for the two nations are not the same. Then too, once the link to direct ratings has come into question, it is not clear why a weighted average of income and education should be used rather than separate scores for income and education. Further, in this research the use of an index interpreted in this fashion would bring into sharp focus the question of whether the findings of the study were partially artifacts of the use of education in defining the occupational scores. Blau and Duncan (1967) were able, in a path analysis, to obtain results, from an index constructed using income and whether the job was white or blue collar, which were very similar to those obtained from an index constructed using income and education. But it is not clear from this experiment that indexes constructed with and without education would deliver the same results in a comparison of the relative effects of high school streams, or of the value of a degree in relation to other credentials. To check this would have been impossible at the time a decision on occupational coding had to be made, because the Canadian data tape did not uniquely identify occupational unit groups.

Equally difficult problems were posed for use of the Hope-Goldthorpe classification. Although it has been used in comparisons among England, France and Sweden (Breen, 1987; Erikson, et al., 1979, 1982, 1983; Portocarrero, 1983a, 1983b, 1985), and between Dublin and England (Breen and Whelan, 1985), Kerckhoff, et al. (1985), working with data from the second study of Occupational Changes in a Generation, concluded that it was impossible to recode U. S. data into the Hope-Goldthorpe categories. To do so precisely would require information not only on the occupational categories of the respondents, but also on the number of workers for whom they held managerial or supervisory responsibility, and on whether they owned their own businesses, and if so how many employees there were. All of these ingredients are used in defining the Hope-Goldthorpe categories (Goldthorpe and Hope, 1974; Goldthorpe, 1980). Just as the necessary information was not available to Kerckhoff, et al., so it is unavailable in the NORC General Social Survey. Further, at the time when a decision on occupational coding had to be made, it would have been impossible to put the Canadian data into more than an extremely rough approximation to the Hope-Goldthorpe classification, since, as mentioned above, occupational unit groups could not be identified.

Goldthorpe and Payne (1986b) have reported a revised coding method, which is simpler, and ought to make comparative studies easier. Unfortunately, when the same data set was coded both ways, almost a fifth of the English male labour force was placed in a different category by the new system than by the old (Goldthorpe and Payne, 1986b), so that the new code does not provide straightforward comparability with earlier work. But it may well be instructive, at some later point, for someome to see whether comparisons made with a North American coding system yield the same results as those with the more recent English one.

Another code previously used in comparative studies, which have recently begun to appear (Ahrne and Wright, 1983; Black and Myles, 1986), is E. O. Wright's (1980) neo-Marxist classification. As Wright points out, his is not an occupational classification. From data presented in Wright (1980) it appears that some of his categories are very occupationally heterogeneous. Working with secondary data, he estimated that in the American petit bourgeousie 42 per cent were in professional, technical and managerial occupations and 28 per cent were farmers. In his category for managers and supervisors, 35 per cent were in professional, technical and managerial occupations, but as many as 16 per cent were in lower blue collar occupations. Later, using original data from an American national sample, Wright *et al*. (1982) pointed out that if respondents in each of the occupational categories employed in the study were predicted to fall within the class most common for their occupational category, 45 per cent were misclassified. A classification involving so much variation appears unlikely to provide a useful reading on the linkage between education and occupation.

The CMS Coding Scheme

Since direct comparability with earlier work could not be achieved, attention focussed on the CMS classification scheme. It had been created with the intention of capturing as much of the social standing of occupations as possible, while marking off categories which were of interest in Canadian sociology at the time of its construction (Pineo, personal communication). With these objectives in mind, 16 categories were defined: Independent Professional, Employed Professional, High Level Management, Semi-professional, Technical, Middle Management, Supervisors, Foremen, Skilled Clerical-Sales-Service, Skilled Crafts and Trades, Farmers, Semi-skilled Clerical-Sales-Service, Semi-skilled Crafts and Trades, Unskilled Clerical-Sales-Service, Unskilled Manual, and Farm Labourers.

As there are few respondents classed as independent professionals and high level managers, and as the distinction between high level and middle managers is necessarily somewhat arbitrary, in this research the two professional categories have been combined, as have the two managerial.

The categories of the system have been formed by grouping the some 500 unit codes of the Canadian Classification and Dictionary of Occupations. In placing so many unit codes into 16 categories a number of difficult decisions about borderline cases had to be made. In preparation for recoding other nations into the CMS system, the placement of each unit group was examined, and it was concluded that only 12 of them appeared misplaced. In most of these cases, one could see how another rater might have assigned the occupation to another category, and the categories were usually small. (For example, there is a difference of opinion as to whether to place osteopaths in the professional group or in the semi-professional, but this is not of concern because there are few practicing in Canada, and none at all in the CMS sample.)

The only case of concern was that of elementary school teachers. If this study, like most multi-national mobility research, was focussed on males alone, their precise placement would not be of great moment. But when females are included, what is done with them matters much more.

In the original PPM code elementary school teachers were classified as professionals along with such occupations as accountants, dentists, lawyers and university professors. There has been much disagreement as to where to draw the line between professionals and others. For diverse views as to how to define the professional category see, for example Moore (1970), Rueschemeyer (1964), Woodward (1957) and Wilensky (1964). But elementary teachers were clearly distinct from the other occupations placed in this category at the time of the Canadian Mobility Study. Two years earlier, the 1971 Census had shown that fully 10.0 per cent of elementary teachers had not gone beyond Grade 11 and a further 33.0 per cent had no university training.[3] If one thinks of a profession as having such characteristics as a large body of theory which must be grasped by its members, or as an occupation that can be pursued only after long, difficult training, there is clearly something missing. Accordingly, it was decided to move elementary teachers into the Semi-professional category.

Other difficulties in placement of unit groups have been well discussed by Pineo *et al.* (1977). Here it will suffice to mention the need to place heterogeneous unit groups into the category in which the bulk of those found in the unit group were best located. In the vast majority of cases this was a matter of making choices among the three skill levels. Usually it involved only small groups of workers not otherwise classified, and often labelled simply as workers in a particular industry. Most such groups have been classified as semi-skilled. The same problem has arisen in the other data sets. It has in fact been the most frequent difficulty in recoding. It has been handled in the same way for the other three nations, although not always as satisfactorily as for Canada. When the difficulties have been particularly problematic, they have been discussed in the chapter comparing the affected nation with Canada.

It should be mentioned here that in the Canadian case two clerical unit groups are particularly difficult to place. These groups, General Office Clerks and Clerical and Related Occupations, n.e.c., have been placed at the unskilled level in the CMS code, on the grounds that the job descriptions provided by the Canadian Classification and Dictionary of Occupations do not indicate any very great degree of skill (Pineo, personal communication). On the other hand, the descriptions are quite general and could easily encompass jobs in which greater skill is required. The writer has not seen a compelling case for moving these categories to the semi-skilled level, but the reader will discover in later chapters that for Canadian males the semi-skilled and unskilled white collar workers are usually in reverse order in terms of the educational standing of their members. This is not simply an idiosyncacy of the data set as the same pattern appears in custom tabulations from the 1981 Census. Examination of the education of respondents in the two awkward unit groups reveals that they are well above others in the unskilled category, both in the CMS data and in the Census. This suggests that any comparisons between the unskilled and the semi-skilled white collar groups for Canadian males not be taken very literally.

Appropriateness of the CMS System

In terms of its categories, the PPM system seems well suited for multi-national comparisons of the link between education and occupation. While there is no established theory as to what occupational categories ought to be defined to identify the links between education and occupation most clearly, on the basis of what was known beforehand, and what was learned in the study, the categories appear very appropriate: they correspond to divisions of the labour force which, with few exceptions, can be distinguished for all four nations, and which, as will be seen in Chapter Eight, differ in the educational standing of their members in largely similar ways across nations.

In any industrial society there is a group of occupations referred to as the professions, entry to which requires extended preparation, and which are at or near the top in terms of social standing. Similarly, in any industrial society there are occupations which have some of the marks of a profession, but not others: perhaps the training required is less extensive, or its members are subordinate to a professional, as in nursing, or some people are able to make their way into the field on sheer talent, as in Canadian journalism. Occupations of this kind can be placed in the category for semi-professionals.

The division between blue collar and white collar workers is useful for comparative study, because, as will be seen, at least in the four countries examined, the categories for white collar workers are always higher in educational standing than those for blue. Dividing both white and blue collar workers into three skill levels (skilled, semi-skilled and unskilled) is common in all four nations, although as will be discussed below, in the case of England the dividing line in official statistics was not set in quite the same place as in the PPM system. In each nation the skill levels vary in education.

The occupational code schemes for each of the four nations include various unit groups for managers and supervisors. Thus it is possible, although not without difficulties, to be discussed below, to use such categories in comparative work. Farmers and farm workers also have distinctive codes in all four nations. Where managers and supervisors can be distinguished, they usually differ appreciably in education. Farmers and farm workers, relative to others, are much better educated in England than in the other nations. Thus, it is not only possible but desirable to distinguish managers, supervisors and farmers and farm labourers.

As well as having useful categories, the system appears, in one testable way, to perform as intended in all four nations. As mentioned above, it was designed to pick up much of the social standing dimension in Canada. Working with respondents in the labour force in the study samples, it may be shown to do so for other nations as well. For Canadian males a one-way ANOVA, using the Blishen socio-economic index as dependent variable, yields an eta-squared of .807; for females eta-squared is .788. For U. S. males, using Seigel's prestige scores as dependent variable, eta-squared is .766; for females it is .689. For English males, using Hope-Goldthorpe prestige scores (Goldthorpe and Hope, 1974) it is .746. As pointed out above, the West German data file lacks an indigenous measure of occupational standing, but, if the Treiman scale is used as dependent variable eta-squared is .772 for males and .793 for females.

Although the PPM system was not designed to pick up variation in the skill required to perform in an occupation Jones (1980) has shown that it does so. Using the estimates of General Educational Development (GED) and Specific Vocational Preparation (SVP) required for each occupational according to the Canadian Classification and Dictionary of Occupations (CCDO) as the criterion of the skill required, he was able to show that the PPM categories picked up 70 per cent of the variation in GED and 65 per cent of the variation in SVP. These results suggest that, insofar as employment practices correspond to the skill requirements estimated by the CCDO, the categories of the PPM system should be well differentiated in terms of the education of their incumbents.

Occupational Coding for the Three Other Nations

In placing unit groups from other nations into the CMS system a two or three stage procedure was employed. Initially the unit groups were placed into CMS categories. After three weeks their placement was reviewed. For each nation a small number of borderline cases were adjusted. In the English case an indigenous classification scheme, developed by the Office of Population Censuses and Surveys (1970) contained many categories similar to those in the CMS scheme. Categories were present for independent and employed professionals, for managers and for skilled, semi-skilled and unskilled blue collar workers. The writer's placement of unit groups was compared with the OPCS placement of unit groups for categories with similar titles.

Although it was ordinarily reasonably straightforward to place unit codes for other nations into CMS categories, some collapsing has been required. National differences in the coding of managers, supervisors and foremen often dictate it. Because other countries have relatively few respondents in agriculture, it has always been necessary to group farmers and farm labourers. Let us see how this has come about.

The United States

American data have been taken from the NORC General Social Survey cumulative file. In this data set, occupations are coded into the 1970 U. S. Census 3-digit scheme. (U. S. Bureau of the Census, 1971) Ordinarily there is little problem in recoding into the PPM system, but there are difficulties with managers, supervisors and foremen. Some 6.6 per cent of the U. S. cases are placed in category 245, Managers and Administrators, n.e.c., which includes both occupations which would be classified as managerial in the CMS scheme -- such as city managers and investment department managers -- and occupations which would be classed as supervisory -- such as news agents and launderette managers. Apart from this category, 4.5 per cent of the cases fit in the CMS category Managers and 4.4 in the category Supervisors. Since an ambiguous grouping contains so many of those who must be classed as managerial or supervisory, it is impossible to make a straightforward distinction between the two, or to believe that without the ambiguous group a good representation of either managers or supervisors can be had. Thus the study has employed a single category of Managers and Supervisors.

Unlike the 1970 U. S. Census code, the Canadian 1971 Census code, on which the CMS code is based, includes many codes for foremen, one category in fact for each of the subdivisions of the blue collar world identified in the Classification. The U. S. Census includes only two. In the CMS data, 5.9 per cent of respondents are classed as foremen, while the two U. S. codes take in just 1.7 per cent. Yet the percentage of blue collar workers is similar in the two countries. It is not clear how American foremen could, on the average, oversee more than three times as many workers as their Canadian counterparts. This concern is supported by data from an international study using common questions and coding schemes, reported by Black and Wright (1986), which concluded that the U. S. had more supervisors (a term including foremen) than Canada.

The two categories for foremen, like others in the U. S. system, are defined by a series of occupational titles, rather than by general statements about the kind of work performed, which are found in the CCDO. It may thus be that Canadian coders feel freer in placing someone in a category for foremen if he is doing the right kind of work, whereas American coders feel restricted by the occupational titles. In the Canadian case, it appears likely that if someone had not been classed as a foreman, he would usually have been classed as a skilled craftsman or tradesman, since the categories for foremen are in fields in which skilled workers are common, and in which foremen are expected to have at least the skills of those under their supervision. (In neither system are those who do largely the same work as those under their direction, as "lead hands", "gang leaders", "working foremen" and the like classed as foremen.)

Fortunately, in neither data set is there a large difference between the education of foremen and that of skilled craftsmen and tradesmen, so that collapsing, which will be necessary because of the small numbers of American foremen, will cause little loss of useful information.[4] Insofar as workers who would have been coded foremen in Canada are treated as skilled workers in the U. S., collapsing will also create more comparable categories.

Altogether, when managers and supervisors are brought together, then foremen and skilled craftsmen and tradesmen, then farmers and farm workers, eleven categories remain. The categories remaining provide a more elaborate categorical code than has been used to date in comparing the two nations. (McRoberts and Selbee (1981) collapsed the CMS code into six categories for a comparison between the two nations.) The unit groups in each category, as used in this study, are listed in Appendix A.

The assignment of one specific unit group requires a brief comment. As mentioned above, for this study Canadian elementary teachers were shifted from their original placement among the professions to the category for semi-professionals, because their training did not seem appropriate for a profession: in 1971 10 per cent had not gone beyond Grade 11, and a further 33 per cent had no university training. But in the U. S. code, elementary teachers have been placed among the professionals. In the U. S. in 1980, near the mid-point of the period during which the data were gathered, less than one half of one per cent did not have degrees and 41.8 per cent held degrees beyond the Bachelor's (U. S. Bureau of the Census, 1981). Had American elementary teachers not been classified as professionals, it might reasonably have been suggested that the code scheme had been set up to favour one of the hypotheses of the study, namely, that university degrees would be of greater occupational value in Canada than in the U. S. This could have been suggested on the grounds that the score for university training in the U. S. had been downward biased by the misclassification of a unit group that contained a large proportion of university graduates. This point would, of course, have been of particular concern when comparing females. Thus what was done on the grounds that the occupation had reached a more advanced stage of professionalization in the U. S. also enabled a hypothesis to be tested without concern that it might have been favoured by a coding decision.

England

The data for England come from the 1972 Oxford Mobility Study. While, strictly speaking, the data should be referred to as English and Welsh, the writer has followed the Oxford team in referring to the data as English. If this is not precisely accurate, it at least has the advantage of simplicity.

The English coding scheme is based on the 222 categories of the Office of Population Censuses and Surveys *Classification of Occupations (1970)*. This places the basic 222 occupations in 17 broader categories, some of which, as mentioned above, are similar to those of the CMS code. Usually, where the categories are similarly labelled, only borderline occupations appear to have been differently placed. But the systems do differ in their readiness to classify blue collar workers as skilled. The Canadian system requires that such occupations involve approximately two years' training (Pineo, Porter and McRoberts, 1977), while the OPCS system requires only a specific and definite skill. Some 28 occupational titles which, in the writer's attempt to place them in the Canadian system, were classed as semi-skilled were classed as skilled by the OPCS. Out of concern that the English classification might be picking up some aspect of English social structure not evident to an outsider, those in occupations classed as skilled by the OPCS and semi-skilled by the writer were compared with those classed as semi-skilled by both. Using sixteen educational categories, quite small differences were found. (The Index of Dissimilarity was 6.1. X^2 was 6.36 with 15 df.) Accordingly, it seemed reasonable to group these cases with those classed as semi-skilled by both systems.

Although no great problems were caused by the English coding for managers, supervisors and foremen, the methods used in handling the complex English coding system must be explained. The OPCS system uses two codes, one to assign a respondent to one of the 222 occupational categories, and one to indicate whether the occupation involves managerial or supervisory responsibilities. An 89 page index indicates the occupational titles to which these supplementary codes apply. The Oxford study team has added a further code to indicate occupations which, in their view involve managerial or supervisory responsibilities, but which have not been identified as involving them by the OPCS.

Managerial or supervisory duties are identified quite liberally. When the additional code added for the study is used, 29.4 per cent of the males in the labour force, aged 25-64 are identified as having managerial or supervisory responsibilities. Thus Kerckhoff, et al., (1985) in matching English and American categories, ignore the second OPCS code and the codes added for the study and treat as managerial or supervisory only those put into managerial or supervisory categories by the first code. This strategy has been followed in matching the Canadian categories Managers and Supervisors.

In matching the Canadian category Foremen it has been necessary to use the second OPCS code. The first code includes as foremen only those who have oversight of workers in more than one trade. So, for example, a carpenter overseeing the work of others in his trade would be classified as a carpenter. To find out whether he is a foreman, the second code must be used. After reviewing the index of occupations mentioned above, the writer concluded that those coded as foremen provide a reasonable match to the occupations that would be classified the same way in the Canadian system. Accordingly, the second OPCS code has been used to define foremen in the English data.

Other categories could be handled fairly straightforwardly. The unit groups placed in each category are listed in Appendix A.

The Federal Republic of Germany

Data for the FRG come from SUPERFILE, a cumulative file of cases from samples gathered between 1976 and 1983. The first of the nine has not been used, since it was not fully national. (Berlin was not included.)

The occupational code in SUPERFILE is based on the International Standard Classification of Occupations (International Labour Office, 1968). Generally speaking, little difficulty was experienced in translating this code into Canadian terms. The resulting allocation of unit codes to categories is shown in Appendix A.

However, the category for foremen did give rise to some uncertainties. The ISCO system provides only two categories for foremen, and as was the case with the American data, relatively few people have been placed in them. Only 2.0 per cent of those between 25 and 64, in the labour force have been defined as foremen. Again, as was the case with the United States, the proportion of blue collar workers in the labour force of the two countries is similar. But unlike the situation in the United States, in the SUPERFILE data there is a clear difference between the training of foremen and skilled blue collar workers. (Far more foremen have attained the level of master craftsman or technologist.) There is also evidence that some nations have fewer supervisors than others and define their duties differently: Ahrne and Wright (1983) and Black and Myles (1986) provide evidence that Sweden differs in this way from Canada and the U. S. Since foremen and skilled workers have different training, and since the lower proportion of foremen in Germany may reflect real differences in work organization, foremen have been kept distinct from skilled blue collar workers, although there remains some uncertainty as to whether all who would have been classified as foremen in the

Canadian data have been placed in that category in the German.

Another difficulty in the West German case arises from the small number of codes available to cover the areas of clerical work in which women are most strongly represented. The distinction between skilled and semi-skilled white collar workers is difficult to make on this account. The details of the problem and its resolution will be found in Chapter Six.

EDUCATIONAL CODES

As pointed out above, it is both unnecessary and undesirable that education codes for all four nations be the same. But it is essential that each code pick up the most occupationally relevant aspects of the education system it represents. It is necessary to rely on those who defined the coding schemes for the various national studies to have included the most useful categories for their own nations. But careful consideration has been necessary in putting together the study codes from the categories other social scientists have selected.

The ability to create codes which will allow for reasonable comparisons rests on the flexibility of the codes in the CMS data, since these must be recombined for pairwise comparisons with other nations. The Canadian data contain three questions useful for the purpose. The first simply indicates the number of years of schooling completed. The second indicates the highest level of schooling completed, in

17 categories: None; Elementary Incomplete; Elementary Complete; Some Vocational Secondary; Some Academic Secondary; Vocational Secondary Complete; Academic Secondary Complete; Post-Secondary Program (n.e.c.) Incomplete; Post-Secondary Program (n.e.c.) Complete; Nurse's or Teacher Training Incomplete; Nurse's or Teacher Training Complete; Community College Incomplete; Community College Complete; Some University; University Diploma; B.A.; Professional Degree; and M.A. or Ph.D.

Some of the categories require brief explanation. The categories for secondary schooling include only those who have no post-secondary training. The categories for community college training include as well such institutions as the technical institute and the college classique. The categories for post-secondary training, n.e.c., include those who have attended business colleges and trade schools, and will be referred to in those terms.

The third question useful for comparative purposes asks whether the respondent has completed training, outside the regular school system, which has led to qualifications in a trade. As examples, the question includes apprenticeships, company training programs and training in the armed forces. Police and firefighters often indicated they had completed such training, presumably because of their extended periods of apprentice-like in-service training. Apart from these two groups, the bulk of those responding positively to this question were in occupations in which formal apprenticeships have been a standard form of training, as for carpenters, plumbers or electricians. For simplicity, those who responded positively to this question will be referred to as having completed an apprenticeship.

From these three questions the Canadian codes for comparison with other national systems have been built up. The categories to be used will be identified as the other systems are discussed.

Criteria for Setting up the Study Codes

Codes were set up with three objectives in mind:

1. to represent elements of the system that are involved in the hypotheses, e.g., in the European systems, codes must distinguish types of secondary school. For all systems university training must be identified.
2. to represent distinctive features of the national system, e.g. in England many professionals do not have degrees, but have acquired membership in professional institutes through work experience, part time study and self study. Their qualifications are identified in the data set. If they were not represented in the study code, perspective on the standing of university graduates would be lost, since a major competing group

could not be identified. Then too, omission of such a category could lead to an understatement of the strength of association between education and occupation. Analogous arguments can be made for the inclusion of other distinctive credentials.

3. to represent features which have equivalents or counterparts in the system to which comparison is to be made, e.g., in the U. S. data years of university completed are identified directly, whereas in the Canadian they must be estimated. Since in both systems years of university may be seen as a meaningful qualification, it was desirable to make the estimates in the Canadian case. Without them, it could be suggested that the Canadian coefficient was biased downward when the strength of association between education and occupation in the two nations was compared.

The Study Code for The United States

Education codes in the U. S. data sets which have been most frequently used for comparative purposes are not elaborate. The Census has requested only the number of years of elementary or secondary school completed and the number of years of university completed. The two studies of Occupational Change in a Generation (Blau and Duncan, 1967; Featherman and Hauser, 1978) have done the same. Thus McRoberts (1975), in comparing path diagrams for Canada and the U. S. relied on number of years of education completed. Work by Jencks, _et al._ (1979) and by Faia (1981) has shown, however, that there is particular advantage to obtaining a degree. Unfortunately, in the OCG data sets, it is necessary to estimate whether a degree has been obtained from the number of years of university reported to have been completed.

Over the OCG studies, the General Social Survey offers the advantage of including a sample of the full female labour force, and of providing a direct measure of whether a high school diploma, a degree or a graduate degree has been obtained. This data set also indicates the number of years of primary and secondary education completed, and the number of years of university level training completed. Collapsing is necessary at the lower end of the educational distribution to make up for small numbers and at the upper end to acheive a code which can be matched from the Canadian data, which treat graduate degrees differently than the American data do.[5] After collapsing 8 categories remain: up to Grade 7; Grade 8 or 9; Grade 10 or 11; secondary complete; 1 year university; 2 years university; 3 years university; and degree(s) complete.

Canadian Codes for Comparison With the U. S.

The educational codes for the U. S. and Canada can fairly readily be matched, but two issues have had to be dealt with. First, the American codes have no categories for those who have post-secondary non-university training. Those who, in the Canadian data, have indicated such training have had to be recoded into the categories in which they would have been placed in the American system. It is fairly straightforward to recode those with university diplomas (but not degrees), or with nurse's or teacher training, to "secondary complete". But those with community college training, or other post-secondary training, will often not have finished high school. Using estimates of the number of years likely to have been spent in post-secondary training, i.e., two years for completion of a program, one year for an incomplete program, and subtracting from the total number of years completed provides an estimate of the number of years of elementary and secondary schooling completed.[6]

The second problem was to estimate years of university completed for Canadians with incomplete degrees. This was estimated by subtracting the number of grades required for university entrance in the province of residence at age 16 from the number of years of schooling completed. In the case of Quebec, a distinction had to be made between the French and English systems for those who would have likely entered university before establishment of the CEGEP system. It was assumed that respondents had gone through the secondary system corresponding to their mother tongue.

The Study Code for England

The English data set provides details on the type of school attended, examinations passed, school leaving age, tertiary academic credentials and occupational credentials obtained out of school. As elements of each of these are incorporated in the study code, and as the English system is unfamiliar in detail for many Canadian sociologists, the elements most closely related to the study code should be discussed.

At the secondary level the data distinguish several school types. In a major drive to establish comprehensive schools during the middle and late 1970s, all but comprehensives and independent schools were eliminated. But the Oxford Mobility Study found it necessary to distinguish:

1. the secondary modern school, which took all pupils not admitted to other schools.
2. comprehensive schools, which offered a full range of secondary programs. (But only 1.6 per cent of those in the sample had attended such schools.)
3. technical schools, which emphasized science and technology.
4. grammar schools, which emphasized academic subjects,

and were the most common route into the universities.

5. direct grant schools, which enrolled both fee-paying and non-fee-paying students (at least 25 per cent of the student body), and received direct grants from the central government.
6. independent schools.

Although there is much interest in the effects of the more prestigious selective schools, their former students are too few in the sample for separate analysis. Here a distinction will be made between non-selective schools (secondary modern and comprehensive) and selective schools (technical, grammar, direct grant and independent.) Earlier writers have also felt that dichotomizing the several types of school was an appropriate way of dealing with the small numbers who had been through some of them. Hope (1972b) remarked that a simple distinction between secondary modern and other schools would capture most of the variation that mattered. Kerckhoff and Everett (1986) worked with a dichotomy between secondary modern and selective schools, leaving comprehensive schools out.

Another feature of the English system which is unfamiliar to Canadians, and which is also quite different from what is found in continental systems, is its two levels of examination for secondary students. Ordinary Level examinations are usually written at the age of sixteen, and Advanced Level examinations are usually written two years later. Any number of these examinations may be written, but those planning to attend university usually concentrate their studies for the two years after their O-Levels on a small number of subjects in which they intend to write A-Level examinations. Typically three A-Levels are required for entrance to university.[7]

The uses of data on school leaving age and tertiary academic qualifications are readily explained. The question on school leaving age allows identification of those who stayed in school past the legal minimum leaving age, without passing any O-Levels, and those who, after passing some O-Levels, remained in school to age seventeen or later without passing any A-Levels. From the question on tertiary academic qualifications those who have partial and complete degrees may be distinguished.

The final code to be drawn upon distinguishes occupational qualifications. All qualifications except those obtained through on-the-job training (as in apprenticeships) have been used. Thus the study code distinguishes:

1. City and Guilds or National Certificates. These craft, trade and technical certificates vary in level, up to the point of being considered in official statistics to fall into the next category. For simplicity they are referred to here as craft/trade certificates.
2. Level C qualifications. These are treated in official statistics as equivalent to a partial degree. Examples are non-degree diplomas from Colleges of Education, or

basic nursing qualifications.

3. Level B qualifications. These are treated in official statistics as being at degree level. An example would be membership in one of the engineering societies, to which entrance has been granted on the basis of examination. Many professional societies have not required degrees for entrance, although requirements have tended to rise (Dore, 1976a). This category picks up many non-degree holding professionals.

No standard method of combining the English codes has been arrived at. Heath (1981) used a five level scale involving examinations passed, some vocational qualifications and presence or absence of a degree. Hope (1981) developed a subjective ranking, using school type, vocational training and university training. He did not use information on examinations passed. Coté (1983) devised a scale using all of the criteria listed above, but as he hoped to develop an interval scale he grouped combinations of qualification which, for the present purposes, must be kept apart.

As pointed out above, it is necessary to distinguish between selective and non-selective schools, and to idenfity those with university training. To get a clear reading of the effect of school type, it is necessary to compare those from selective and non-selective schools who are similar in terms of school leaving age, in terms of O-Levels written, and in terms of whether they have obtained craft/trade certificates. To get a clear reading on the standing of university graduates, it is necessary to identify those who have Level B qualifications, but not degrees, as the two groups may be competitors for many upper-level positions. For analogous reasons, those with Level C qualifications, but no university, must be distinguished.

Given the features required in the code, and given the numbers available, a sixteen category system could be defined, including:

1. non-selective secondary, left no later than legal leaving age
2. selective secondary, left no later than legal leaving age
3. non-selective secondary, stayed past legal leaving age
4. selective secondary, stayed past legal leaving age
5. as in #1, with craft/trade certificate
6. as in #2, with craft/trade certificate
7. as in #3, with craft/trade certificate
8. as in #4, with craft/trade certificate
9. non-selective secondary, some O-Levels
10. selective secondary, some O-Levels
11. some O-Levels, attended to age 17 or later
12. some A-Levels
13. Level C qualifications (without university)
14. Level B qualifications (without university)
15. some university
16. degree(s) complete

The Canadian Code for Comparison With England

The English code has been set up to include general education and specific vocational preparation, apart from on-the-job training. The Canadian code represents the same elements of the Canadian system. It differs, of course, in the categories for secondary training, since the Canadian data allow a distinction between academic and vocational programs rather than between types of school, and because the measure of progress is not examinations passed or years attended but grades completed. It will differ as well in terms of non-university vocational credentials.

Incorporating these differences is straightforward. The only issue is how to handle those with partial community college, business school or trade school training. Since partial completion of programs is not distinguished in the English data, it is necessary to categorize such cases in terms of their secondary school standing. Years of secondary school have been estimated in the same way as for comparison with the U. S. Since no information is available on secondary track for such cases, they have been put into categories labelled 'track uncertain'. The resulting code contains the following categories:

1. elementary incomplete
2. elementary complete
3. Grade 9, academic

4. Grade 9, vocational
5. Grade 9, track uncertain
6. Grade 10, academic
7. Grade 10, vocational
8. Grade 10, track uncertain
9. Grade 11, academic
10. Grade 11, vocational
11. Grade 11, track uncertain
12. secondary complete, academic
13. secondary complete, vocational
14. secondary complete, track uncertain
15. business or trade school
16. community college
17. nurses' or teacher training
18. university diploma
19. degree partially completed
20. degree(s) complete

The Study Code for the Federal Republic of Germany

Two codes, one for formal education and one for occupational training, are found in SUPERFILE. As West German education is not widely familiar among Canadian sociologists, some explanation of the codes must be provided. For detailed discussion of West German education, see Max Planck Institute (1983) and Teichler and Sanyal (1982).

The first code indicates completion of programs in the secondary schools. One category indicates completion of the Hauptschule, a school entered by those who have not attempted or have not gained entrance to others. This school has sometimes been referred to in English as the Main school; this usage will be followed here. A second category indicates completion of the Realschule, often referred to in English as the Real school, which ordinarily takes a year longer to complete than the Main school, and which has traditionally been a route into middle level employment. A third category indicates that, after additional study, often in an advanced secondary school specializing in technical matters, the respondent has obtained the entrance requirements for tertiary level occupational training, including for example, the engineering schools. A final category is reserved for those who have obtained the Abitur, the diploma required for entrance to university. Ordinarily this will have been won by those who have attended a third type of secondary school, the quite rigorous Gymnasium.

A second code scheme is devoted to occupational training. Under the German "dual system" those between 15 and 18 who are not in full time schooling ordinarily undergo an apprenticeship, during which they will also spend a specified number of hours in the classroom. The coding scheme for occupational training distinguishes those who have completed apprenticeships, those who have been to a full time vocational school, and those who have completed a vocational practicum. Further categories are included for those whose qualifications are at higher levels. Those who have completed vocational training at the level of technologist or master craftsman are distinguished, then those who have completed Technical and Vocational College (Fachhochschule). These schools offer training in such fields as engineering, business and social work. Finally those who have completed university or equivalent programs are distinguished.

To Canadian eyes, it initially appears odd that there is no category for those who have not completed university, or for those with a general B.A. But some 90 per cent of males who acquire the Abitur, and 80 per cent of the females, have traditionally gone on to university (King, et al., 1974), so that those with only the Abitur would have to be grouped with some other category, quite likely those who had gone to university but not completed it, even if the latter had been distinguished. Teichler and Sanyal (1982) state that most of those who have the Abitur, but have not completed university, are probably university dropouts. The absence of a category for a general B.A. reflects the strongly professional orientation of West German universities (Max Planck Institute, 1983; Teichler and Sanyal, 1982).

Muller (1972b), in a path analytic study of West German social mobility, has argued that formal vocational training should be included in the definition of education, both because vocational training includes some theoretical elements, and because its inclusion increases our ability to predict occupational standing. As will be seen in Chapter Six, more than half the West German sample had completed an apprenticeship, so that to leave out occupational trainimg would be to omit something fundamental to the system. As the Canadian education codes include both general academic training and specific vocational preparation, it is straightforward, from a comparative point of view, to put together a code for West Germany which includes elements from both of the codes in the West German data.

From the first code the distinction between the Main school and the Real school has been taken. Attendance at the Main school or the Real school has had to be cross-classified with the most common forms of occupational training to see what difference school type makes net of later vocational training. No separate code for the gymnasium is necessary, since those who graduate are recognized by the code for the Abitur, and too few of its graduates go elsewhere than to university for categories involving attendance at the gymnasium and some other outcome to be worthwhile. Other distinctions made possible by the two codes have been incorporated as far as numbers have allowed. For males, eleven categories have been distinguished:

1. no vocational training (Those in this category have usually failed to complete the Main school.)

2. Main school, apprenticeship
3. Real school, apprenticeship
4. Main school, full time vocational school
5. Real school, full time vocational school
6. Main or Real school, vocational practikum
7. entrance requirements for tertiary technical programs
8. entrance requirements for university
9. master craftsman or technologist
10. tertiary vocational training
11. university or equivalent training

For females, the available numbers require collapsing of categories 7 and 8 into a single category for tertiary entrance qualifications.

Canadian Codes for Comparison With The FRG

As for the comparison with England, it will be necessary to distinguish levels of primary or secondary school achieved, high school track, post-secondary occupational training and university training. Some additional codes will be needed as well. German university education is strongly professional in its orientation, and degrees have been prerequisites for placement beyond a certain level in the civil service, the traditional chief employer of graduates. (Teichler and Sanyal, 1982) Thus it seems more appropriate to compare West German degrees to Canadian professional and graduate degrees than to Canadian B.A.s. Accordingly, a distinction will be made in the Canadian codes between the B.A. and other degrees.

A set of codes must be introduced because of the presence of codes for apprenticeship in the West German study code. In the Canadian code each category below the tertiary level, numbers permitting, will be subdivided into a category for those who have completed out-of-school trade training and those who have not.

One distinction made in the English case will be dropped here. The number of grades completed among those with incomplete secondary school will not be distinguished. Since partial secondary qualifications have been taken quite seriously by Canadian employers, it was undesirable to omit the category for incomplete secondary training simply because the West German code includes only complete programs. (Except for those few cases in which someone did not complete the Main school.) At the age level in which Canadians might be dropping out of high school, West Germans are usually into apprenticeships. Those who have difficulty in the gymnasium, from which many people are graduated at 20, are often able to repeat a year or to transfer to the Real school, so that relatively few will end up with no diploma. It was concluded, therefore, that since dropping out at varying grade levels was a distinctive feature of the Canadian system, it should be recognized in the Canadian codes. On the other hand, the code is quite elaborate, and examination of the data has shown that there are no important differences in the results if those who have partially complete secondary schooling are distinguished by grade level. Thus the code used here does not make such distinctions.

With these decisions made, the Canadian code, for males, was defined to include 23 categories:

1. elementary incomplete
2. as in #1, trade training
3. elementary complete
4. as in #3, trade training
5. partial secondary, vocational
6. as in #5, trade training
7. partial secondary, academic
8. as in #7, trade training
9. partial secondary, track uncertain
10. as in #9, trade training
11. secondary complete, vocational
12. as in #11, trade training
13. secondary complete, academic
14. as in #13, trade training
15. secondary complete, track uncertain
16. as in #15, trade training
17. business or trade school
18. community college
19. nurse's or teacher's training

20. university diploma
21. partial university
22. B.A.
23. professional or graduate degree

For females, as was the case with the West Germans, it was necessary to collapse categories. In the Canadian data so few women with trade training are found that six of the eight categories used for males have had to be eliminated. A distinction is preserved, however, between those with trade training and incomplete secondary schooling and those with trade training and complete secondary schooling.

The Fuller Canadian Codes

The final code schemes to be developed have been referred to as the fuller Canadian codes. These are intended to include as many distinctions from within those available in the Canadian data as sample size will permit. In defining these codes use was made of distinctions which had been found helpful in comparing Canada with other nations and of some other distinctions which the data made possible but which had not been necessary for comparison. These fuller codes were created with the hope of obtaining as complete a view as possible of the effects of various forms of education in Canada. It was also desirable to see whether any of the results obtained with less elaborate codes would be changed if the fullest possible code was employed.

For males the sample size and educational distribution made possible a set of 35 categories. For females, the smaller sample and the lack of respondents with trade training reduced the possibilities to 20 categories. It will be convenient to describe the more elaborate code for males first.

Perhaps the simplest way to describe the code for males is to point out that it involves three basic additions to the code used for comparison with West Germany. First, distinctions have been made among those who have reached different grade levels within the secondary system, but who have not been graduated. Second, those with post-secondary non-university training have been divided into those who have and have not completed their programs. In the case of those with community college, business school or trade school training, those who have completed high school are distinguished from those who have not.[8] The third difference involves an elaboration of the codes used to distinguish those with trade training from those without. For each category of education, except for the universities and teachers' or nurses' training, a distinction has been made between those with trade training and those without it.

The major difference between the codes for males and females is that for females the categories involving trade training are reduced from thirteen to one. Those with trade training who have attended business or trade school, or community college, are grouped with others who have been in these programs, rather than placed in the category for those with trade training. Other categories involving trade training are grouped. Some categories involving the vocational track in high school are also brought together, reducing the total number of categories from thirty-five to twenty.

As the codes used in this phase of the study are deliberately complex, requiring some attention to be understood in detail, and as a conceptual understanding of their origins will suffice for the moment, the precise categories used are not shown here, but appear, where they are necessary, in Chapter Seven.

Notes to Chapter Two

1. Such codes are found in the National Longitudinal Studies, which provide data on the labour force experience of men and women who in the initial year were 14-24, of men who in the initial year were 45-59 and of women who in the initial year were 30-44. (For details see Parnes, 1982.) The data on young men were used by Kerckhoff and Everett (1986) in their examination of a series of hypotheses inspired by Turner. But the gaps in the age range would make it necessary to compare, not full national samples, but samples of those in ten or fifteen year cohorts. In the other data sets sample size in such cohorts would often be too small for effective analysis. The West German data and the Canadian female data would be of very limited use. Even the larger samples for Canadian and English males could not have been divided into as many educational categories as appeared desirable.

2. In an attempt to see whether idiosyncracies in the list of occupations rated directly might account for the apparent difference in performance of the measures, five high-ranking political occupations, not covered by the socio-economic index, were removed from the list of those covered by direct ratings. Then the single highest remaining score was removed. The upper decile still covered 35.7 per cent of the interdecile range.

3. These figure are calculated from data presented in Table 1 of Bulletin 3.3-2 (Statistics Canada, 1975. Ottawa: The Queen's Printer). They include kindergarten teachers, but this

seems appropriate as they are found in the CMS unit group as well.

4. As will be seen in the other comparisons, where these categories have not been collapsed, there is a difference between foremen and skilled blue collar workers in Canada, although not a great one. But there is only a trivial difference in the U. S. data. Working with the eight educational categories used in the study and a total of 567 cases, a comparison of the two occupational categories for the U. S. yields $X^2 = 9.08$ with 7 df.

5. The Canadian data distinguish the B.A., professional degrees and graduate degrees. The Canadian code for professional degrees includes some which are treated as graduate degrees in the U. S., for example, degrees in medicine and dentistry, but also includes some which are treated as undergraduate in the U. S., for example, basic degrees in engineering. Since the three Canadian codes cannot be aligned with the two American codes for undergraduate and graduate degrees it has been necessary to place all degrees into a single category for this comparison.

6. One and three year programs exist. The extent of the imprecision introduced by their presence is unclear. But, in any case, the degree of error will not exceed one year for those who have taken such programs.

7. As the dual examinations came into existence only in 1951,

and the sample includes respondents with Irish and Scottish education, it is necessary to set up some rough equivalencies. Following the Oxford Mobility Study coding manual, those with one or more English O-Levels are grouped with:

> those who have passed Scottish O-Levels;
>
> those with the earlier English or Scottish School Certificate; and
>
> those with the Irish Intermediate Certificate.

Those with one or more English A-Levels are grouped with:

> those holding the earlier English Higher School Certificate;
>
> those holding the Scottish Leaving Certificate; and
>
> those holding the Irish Leaving Certificate.

8. This distinction was made by estimation. The estimated number of years required for post-secondary training, as defined above in discussion of the codes for comparison with the U. S., was subtracted from the total years of schooling. If the remainder was no less than the number of grades required to complete secondary school in the province of the respondent's residence at age 16, the respondent was treated as having completed secondary school.

CHAPTER THREE

MATHEMATICAL METHODS

The study has been largely conducted through Analysis of Association. The models used have been developed by Goodman (1979, 1984), Andersen (1980) and Clogg (1982a,1982b). ANOAS models, to the writer's knowledge, have not yet appeared in published studies of the link between education and occupation, although a study by Smith and Garnier (1986) has examined the link between father's occupation and children's education. As the ANOAS models used are not yet widely familiar in Canadian sociology, their choice should be explained.

To examine the hypotheses set out in Chapter One, several measures are necessary. To compare the standing of different educational backgrounds, within and between nations, coefficients representing their standing are needed. To compare the strength of the link between education and occupation across nations, a coefficient for that association is required. The conclusions that can be drawn from a model depend on how well it fits, so some measure of goodness of fit is needed. Finally, a measure is required for the extent of dissimilarity among sub-groups, defined by age, sex and other demographic characteristics. In particular, it is necessary to be able to decide whether apparent differences can reasonably be attributed to chance. On the other hand, it is not necessary to be able to incorporate multiple variables in a causal model: the hypotheses are based on the relationship between two variables only.

THE ROW BY COLUMN MODEL

The measures required can be obtained in a unified framework through Goodman's (1979b) multiplicative row-column model and its variations. As it is cumbersome to refer to 'the multiplicative row-column model', and its alternate label, 'Model II' means nothing except by contrast to Goodman's Model I, which will not be used here, the model will be referred to henceforth as the Row by Column (R x C) model.

This model, like other ANOAS models, may be viewed as an extension of the standard log-linear model. ANOAS models may also be regarded as special cases of the general logistic-multiplicative model presented by Logan (1983), but as sociologists are familiar with log-linear models from two decades of use, the Row by Column model can best be approached through them.

When log-linear modelling became familiar to sociologists in the late 1960s, they were well accustomed to cross-tabulating one variable by another, then controlling for additional variables by setting up three-and-more way tables.

The Columbia School had developed a systematic approach to the analysis of survey data which involved careful attention to the way in which the relationship between two variables was altered when three-or-more way tables were created (Lazarsfeld, 1968; Rosenberg, 1968). But if two variables, whose relationship was to be examined by controlling for other variables, were polytomous, testing the significance of the differences between layers of a three way table could be very complicated, and the complexities for four-or-more way tables could be immense. A major contribution of log-linear modelling lay in its provision of straightforward tests for the presence of three way interaction, which made it possible to quickly assess the significance of the effects of a control variable (Duncan, 1982). In four-or-more way tables more complex effects could be tested equally readily.

A further advantage over previously available techniques was found in the ability to block cells, that is, to select particular cells to be treated as if they were not present in the table. By treating cells as if they were absent it was possible to assess their contribution to the association between variables. If, after blocking a set of cells there was a significant drop in L^2, and the association remaining could be attributed to chance, attention could then be focussed on the cells which created the change.

While standard log-linear models were very powerful tools, they were basically designed for qualitative data. In the case of ordinal-by-ordinal tables, the standard models could be applied only by ignoring the ordering of categories. Unfortunately, the standard methods of dealing with ordinal-by-ordinal tables in the late 1960s had their own strong limitations. Typically, such measures as the taus, gamma and Somer's d were applied to such tables as measures of the strength of the association. But it was difficult to compare these measures across tables because their numeric values were affected by marginal totals (Blalock, 1976; Goyder, 1985). (This was not the case in the specific instance of gamma for a 2 x 2 table.) There was no straightforward way to correct for marginal effects. Again, if the value of a measure of association for an ordinal-by-ordinal table was strongly affected by a set of cells, there was no standard method of assessing their impact. As the log-linear model took account of marginals, and allowed for cell blocking, it was natural to consider ways in which it might be extended to handle tables with ordered categories. A review of attempts to do so is given by Agresti (1983).

The Row by Column model used here, like other attempts to handle the ordinal-by-ordinal table, involves the addition of a term to the standard log-linear model. Under the hypothesis that rows and columns of a two-way table are independent, the standard log-linear model, when fitted to data, takes the form

$\ln F_{ij} = l_o + l_i + l_j$, where

F_{ij} is the cell frequency to be predicted,

l_o is the mean of the logs of the cell expectancies,

l_i is the mean of the logs of the cell expectancies in row i, minus l_o, and

l_j is the mean of the logs of the cell expectancies in column j, minus l_o.

(Roman characters have been used since the terms are estimated from the data.)

The term l_o ensures that the number of cases in the table of expected values equals the number in the table of observed values. The terms l_i and l_j ensure that the row and column sums of the table of expected values match the totals for the observed table. These terms serve the same functions in more complex models.

Often when the independence model does not fit, the heavy cells are concentrated in a zone running from one corner of a table to the opposite corner. Birch (1965) pointed out that, if the row categories are of equal width on some numeric scale, it is possible to assign the categories scores which rise by a constant amount from one category to the next. The columns can be treated in the same way. Then it is often possible to fit a table with heavy cells running from corner to corner by adding a term of the form:

$c(m_i)(n_j)$, where

m_i is a score for the ith row,

n_j is a score for the jth column, and

c is a coefficient expressing the strength of association between rows and columns. While the row and column scores, in Birch's approach, are assigned by the analyst, c must be estimated from the data.

If c = 0 or if either m_i or n_j is zero, the predicted value for a cell will, of course, be unaffected by the term. Otherwise, if the m_i and the n_j are of the same sign, then as they become larger, the predicted value for the cell increases. If one of them is of the opposite sign to the other, then as they become larger the predicted value for the cell declines. As c increases it multiplies whatever effect is created by the m_i and the n_j. By appropriate choice of c, m_i and n_j, the observed frequencies in a table with a strong zone of concentration running from one corner to another could often be fitted very well.

Later other writers (Goodman, 1972; Haberman, 1974a, 1974b) pointed out that terms of the same form could be used for ordinal-by-ordinal tables if scores could be assigned to the categories a priori. But for our immediate purposes, scores must be obtained from the data, so as to estimate the distances between categories. A precursor to the method used here was developed by Simon (1974), who established a method of estimating distances between the rows of a table on the assumption that the columns were equidistant. His method was applied to the father-son mobility table by Duncan (1979). At almost the same time, Goodman (1979b) and Andersen (1980) developed methods of obtaining scores for both the rows and the columns from the data. Goodman's Row by Column model, on which the analysis conducted here is based, takes the form:

$$\ln F_{ij} = l_o + l_i + l_j + c(m_i)(n_j) ,$$

where the terms continue to perform the functions described above. Note, however, that the values of all terms must be obtained from the data.

There does not appear to be standard notation for the final term in the R x C model. Goodman (1979b), Andersen (1980) and Clogg and Schockey (1983) use different symbols. Nor has the coefficient c, which expresses the strength of association between rows and columns, received a name. It has ordinarily been referred to by the symbol representing it. Here it will be referred to as the association coefficient.

The elements of the term $c(m_i)(n_j)$, with the other terms of the model, may be obtained from the data through an iterative procedure presented by Goodman (1979b), which yields maximum likelihood estimators of the cell frequencies. The algorithm has the advantage that it is not necessary that the table be laid out in a way that makes it easy to see a corner to corner pattern. If some rearrangement of the rows or columns will create such a pattern, the algorithm that defines rows and column scores will assign scores which put the out of order categories into place.

From the c, m_i and n_j of the fitted model it is straightforward to calculate the predicted log odds for 2 x 2 subtables within the larger table. (It can be done for any 2 x 2 table whose four cells form a rectangle.) If the cells are in rows i and i+1 and in columns j and j+1, the logs of the predicted cell frequencies will be:

$$l_o + l_i + l_j + cm_i n_j \qquad l_o + l_i + l_{j+1} + cm_i n_{j+1}$$

$$l_o + l_{i+1} + l_j + cm_{i+1} n_j \qquad l_o + l_{i+1} + l_{j+1} + cm_{i+1} n_{j+1}$$

To obtain the log odds from the logs of the cell frequencies, we add the value for the NW (North-West) cell to the value for the SE cell and subtract the values for the NE and SW cells. The result, after factoring, turns out to be

$$c(m_{i+1} - m_i)(n_{j+1} - n_j).$$

From this formula for the predicted log odds it may be seen that c gives the predicted log odds for a 2 x 2 table in which

$m_{i+1} - m_i = 1$, and

$n_{j+1} - n_j = 1$.

As many sociologists are not used to thinking in terms of log odds, it may be useful to provide some illustrative tables in which c takes on a range of values similar to those which will be encountered in later analysis. For simplicity the illustrative tables will be 2 x 2 and the row and column totals will be 1000. If the row categories are one unit apart and the column categories are as well, and c = .800, the corresponding table, rounded to whole numbers, is:

598	402
402	598

.

If c = 1.000, the corresponding table is:

622	378
378	622

.

Or if c = 1.200 the table is:

651	349
349	651

.

The R x C model can describe a large cross-tabulation in far fewer coefficients than there are cells in the table. If the basic model fits, only I row scores, J column scores and an association coefficient are needed. Since the number of coefficients increases with the number of rows and columns, while the number of cells increases as the product of the number of rows and columns, the advantage of the model becomes greater as tables increase in size.

Under standard log-linear modelling it is possible to test for independence of rows and columns by comparing the L^2 for the independence model (the value of the likelihood ratio test)to the values in standard chi-square tables. Unfortunately, when this test tells us that the rows and columns are not independent, it tells us nothing of the form of the relationship. The R x C model allows us to test whether there is an association of the form it is designed to pick up, since applying the R x C model, if there is an association, will cause a decline in L^2 from its value under the independence model. The number of degrees of freedom used will be modest: (I + J - 3) degrees of freedom are required. If the association takes the form the R x C model is designed to detect, a large part of the L^2 of the independence model will be accounted for with a relatively small number of degrees of freedom. Thus, in these circumstances, the test will be more powerful in detecting association between rows and columns than the standard log-linear test for independence.

The R x C model can be extended by adding further terms, if this is necessary to obtain a good fit. One approach is to add additional terms applying to particular cells or groups of cells to improve the fit of the model in areas where it is weak. This extension of the R x C model has been employed by Smith and Garnier (1986) in an examination of the link between father's occupation and children's education, by Grusky and Hauser (1984) in a comparison of the link between fathers' and sons' occupations in 16 nations, by Breen and Whelan (1985) in comparing father-son mobility tables for Dublin and for England, and by Breen (1987) in comparing father-son mobility in England, France and Sweden. It was also used by Hauser (1984) in examining father-son mobility in the same three nations.

The model can also be extended for conditional and partial analysis. In conditional analysis a test may be performed which serves a purpose similar to that of the test for three-way interaction in standard log-linear modelling. First a model is fitted requiring the coefficients for each sub-group to be the same. Then the constraint is removed, and coefficients are obtained for each sub-group independently. The difference between the L^2 values for the two models can then be tested to see if the model which assumes the relationship between the two variables may differ among sub-groups provides a significantly better fit. In partial analysis

(Clogg, 1982a), it is possible to obtain an association coefficient for two variables, controlling for others.

Thus the R x C model and its extensions can provide the measures required for the study. It can provide a measure of the strength of the link between education and occupation in the form of the association coefficient, and measures of the relative standing of educational backgrounds in the form of the n_j. By extension to conditional analysis it allows for comparison of sub-groups. By treating models as log-linear, they can be tested for goodness of fit.

Since the term $c(m_i)(n_j)$, once evaluated, is simply added to the other terms in the model, the model becomes, in effect, log-linear. Since this is so, its adequacy may be tested by the same methods used for standard log-linear models. One consideration must be how far L^2 declines from its value under the independence model. Another must be how readily departures from the model can be attributed to chance. Another, of some importance in a study in which samples are large enough that substantively trivial differences may be statistically significant, must be how small the remaining L^2 is in relation to the sample size.

If a model does not fit well, one way to work towards a fit is to block cells or (what is equivalent in terms of fitting) to assign terms to particular cells so that they are precisely fitted. As the interest of this study is in the broad pattern of linkage between education and occupation, no attention will be given to the values of the cell coefficients required to obtain precise fits.

The ability to block cells, or to fit them precisely with cell coefficients, is particularly advantageous for this research because the procedure is often easily interpretable. It will be seen in the following chapters that cells not well fitted by the basic R x C model often combine a particular form of education with an occupation or set of occupations to which it is supposed to provide entry. When this is so, an excess of cases beyond those predicted by the basic model can be readily interpreted.

Standardization of Coefficients

For the coefficients to be identified, four restrictions are necessary (Anderson, 1980). Here three sets of restrictions will be mentioned. Initially, Goodman (1979b) suggested that the sum of the (unweighted) row coefficients be set to zero, that the sum of the squared row coeffients be set to 1, and that the same be done with the column coefficients. Two years later he suggested (Goodman, 1981) that the row and column coefficients be standardized in the usual way. Another approach, used by Breen and Whelan (1985) and by Breen (1987) is to set the row and column coefficients so that their maximum value is 1.00 and their minimum is .00. Unfortunately, this approach makes it impossible to detect differences in scores at the extremes and university degrees, which must be compared, always lie at or near the upper end of the range for education scores.

Goodman's initial proposal has the advantage that if two tables have the same row and column categories the coefficients can be compared without concern for the effects of varying marginal totals. It has the disadvantage that it makes comparison of tables of different sizes much less straightforward, since the more coefficients there are, the more they will have to be shrunk toward the mean for the sum of their squares to equal 1. The shrinkage required cannot be compensated for in a straightforward way, because the extent of shrinkage depends on the location of the extra categories in the larger table: if they lie near the mean they will induce less shrinkage in the coefficients for other categories than if they lie near the extremes. This complication also makes it difficult to compare tables whose dimensions are the same, but in which one table does not have exactly the same categories as the other. Another awkward feature in comparing tables is that the means of the unweighted row and column coefficients are set to zero. Thus a large shift in a very small category can move the rest of the coefficients up or down substantially.

The usual method of standardization allows the results to be affected by marginal totals, but on the other hand allows comparisons to be made with tables that are not of the same size, or that do not have exactly the same categories. This is no small advantage, since, as has been seen above, educational systems require quite different codes. A further advantage lies in the interpretability of coefficients. Sociologists are used to working with measures which are expressed in terms of standard deviations from the mean. Then too, the means of the coefficients will be influenced much less by small categories than under Goodman's initial proposal.

For the present study standardized measures are conceptually appropriate. The scores for occupational categories, as will be seen, are very similar across nations, but always involve some statistically significant differences. Since occupational categories do not have quite the same relative educational requirements in the various nations it is necessary to obtain educational coefficients which identify the standing of a particular credential within the system of occupational requirements prevailing in a given society.

Using standardized scores, the interpretation of coefficients must obviously be in relative terms. If an occupational category receives a coefficient of 1.000 then, in terms of the education of those in it, it lies one standard deviation above the average for its country. If an educational category receives a coefficient of 2.000 then, in terms of the occupations of those in it, it lies two standard deviations above the average for its country. Since occupational categories are given coefficients in terms of the education of those in them, the occupational coefficients will sometimes be referred to as measures of the education-linked standing of occupations. In a similar way, educational coefficients will be referred to as measures of the occupation-linked standing of a particular credential.

If interest is focussed on the relative standing of row or column categories within separate contexts, it does not matter that marginals are unequal. But it is sometimes desirable to see how nations, or sub-populations within nations, would compare if their marginals were equal. This is particularly so when it is thought that differences in the marginals may provide an explanation for differences in the coefficients. In situations of this kind, it is possible to Deming adjust one table to the marginals of another (Deming, 1943), then to refit the R x C model on the adjusted table.

Obviously, to adjust two tables so that their marginals are alike requires that they employ the same categories, or that they can be collapsed into the same categories. If only the rows (or columns) are alike, so that we can Deming adjust only the rows (or only the columns), each row (or column) category is multiplied by a factor which will bring the number of cases in the category to the proportion found in the same category in the other table. When it is desirable to adjust both rows and columns, it is necessary to multiply, first the row (or column) categories, to bring them to the desired proportions, then the column (or row) categories. Alternate adjustment of rows and columns continues until the resulting cell estimates stabilize. Since Deming adjustment preserves the odds ratios for 2 x 2 subtables within the unadjusted table, which the coefficients of the model are designed to estimate, the coefficients for a Deming adjusted table may be compared with those of the table to whose marginals it has been adjusted.

If table A is adjusted to the marginals of table B, and the coefficients for the adjusted table A are compared to those for table B, one pattern of differences will be obtained. If table B is adjusted to the marginals of table A, another pattern of differences will be obtained. It will not ordinarily be numerically identical to the first pattern. But the profile of the differences will often be very similar; that is, if a particular category is higher in table A in one comparison, it will be higher in the other, and if a difference is large in one comparison, it will be large in the other. For the data examined here the profiles of differences are often similar. When they are not, there has been difficulty in obtaining a good fit for one adjusted table or the other.[2]

The Row by Column Model and Canonical Analysis

An earlier method of obtaining scores for the rows and columns of a contingency table is canonical analysis. Its use with mobility data has been advocated by Beck (1973), Duncan-Jones (1972a, 1972b), Hope (1972b) and Klatsky and Hodge (1971), and its more general use by Davis (1977). Very detailed treatments have been presented by Gittins (1985) and Nishisato (1980).

This method of assigning sccres should be briefly outlined. Treating the row scores as one variable and the column scores as a second, scores are assigned so as to maximize the correlation between them. If the correlation of these two variables does not account for all the variation in the table, two more variables are created, orthogonal to the first, and row and column scores are assigned to maximize the correlation between them. The process of defining pairs of variables and maximizing their correlations continues until the variation in the table is exhausted.

Although the canonical analysis of contingency tables has sometimes been discussed without reference to canonical correlation, the two are closely associated. If (i-1) of the i row categories of a table are represented by dummy variables, and (j-1) of the j column categories are treated in the same way, a canonical correlation may be obtained between the dummies representing the row categories and those representing the column categories. The coefficients which will be assigned to the row and column categories will be the same, up to a linear transformation, as those obtained from the canonical analysis of a contingency table.

If, on theoretical grounds, it is believed that a table is the surface manifestation of an underlying structure involving more than one pair of variables, in which each variable based on the row categories is orthogonal to each other, and each variable based on the column categories is orthogonal to each other, then the canonical approach has an advantage. Since there is no theoretical reason to believe that an occupation by education table is so composed, on grounds of conceptual parsimony the R x C has the advantage in this situation.

The R x C model is well adapted to fitting tables in which frequencies fall off sharply in two corners, but not in the others. Since the term $c(m_i)(n_j)$ affects the logs of the predicted cell frequencies, when the row and column scores are of opposite sign, as they increase in magnitude predicted cell frequencies decrease rapidly. High values of c increase the rate of falloff. Thus a table with very high frequencies running from one corner to the other and very low frequencies in the other corners can often be readily fitted.

As the writer is unaware of any systematic comparison of the results of canonical analysis and R x C modelling, he has compared them on over 40 tables of artificial data, as well as on each of the basic tables examined in the following chapters. Some results for the tables used in this study are presented, as part of a general discussion of the performance of the R x C model, in Chapter Eight.

COPING WITH COMPLEX SAMPLES

The use of R x C models is complicated by the sample designs of the studies from which the data have been drawn. All of the data come from multi-stage, stratified samples, and the Canadian data are weighted as well. But the usual L^2 and X^2 goodness-of-fit tests cannot be assumed to be accurate under complex sampling. Yet it appeared to be necessary to obtain usable goodness-of-fit tests. In a field in which differences are often subtle, the alterations in coefficients which can result from blocking of cells must be borne carefully in mind. It is thus of some substantive importance to have a meaningful goodness-of-fit test available when deciding whether a model is satisfactory. Similarly, in a field in which differences are often subtle, the lack of meaningful standard errors, which can be obtained only by taking the sample designs into account, creates a danger of obtaining results whose bearing on the hypotheses cannot be adjudicated.

Obtaining Standard Errors

A variety of methods exist to estimate standard errors under complex sampling: the delta method (Kish, 1965; Woodruff, 1971) half sampling (McCarthy, 1966) and its generalization, orthogonal replication (Gurney and Jewett, 1975), bootstrapping (Efron, 1979) and jackknifing (Tukey, 1958; Brillinger, 1964; Miller, 1974). Discussions of these methods are found in Lee, et al. (1987) and Kalton (1983). Empirical examinations of their relative performance have suggested that all perform reasonably well and that none shows any great overall advantage (Bean, 1975; Burt and Cohen, 1984; Frankel, 1971; Lemeshow and Levy, 1979). These studies suggest that, where a choice is open, it can be made on practical grounds, in terms of cost, availability of programs, and the like. In this study, it has been most straightforward to proceed by jackknifing.[3] As none of the studies cited has compared the possible techniques in terms of their effectiveness with the coefficients of ANOAS models, both jackknifing and balanced half sample replication were used with the American data, to which each could readily be applied. The results did not differ greatly, as may be seen in Appendix C.

Jackknifing aims to estimate the variance that would occur in the coefficients of interest under replicated sampling. To make the estimates, it examines the variation among subsets of the data in hand. The subsets created for this purpose are often refered to as pseudoreplicates.

The formation of pseudoreplicates varies with the sampling scheme. In the simplest case, when a set of observations have been obtained by simple random sampling, pseudoreplicates are formed by simply taking out one case at a time. The others may (optionally) be weighted up so that the pseudoreplicate returns to the size of the original sample.

An analogous method can be used with a series of sub-samples, each obtained through the same sampling methods. In this situation one sub-sample at a time can be removed, and the others reweighted so that the pseudoreplicate returns to the size of the full sample.

For stratified sampling, with primary sampling units (PSUs) chosen within strata, a technique was originated by Frankel (1971) for the case in which two PSUs are chosen per stratum, and generalized to the situation in which more than two PSUs are found in (some of) the strata. In each stratum one PSU is removed at a time, and the others are weighted up so the stratum total returns to its original value. If there are k PSUs in a stratum, up to k pseudoreplicates may be created, each including one modification of a single stratum, together with the cases from the other strata. The variability among the pseudoreplicates created for a stratum captures the effects of that stratum on the variability of the sample.

Procedures by which standard errors may be estimated in the simple and stratified cases have been developed respectively, by Quenouille (1949, 1956) and Jones (1974). An example of the use of a formula for the simple case is found in Mosteller and Tukey (1968). If an unstratified sample is treated as having a single stratum, Jones' formula yields a standard error asymptotically equivalent to that provided by the earlier formula. In this study the earlier formula has been used. As it would be tedious to go through the formulas here, the interested reader is referred to the chapter notes.[4]

Calculating Standard Errors for National Samples

Canada

The application of jackknifing to the four national samples requires brief explanation. For the Canadian data, no previous studies have reported standard errors calculated with the complex sample design taken into account. However, a data tape made available by Statistics Canada for this study makes it possible to use the jackknifing approach.

The Canadian Mobility Study data were obtained from a dropoff questionnaire given to eligible members of households in the Canadian Labour Force Survey in July of 1973. A review of the data collection procedures is provided by Boyd, *et al.* (1985). The labour force survey itself is a multi-stage areal probability sample, obtained through procedures described in Statistics Canada (1966). Case weights have been attached to respondents in the Canadian Mobility Study to correct for varying sampling fractions, for differences between study estimates and independent estimates of the age and sex composition of the populations, and for non-response.

Since the data tapes do not, and under the restrictions of the Statistics Act, cannot identify primary sampling units, it is impossible to recapture the full stratification in the sample design. But it is possible to make use of the rotation groups. Households remain in the labour force survey sample for six months before being replaced. Thus, at any given moment there are six sub-samples, each obtained through the same sampling techniques and each weighted in the same way. Using them as the basis of jackknifing, six pseudoreplicates have been created, by leaving out one at a time and weighting the others up to preserve the original sample size.

Since there is a possibility that non-random differences may exist among sub-samples, because of attrition, learning effects or other factors, there is also a possibility that standard errors estimated from the rotation groups are biased upward. In any event, as will be seen in later chapters, the standard errors obtained are small enough to serve their purpose well.

The United States

The General Social Survey Cumulative File contains data collected in differing ways. From 1972 to 1976 all or part of the sample was drawn using quotas at the final stage of sample selection. From 1975 to 1983 all or part of the sample was drawn within the same sampling frame, but with strict probability procedures for sampling at all levels. After 1983 all data have been gathered from a new sampling frame. Since jackknifed standard errors and goodness-of-fit tests depend on a common sampling method, the study has relied on cases from the period 1975 to 1983, drawn by strict probability methods.

Samples were drawn from 101 primary sampling units, stratified by region, age distribution, and racial proportions. Fuller details on the sampling are found in Davis (1985). Although the PSUs were drawn one from a stratum, they have been arranged so that they may be paired into pseudostrata for purposes of variance estimation (Frankel, personal communication). PSUs numbered 1 and 2 are paired, as are 3 and 4, then 5 and 6, and so on until the last three are reached. These are treated as having come from a single stratum. Given the pseudostrata, it is straightforward to create the pseudoreplicates required for the stratified jackknife.[5]

England

The English data have been obtained through sampling procedures described by Kalton (1973). Potential sampling units were defined within the nine Standard Economic Regions of England, and for the Southeast Region, within the sub-region of Greater London. Within these regions PSUs were selected with probability proportional to the number of electors residing within them. The selection was made from a list of potential PSUs which had been ordered by population density. Working from a random start, PSUs were selected at constant intervals along the list. This procedure provides some stratification by population density.

As the sample includes 417 PSUs, and as computer time required for calculations seemed likely to be high because of the complex iterations required, the PSUs were grouped randomly into sets of three. (In a few instances, groups of two or four were used because of the available number of PSUs.) The grouping took place within regions and within groups of PSUs defined as Rural Districts or Other. The latter distinction will pick up some of the stratification by population density built into the sampling.[6]

The result was a set of 139 units, within 19 strata, to which the stratified jackknife could be applied. As it turned out, the grouping of PSUs did save a good deal of computer time: with 139 pseudoreplicates, the run to estimate standard errors for England took close to 35 minutes on a Cyber 170/730.

The Federal Republic of Germany

The West German data come from a cumulative file including data from surveys conducted over nine years, beginning in 1976. The surveys were based on essentially identical three stage area probability sampling. The sampling methods are described in ZUMA (1978). The data tape does not distinguish PSUs, and thus, as with the Canadian Mobility Study, it is necessary to make use of subsets of the data drawn in the same way, but not at the same time. However, since the subsets were drawn at annual rather than monthly intervals, there is perhaps more reason for concern that subsets differ because of changes in the society during the period they cover, and that therefore the standard errors are biased upwards. As it happens, the standard errors, particularly for females, are sometimes uncomfortably high, but this could have resulted from the combination of relatively small sample sizes with an inability to recapture the stratification of the sample. In any case the basic purposes of the study are not impeded, as will be seen in Chapter Six.[7] Given a decision to use year-of-sample as the basis for jackknifing, it was straightforward to create pseudoreplicates by leaving out one year's sample at a time, and weighting the remainder of the cases to restore the original sample size.

Testing Differences in Coefficients for Significance

Given standard errors, it is usually straightforward to compare two coefficients with a t-test. But in this study the standard formulas do not hold. They were developed for situations in which the standard errors of two statistics could be assumed equal. But here they cannot: the samples are of quite different sizes and have been gathered in different ways.

In this situation, a test developed by Welch will be used. Welch's test takes the form of the standard t-test, with an adjusted number of degrees of freedom. When the number of degrees of freedom on which the standard errors are based is large, the normal approximation can be used. This can be done in comparing Canada with either the U. S. or England, because the stratified jackknife estimates for these nations involve, respectively, 50 and 117 degrees of freedom. But when comparing Canada and West Germany, where the standard errors are estimated with, respectively, 5 and 7 degrees of freedom, this cannot be done, and a formula for the adjusted degrees of freedom presented by Welch (1938) must be used. A brief statement of the rationale for Welch's test is found in Pearson and Hartley (1976), who also provide tables for its use. For fuller details, the reader is referred to the original papers by Welch (1938, 1947).

There is a difficulty in comparing two coefficients drawn from the same sample. If, in sampling, the occupational outcomes for one educational category go up, the coefficient for that category will go up. But, since each coefficient reflects the odds ratios of the category to which it applies, and the means of the category scores are set to zero, the coefficients for other categories will, other things being equal, go down. That is, the coefficients are not independent and therefore it is incorrect to use the standard errors presented for them to carry out either a standard t-test or Welch's test. It is possible, however, to take the difference observed between two coefficients and to jackknife it directly. Whenever two coefficients from the same sample are compared and the standard error or the significance of their difference is mentioned, the standard error has been obtained by direct jackknifing.

Goodness-of-Fit Tests

A variety of proposals for obtaining goodness-of-fit tests under complex sampling have been reviewed by Lee, et al. (1986), who point out that a test presented by Fay (1985) provides a widely useful solution to the problem: the method is applicable to samples suitable for either simple or stratified jackknifing, to half sample replication or to bootstrapping. Further, a program, CPLX, is available to carry out the test for standard log-linear models.

Fay's test, when applied to samples suitable for jackknifing, uses pseudoreplicates of the same form as those required to compute standard errors. The test is based on a measure, G, whose sampling distribution is derived in Fay (1980). Fay's test may be used either with X^2 or with L^2. With an adaptation in the formula, it can be used to test the difference between two models. As going through the formulas for calculating G would be quite tedious for the reader without special interest, the interested reader is referred to the chapter notes.[8]

One small issue in using Fay's test is whether it is best to use X^2 or L^2 for goodness-of-fit tests applied to R x C models. Tests of differences between models require the use of L^2, but the situation for simple goodness-of-fit tests is less certain. On the one hand, L^2 is the measure minimized by the maximum likelihood estimates created by Goodman's (1979b) algorithm. It is also, when divided by the sample N, interpretable as the amount of information per case remaining in the table after the model has been fitted (Gokhale and Kullback, 1978). On the other hand, Fay (1983) and Larntz (1980) have presented simulation data favouring X^2 for goodness-of-fit tests. Unfortunately, their evidence is based on smaller tables than those used here and on independence models rather than R x C models. The relative performance of X^2 and L^2 for these models does not seem to have been investigated.

On the basis of Fay's simulations, which at least are based on use of his own test, the writer decided to use X^2. Since the programs used routinely calculate both X^2 and L^2, it is now apparent that the choice, as might have been expected, usually made little difference.

One problem has arisen in practice, though, because X^2 is relatively vulnerable to small cell expectancies. Occasionally, in the corner of a table where very few cases are found and the R x C model has provided low fitted values, a very low fitted value falls into a cell that has a few cases in it, which then make a very large contribution to X^2. A cell of this kind, which contains only a small number of cases, and whose contribution to X^2 is much out of proportion to the difference between observed and expected values, will be referred to here as a nuisance cell. (In this study nuisance cells have never involved more than four observed cases.) If there is only one such cell, it can usually simply be blocked out. If more than one cell is affected, however, blocking them out sometimes affects the coefficients of the model substantially. Under these circumstances, since it seems inappropriate to judge the overall fit of a model on the basis of a few cells which contain very few cases among them, it appears preferable to use L^2 as the measure of fit. This has been done regularly with Canadian females, but has had to be done only once elsewhere.

Another issue in testing for fit is how best to report the results. To avoid the creation of another dozen or more tables, it was decided to provide the basic material in the text. For each model fitted to an occupation by education table, apart from those that have been Deming adjusted, the text will indicate the value of L^2 and L^2/N. Where cells have been blocked the decline in L^2 will be reported. The reader may assume in all such cases that the decline is significant at .01 or beyond by Fay's test. The proportional reduction in L^2 from its baseline value under independence to its value under the model accepted will also be given.[9] Where a significance test has been based on X^2, this too will be reported.

In the literature an Index of Dissimilarity is sometimes reported along with L^2/N, as a second measure of fit whose value is not affected by N. Indexes of Dissimilarity have been routinely calculated, along with L^2/N, but the Index, divided by 100, rarely differs from L^2/N by more than .025. As the Index gives essentially the same message as to the fit of a model, in the interests of an uncluttered presentation only L^2/N will be reported.

As mentioned above, L^2 tests may be used to see whether two sub-populations can reasonably be regarded as alike. Because of the sample sizes, a significant L^2 has sometimes been obtained when the differences between sub-populations have been quite small. For someone with a strong interest in the detailed differences between sub-populations, a comparison of their coefficients could be fruitful. For the more general interests of this study, it has seemed appropriate to pass them by. If, for example, each sub-population is represented by a 13 x 16 table, then each sub-population will have 30 coefficients. To examine so many coefficients, when the basic differences between sub-populations are small, has seemed an unnecessary distraction from the major interests of the study.

The reader will note that models have sometimes been accepted when their X^2 or L^2 values are significant at .05. From the formula for G, it is possible to calculate the value of X^2 or L^2 which would have brought G to its critical value. This will be reported in any instance in which a model was accepted when it was statistically significant. This has occurred most frequently with the Canadian male data set, which because of its size, even when the fit is very good by other standards, sometimes yields a significant X^2 or L^2.

Because large samples have this effect, greater reliance has been placed on L^2/N values. (The only model accepted above the arbitrary value of .100 took the value of .101.) Although there is as yet no convention as to how well an R x C model should fit, published studies in which a model with a significant X^2 or L^2 has been accepted have involved values of L^2/N at roughly the level of those accepted here.

Similarly, in deciding how closely to examine the coefficients for a Deming adjusted table, L^2/N values of over .100 have been taken as unsatisactory. For Deming adjusted tables, the value of L^2 and of L^2/N will be reported, but no significance tests results will be presented. While it is technically possible to do jackknifed goodness of fit tests for such tables, their interpretation would not be very helpful.[10]

Computation

While ANOAS models can be fitted through GLIM, it will not allow tables as large as many of those used here. While they can be fitted through subroutine LOGLINEAR in SPSSX, the subroutine would have to be run several times, perhaps as many as 20, to obtain adequate fits of some of the models to be tested, and for jackknifing the number of runs would have to be multiplied by the number of pseudoreplicates. It was therefore preferable to use ANOAS and ANOASC, two FORTRAN programs written respectively by Clogg (1980) to fit ANOAS models, and by Clogg and Schockey (1983) to fit conditional ANOAS models. As the source codes were made available by Clogg, the programs could be readily modified for the purposes of this research. Modifications have been made to allow for larger tables, to include additional diagnostics of fit, and to calculate model coefficients in standardized form as well as in the form initially suggested by Goodman.

Some of the goodness-of-fit tests reported here were carried out through CPLX, another FORTRAN program, written and made available by Fay. Since CPLX does not fit ANOAS models, it was necessary to write additional programming. Using the basic algorithms of ANOAS and ANOASC, two further programs, ANOAJAC and ANOCJAC, were written to take a series of pseudo-replicates, to fit models for each of them, and to calculate standard errors for the coefficients and jackknifed tests of goodness of fit.

Potential Problems in the Methodology

As the methodology of the study involves several features that have as yet not appeared in the sociological literature, one contribution of the study has been to test out the methodology on a real sociological problem. As yet, in the published literature the R x C model has not been applied to occupation by education tables, or to tables as large as those used here. The writer is unaware of a published use of Fay's test with ANOAS models in the sociological literature, although he is aware of some unpublished work.

In attempting this work, the writer was keenly aware of some potential difficulties. For one, it might have proved difficult to obtain adequate fits without blocking many cells. This possibility was raised by the presence in the education codes of particular forms of education intended to lead to particular types of work. Cells reflecting such a linkage might often be heavy, and require blocking. If too many had to be blocked, model coefficients could be altered quite strongly, placing the notion of an underlying regular association between education and occupation in jeopardy, and making comparisons between nations hazy. Or well fitting, interpretable models might be obtainable for one nation but not for another. On the surface the tables showed patterns of the kind the R x C model is intended to deal with, but their sheer complexity made it difficult to be certain, without fitting the models, whether satisfactory fits could easily be obtained. Another possibility was that the standard errors for coefficients might be too high for interesting differences among nations to be significant, even though they took the form predicted. As no studies could be located in which standard errors had been reported for the coefficients of the R x C model, and as their sampling distribution was not known, the only way to assess this possibility was to conduct the analysis.

The study was therefore viewed, in part, as an effort to see how effectively the R x C model could deal with tables of the kind used here. A review of its performance will be presented in Chapter Eight.

Notes to Chapter Three

1. Sometimes the three terms on the r.h.s. of the independence equation are collapsed into two, but this is of no concern for the present purpose. Here the usage follows Andersen (1980) in keeping the three terms distinct.

2. Another procedure, which should often generate essentially equivalent results, would be to take the coefficients for one table, and to standardize them using the marginal totals for the other table. However, a shift in the marginals of a table will sometimes require blocking of different cells than those which had to be blocked in the original table, and the seemingly straightforward procedure of standardizing to the marginals of another table does not take account of this. Fitting a Deming adjusted table allows the possibility to be checked.

3. Jackknifing can be applied to all of the data sets, whereas half sampling can be applied only to the American data. Bootstrapping would require additional computer time: repeated samples must be drawn from the cases in the data set, so that the variability in these samples can be examined. It is not clear how the delta method could be applied in a context in which coefficients are defined only by iteration. It is also true that some simulation results (Efron, 1983) indicate that the delta method will sometimes give downward biased standard errors.

4. Calculation of standard errors under simple jackknifing,

requires that a series of pseudovalues be obtained, one for each pseudoreplicate. In the notation of Mosteller and Tukey (1958) the pseudovalue corresponding to the jth replicate is denoted by y_{*j}.

$y_{*j} = ky_{all} - (k-1)y_j$, where

y_{all} is the statistic of interest, calculated for the entire sample,

y_j is the statistic of interest, calculated for the jth pseudoreplicate, and

k is the number of pseudoreplicates.

The mean of the y_{*j} is denoted by y_*.

The estimated standard error is given by

$$s_*^2 = \frac{\sum y_{*j}^2 - (1/k)(\sum y_{*j})^2}{k(k-1)} .$$

To avoid unnecessary shifts in notation, Jones' (1974) formula for the stratified case will be reexpressed in notation similar to that of Mosteller and Tukey. First, it is necessary to obtain a measure of the variability within each stratum. This will be denoted by s_g^2

$s_g^2 = ((k_g -1)/k) \sum (y_{gj} - y_g)^2$, where

k_g is the number of pseudoreplicates formed by removing PSUs from stratum g and reweighting the remaining PSUs,

y_g is the statistic of interest, calculated with the stratum g unmodified, and

y_{gj} is the statistic of interest, calculated with stratum g modified by removal of PSU j and with the remaining PSUs reweighted.

The standard error may be estimated by summing the s_g^2 across strata and taking the square root.

Jones' full formula contains a correction for the finite number of PSUs within a stratum . Denoting the number of potential PSUs within a stratum by N_g and the number of strata by M, the standard error of y, corrected in this way, may be obtained from the formula

$$s^2(y) = \sum_M ((N_g - n_g)/N_g)(s_g^2) \quad .$$

While this correction may very often be neglected (Kalton, 1983), in the English case it would make a nontrivial difference: it may be calculated from data presented by Kalton (1973) that about 18 per cent of the potential PSUs were selected. Assuming this figure to be constant across strata (likely a very good approximation), applying the correction would reduce the standard errors for the English data by around 10 per cent. Unfortunately, the correction is not precisely accurate: it assumes PSUs of equal size, but the PSUs were selected with probability proportional to size from a list in which some were about twice as large as others. Those selected will therefore be larger, on average, than those omitted. On this account the correction has not been applied, but the standard errors for England are nonetheless slightly high. This causes no complications in practice, as the comparisons made with the English data are not borderline cases.

5. As a matter of methodological interest, standard errors for the U. S. have also been calculated by balanced half sample replication. PSUs 99 and 101 were grouped, and the necessary replicates could then be created. The results, as earlier studies have suggested, and as may be seen in Appendix B, are, over all, about the same for the two methods.

6. It is not possible to duplicate the sampling procedure because the data tape does not contain a measure of population density. Since, on the average, fewer than 25 respondents were taken from any PSU, and since the tape already identifies economic region and form of local government (Rural District, Urban District, County Borough or Metropolitan Borough), it would be difficult to place much detail on population density onto the tape without also making it possible to identify some individual respondents.

7. It is impossible to test the significance of year to year variation, but some perspective on its magnitude can be obtained from the fit of a model which assumes no three factor interaction, using the education and occupation codes outlined in Chapter Two. Whether the test is done for males or females, or for the two together, using the male codes, L^2 is too small to reach conventional levels of significance, making no allow-

ance for design effects. Such a result ought not to be taken overseriously as an approximation to a significance test, since the combined effect of many small cell expectancies with complex sampling is not well understood. But it is clear than whatever year-to-year variation is present is of a magnitude which is commonly regarded as non-problematic.

8. The formula for G reads

$$G = \frac{(X^2(Y))^{.5} - (K+)^{.5}}{(V/8X^2(Y)))^{.5}}$$

Fay denotes a table based on a total sample by Y. He denotes a pseudoreplicate by $Y+W_{ij}$. Thus $X^2(Y)$ refers to the X^2 value obtained from a total sample and $X^2(Y+W_{ij})$ refers to the X^2 obtained from a pseudoreplicate. The other terms are defined so that

$$P_{ij} = X^2(Y+W_{ij}) - X^2,$$

$$K = \sum_i b_i \sum_j P_{ij},$$

K+ = K, if K is positive, zero otherwise,

$$V = \sum_i b_i \sum_j P_{ij}^2, \text{ and}$$

b_i depends on the form of the pseudoreplicates. For the simple jackknife, $b_i = (n-1)/n$, where n is the number of pseudoreplicates. For the stratified jackknife $b_i = (J_i - 1)/J_i$, where J_i is the number of pseudoreplicates in stratum i.

The difference between two models may be tested by a variation in the formula, where $G^2(Y)$ denotes the L^2 value for the less restricted model and $G^2{'}(Y)$ denotes the L^2 from the more restricted. Then

$$P_{ij} = (G^2(Y+W_{ij}) - G^2{'}(Y+W_{ij}) - (G^2(Y) - G^2{'}(Y))$$

K and V are defined as above, using the modified P_{ij}. Then

$$G = \frac{(G^2(Y) - G^2{'}(Y))^{.5} - (K+)^{.5}}{(V/8(G^2(Y) - G^2{'}(Y)))^{.5}} .$$

9. No significance levels will be reported for the difference between the baseline model and the R x C model (or when cells are blocked, the blocked model). This will be so for three reasons. The first is that the differences are so great that there is essentially no doubt about their arriving by accident. The second, applying to the English and American data sets, is that the computation costs of such tests could be quite large. It has been reported above that a test for the difference of two models, using the English data, used 35 minutes of central processing time on a Cyber 170/730. If not similar amounts, at least large amounts, of time would have been necessary to check the difference between the baseline model and any other model.

While the demands of the American data would not have been as great, they would still have seemed quite substantial in relation to the lack of doubt on the question at hand. The third reason, applying in situations in which cells had been blocked, is that in these circumstances a test for the difference between the baseline model and the R x C model, although sometimes reported, is not technically correct. If the R x C model is not believed to be the correct one, then there is no theoretical reason to believe that the difference between it and any other model within which it is nested will follow the X^2 sampling distribution.

10. It is possible to weight the cases in a sample so as to reproduce the cell values of a Deming adjusted table, then to create pseudoreplicates with the weights applied. Using these pseudoreplicates, a jackknifed goodness of fit test could be carried out. Had the sample been drawn from a population in which occupation and education were distributed as in the margins of the adjusted table, the case weights would simply be compensating for disproportionate sampling, and the significance test could be interpreted in the usual fashion. But the population distributions from which samples are drawn are not those of the adjusted tables. A goodness of fit test thus will yield the probability that we would obtain a particular X^2 or L^2 value, given that the model was correct, and that we had sampled disproportionately from an imaginary population. Knowing the probability of obtaining a particular X^2 or L^2 when

sampling from a population other than the one we have actually sampled from is not very helpful for our purposes here.

CHAPTER FOUR

THE UNITED STATES AND CANADA

Canadian students of comparative mobility have traditionally compared their nation with the United States. Pineo (1976) reviewed early work, which tended to show no or small differences. McRoberts (1975), using Blau and Duncan's model of status attainment with Canadian Mobility Study data, obtained results essentially similar to those reported earlier for the U. S. (Blau and Duncan, 1967) McRoberts and Selbee (1981), using log-linear modelling, concluded that the father-son mobility table, apart from differences in the marginals, was very much the same in the two nations: such differences as were present were small and of uncertain statistical significance. Goyder and Curtis (1977) compared the transmission of occupational status across three generations of males in the two nations, and concluded that it was much the same. On the other hand, Goyder (1985), while finding small changes in the father-son occupation table from the earlier cohorts in the CMS data to the later, found nothing similar in American data. He suggested that the changes in Canada were due to its later industrialization.

While much useful comparative work has been done, studies to date have focussed primarily on issues other than those considered here. McRoberts' comparison of path models included the effect of education on occupational standing, but, by the nature of the model, could not yield evidence on the relative effects of particular credentials in the two nations. Other studies have focussed on occupational transmission without attention to the role of education in the transmission. Here previous work will be extended by comparing the strength of association between education and occupation by an alternate methodology, by comparing the relative value of credentials, and by including women in the comparison.

Distributions for Occupation and Education

In comparing two nations through the R x C model, it sooner or later becomes necessary to take account of their marginal distributions. As pointed out in Chapter Three, the coefficients for occupational and educational categories have been standardized. The term in the model which includes these coefficients takes the form

$c(m_i)(n_j)$, where the m_i are occupation coefficients, and the n_j are education coefficients.

In order for the predicted cell values to remain stable, the value of this term must remain constant as the occupation and education coefficients are standardized. Standardizing either the row or the column coefficients does not affect the other set. Thus, if one nation's occupational scores are shrunk more than another's in standardization, the nation whose scores contract most strongly must show a correspondingly greater increase in the association coefficient. The same must occur if one nations's education coefficients shrink more than the other's. Thus, since the changes in row and column coefficients with standardization depend on the marginals, an informed comparison of association coefficients requires an awareness of the marginals.

When marginal effects are dealt with by Deming adjustment, it is often necessary, in examining the changes it brings about in the fitted model, to look at the particular rows and columns which have been most strongly multiplied. This may, for example, help to explain why cells which were well (or poorly) fitted before the adjustment now require (or do not require) blocking. This too requires a knowledge of the marginals in the two tables. For these reasons, and to provide an orienting sense of the data, this and succeeding chapters will present the marginals for occupation and education.

U. S. respondents have been recoded into the occupational categories of the Canadian Mobility Study, as discussed in Chapter Two. While, in general, there was little difficulty with recoding, placing unit groups into skill levels was sometimes difficult because of broadly defined unit groups. For females, there were difficulties, to be discussed below, with skill levels among white collar workers. It seems plausible that, for males, the figure for any one of the three skill levels among blue collar workers might be out by two or three percentage points because of this. But it appears likely that other categories are more accurately matched, both in absolute and in proportional terms. Because of the large number of quite specific unit groups, it is particularly easy to identify professionals, and farmers and farm labourers.

Table 4.1 shows the occupational distributions for males in the labour force in the U. S. and in Canada. The proportion in the professions is 2.1 percentage points higher in the U. S. sample, but the difference is more than balanced out at the semi-professional level, where the U. S. is 2.8 percentage points lower. As discussed in Chapter Two, elementary teachers in Canada were coded as semi-professional. In the U. S., where in 1980 less than one half of one per cent did not have degrees, and close to two fifths had degrees beyond the Bachelor's, they have been classified, along with secondary teachers, as professional. This difference in classification largely accounts for the high U. S. figure for professionals and the correspondingly low figure for semi-professionals: 1.6 per cent of the U. S. male sample are elementary teachers. If occupations classified as professional, semi-professional, technical, managerial and supervisory are grouped 33.5 per cent of American males are included, compared to 31.2 per cent of Canadians. At the bottom of the table, of Canadian males, 6.1

Table 4.1

Occupational Distributions of U. S. and Canadian Males, in Percentages

Occupational Category	U. S.	Canada
Professional	11.4	9.3
Semi-professional	2.0	4.8
Technical	2.9	1.9
Managers and Supervisors	16.2	15.2
Clerical, Sales and Service		
Skilled	3.4	4.3
Semi-skilled	7.9	6.0
Unskilled	3.6	2.0
Crafts, Trades and Manual		
Skilled	22.4	26.5
Semi-skilled	14.4	10.9
Unskilled	12.6	13.1
Farmers and Farm Labourers	3.3	6.1
Total	100.1	100.1
N	2339	11601

per cent are farmers or farm labourers, compared to 3.3 per cent of American males. The only other differences which exceed 3 percentage points are those for skilled and semi-skilled blue collar workers. The former are more common in Canada and the latter in the U. S., but since problems in recoding occupational unit codes were greatest in deciding between skill levels, it may be wise not to take the size of these differences very literally. The overall impression is that the occupational distributions are much alike. Certainly there is no obvious reason to think differences in the distributions ought to affect the association coefficients greatly.

At first glance the distributions for females appear to be much less alike than those for males. Table 4.2 provides the distributions for females in the labour force. Of American females, 11.6 per cent are in professional occupations, compared to 5.0 per cent of Canadians, and 33.6 per cent of Americans are in semi-skilled white collar positions against 22.8 per cent of Canadians. The differences in the figures for professionals largely reflect the categorization system: 4.6 per cent of the U. S. female sample are elementary teachers. In the case of semi-skilled white collar workers, no deliberate decision was made to code an occupation differently in the two nations; rather, the American unit codes for such occupations are less well differentiated, and it was therefore necessary to code women into the semi-skilled category who, with better differentiation, might have been placed elsewhere. For

Table 4.2

Occupational Distributions of U. S. and

Canadian Females, in Percentages

Occupational Category	U. S.	Canada
Professional	11.6	5.0
Semi-professional	6.0	14.1
Technical	2.4	1.8
Managers and Supervisors	10.6	9.4
Clerical, Sales and Service		
Skilled	8.6	21.3
Semi-skilled	33.6	22.8
Unskilled	10.8	6.9
Crafts, Trades and Manual		
Skilled	2.4	1.8
Semi-skilled	10.3	8.9
Unskilled	3.6	7.0
Farmers and Farm Labourers	.2	1.1
Total	100.1	100.1
N	1755	4457

example, 8.6 per cent of the U. S. female sample are placed in the category Secretaries Not Elsewhere Classified. The categories Salesmen and Sales Clerks Not Elsewhere Classified, Clerks Not Elsewhere Classified, Miscellaneous Clerical and Unspecified Clerical together make up another 7.9 per cent. This limitation of the U. S. data underscores the point made in Chapter Two that the precise differences among skill levels should not be treated too literally. To ensure that this problem was not affecting the results, models were fitted with the skilled and semi-skilled categories collapsed and uncollapsed. No differences important for the present purposes emerged. Coefficients for the collapsed tables will be found in Appendix B.

Apart from the differences in categorization, the two female occupational distributions are much alike. As was the case for males, it seems unlikely that the distributions will make much difference to the association coefficients.

The educational distributions, on the other hand, show differences which might affect them. Table 4.3 provides data for males. As was pointed out in Chapter One, the U. S. has a much more extensive post-secondary system than Canada. In Table 4.3 we see that only 22.1 per cent of American males have not completed high school, compared with 58.0 per cent of Canadian males. Because of small numbers in the American sample, those with less than Grade 8 were grouped, then those with Grades 8 and 9, and finally those with Grades 10 and 11.

Table 4.3

Educational Distributions for U. S. and Canadian Males, In Percentages

Education	U. S.	Canada
Up to Grade 7	6.0	16.3
Grade 8	8.1	11.5
Grade 9		9.4
Grade 10	8.0	12.5
Grade 11		7.9
Secondary complete	34.5	24.5
1 year university	6.2	2.1
2 years university	9.6	1.5
3 years university	4.6	2.1
Degree(s) completed	22.9	11.8
Total	99.9	100.1
N	2339	11601

For comparability, Canadians with less than Grade 8 were grouped, but for a nation where so many have incomplete high school, the other collapses appeared excessive.

A straightforward comparison of the variability in education cannot be made because both distributions have been incompletely represented, at the lower end as just mentioned, and at the upper end by not distinguishing graduate degrees. This distinction, while desirable, could not be made because of non-comparable codes.[1] But the inter-quartile range is three years for the U. S., and four for Canada. This suggests that a comparison of association coefficients could be affected by marginal differences.

Similar comments can be made about differences in education between U. S. and Canadian females, for whom data are presented in Table 4.4. For U. S. females the inter-quartile range is two years, and for Canadian females three. The only point requiring further comment is the presence of an extra category for nurses' and teachers' training in the Canadian table. Although some respondents in this category will not have completed secondary school, for practical purposes it can be regarded as a sub-division of the category Secondary Complete. The extra category is shown here because, as will be seen later, the category allows a good fit to be obtained for Canadian females, within a readily interpretable model.

Table 4.4

Educational Distributions for U. S. and Canadian Females, In Percentages

Education	U. S.	Canada
Up to Grade 7	2.5	9.8
Grade 8	5.2	8.2
Grade 9		9.4
Grade 10	11.1	13.6
Grade 11		10.0
Secondary complete	41.0	27.7
Nurse's or Teacher's Training	n.a.	8.3
1 year university	8.1	2.3
2 years university	8.1	1.1
3 years university	4.7	1.5
Degree(s) completed	19.4	8.0
Total	100.0	99.9
N	1755	4457

COMPARISONS FOR MALES

Model Fitting

As the analysis proceeds more smoothly for males, they will be treated first. For both nations, the R x C model, with no cells blocked, has been accepted. In the American case, X^2 = 90.05, with 54 df. While Fay's G indicates that this value is significant at the .05 level, it is only .17 above the critical value. Neither the standardized residuals nor the components of L^2 suggest cells whose blocking would markedly improve the fit, which on other grounds appears quite good. L^2, from its baseline value of 1288.81 under independence, drops to 90.59, a decline of 93.0 per cent. L^2/N = .038.

In the Canadian case, X^2 = 266.30, with 71 df. While Fay's G indicates that this value is significant, the .05 critical value is not a great distance below at 249.37. In other respects the fit is excellent. From its independence value, 5822.82, L^2 drops to 256.96, a decline of 95.6 per cent. L^2/N = .022.

Comparison of Coefficients

Although the two nations are not greatly different in their association coefficients or their occupational coefficients, they differ sharply in their education coefficients. While the association coefficients differ in the first decimal place - the U. S. figure is 1.056 and the Canadian is .966 - the difference is not statistically significant.

Comparison of Occupational Categories

The occupational coefficients are shown in Table 4.5, with their standard errors below them. For convenience, the American results will be reviewed, then the Canadian. In the American data the professionals stand out, with a coefficient of 2.288. Rated in terms of their education, compared to that of their countrymen, the professionals lie more than one and a half standard deviations above any other category. Four other categories, Semi-professional, Technical, Managerial and Supervisory and Skilled Clerical-Sales-Service come in at similar levels: their coefficients range only from .541 to .718. Rated in terms of their education, white collar workers received coefficients which declined sharply with skill level, from .718 for the skilled to -.554 for the unskilled. Skilled blue collar workers come in just below the unskilled white collar workers, with a coefficient of -.601. Further declines are seen for the semi-skilled and unskilled, who with a coefficient of -.967 come in at the lowest level in the table. Farmers and farm workers appear between the semi-skilled and the unskilled, although their precise position cannot be well fixed because of their high standard error.

Coefficients for Canadian males show a very similar

Table 4.5

Occupational Coefficients for U. S. and Canadian Males

Occupational Category	U. S.	Canada
Professions	2.288 (.089)	2.116 (.062)
Semi-professions	.670 (.138)	1.424 (.074)
Technical	.577 (.108)	.758 (.062)
Managers and Supervisors	.541 (.081)	.727 (.026)
Clerical, Sales and Service		
Skilled	.718 (.094)	.614 (.039)
Semi-skilled	.168 (.089)	-.144 (.062)
Unskilled	-.554 (.196)	.168 (.103)
Crafts, Trades and Manual		
Skilled	-.601 (.076)	-.450 (.033)
Semi-skilled	-.767 (.102)	-.859 (.078)
Unskilled	-.967 (.102)	-1.187 (.082)
Farmers and Farm Labourers	-.865 (.234)	-.983 (.037)

pattern: r=.938. By Welch's test, discussed in Chapter Three, only two coefficients differ between nations at the .05 level: those for unskilled white collar workers and for semi-professionals. It was pointed out in Chapter Two that Canadian males show an inversion of education levels for skilled and semi-skilled white collar workers. As there is, as discussed in Chapter Two, some possibility that the inversion arises from the misplacement of two occupational unit groups, it is suggested that the reader take the relative placement of these groups rather lightly. The other difference between Canadian and American males is not suspect on such grounds. Canadian semi-professionals, relative to their countrymen, clearly stand higher than their American counterparts: the Canadian coefficient, at 1.424 is well above the American at .670. ($p<.001$) Although the two sets of coefficients are not identical, they are enough alike that discussion of differences in occupational scores will be unnecessary in interpreting the education coefficients: they reflect the impact of education on a very similar occupational ordering.

Comparison of Educational Categories

The educational coefficients for males are presented in Table 4.6. As in reporting on the occupational coefficients, the American results will be reviewed first, then the Canadian. In the American data, as might have been expected, scores rise progressively with level of education. There is

Table 4.6

Educational Coefficients for U. S. and Canadian Males

<table>
<tr><th>Educational Category</th><th>U. S.</th><th>Canada</th></tr>
<tr><td>Up to Grade 7</td><td>-1.767
(.226)</td><td>-1.329
(.021)</td></tr>
<tr><td>Grade 8</td><td rowspan="2">-1.080
(.228)</td><td>-.921
(.028)</td></tr>
<tr><td>Grade 9</td><td>-.520
(.051)</td></tr>
<tr><td>Grade 10</td><td rowspan="2">-.869
(.157)</td><td>-.270
(.034)</td></tr>
<tr><td>Grade 11</td><td>-.044
(.050)</td></tr>
<tr><td>Secondary Complete</td><td>-.467
(.084)</td><td>.365
(.029)</td></tr>
<tr><td>1 year university</td><td>.038
(.122)</td><td>.980
(.094)</td></tr>
<tr><td>2 years university</td><td>.458
(.078)</td><td>.747
(.117)</td></tr>
<tr><td>3 years university</td><td>.545
(.104)</td><td>1.061
(.018)</td></tr>
<tr><td>Degree(s) complete</td><td>1.547
(.105)</td><td>2.074
(.051)</td></tr>
</table>

one sharp break in the progression, between three years of university and completion of a degree, where the coefficient jumps more than a full standard deviation from .545 to 1.547. This is reminiscent of the "B.A. bonus" found by Jencks, et al. (1979) in status attainment models.

There are important similarities in the Canadian pattern. Scores rise with educational level, with the single exception that those with one year and two years of university are in reverse order. The two coefficients, however, are not significantly different.[2] The Canadian data also show a sharp jump between the two uppermost categories, from 1.061 for three years of university to 2.074 for those with degrees. To correlate the two sets of coefficients the Canadian coefficients for Grade 8 and Grade 9 were matched with the American coefficient for the collapsed Grade 8 and Grade 9. Grades 10 and 11 were treated similarly. When this was done, Pearson's r was .971.

While the ordering of coefficients is similar for the two nations, their magnitude is very different, indicating that the relative occupational value of a given credential may be quite different in the two nations. Beginning at the highest level, the coefficients for completed degrees are 2.074 for Canada and 1.547 for the U. S. Thus, when rated in terms of their occupations, Canadians with degrees come out more than a half standard deviation above their American counterparts. About the same gap separates Canadians and Americans with three years of university, for whom the coefficients are 1.061 and .545. At the level of complete high school, the difference increases to more than four-fifths of a standard deviation: the Canadian coefficient is .365 and the American is -.467. Even if comparison is made between the American combined category for Grades 8 and 9 and the Canadian Grade 8, and between the American combined category for Grades 10 and 11 and the Canadian Grade 10, the occupation-linked standing of the Canadian credential is always higher.

These results are fully consistent with the hypotheses that a university degree, relative to other credentials, would stand higher in Canada, and that completion of secondary school would as well. Higher coefficients in Canada at the level of partial university fill out the pattern: at all levels between secondary complete and degree complete the coefficients differ at .001. The results for partial secondary education, although they do not correspond to a stated hypothesis, are also consistent with the notion that contest mobility leads to a relative devaluing of credentials. If comparisons are made between Americans with Grade 10 or 11 and Canadians with Grade 10, the differences are again significant at .001. Below this level, the high American standard errors lead to non-significant differences.

It was also suggested in Chapter One that in the U. S. those with partially completed degrees would be more clearly graded than in Canada. For the comparison the coefficients for those with fewer years of education were subtracted from the coefficients for those with a greater number of years completed. For the U. S. the results were:

1 year versus 2 years	.420	(s.e. = .155)
2 years versus 3 years	.093	(s.e. = .120
1 year versus 3 years	.507	(s.e. = .206)

The difference between those with one year and those with either two or three years was significant at .01 by a one-tailed test. The difference between those with two and three years was not significant.

For Canada the results were:

1 year versus 2 years	-.233	(s.e. = .130)
2 year versus 3 years	.314	(s.e. = .071)
1 year versus 3 years	.081	(s.e. = .083)

Those with an estimated two years of university scored lower than those with one year and those with three years were not significantly higher than those with one year. The only case in which those with more education scored significantly higher than those with less arose for those with two and three years, where the difference was .314 ($p<.001$). But even in this case, the difference was significant only because those with two years of university training scored below those with one. While the lack of straightforward progression of scores in the Canadian data may at least in part reflect the need to estimate the number of years completed, the data certainly show no signs that employers are using the number of years completed in a clearly graded way.

For two comparisons out of three the difference between those with more education and those with less is greater for the U. S. than for Canada. The advantage of those with two years over those with one is greater in the U. S. by .653 ($p<.001$). The advantage of those with three years over those with one is greater in the U. S. by .426 ($p<.05$). Contrary to expectation, those with three years of university training have a greater edge over those with two in Canada than in the United States, by .221, but this difference is not significant. In any case, it arises because of the low score of those with two years of training in Canada, not because of a strong upward trend in the Canadian coefficients. In most respects, then, these results are consistent with the expectation that in the U. S., among those with incomplete university, the edge conferred by additional years of training would be greater than in Canada.

COMPARISONS FOR FEMALES

Model Fitting

One of the advantages of working with males and females separately is that hypotheses may, in effect, be tested twice. But for females the tests are based on slightly different modelling. For both the U. S. and Canada one cell has had to be blocked. For the U. S., it was a non-interpretable nuisance cell, with only two cases in it, but a very low fitted value, which created a large contribution to X^2.[4] When it was removed, X^2 dropped from 151.29 to 107.35, with 47 df in the accepted model. By Fay's G, this value was significant at .05, but it was only .54 above the critical value. L^2, at 97.24, was reduced by 89.9 per cent from its independence value of 962.35. L^2/N was .055.[5]

For Canadian females, the cell blocked was substantively interpretable. Initially a model was fitted without distinguishing those with nurse's or teacher's training from others with complete secondary education. Under these circumstances it was necessary to block a heavy cell corresponding to semi-professional occupations and complete secondary education. With a category for nurse's or teacher's training, an equally good fit could be obtained by blocking the cell representing semi-professional occupations and these types of training. This meant that fewer cases had to be removed from the table, and that a straightforward interpretation could be given as to why the blocked cell was not well fitted by a model which otherwise appeared acceptable: since 77.3 per cent of the cases in the cell were nurses or teachers, the heavy weight of the cell could be attributed to the link between these two occupations and the training required to enter them.

For reasons given in Chapter Three, for Canadian females L^2 has been used in testing goodness of fit. Blocking one cell lowered L^2 from 497.39 to 324.97, with 79 df in the accepted model. While, at this level, Fay's G indicated that L^2 was significant, the critical value was not a great distance below, at 308.85. Under the accepted model 87.9 per cent of the L^2 under independence, 2768.59, had been accounted for. L^2/N was .072. As there were no other clear targets for blocking, the model was accepted.

Comparison of Coefficients

As was the case for males, the American and Canadian association coefficients do not differ greatly. The American coefficient, at 1.018, is higher than the Canadian, at .925, but the difference is not significant, although it may be noted that the U. S. coefficient is the higher for both sexes.

Comparison of Occupational Categories

Occupational coefficients for females are presented in Table 4.7. As before, those for the U. S. will be reviewed, then those for Canada. Much of the pattern observed for U. S. females is familiar from the analysis of males. (Leaving out farmers and farm workers, who have been omitted from the American female analysis for want of numbers, the correlation between the two sets of coefficients is .961.) Based on their education, the professionals receive a coefficient well above the other categories, at 2.136, more than 1.2 standard devia-

Table 4.7

Occupational Coefficients for U. S. and Canadian Females

Occupational Category	U. S.	Canada
Professions	2.136 (.146)	2.454 (.171)
Semi-professions	.972 (.103)	1.777 (.158)
Technical	.753 (.162)	.418 (.131)
Managers and Supervisors	.425 (.113)	-.093 (.086)
Clerical, Sales and Service		
Skilled	.084 (.083)	.298 (.074)
Semi-skilled	-.216 (.070)	-.271 (.085)
Unskilled	-.892 (.114)	-.485 (.120)
Crafts, Trades and Manual		
Skilled	-.710 (.260)	-1.029 (.058)
Semi-skilled	-1.357 (.134)	-1.343 (.104)
Unskilled	-1.457 (.163)	-1.291 (.084)
Farmers and Farm Labourers	N.A.	-1.682 (.127)

tions above any other category. Both within the clerical-sales-service group and within the crafts-trades-manual group coefficients decline with skill level. One difference between the sexes is worth observing, though. While for males, the four categories Semi-professional, Technical, Managerial and Supervisory and Skilled Clerical-Sales-Service were essentially alike, for females they are differentiated. The highest coefficient, at .972, for semi-professionals, is well above the lowest, at .084, for skilled white collar workers.

As was the case for males, the Canadian coefficients, are much like those for the U. S. Omitting the Canadian score for Farmers and Farm Labourers, who are left out of the U. S. analysis because of small numbers, the correlation between U. S. and Canadian scores is .950. While the American coefficient for semi-professionals is now clearly higher than any other except that for professionals, it is still, as it was for males, well below the Canadian figure of 1.777. ($p<.001$) On the other hand, the Canadian coefficient for managers and supervisors is lower than the American, at -.093 compared to .425. ($p<.001$) Although these differences are not trivial, they occur in a context of massive similarity and raise little difficulty for a straightforward interpretation of the education coefficients.[6] These are found in Table 4.8.

Table 4.8

Educational Coefficients for U. S. and Canadian Females

<table>
<tr><th>Educational Category</th><th>U. S.</th><th>Canada</th></tr>
<tr><td>Up to Grade 7</td><td>-1.915
(.178)</td><td>-1.941
(.049)</td></tr>
<tr><td>Grade 8</td><td rowspan="2">-1.684
(.173)</td><td>-1.039
(.111)</td></tr>
<tr><td>Grade 9</td><td>-.595
(.093)</td></tr>
<tr><td>Grade 10</td><td rowspan="2">-1.151
(.134)</td><td>-.231
(.093)</td></tr>
<tr><td>Grade 11</td><td>-.093
(.029)</td></tr>
<tr><td>Secondary complete</td><td>-.349
(.116)</td><td>.514
(.039)</td></tr>
<tr><td>Nurse's or Teacher's training</td><td>NA</td><td>.647
(.163)</td></tr>
<tr><td>1 year university</td><td>.251
(.108)</td><td>1.220
(.108)</td></tr>
<tr><td>2 years university</td><td>.357
(.107)</td><td>1.289
(.161)</td></tr>
<tr><td>3 years university</td><td>.815
(.103)</td><td>1.366
(.183)</td></tr>
<tr><td>Degree(s) complete</td><td>1.638
(.124)</td><td>1.874
(.027)</td></tr>
</table>

Comparison of Educational Categories

As before the general pattern is for scores to increase with educational level, and as before the only exception is that, for Canada, those with partial university are not cleanly differentiated. For Canadian females, the categories for one, two and three years of university are trivially different. But, if the category for nurse's and teacher's training, not used for the U. S., is ignored, r = .954. Again as before, the pattern of differences between nations shows that through the secondary and post-secondary range Canadian credentials are of higher occupation-linked standing than American. For those with completed degrees, the U. S. score is 1.638, against 1.874 in Canada. ($p<.05$) For those with three years of university, the American score is .815, the Canadian 1.366. ($p<.01$) The differences are of increasing magnitude for those with two years and one year of university. For those with high school complete, the difference is more than four-fifths of a standard deviation: the Americans, compared to their countrywomen, score -.349 and the Canadian, compared to theirs, score .514. ($p<.001$) If the strategy is adopted of comparing Americans with Grade 10 or 11 with Canadians with Grade 10, and Americans with Grade 8 or 9 with Canadians with Grade 8, the differences continue to be significant. Only for those with less than Grade 8 is there approximate equality of the coefficients. Thus for females, as for males, the results are strongly supportive of the notion that Canadian credentials are of higher occupation-linked standing than American.

Again, as for males, there is clearer grading of those with partial university in the U. S. For U. S. females, subtracting the coefficients for those with the lesser education from the coefficient for those with the greater yields the following results:

1 year versus 2 years	.106	(s.e. = .137)
2 years versus 3 years	.458	(s.e. = .176)
1 year versus 3 years	.564	(s.e. =. 163)

Although the difference for one and two years is not significant, the others are significant at .01.

For Canada the differences are as follows:

1 year versus 2 years	.069	(s.e. = .182)
2 years versus 3 years	.077	(s.e. = .243)
1 year versus 3 years	.146	(s.e. = .170)

All of the differences are smaller than their American counterparts, and all are smaller than their standard errors.

Unfortunately, the standard errors for both nations are rather high, and make comparison difficult. Since the difference between one and two years is of about the same order in the two nations, it is little surprise that the two nations do not differ significantly. But the edge of those with three years over those with two is greater in the U. S. by .387, and this fails to reach significance. Even the difference between one and three years, which is greater in the U. S. by .418, just fails to reach significance. Thus, while the pattern of the coefficients is broadly consistent with the expectations set out in Chapter One, the data cannot provide clear support for them.

Constancy of Findings

For reasons pointed out in Chapter One, tests have been made for a series of sub-population differences. For both nations tests have been made for differences between those 25-44 and those 45 and over. For both males and females, in both nations, the differences were very small or insignificant.[7] It should be borne in mind, if there is any temptation to conclude that there are no age differences, that the comparison here is not very fine grained. But the U. S. sample size does not permit more detailed analysis. While the Canadian data would allow it, later chapters will show that the association between education and occupation differs in important ways when more elaborate educational codes are used. A more detailed age breakdown has therefore not been used here.

For the U. S., while it was not possible to compare blacks and non-blacks directly, because of the small number of blacks in the sample, it was possible to see what happened to the coefficients when an R x C model was fitted without blacks. While there were variations in the coefficients, these were small and in no way affected the hypotheses. (The interested reader will find the coefficients compared in Appendix B.) For Canada, tests were made with a three way distinction among francophones in Quebec, immigrants and others. Tests of the difference between models with coefficients for the three groups constrained to be equal and models with coefficients free to vary showed no significant differences for females and a just-significant difference for males. For males the difference was quite small in relation to sample size and the coefficients for the various groups were much alike. While the variations would be of interest in a study focussed on subgroup differences, for the purposes of this study they may be passed by.[8]

A further question about the generality of results could be raised on the grounds that the American samples are smaller than might have been hoped for. It is reassuring to note that when R x C models are fitted to tables based on more of the General Social Survey data the results are essentially similar. To the cases which have been used, which were drawn between 1976 and 1983 by strict probability methods, it is possible to add those drawn in the later part of the period from a different sampling frame, or those drawn earlier with quotas at the block level. If either is done, or if both groups are added, the results are basically the same. In Appendix B the interested reader will find comparative tables, showing coefficients based on the study sample and coefficients obtained after adding both other groups.

Having seen so many similarities, one might wonder whether a single model for the two sexes would suffice. In the American case, a test for three factor interaction provides a negative answer to the question. With 63 df, $L^2 = 102.15$, and G yields $p<.001$. A comparison was made between the results for U. S. females and the results for U. S. males, Deming adjusted to the female marginals. The differences in the row and column coefficients were of about the same magnitude as those presented above. While there were changes in the absolute value of the male coefficients, there was no clear pattern in the changes. The major difference between the unadjusted and the adjusted results was in the association coefficient, which dropped from 1.056 in the unadjusted table to .807 in the adjusted. While the association coefficients for males and females were similar in the unadjusted data, with the males coming in at 1.056 and the females at 1.016, it appears that the females were making more out of less variability. Unfortunately, this conclusion cannot be confirmed from results obtained by Deming adjusting females to male marginals, because the resulting table cannot be fitted readily. $L^2/N = .127$.

Essentially, the fit is bad because of the great magnification of cells involving skilled blue collar workers, which if not precisely fitted before adjustment caused little problem, but which, when magnified made large contributions to

L^2. Thus, while the males, when adjusted, appeared to be making less out of more variability, the anticipated mirror image finding, that females appeared to be making more out of less variability, could not be obtained.[9]

A comparison of the same kind can be made for Canada, but, as the most detailed education codes for Canada are used in Chapter Seven, consideration of differences between the sexes in Canada will be deferred to that chapter.

Deming Adjustments Between Nations

Here an examination will be presented of the effects of giving Canada the marginals of the United States, and the U. S. the marginals of Canada. When Canadian males are Deming adjusted to U. S. marginals, $L^2 = 496.19$ with 72 df. While this approaches twice the value for the unadjusted table, it is still a good fit in relation to sample size: $L^2/N = .043$. But when females are adjusted the fit is not satisfying. L^2 is not much greater, at 539.07 (with 79 df), but the sample is much smaller. $L^2/N = .130$.

Many of the cells which are least well fit by the model involve 'odd' combinations of education and occupation: for example, university graduates in semi-skilled blue collar jobs, or those with three years of university training in unskilled blue collar work. The examples given, like many other poorly fitted cells, are in educational categories which were strongly multiplied to match the U. S. marginals. Whereas beforehand, the cells were easily fitted, after adjustment they were not. It seems that precisely when adjustment for differing marginals is most desirable, there is the greatest risk that small departures from a model will be magnified to create an overall poor fit. Because of the poor fit of the female model, the coefficients from it will be treated as quite imprecise, with a bearing on the themes to be discussed, but with little persuasive power.

Fortunately, when the American samples are adjusted to Canadian marginals, the fits are acceptable. For males, L^2 (54 df) = 130.42 and L^2/N = .056. For females, L^2 (47 df) = 69.64 and L^2/N = .039. For males, the association coefficients remain in the same neighbourhood after adjustment. The occupational coefficients shift, but in no very clear pattern. But a patterned shift takes place in the educational coefficients.

The education coefficients for U. S males and for Canadian males, unadjusted and adjusted to U. S. marginals, are presented in Table 4.9. Unlike the unadjusted scores, the coefficients obtained after adjustment to U. S. marginals are usually lower than those for the U. S., and the adjusted scores are without exception lower than the unadjusted: the smallest decline is .486. The coefficients which, after adjustment, are higher than their American counterparts are those for educational levels between Grade Ten and one year of university.

Table 4.9

Educational Coefficients for U. S. Males and for Canadian Males, Unadjusted and Adjusted to U. S. Marginals

Educational Category	U. S.	Canadian Unadjusted	Canadian Adjusted
Up to Grade 7	-1.767	-1.329	-2.321
Grade 8	-1.080 (Grades 8–9)	-.921	-1.604
Grade 9		-.520	-1.106
Grade 10	-.869 (Grades 10–11)	-.270	-.865
Grade 11		-.044	-.669
Secondary complete	-.467	.365	-.207
1 year university	.038	.980	.518
2 years university	.458	.747	.243
3 years university	.545	1.061	.440
Degree(s) complete	1.547	2.074	1.354

While the precise values of the coefficients differ, the same pattern is found when U. S. males are adjusted to Canadian marginals: Canadian coefficients are higher for those with Grade 10 to one year of university, and lower elsewhere.

The stronger showing of Canadian males with Grade 10 to one year of university is consistent with the notion that Canadian employers, with far fewer workers with two or more years of university to choose from, have looked more favourably than American employers on the abilities of workers with a few years' less training; thus the relative advantage of university training is lower in the U. S. On this interpretation, the lower Canadian scores below Grade 10 follow from the necessity of balancing the relatively high scores of those with Grade 10 to one year of university, who make up 47.0 per cent of the sample.

The same pattern is found when Canadian females are Deming adjusted to the marginals of U. S. females. The Canadian coefficients are shifted downward, and the categories between Grade 10 and one year of university score higher in Canada than in the U. S. But as noted above, the fit of the model is not good. The coefficients will therefore not be presented. Since the fit of the model for American females adjusted to Canadian marginals is very good, the educational coefficients for the adjusted table are presented, in Table 4.10, along with the coefficients for the unadjusted table and

Table 4.10

Educational Coefficients for Canadian Females, and for U. S. Females, Unadjusted and Adjusted to Canadian Marginals

<table>
<tr><th>Educational Category</th><th>Canada</th><th>U. S. Unadjusted</th><th>U. S. Adjusted</th></tr>
<tr><td>Up to Grade 7</td><td>-1.941</td><td>-1.915</td><td>-1.276</td></tr>
<tr><td>Grade 8</td><td>-1.039</td><td rowspan="2">-1.684</td><td rowspan="2">-.940</td></tr>
<tr><td>Grade 9</td><td>-.595</td></tr>
<tr><td>Grade 10</td><td>-.231</td><td rowspan="2">-1.151</td><td rowspan="2">-.533</td></tr>
<tr><td>Grade 11</td><td>-.093</td></tr>
<tr><td>Secondary complete</td><td>.514</td><td>-.349</td><td>.012</td></tr>
<tr><td>Nurse's or Teacher's training</td><td>.647</td><td>NA</td><td>NA</td></tr>
<tr><td>1 year university</td><td>1.220</td><td>.251</td><td>.590</td></tr>
<tr><td>2 years university</td><td>1.289</td><td>.357</td><td>.643</td></tr>
<tr><td>3 years university</td><td>1.366</td><td>.815</td><td>1.177</td></tr>
<tr><td>Degree(s) complete</td><td>1.874</td><td>1.638</td><td>2.223</td></tr>
</table>

the coefficients for Canadian females.

As the Canadian coefficients, for both males and females, have been shifted downward by the adjustment to American marginals, it might be expected that scores for American females would rise with adjustment to Canadian marginals. This was the case for every level of education. But the pattern of differences between the adjusted scores for U. S. females and the scores for Canadian females is not quite the same as the pattern shown above. In keeping with the earlier pattern, the American score for a university degree is higher than the Canadian, and so is the score for Grade 7 or less. But the intervening scores are all lower. In effect, the large middle group in which Canadians have a relative advantage has been expanded upward to include those with up to three years of university and downward to include those with Grades 8 and 9.

Two common themes emerge from the adjustments between nations. First, at all educational levels the adjustment lowers Canadian scores, or raises American scores. In breaking down the pattern in the unadjusted data, in which Canadian scores were consistently higher for those with secondary and tertiary education, the adjustments suggest that the higher Canadian scores in the unadjusted data largely result from the smaller proportions with tertiary, or even complete secondary education in Canada. The higher Canadian coefficients reflect the advantages of a relatively small well educated group facing relatively little competition from others with similar credentials. The second common feature is that after adjustment those in the middle of the educational distribution seem to do better in Canada than in the U. S., possibly because of the lower supply of more highly trained people in Canada.

Summary And Discussion

The findings presented in this chapter, as they bear on the hypotheses, have been very largely consistent: for both males and females, the association coefficients for the two nations did not differ significantly, for both males and females the education coefficients were higher for Canada than for the United States at the university and the secondary level, and for both sexes tests for differences among sub-populations turned up very small or statistically insignificant results. For both sexes those with partial university were more sharply graded in the U. S. than in Canada, although for females the differences, because of large standard errors, failed to reach significance. Further, the American results proved stable when models were fitted to samples involving many more cases, drawn by different sampling procedures, from the General Social Survey.

Deming adjustment of one nation's tables to the marginals of the other has led to the suggestion that in the Canadian system those with middle levels of education are viewed more favourably by employers than they are in the American system. The adjustments also suggest that the pattern of differences in the unadjusted tables, in which Canadian coefficients exceed the American for those with secondary and tertiary education, results from the smaller proportions with tertiary, or even complete secondary education in Canada. The smaller group in Canada would be expected to experience less competitive pressure than the larger group in the U. S.

The major difficulty with ANOAS methodology encountered in this portion of the research was the problem of obtaining good fits for some of the Deming adjusted tables. It was pointed out that it is just when the need for taking the marginals into account is greatest, because the marginals differ most sharply, that the potential is greatest for a few aberrant cells to be magnified and to create a poor overall fit. A smaller difficulty, reported in note 7, arose when testing the difference between a model in which all sub-groups were constrained to have the same coefficients against a model in which sub-group coefficients were free to vary. In one instance, a small set of cells with low observed values, but very low fitted values, and hence high contribution to X^2 or L^2, were more influential under the unconstrained model, making it difficult to get a satisfying reading on how much the removal of constraints improved the fit.

On the other hand, the methods used have enabled clear tests of the major hypotheses to be made. They have also provided a spinoff in the form of a question for further research: why, net of marginal effects, does Canada apparently use credentials at varying levels differently than the U. S. does? An explanation was offered in terms of the relative attractiveness of those with middle level credentials in Canada, where those with university training are in relatively low supply. This interpretation, treated as a hypothesis, can on principle be examined through a historical analysis of census and related material. At least it should be possible to see whether the pattern of coefficients shifts in the American direction as the educational level of the Canadian population rises. This suggestion, to the writer's knowledge, has not appeared previously in the literature. It is an unanticipated outcome of using a technology which enables differences in the effects of education at different levels to be examined.

Notes To Chapter Four

1. The Canadian education codes include three categories for degrees: one for the B.A., one for professional degrees and one for graduate academic degrees (M.A., Ph.D.). The General Social Survey distinguishes undergraduate from graduate degrees, but includes degrees in, for example, medicine and dentistry as graduate degrees, whereas these are treated as professional degrees in the Canadian system. Some other degrees which are treated as professional in the Canadian scheme, for example the B.Eng., are classified as undergraduate degrees in the American system.

2. As it has been necessary to estimate the number of years of university completed, by methods described in Chapter Two, the writer was concerned that some flaw in the estimation procedure might have produced the inversion of categories. With this in mind, he varied two of the assumptions on which the estimation was based: first, that teachers who have some university, but not degrees have completed a one year teacher training program, and second, that those in the English system in Quebec began university after Grade 11. Some teacher training programs had been two years in length, so models were fit to the data as if this had been the general practice. Since, before the coming of the CEGEPs it was possible to enter English language universities in Quebec from either Grade 11 or Grade 12, with a corresponding difference in the length of a B.A., models were

fit as if everyone had done it after Grade 12. The differences obtained from these variations in coding were not great: the largest absolute difference was .069. While it was possible, with one combination of assumptions about teacher training and entrance to English universities in Quebec, to put the coefficients into the 'right' order, the writer could see no reason to believe that the assumptions on which this result was based were any better than those underlying Table 4.6, and the set of assumptions which put the coefficients into the 'right' order for males did not yield the same results for females. Females, in fact, are put in the 'right' order by the assumptions underlying Table 4.6. Accordingly, the figures in Table 4.6 have been allowed to stand. As the differences in coefficients under varying assumptions are small, this will make no difference to any conclusions drawn.

4. The cell represents professional occupations in combination with Grade 8 or 9 education. Consideration was given to blocking an additional cell, representing semi-professional occupations and three years of university, but X^2 remained just above the .05 level when it was blocked, so it was left intact.

5. A reader of an earlier draft has enquired as to whether the N on which L^2/N is calculated is that of the full table or a reduced figure obtained by subtracting the cases in the blocked cell from the table total. The total sample N has been employed. Blocking a cell is equivalent, for fitting purposes,

to assigning a coefficient to that cell which will cause it to be fitted exactly. The fitted values for other cells, L^2, and the amount of error in predicting the cell in question will be the same. Since we wish to take full credit for the elimination of error, and since we do not wish to obtain one L^2/N when the cell coefficient is of no interest and another when it is of interest, when the fits obtained are otherwise identical, the full sample N is used.

6. The coefficients for unskilled white collar workers also differ significantly, but will not be focussed upon, because of the difficulties in precise determination of skill levels discussed above.

7. For the Canadian data, tests were made of the difference between a model in which both age categories were constrained to have the same coefficients and a model in which coefficients could vary freely. For males, L^2 was 39.43 with 21 df, and G yielded $p>.10$. For females, L^2 was 29.75 with 20 df and G yielded $p>.05$.

Unfortunately, the test for females was not fully satisfactory. It was pointed out in Chapter Three that sometimes cells with small observed values receive extremely small expected values and thus make a large contribution to X^2 or L^2. Such cells create an increase in a goodness of fit statistic out of proportion to the substantive importance of the error of prediction. When nuisance cells of this kind emerge under one model and not under another, to which it is to be compared, the comparison will be adversely affected. The goodness of fit statistic for the model with a nuisance cell will appear worse in the comparison than it ought to, since it has been inflated by differences between observed and expected values that mean little substantively. In this comparison, when the coefficients were free to vary, several nuisance cells emerged, and propped up the L^2 for the model. In the absence of the nuisance cells, the difference between models might have proved significant, but blocking in the model with coefficients free to vary would have meant that tables with different cells were being compared. Blocking them in both models would have meant that the test for age differences was not based on the same table as the overall analysis for females. It is reassuring to note, however, that the constrained model provides a satisfactory fit in its own right. $L^2 = 423.12$, with 124 df. G yields $p > .10$.

In the American case a test for three factor interaction was used rather than a comparison between a model with coefficients constrained to be equal and a model with coefficients free to vary. For females, L^2 was 66.47 with 58 df, and G yielded $p > .10$. For males the results were a bit less straightforward. With no cells blocked, L^2 was 87.82 with 65 df. G indicates that this value is significant, but in relation to sample size it is not great.

As G tends to reject the null hypothesis too often when there are more than a few sample zeroes in a table, Fay (1983) recommends that if the number of sample zeroes exceeds a threshold and if G is significant the researcher should check to see whether G remains significant with (some of) the cells blocked. To bring the number of zeroes in the table below the threshold, five cells involving various combinations of university training with blue collar and farm work for males in the older group were blocked. L^2 was reduced to a statistically insignificant 64.59 It is plausible that the apparent significance of the results has been inflated by the sensitivity of G to sample zeroes.

The test for three factor interaction was used instead of the comparison of models used with the Canadian data because of cost factors. The tests done on the Canadian data, where only six pseudoreplicates were involved, took close to twenty minutes on a Cyber 170/730, and the effect of using 101 pseudoreplicates could only have been to increase the time greatly. Had it not been for the costs, the comparison of models would have been preferable, since it is focussed on the kind of difference it was hoped to detect, that is, differences in fit which result from changes in the coefficients. The test for three factor interaction is sensitive to any differences in the internal structure of two tables, and for large tables uses up far more degrees of freedom. In the test for three factor interaction low level variation associated with a large number of degrees of freedom may mask the differences it is hoped to detect.

8. Because of the small numbers found in some sub-populations those with some university but without degrees were put into a single category. For females two cells were blocked in each sub-table: a nuisance cell crossing professional occupations with education below Grade 8, and the cell representing the combination of semi-professional occupations with nurse's or teacher's training.

For males, $L^2 = 133.36$ with 36 df, and G yields $p>.01$. However, the .05 critical value is not far removed at 129.75. For females, $L^2 = 121.34$ with 38 df and G yields $p>.10$.

9. In fact, the association coefficient changes by less than .02, but in view of the poor fit, with $L^2/N = .127$, the writer would prefer not to draw any inferences from this limited change.

CHAPTER FIVE

ENGLAND AND CANADA

Pairwise comparisons of England and Canada have not yet appeared in the mobility literature, although England has been compared with Scotland (Hope, 1984), with Dublin (Breen and Whelan, 1985), with the United States (Treiman and Terrell, 1975a; Kerckhoff, 1974, 1977; Kerckhoff, et al., 1985; Kerckhoff and Everett, 1986; Hope, 1984), and with Sweden and France (Ericsson, et al., 1979, 1982, 1983; Hauser, 1984; Breen, 1987). Kerckhoff et al. (1982) have shown that occupation in England is affected by school type, examinations passed and vocational qualifications. But only Kerckhoff and Everett (1986), whose findings were reviewed in Chapter One, have attempted to see how any of these features of English education compares in its effects with features of another national education system. Thus, in examining several hypotheses other than those tested by Kerckhoff and Everett, and in comparing Canada with England this study attempts to break new ground.

Occupational and Educational Distributions

In doing so, it contends with differences in occupational distributions much clearer than those seen between Canada and the United States. Table 5.1 shows the two

Table 5.1

Occupational Distributions of English and Canadian Males, in Percentages

Occupational Category	England	Canada
Professional	5.5	8.1
Semi-professional	2.7	4.4
Technical	1.6	1.8
Managers	6.8	7.6
Supervisors	5.5	7.5
Foremen	6.3	7.7
Clerical, Sales and Service		
Skilled	4.5	4.5
Semi-skilled	10.7	6.4
Unskilled	3.5	2.2
Crafts, Trades and Manual		
Skilled	23.0	18.5
Semi-skilled	14.2	10.7
Unskilled	11.7	13.7
Farmers and Farm Labourers	3.9	6.9
Total	99.9	100.0
N	9101	10549

distributions. In this table the first six occupational categories - professions, semi-professions, technical, managers, supervisors and foremen - are all larger in Canada than in England. The professional category includes 8.1 per cent of Canadians, against 5.5 per cent of the English.[1] The difference cannot easily be attributed to coding because the precision of the English unit groups in the neighbourhood of the professions made it relatively easy to define the category. The same was true for farmers and farm labourers, for whom there is a three percentage point difference between the two nations. Just above them in the table there is a two percentage point difference for unskilled blue collar workers. The concentration of differences at the top and bottom of the table, where the previous chapter showed the highest and lowest scores for the two North American nations, suggested that differing distributions, through their effect on the standardization of coefficients, could affect the comparison of association coefficients. It will be seen below that farmers and farm labourers do not have a particularly low coefficient in England, but the other categories mentioned, as in North American, are at the top and bottom. Thus, as reported below, Deming adjustments were done to see whether differences in the occupational marginals did affect the comparison.

Differences in which the English categories are larger than the Canadian are found for semi-skilled and unskilled white collar workers and for skilled and semi-skilled blue collar workers. The largest of these differences are those for skilled blue collar workers, who make up 23.0 per cent of the English sample and 18.5 per cent of the Canadian, and for semi-skilled white collar workers, who make up 10.7 per cent of the English sample but only 6.4 per cent of the Canadian. Although, as always, there was some difficulty in assigning unit groups to one skill level or another, the process was made easier by the presence of distinctions by skill level in the socio-economic categories defined by the Office of Population Censuses and Surveys (1970), which identifies a skill level for each blue collar unit group in the English data. While, as discussed in Chapter Two, these skill levels were not defined in quite the same way as those in the CMS code, it was very helpful to know that the vast majority of the assignments made without consulting the OPCS matched their own. Since it was still necessary to deal with differences in the way in which skill levels were defined, it is plausible that either of the English figures could be out by one or two percentage points. But it seems reasonable to accept that the differences in these categories do not simply reflect difficulties in recoding.

Tables 5.2 and 5.3 present the educational distributions for England and Canada respectively. As the categories are largely different, few direct comparisons can be made, but it may be noted that Canada has almost three times as many university graduates, 10.1 per cent against 3.6 per cent, and

Table 5.2

Educational Distribution for English Males, in Percentages

Education	Percentage
Non-selective, to leaving age	53.2
Non-selective, to leaving age, craft/trade certificate	4.0
Non-selective, beyond leaving age	7.6
Non-selective, beyond leaving age, craft/trade certificate	1.5
Non-selective, passed O-Levels	.8
Selective, to leaving age	4.5
Selective, to leaving age, craft/trade certificate	2.4
Selective, beyond leaving age	5.1
Selective, beyond leaving age craft/trade certificate	3.7
Selective, passed O-Levels	1.3
Stayed to 17+, after O-Levels	2.4
Passed A-Levels	2.3
Level C qualifications	4.4
Level B qualifications	2.4
Some university	.8
Degree(s) completed	3.6
Total	100.0
N	9101

Table 5.3

Educational Distribution for Canadian Males

For Comparison With English Males, in Percentages

Educational Category	Percentage
Elementary incomplete	13.2
Elementary complete	14.5
Secondary, vocational	
Grade 9	.7
Grade 10	1.3
Grade 11	2.5
Secondary complete	4.2
Secondary, academic	
Grade 9	6.0
Grade 10	6.7
Grade 11	8.2
Secondary complete	9.8
Secondary, stream uncertain	
Grade 9	1.2
Grade 10	1.0
Grade 11	1.1
Secondary complete	2.6
Business or trade school	7.5
Community college	2.0
Nurse's or Teacher's Training	.5
University Diploma	1.9
Some University	5.2
Degree(s) completed	10.1
Total	100.2
N	10549

has far more with some university, at 5.2 per cent against .8 per cent. The difference in the supply of highly trained people is exaggerated by this comparison, though, since the English treat Level B qualifications as degree equivalent, and Level C as equal to a partial degree. If Level B qualifications are included with degrees, the difference between nations is reduced, but Canada still has the higher figure, at 10.1 per cent compared to 6.0 per cent. If Level C qualifications are added to partial university qualifications in England and nurse's and teacher's training is added to partial university in Canada (their basic training goes into Level C in England) the difference between nations is sharply reduced, with Canada coming in at 5.7 per cent and England at 5.2.[2] If the figures are close at the level of partial university, they are not so close at the level of the completed degree. This difference might be expected to be related to the smaller number of professionals and semi-professionals in the English data.

To Canadian eyes, the most striking difference between the nations is the large proportion of the English who attend school to the legal minimum leaving age and then leave without acquiring other credentials. Including both those who attended non-selective schools and those who attended selective, 57.7 per cent of the sample had done so. It will be seen later that the high proportion, 53.2 per cent, in the lowest category in the table, that for attendance at a non-selective school and departure at the legal leaving age, apparently affects the overall strength of association between education and occupation in England.

Another difference in proportions lies in the balance between those who attended selective and non-selective schools in England as compared to those who went through vocational and academic streams in Canada. Summing across the five sub-categories shown in Table 5.2, 67.1 per cent of the English had been to non-selective schools and had no qualifications beyond the O-Levels, and 17.0 per cent had been to selective schools. In Canada the balance of proportions runs in the other direction: 30.7 per cent had been in academic streams and had not gone beyond high school, against 8.7 who had been in vocational streams, and not gone beyond high school. The data do not allow a further 5.9 per cent to be classified by stream, but their numbers are such that they pose no challenge to the notion that the preponderance of Canadians with secondary but not post-secondary education had been in academic programs.

Fitting Models

Although the marginals are quite different from those seen before, the English data can be successfully fitted. To obtain a good fit requires that two cells be blocked, one combining Level C qualifications with semi-professional occupations, the other combining skilled blue collar occupations with the education code including those who left non-selective schools at the legal leaving age, but then acquired craft/trade certificates. These cells are both heavier than they were predicted to be by the basic R x C model, and both involve a particular level of training in combination with an occupational category to which it often provides entry. With these cells blocked, $X^2 = 432.99$ with 152 df. While Fay's G indicates that this is significant, the critical value is not far below at 430.63. Blocking the two cells lowers L^2 from 598.68 to 430.95. This value represents a 92.6 per cent reduction from the value of 4582.71 under independence. $L^2/N = .043$.

The Canadian data can likewise be well fitted, after blocking cells. Those blocked include two nuisance cells, one for farmers and farm labourers and university degrees, and a second involving the same occupational category with university diplomas. The three others are heavy and are interpretable in terms of the link between a particular form of training and an occupational category to which it provides entry. They involve combinations of nurse's or teacher's training with semi-professional occupations, of community college training with technical occupations, and of business or trade school with skilled blue collar work. The interpretation of the latter cell becomes easier when it is realized, as will be shown in Chapter Seven, that over half of those with trade school training have also taken apprenticeships. With these cells blocked, X^2 = 431.45, with 192 df, a value which G indicates to be non-significant. Blocking the cells reduces L^2 from 591.02 to 424.20. The latter value represents a 94.2 per cent reduction from the independence value of 6268.173. L^2/N = .040.

COMPARISON OF COEFFICIENTS

Comparison of Occupational Categories

If the English marginal distributions have been different from those seen in the previous chapter, at least the occupational coefficients have strongly familiar features. In the English data, presented in Table 5.4, the professionals, rated in terms of their education, come out at the top with a coefficient of 2.414, and the semi-professionals follow them. Within the clerical-sales-service group coefficients decline regularly (and strongly) with skill level, from 1.218 for the skilled to -.950 for the unskilled. A regular decline is seen as well for the crafts-trades-manual group. The unskilled blue collar worker shows the lowest coefficient in the table at -1.103.

One coefficient which departs sharply from the North American patterns is that for farmers and farm labourers which, at -.401, is above that for skilled blue collar workers. In England as in North America people in this category have often left school near the minimum leaving age, but in England so

Table 5.4

Occupational Coefficients for English and Canadian Males

Occupational Category	England	Canada
Professional	2.414 (.074)	2.161 (.044)
Semi-professional	2.009 (.086)	1.554 (.074)
Technical	1.229 (.081)	.654 (.060)
Managers	1.355 (.054)	1.233 (.025)
Supervisors	.504 (.065)	.277 (.074)
Foremen	-.159 (.069)	-.189 (.041)
Clerical, Sales and Service		
Skilled	1.218 (.060)	.742 (.052)
Semi-skilled	.242 (.060)	-.085 (.067)
Unskilled	-.950 (.121)	.136 (.112)
Crafts, Trades and Manual		
Skilled	-.431 (.054)	-.477 (.028)
Semi-skilled	-.782 (.075)	-.773 (.086)
Unskilled	-1.103 (.078)	-1.111 (.093)
Farmers and Farm Labourers	-.401 (.142)	-1.007 (.049)

many others have done so that their coefficient is not particularly low.

It, along with eight other coefficients differs significantly from the Canadian scores, which are also shown in Table 5.4. It should not be thought that the large proportion of statistically significant differences implies that the two sets of scores are very dissimilar: their correlation is .930. But, since both samples are relatively large, with relatively low standard errors, many differences appear as significant. Here attention will be drawn to coefficients which differ by more than .25 standard deviations. Farmers and farm labourers of course do, with the English coefficient at -.401 and the Canadian at -1.007. An explanation for this difference has been offered above. The other differences are concentrated among the higher scores. The professionals, semi-professionals, technicians and skilled white collar workers in England have scores which exceed those of Canadians by at least .250, and these differences are significant at .001. Managers and supervisors are also significantly higher in England ($p<.05$), but the differences are smaller. The only Canadian coefficient which significantly exceeds the English is that for unskilled white collar workers. The writer has attempted above to discourage undue reliance on figures for this category.

Although the two nations' scores are not radically different, the pattern of their differences is clear: the six categories which, in both tables, obtain the highest scores all have higher scores in England. These occupations appear to accessible to those whose educational standing, relative to their countrymen, is higher in England. Above it was shown that England has smaller numbers in most of the occupations in question. As shown below, when Canada is Deming adjusted to English occupational marginals the pattern of differences in occupational coefficients changes sharply.

Comparison of Educational Categories

The occupation-linked standing of educational credentials may be seen in Tables 5.5 and 5.6, which, respectively, present the coefficients for England and Canada. The English coefficients for university training and Level B qualifications, 2.663 and 2.805, are both well above the Canadian coefficient for a completed degree, 2.205. (In each case, $p<.001$) The English coefficient for some university, at 1.662, is well above the Canadian at .996. ($p<.001$) Clearly, these results are consistent with the hypothesis that degree level training in England would be associated with higher occupational outcomes than in Canada.

No hypotheses were formally stated about Level C and Level B qualifications because Turner, from whom the hypotheses

Table 5.5

Educational Coefficients for English Males

Education	Coefficient	S. E.
Non-selective, to leaving age	-.732	.066
Non-selective, to leaving age, craft/trade certificate	.430	.094
Non-selective, beyond leaving age	-.195	.086
Non-selective, beyond leaving age, craft/trade certificate	.673	.078
Non-selective, passed O-Levels	.882	.126
Selective, to leaving age	-.192	.074
Selective, to leaving age, craft/trade certificate	.431	.104
Selective, beyond leaving age	.496	.057
Selective, beyond leaving age craft/trade certificate	.834	.063
Selective, passed O-Levels	.930	.105
Stayed to 17+, after O-Levels	1.168	.079
Passed A-Levels	1.259	.079
Level C qualifications	1.541	.083
Level B qualifications	2.805	.113
Some university	1.662	.133
Degree(s) completed	2.663	.098

Table 5.6

Educational Coefficients for Canadian Males

For Comparison With English Males

Educational Category	Coefficient	S. E.
Elementary incomplete	-1.298	.073
Elementary complete	-.903	.056
Secondary, vocational		
Grade 9	-.571	.180
Grade 10	.037	.117
Grade 11	.012	.020
Secondary complete	.216	.073
Secondary, academic		
Grade 9	-.632	.073
Grade 10	-.345	.078
Grade 11	-.185	.056
Secondary complete	.329	.041
Secondary, stream uncertain		
Grade 9	.013	.119
Grade 10	.341	.137
Grade 11	.402	.109
Secondary complete	.439	.096
Business or trade school	.292	.047
Community college	.597	.108
Nurses' or Teachers' Training	.865	.144
University Diploma	1.105	.066
Some University	.996	.025
Degree(s) completed	2.205	.091

were derived, did not deal with them. Certainly their high scores, at 2.805 and 1.541, are consistent with the notion that in a nation with a relatively small supply of degree level personnel, degree level training will result in high standing. But Turner's notion was that the small size of the university trained population was a result of a particular form of institutionalized mobility. Question must be raised as to how far Level C and Level B qualifications reflect the sponsored mobility which he believed to be the characteristic route to the top in England. The problem lies in the varied means by which Level C and Level B qualifications have been obtained. There is a sense in which, for example, accountants, who have been trained in an apprentice-like way, could be regarded as having undergone a form of sponsorship, although not through the school system. But if someone has acquired engineering qualifications through self-study or non-university courses, this appears more like contest mobility. Without clear data on the routes taken to Level C and Level B qualifications, it is impossible to say to what extent the presence of these credentials supports Turner's analysis and to what extent it indicates that something was left out of it. For the moment, since the question cannot be answered from the data available, it can only be said that within these categories there are channels of mobility which Turner has not dealt with, and that a full understanding of the relationship between education and mobility in England will have to deal with channels outside the school system in more detailed fashion.

The second hypothesis to be tested is that selective schools in England confer greater occupational advantage over non-selective than the academic stream in Canada confers over the vocational. In Canada, for those with no post-secondary training, if the coefficient for the vocational stream is subtracted from that for the academic, the results are:

for Grade 9	-.061	(s.e. = .208)
for Grade 10	-.382	(s.e. = .131)
for Grade 11	-.197	(s.e. = .059)
for secondary complete	.113	(s.e. = .058)

For those who have not completed their secondary schooling an academic background appears to be less advantageous than a vocational, whereas for those with complete secondary training the situation is reversed, but most of the differences are small: using a two-tailed test, only those for Grade 10 and Grade 11 are significant, and only that for Grade 10 exceeds an absolute value of .200.

In England, on the other hand, some quite large differences favouring selective schooling appear. If scores for non-selective schooling are subtracted from those for selective, for those who have not gone beyond their O-Levels, the differences, with their standard errors in brackets, are:

for those leaving at the minimum age	.540	(.097)
for those leaving at the minimum age, holding craft/trade certificates	.001	(.153)
for those staying past the minimum age	.689	(.113)
for those staying past the minimum age, holding craft/trade certificates	.161	(.102)
for those who have passed O-Levels	.048	(.158)

For those with no additional credentials in the form of O-Levels or craft/trade certificates, the differences are quite large, at .540 for those who left at the legal minimum age, and .689 for those who stayed beyond it. If additional credentials are held, the differences are much smaller, and are not statistically significant.[3]

For those with no extra credentials, the hypotheses are strongly supported. Comparing the differences found for England with those found for Canada, all tests are significant at .01 or beyond. At the same time a limitation of the power of school type is shown in that, if further credentials are held, the differences associated with school type are greatly reduced, and become statistically non-significant. These results refine conclusions of Kerckhoff and Everett (1986), who showed that occupational standing, for males aged 25-34, was associated with school type, in a pattern basically favouring those who had attended selective schools, but presented no overall measure of the relative standing of those who had attended different types of school and no analysis of sub-categories among those who had attended a given type of school.

A further hypothesis tested was the null, that the link between education and occupation would not differ between nations. This hypothesis was rejected at .001. For Canada c = 1.1116 (s.e. = .029), and for England c = .828 (s.e. = .039). This proves to be the only significant difference in association coefficients found in the study. An effort has therefore been made, through Deming adjustments, to see whether the difference can be interpreted in terms of structural differences between the nations. The results will be presented below, after a consideration of sub-population differences.

Sub-population Differences

As in the other between-nation comparisons, it is desirable to see whether the differences that appear when all cases are considered are modified for particular sub-populations. Both nations have been tested for differences between those aged 25 to 44 and those 45 and over. Canada has been checked for differences among immigrants, francophones in Quebec and others.

As the results for Canada are simpler, they will be dealt with first. Essentially, the tests show no significant differences. For the age comparison, $L^2 = 66.24$ with 31 df. Fay's G yields $p>.10$. For the comparison among immigrants, francophones in Quebec and others $L^2 = 153.927$ with 62 df and Fay's G again yields $p>.10$.

The English results are not quite so simple. A test for three-way interaction among age, education and occupation yields an L^2 of 235.49 with 152 df and G yields p<.01.[4] Although the difference was small in relation to sample size, (L^2/N = .024), and it was therefore expected that the differences in coefficients would be minor, the age groups were adjusted to each other's marginals. The differences in coefficients after adjustment was done were quite minor: when the older group was given the marginals of the younger, the correlation between the occupation coefficients was .988. Between the education coefficients r was .974. For the younger group the association coefficient was .926 and for the older it was .988. As each sub-sample contained over 4000 cases, and the coefficients were so close it appears that the test for three factor interaction was simply sensitive to small differences. While these could be of interest in a study focussed on differences between age cohorts, for the purposes of this research they may be passed by.[5]

Deming Adjustment Between Nations

More interesting results were obtained by Deming adjusting each nation to the other's occupational marginals. As noted above, marginal differences were patterned in such a way that the standardization of coefficients could be affected. It is not possible to adjust fully for the education marginals, because the categories are different. But the rows can be fully adjusted. As the fit in each case is good, and the results are consistent, attention will be focussed on only the adjusted Canadian data. The same cells are blocked as for the unadjusted data. For this adjustment, L^2 (192 df) = 400.51 and L^2/N = .038.

The occupational coefficients are shown in Table 5.7. The six categories whose original scores were the highest all increase. Instead of being uniformly lower than their English counterparts, they are now about evenly matched: three are higher and three lower. Thus it appears that the English occupational structure is a key reason for the patterned differences in occupational scores seen earlier.

Further examination of the scores does not yield a great deal: the two largest differences between the English and Canadian data remain those for farmers and farm labourers, and for unskilled white collar workers. These have been discussed above.

As the adjustment has shrunk the occupational categories most closely associated with higher levels of education, these categories have also been reduced. Their scores are affected, as may be seen in Table 5.8. Every category from Grade 11 upward through the post-secondary categories has a higher score after adjustment. While the changes in these scores do not bring those which can be compared to English

Table 5.7

Occupational Coefficients for English Males and for Canadian Males, Unadjusted and Adjusted to English Occupational Marginals

Occupational Category	England	Canada Unadjusted	Canada Adjusted
Professional	2.414	2.161	2.540
Semi-professional	2.009	1.554	1.806
Technical	1.229	.654	.939
Managers	1.355	1.233	1.542
Supervisors	.504	-.277	.449
Foremen	-.159	-.189	-.105
Clerical, Sales and Service			
Skilled	1.218	.742	.968
Semi-skilled	.242	-.085	.120
Unskilled	-.950	.136	.236
Crafts, Trades and Manual			
Skilled	-.431	-.477	-.443
Semi-skilled	-.782	-.773	-.785
Unskilled	-1.103	-1.111	-1.107
Farmers and Farm Labourers	-.401	-1.007	-.948

Table 5.8

Educational Coefficients for Canadian Males, Unadjusted And Deming Adjusted to English Occupational Marginals

Educational Category	Unadjusted	Adjusted
Elementary incomplete	-1.298	-1.229
Elementary complete	-.903	-1.229
Secondary, vocational		
Grade 9	-.571	-.429
Grade 10	.037	.148
Grade 11	.012	.099
Secondary complete	.216	.280
Secondary, academic		
Grade 9	-.632	-.490
Grade 10	-.345	-.214
Grade 11	-.185	-.053
Secondary complete	.329	.461
Secondary, stream uncertain		
Grade 9	.013	.098
Grade 10	.341	.439
Grade 11	.402	.525
Secondary complete	.439	.519
Business or trade school	.292	.399
Community college	.597	.641
Nurses' or Teachers' Training	.865	.994
University Diploma	1.105	1.208
Some University	.996	1.123
Degree(s) completed	2.205	2.340

scores up to English levels, a fraction of the difference is made up: for those with degrees 29.4 per cent of the difference is made up, and for those with some university 19.7 per cent.

The stretching out of the occupational and educational scores that results from adjusting the occupational marginals inevitably affects the association coefficient. It moves down from 1.116 to 1.005. Thus the difference in the association coefficients for the two countries can be partly accounted for by marginal differences, the most striking of which is the smaller proportions of English respondents in the upper occupational categories.

While it is not possible to fully adjust the educational marginals, since the categories are different, there is particular interest in the very large category at the bottom of the English distribution. Other things being equal, a nation with a large undifferentiated category at the bottom of the scale might be expected to have a lower association coefficient than a nation with greater differentiation. Some perspective on the question can be obtained by collapsing categories in the Canadian data. If the rows are adjusted and then all educational categories up to Grade 10 are placed in a single category, it is possible to fit a model to see what would happen if distinctions in the bottom (approximately) one half of the Canadian distribution were not present, the occupational distributions were the same, and the odds ratios for uncollapsed categories remained the same. Since the resulting table is highly artificial, no attention will be given to the row and column coefficients. After blocking the same cells as before, in the uncollapsed part of the table, fit of the model is good. (L^2 (180 df) = 308.60; L^2/N = .029) The association coefficient declines to .878, still above the English value at .828 but well below the 1.005 obtained by adjusting the occupational marginals, and much below the original 1.116. To return the association coefficient to the level of 1.005 would require that the other twelve categories acquire enough extra impact to make up for what was lost by collapsing eight categories into one. In England no compensation of this kind appears to be present. A model was fit to the English data, blocking the same cells as before, but leaving out the first column, and c came to .845. Then a model was fitted to the adjusted Canadian data, blocking the same cells as before, but leaving out those with Grade 10 or less, and the Canadian c was .922. The ratio of these coefficients is about the same as the ratio between the coefficients for the full English table and for the adjusted and collapsed Canadian table. Thus it appears that the heavy concentration of cases at the bottom of the educational distribution in England is not compensated for, and accounts for a substantial portion of the difference in the overall association coefficients.[6]

A further possible explanation for the difference between nations is that England makes greater use of on-the-job training to differentiate workers. Available data do not allow for a thorough test of this possibility, but both data sets do have codes which include apprenticeships. While no effort to define the most appropriate education codes including apprenticeship has been made, some preliminary analysis suggests that the effects of apprenticeship on the association coefficient are of roughly similar magnitude.

Summary and Discussion

The evidence obtained from a comparison of England and Canada has been supportive of two hypotheses derived from Turner: that university education would be relatively more advantageous in England than in Canada and that the difference in favour of the selective English school, compared to the non-selective, would be greater than the difference in favour of the Canadian academic stream compared to the vocational. Sub-population differences were small or non-significant.

One difference that was not hypothesized appeared in the overall strength of the link between education and occupation: for England c was .828, while for Canada it was 1.116.

A series of Deming adjustments suggested that some of the differences found can be attributed to structural differences between nations: the most striking of these are the smaller proportion of English respondents in the upper occupational categories and the larger proportion of English respondents in the lowest educational category. Adjusting Canada to English occupational marginals brought the association coefficient down to 1.006. Collapsing to place educational categories below Grade 10 in a single category brought it down to .878. Although, in principle, England could make up the lack of differentiation at the bottom of the system by closely matching occupation and education at higher levels, it appears that this is not what has been done: when R x C models are fit without the lowest category in England and without the collapsed category in Canada, association is still a bit higher in Canada. A substantial part of the lower association in England appears to be attributable to the lack of differentiation at the bottom, for which there is no compensation through stronger matching at higher levels of education.

In terms of the underlying concepts, the data remind us that not all mobility occurs through the schools. English Level C and Level B qualifications may be obtained in various ways, which include self study, non-university courses, and apprentice-like training as well as university work. It is unclear from available data how much of the ascent to high occupational levels through obtaining these qualifications can be thought of as sponsored and how much as contest mobility.

On the methodological side, only one new difficulty with the R x C approach was experienced, although there were reminders of some mentioned earlier. The difficulty encountered, and mentioned in chapter note 3, is that cell blocking may cause awkwardness in comparing coefficients: if two columns of a table are to be compared, a substantive interpretation of the results will be more complicated if different cells are blocked in one column than in the other. On the positive side, R x C modelling allowed detection of some subtle differences between nations in the relative position of occupational groups. Through Deming adjustment it has allowed the effects of the occupational distribution on the relative standing of occupations to be examined. It has also provided perspective on the impact of the heavy concentration of cases at the bottom of the English educational distribution. In general, then, the methodology has performed well in comparing England and Canada.

Notes to Chapter Five

1. The Canadian figure does not equal that seen in the previous chapter because of two changes in the sample used. To better match the English sample, which includes only those who had British education after age 11, the Canadian sample was restricted to those who were in Canada at the age of 16, rather than including all those who immigrated at an earlier age, as it did for the comparison with the U. S. The second difference involves the education codes. In this chapter the lowest category is Elementary Incomplete. In the previous chapter it was Up to Grade 7. There are fewer missing values on the question which includes the code Elementary Incomplete than on the question which provides grade levels.

2. This comparison may understate the proportion in Canada who have qualifications which in England would be coded as Level C or Level B. Some of the qualifications included under the Canadian code for university diplomas, e.g. bankers' certificates, or accounting credentials, would probably be treated as falling in one of the English categories. Since a breakdown of the credentials included under university diplomas is not available, this problem can only be referred to.

3. The comparison for those who left at the minimum leaving age, then acquired craft/trade certificates, is based on a model in which the cell involving skilled blue collar workers has been blocked for those from non-selective schools but not

for those from selective schools. The interpretation to be placed on the difference between categories would have been somewhat simpler if there had been similar blocking, or no blocking in each. Had it seemed appropriate to sacrifice some goodness of fit for greater simplicity in interpretation the blocked cell might have been left unblocked. Had this been done, the coefficient for selective schooling would have been the greater by .226, and the importance of school type would thus have appeared to be somewhat greater than it appeared with the cell blocked. The effect of blocking, then, was somewhat conservative, in the sense that it reduced the difference between types of schooling which were hypothesized to have different occupational effects.

4. Here, as with the U. S., the test for three factor interaction was used instead of a test of the difference between a model with coefficients for sub-groups constrained to be equal and a model allowing coefficients to vary freely, because of the computer time liable to be used for the latter test.

G is sensitive to the number of non-structural zeroes in a table and will tend to reject the null hypothesis too often if too many are present. To deal with this problem Fay (1983) suggests that tests be done with and without blocking cells with zero values. If the test goes from significant to non-significant when they are blocked, then it is clear that the results are sensitive to these values, and the researcher can decide on substantive grounds what this implies for the work. On this basis, the test was done in two forms: once without any structural zeroes and a second time with structural zeroes placed in cells where (a) both age groups had zero values, or (b) contiguous cells had zero values. Twenty-eight cells were blocked, bringing the number of remaining non-blocked cells below the level at which Fay suggests such cells are apt to be problematic. The first test yielded $L^2 = 256.60$ with 180 df, and G provided a significance level of .001. The second, more rigourous, test was reported in the text.

5. A further reason to give little attention to these coefficients is that the Deming adjusted tables are not well fitted. When the older respondents were adjusted to the marginals of the younger, L^2/N was .111. While two cells were clearly worse fitting than others, their blocking reduced L^2/N only to .093, and, of course the models to be compared, if these cells were blocked, would no longer match precisely.

6. The English model does not fit as precisely as might be wished, but there are no obvious cells to block beyond the two blocked in models throughout the chapter. ($L^2 = 409.51$; $L^2/N = .096$) The Canadian model fits quite well. ($L^2 = 256.78$; $L^2/N = .045$)

COMPARISON OF MALES

Occupational and Educational Distributions

Table 6.1 shows the occupational distributions for West German and Canadian males. The Index of Dissimilarity is higher, at 19.3, than those for Canada and the U. S. or Canada and England, both of which were below 14.0. One possible reason is that SUPERFILE includes only citizens, omitting guest workers, who are disproportionately represented in positions of low standing, while the Canadian figures apply to the entire labour force. Note that in the German sample only 6.9 per cent are unskilled blue collar workers, compared to 13.6 per cent for Canada. Note also that supervisors and foremen, taken together, make up 7.0 per cent of the German sample, but 15.1 per cent of the Canadian. (This difference parallels findings from Ahrne and Wright (1983) and Black and Myles (1986), who showed that Canada had more supervisors, defined to include foremen, than Sweden.)

It might be thought that difficulties in placing the occupational unit codes of the West German data set into the categories of the Canadian Mobility Study could have led to the relatively large Index of Dissimilarity. But there did not seem to be any unusual difficulties for males. There were, as usual, awkward decisions in deciding on skill levels. As usual, the professions were represented by quite specific unit

Table 6.1

Occupational Distributions of West German and Canadian Males, in Percentages

Occupational Category	West Germany	Canada
Professional	11.3	8.6
Semi-professional	3.4	4.5
Technical	3.1	1.9
Managers	8.5	7.3
Supervisors	3.9	7.4
Foremen	3.1	7.7
Clerical, Sales and Service		
Skilled	4.4	4.2
Semi-skilled	8.9	6.2
Unskilled	1.1	2.0
Crafts, Trades and Manual		
Skilled	25.8	19.1
Semi-skilled	15.9	11.4
Unskilled	6.9	13.6
Farmers and Farm Labourers	3.7	6.3
Total	100.0	100.2
N	3625	12795

groups. While there were particular difficulties with skill levels for white collar workers, the problems were far more important for females, and thus will be discussed below.

Tables 6.2 and 6.3 present the educational distributions. The German distribution, shown in Table 6.2, includes one category reminiscent in its size of the undifferentiated grouping at the bottom of the English distribution. The category for those who had completed the Main school and an apprenticeship includes 44.1 per cent of the sample. But this category differs in two ways from the English category: it is not directly at the bottom of the scale; and everyone in it has had training in specific occupational skills. They are grouped in a single category only because they must be for analysis.[1]

While most of the categories of the West German distribution cannot be equated with categories in the Canadian, some comment should be made on the university trained. These two nations are the first pair for whom the total proportion of graduates is similar: the German figure for university graduates, at 9.6 per cent, is higher than that for Canadians with graduate or professional degrees at 5.4 per cent, but a bit below the figure for all Canadian degrees at 10.7 per cent.

The pattern seen in comparing Canada and England returns when the proportions from particular school types are compared with the proportions from different high school tracks. Of the West German sample, 51.8 per cent had been to the Main School, then gone on to an apprenticeship or to a

Table 6.2

Educational Distribution for West German Males, in Percentages

Educational Category	Percentage
No vocational training	6.8
Main school plus apprenticeship	44.1
Main school plus vocational school	3.9
Real school plus apprenticeship	10.2
Real school plus vocational school	2.3
Vocational practicum	1.7
Technical Institute (Master Craftsman, Technologist)	10.6
Entry requirements for Technical and Vocational Colleges	2.0
Entry requirements for University	2.5
Technical and Vocational College	6.3
University	9.7
Total	100.1
N	3625

Table 6.3

Educational Distribution for Canadian Males,

For Comparison With West German Males, in Percentages

Educational Category	Percentage
Elementary incomplete	11.9
plus apprenticeship	1.5
Elementary complete	12.2
plus apprenticeship	2.8
Secondary, vocational	
partial	2.9
plus apprenticeship	1.3
complete	2.6
plus apprenticeship	2.0
Secondary, academic	
partial	14.5
plus apprenticeship	4.2
complete	6.8
plus apprenticeship	2.6
Secondary, stream uncertain	
partial	2.0
plus apprenticeship	1.2
complete	1.5
plus apprenticeship	1.0
Business or trade school	8.2
Community college	2.3
Nurses' or Teachers' Training	.5
University Diploma	2.2
Some University	5.3
B.A.	5.3
Graduate or professional degree	5.4
Total	100.2
N	12795

vocational school, compared to 12.5 per cent who went to the Real school and followed the same vocational routes. In Canada the less prestigious option is the less common: 8.8 per cent had taken vocational programs, and not gone past high school, against 28.1 per cent who had taken academic programs.[2]

The proportion coded as having done apprenticeships is strikingly lower in Canada. For West Germany two categories, involving attendance at the Main school and the Real school, sum to 54.3 per cent. For Canada, eight categories are involved, each involving one level of formal education, from elementary incomplete to secondary complete. But the eight categories include only 16.6 per cent of the sample.

Model Fitting

For both nations, categories involving apprenticeship are strongly linked with skilled blue collar occupations, frequently to the point at which a model cannot be well fitted without blocking the cell. Cells blocked for the West German sample include one whose education code is Main School Plus Apprenticeship and whose occupation code includes skilled blue collar workers. Three further cells are blocked, all of which involve those with Technologist's or Master Craftsman's training. This form of training is involved in heavy cells with three occupational categories - Technical, Foremen and Skilled Crafts, Trades and Manual. Blocking so many cells within the category for Technologist's or Master Craftsman's training renders the coefficients for that category much less interpretable than those for other categories, but as it is not a category which figures in the hypotheses, this poses no major problem for the present study.

A more serious problem arises from blocking the cell combining Main School plus Apprenticeship with skilled blue collar occupations: 16.6 per cent of the cases in the sample fall in that cell. The coefficients of the model accepted, if applied to this cell, provide an estimated value which is low by 434, or 11.9 per cent of the sample. Thus it must be borne in mind that the model presented here requires supplementation to provide a clear picture of the total labour force. Fortunately, as it was necessary to fit a model without the cell blocked in the course of analysis, it can be stated that no conclusions offered here would have been changed if it had not been blocked.

With four cells blocked, X^2 = 406.50 with 95 df, and p>.05. Blocking cells reduces L^2 from 446.77 to 314.52. At that value it has fallen to 10.8 per cent of its independence value, 2924.48. L^2/N = .087.

To obtain a good fit for Canada, it was necessary to block two cells unrelated to apprenticeship. One involved nurse's or teacher's training and the semi-professions. The other involved community college training and the occupational category for technical positions. Six of the eight cells combining apprenticeships with skilled blue collar work had to be blocked. (The exceptions were those which also involved complete secondary schooling, in the academic stream or in an uncertain stream.) It was also necessary to block the cell crossing trade school with skilled blue collar work. It will be shown in Chapter Seven that most of those with trade school had completed apprenticeships as well.[3] While the cases taken from the Canadian table do not represent a large proportion of the sample, 6.0 per cent altogether, the concentration of blocked cells in the row for skilled blue collar workers must be borne in mind while interpreting the coefficient for that row.

With these cells blocked, $X^2 = 728.59$ with 224 df. While Fay's G indicates that this is significant, the critical value is not far below, at 706.10. Blocking cells reduces L^2 from 1053.48 to 696.42. At this level it has fallen to 8.7 per cent of its independence value, 7996.74. $L^2/N = .054$.

Comparison of Coefficients

Comparison of Occupational Categories

The occupational coefficients for West Germany, presented in Table 6.4, show many features now familiar from other nations. Professionals have the highest coefficient, followed by semi-professionals. The scores decline with skill level within the Clerical-Sales-Service group and within the Crafts-

Table 6.4

Occupational Coefficients for West German and Canadian Males

Occupational Category	West Germany	Canada
Professional	1.947 (.069)	2.134 (.059)
Semi-professional	1.696 (.104)	1.431 (.074)
Technical	.673 (.059)	.676 (.106)
Managers	.801 (.071)	1.172 (.047)
Supervisors	.355 (.055)	.175 (.065)
Foremen	-.026 (.144)	-.146 (.045)
Clerical, Sales and Service		
Skilled	.589 (.088)	.576 (.044)
Semi-skilled	.195 (.074)	-.133 (.056)
Unskilled	-1.212 (.080)	.066 (.076)
Crafts, Trades and Manual		
Skilled	-.601 (.077)	-.538 (.044)
Semi-skilled	-.715 (.086)	-.802 (.057)
Unskilled	-1.553 (.117)	-1.089 (.055)
Farmers and Farm Labourers	-.845 (.128)	-.892 (.037)

Trades-Manual group. Overall the West German and Canadian scores, also found in Table 6.4, correlate at .919. Ignoring differences of borderline significance, or which involve the now familiar difficulties with unskilled white collar workers, differences in three categories may be noted. Managers have higher education-linked standing, relative to their countrymen, in Canada, where their coefficient is 1.172, than in West Germany, where it is .801. ($p<.01$) Semi-skilled white collar workers have higher relative standing in West Germany, where their coefficient is .195, compared to -.133 for Canadians. ($p<.01$) Finally, unskilled blue collar workers score higher in Canada, at -1.089, against -1.553 in West Germany. ($p<.01$) As there is no obvious pattern to the differences and the overall correlation between the two sets of scores presents no problems for interpreting the education coefficients, attention will move to Tables 6.5 and 6.6, where these are presented.

Comparison of Educational Categories

The lowest coefficient for West Germany, as shown to Table 6.6, is that for those with no vocational training, who, as pointed out in Chapter Two, have usually not finished the Main school either. Their score, at -1.400 is almost three quarters of a standard deviation below the score for the Main school plus apprenticeship, at -.655. At the other extreme, university training has greater occupation-linked standing than any other form of training: its coefficient is 2.246, more

Table 6.5

Educational Coefficients for West German Males

Educational Category	Coefficient	S. E.
No vocational training	-1.400	.134
Main school plus apprenticeship	-.655	.071
Main school plus vocational school	-.550	.104
Real school plus apprenticeship	.395	.056
Real school plus vocational school	.617	.079
Vocational practicum	.398	.178
Technical Institute (Master Craftsman, Technologist)	.071	.080
Entry requirements for Technical and Vocational Colleges	.577	.088
Entry requirements for University	.780	.098
Technical and Vocational College	1.426	.113
University	2.246	.138

Table 6.6

Educational Coefficients for Canadian Males, For Comparison With West German Males

Educational Category	Coefficient	S. E.
Elementary incomplete	-1.437	.051
plus apprenticeship	-.694	.153
Elementary complete	-.976	.051
plus apprenticeship	-.433	.125
Secondary, vocational		
partial	-.106	.074
plus apprenticeship	.129	.072
complete	.261	.055
plus apprenticeship	.335	.126
Secondary, academic		
partial	-.388	.011
plus apprenticeship	-.147	.049
complete	.300	.049
plus apprenticeship	.257	.062
Secondary, stream uncertain		
partial	.231	.060
plus apprenticeship	.249	.105
complete	.399	.088
plus apprenticeship	.411	.088
Business or trade school	.276	.040
Community college	.658	.084
Nurse's or Teacher's Training	.735	.129
University Diploma	.951	.054
Some University	.918	.042
B.A.	1.673	.042
Graduate or professional degree	2.313	.103

than four-fifths of a standard deviation above the coefficient for the Technical and Vocational Colleges. Their graduates in turn are almost three-quarters of a standard deviation above those who have the entry requirements for university but who have not completed it, whose coefficient is .780.

Equally clear differences are found between those who went to the Main school and those who went to the Real school. If the coefficients for those who went to the Main school are subtracted from the coefficients for those who went to the Real school the resulting figures are:

for those with apprenticeships	1.050	(s.e. = .100)
for those with vocational school	1.167	(s.e. = .155)

In each case the difference is more than a full standard deviation. Even in a system in which great emphasis is placed on vocational training after the completion of secondary school, school type shows a very strong influence.

Canadian figures, shown in Table 6.6 show patterns largely familiar from the comparison with England. But those with degrees have been divided into those with B.A.s and those with graduate and professional degrees, and those with apprenticeships have been distinguished from those without. The two categories for degrees are clearly distinguished with a score of 2.313 for those with graduate and professional degrees and of 1.673 for those with B.A.s. The occupational edge obtained by those who complete the B.A. remains, though, as those with only partial degrees come in more than two thirds of a standard deviation below them, at .918.

For those who are not in skilled blue collar work, apprenticeships appear to make progressively less difference as formal education increases. Those with apprenticeships are most frequently found in skilled blue collar work, for which they have trained. But many of them are found in blocked cells involving skilled blue collar positions and apprenticeships in combination with other training. That those with apprenticeships are often found in skilled blue collar work is not surprising. Here what happens to those who have taken apprenticeships but are not in skilled blue collar work will be examined. If the scores for those without apprenticeships are subtracted from the scores for those who have completed them, the resulting figures are:

for elementary incomplete	.743
for elementary complete	.543
for partial vocational secondary	.235
for complete vocational secondary	.074
for partial academic secondary	.535
for partial secondary, stream uncertain	.018

(Some educational categories have been omitted because the cell involving them and skilled blue collar positions has not been blocked.) The largest gap, .743, appears for those who have not completed elementary school. The differences between those with and those without apprenticeships are also above .500 for those with complete elementary training and with partial academic secondary training. For those with partial high school, the value of apprenticeship is greatest for those from an academic stream, and least for those whose stream is uncertain, presumably because the latter have partially completed a form of vocational training anyway. In a broad sense, the occupational advantage of apprenticeship, for those who are not in skilled blue collar work, decreases as the score for those without one increases: Pearson's r = -.947.

Comparing the vocational and academic streams, a picture emerges which adds subtlety to that obtained from the comparison with England. If the scores for the vocational stream are subtracted from those for the academic, the results are:

for partial secondary	-.282	(s.e. = .075)
plus apprenticeship	-.276	(s.e. = .103)
for complete secondary	.039	(s.e. = .054)
plus apprenticeship	-.078	(s.e. = .129)

As before, the scores for those with partial secondary favour those from the vocational track. The differences exceed .25 standard deviations and are both significant by a two-tailed test. For complete secondary, the differences favour the academic stream in the absence of an apprenticeship, and the vocational in its presence, but do not reach significance.[4]

Examining the Hypotheses

With the key patterns in the coefficients in mind, the hypotheses can now be examined straightforwardly. While the German association coefficient is the higher, at 1.273 (s.e. = .078) compared to 1.156 (s.e. = .026) the difference is not significant. In Chapter Two it was pointed out that it was unclear whether West Germans with university education should score higher than Canadians with degrees, or higher than those with graduate and professional degrees, or at about the same level as the latter. As it turns out, the Canadian coefficient for those with graduate and professional degrees, at 2.313 is slightly higher than the German at 2.246, but the difference is not significant. Canadian B.A.s, of course, scored lower.

From the data presented above it is clear the hypotheses about the relative effects of school types and tracks are supported. For West Germany, the differences favour the Real school by more than a standard deviation. For Canada, the differences between tracks are less than $\pm$.100, if high school is complete, and favour the vocational track if it is not. Comparing one set of differences to the other, in each of the eight possible comparisons the German figure exceeds the Canadian at the .005 level. These results clearly support the hypothesis that the relative occupational value of the Real school, compared to the Main school, is greater than that of the Canadian academic stream compared to the vocational.

Comparing Sub-populations

An examination of sub-populations adds little complexity to the picture presented. Comparing those from 25 to 44 with those 45 to 65 in the West German sample, little difference is found. For a model requiring the coefficients for both groups to be the same, $L^2 = 479.41$, a value which declines only to 461.93 when the coefficients are allowed to vary freely. With 22 degrees of freedom in the comparison, the difference is not significant. Making the same comparison for Canadian males, the difference between models is somewhat greater: 94.60 with 34 df. ($p<.05$) A similar comparison of models with the sample divided into francophones in Quebec, immigrants and others yields a difference of 180.54 with 68 df. Again, $p<.05$. While the two differences for Canada are significant, their relatively low L^2 values, in relation to an N of 12975, indicate that sub-population differences are not of great magnitude. Thus, while they might be examined more closely in a study focussed on sub-population differences, they will be passed by without further comment here.

COMPARISON OF FEMALES

Occupational and Educational Distributions

As in the comparison with the United States, examining females allows the hypotheses to be tested twice, but, as in the earlier comparison, the tests for females must use slightly different models. One reason is the small numbers in some categories, which will be apparent in examining the marginals, in Table 6.7. As above the German data do not include guest workers, and as above the Canadian data reflect no corresponding restriction.

Most of the differences between nations are relatively small, involving a spread of no more than 2.5 percentage points. A larger difference is found for managers, who make up 7.6 per cent of the West German sample but only 2.5 per cent of the Canadian. But the largest differences occur among white collar workers. In West Germany, semi-skilled white collar workers make up 40.4 per cent of the cases, but in Canada only 23.1 per cent. Skilled white collar workers make up only 1.7 per cent of the West German sample, against 21.1 per cent of the Canadian. Unskilled white collar workers are also less common in West Germany, where they make up 3.1 per cent of the female labour force, against 7.2 per cent for Canada. The difficulty lies in the relatively small number of categories in the International Standard Classification of Occupations which represent the clerical area. Among West German females, 28.8

Table 6.7

Occupational Distributions of West German and Canadian Females, in Percentages

Occupational Category	West Germany	Canada
Professional	7.3	4.8
Semi-professional	12.0	13.3
Technical	1.4	1.8
Managers	7.6	2.5
Supervisors	6.1	6.9
Clerical, Sales and Service		
Skilled	1.7	21.1
Semi-skilled	40.4	23.1
Unskilled	3.1	7.2
Crafts, Trades and Manual		
Skilled	3.2	1.8
Semi-skilled	7.0	9.5
Unskilled	7.5	7.0
Farmers and Farm Labourers	2.6	1.1
Total	99.9	100.1
N	1834	4751

per cent fall into just four categories, each classified as semi-skilled for want of a clear way to identify the skilled or the unskilled within them. The four are Bookkeepers and Cashiers (including such occupations as bookkeeping clerks and post office counter clerks), Bookkeepers, Cashiers and Related Workers, Not Elsewhere Classified (including cost computing clerks and wages clerks), Correspondence and Recording Clerks (including general office clerks and various other subdivisions), and Salesmen, Shop Assistants and Demonstrators.

In view of this heavy concentration of cases, consideration was given to presenting the results with the Clerical-Sales-Service categories collapsed. It was decided to retain what distinctions could be made, largely because of a desire to present the full results for Canadian females, who have not yet been examined with an education code involving high school stream or post-secondary vocational training. But it must be recognized that the scores for the various skill levels are not properly comparable between nations. Fortunately, though, the West German scores for other categories are much the same with or without collapsing. ($r = .981$) It can also be said, having fitted the model both ways, that none of the results on the hypotheses are altered if the Skilled and Semi-skilled Clerical-Sales-Service categories are collapsed. The coefficients for the collapsed models may be found in Appendix B.

Another distinctive feature of the marginals for West German females is shown in Table 6.8, where the educational

Table 6.8

Educational Distribution for West German Females, in Percentages

Educational Category	Percentage
No vocational training	19.8
Main school plus apprenticeship	35.3
Main school plus vocational school	3.4
Real school plus apprenticeship	16.3
Real school plus vocational school	5.1
Vocational practicum	2.3
Technical Institute (Master Craftsman, Technologist)	3.2
Entry requirements for Technical and Vocational Colleges	1.3
Entry requirements for University	1.6
Technical and Vocational College	2.5
University	9.1
Total	99.9
N	1834

distribution is presented. As compared to 6.9 per cent of the males, 19.8 per cent of the females have no vocational training.

Their distribution is not straightforwardly comparable to the Canadian, presented in Table 6.9. But, as for males, attention should be drawn to the proportion of university graduates. Among the West Germans, 9.1 per cent hold degrees compared to 2.6 per cent of Canadians who hold graduate and professional degrees and 7.5 per cent who hold any degree. As for males, the ratio of those who have been through the Main school to those who have been through the Real school is higher than the ratio of Canadians who have been through vocational tracks to those who have been through academic tracks. Among West Germans, 38.7 per cent have been through the Main school and have either taken apprenticeships or gone to a further vocational school, compared to 21.4 per cent who have been to the Real school and taken similar vocational training. Canadians with vocational high school training make up only 5.5 per cent of the sample, compared to the 27.9 per cent who have been in academic secondary programs. The Canadian figures do not include those who have taken apprenticeships, as they are so few in number that they could not successfully be divided by track. One of the most striking features of the comparison is that only 5.0 per cent of Canadian females had taken apprenticeships, against 51.6 per cent of the West Germans.

Table 6.9

Educational Distribution for Canadian Females,

For Comparison With West German Females

Educational Category	Percentage
Elementary incomplete	6.8
Elementary complete	11.1
Secondary, vocational	
partial	2.0
complete	3.5
Secondary, academic	
partial	15.7
complete	12.2
Secondary, stream uncertain	
partial	3.8
complete	1.8
Less than complete secondary plus apprenticeship	3.1
Complete secondary plus apprenticeship	1.9
Business or trade school	13.6
Community college	1.7
Nurse's or Teacher's Training	7.7
University Diploma	3.2
Some University	4.6
B.A.	4.9
Graduate or professional degree	2.6
Total	100.2
N	4751

Model Fitting

Readers familiar with log-linear modelling will recognize that sometime when a model yields a non-significant L^2, blocking cells will still produce a decline in L^2 which is significant. In such situations a decision must be made as to whether to accept the first model, in whose favour it can be said that variations from it can reasonably be attributed to chance, or the second, in whose favour it can be said that blocking creates an improvement in fit too great to be easily attributed to chance. The West German female table raised an issue of this kind. While a model with no cells blocked yielded a nonsignificant X^2, L^2/N was higher than that for any model accepted for any other table, and two further cells, if blocked, provided a significant decrease in L^2. But blocking introduced an additional complexity to the analysis. The two cells in question were the two heaviest in the table, together including almost one-fifth of the cases. Thus the coefficients of the fitted model would define the relationship between education and occupation for much less than the full sample. It was decided to run the analysis both ways, to see whether blocking the two heavy cells made any difference to the hypotheses. As it did not, only the model with blocked cells, which at least provides a more acceptable L^2/N, will be presented.

For this model, $X^2 = 178.72$, and G yields $p>.10$.

Blocking two cells reduces L^2 from 221.63 to 184.37 ($p<.001$). This value represents a decline of 86.5 per cent from the baseline value of 1364.64. $L^2/N = .100$. The two blocked cells were those involving the Main school and the Real school plus apprenticeship. These forms of training were combined with the semi-skilled white collar occupational categories, and when coefficients defined with these cells blocked are used to obtain expected values for these cells, the expected values fall 298 cases short of the observed. This many cases represents 16.2 per cent of the sample. The coefficients for the model should be read with an awareness that they apply to the table without these two very heavy cells, which to be fitted well would require their own cell coefficients.

The model accepted for Canada, while it involves six blocked cells, does not involve the loss of large numbers of cases. For this model $L^2 = 479.08$. While G yields $p<.05$, the critical value is not far below at 462.89. Cell blocking reduces L^2 from 885.18. L^2 for the accepted model is 87.4 per cent below the independence value of 3813.62. $L^2/N = .101$.

Of the six cells blocked, one was a nuisance cell and the others combined a form of training with an occupational category to which it provides entry. The nuisance cell combined complete elementary education with professional occupations. Three cells involved the semi-professions, in combination with nurse's or teacher's training, university diplomas, and partial degrees. On examination of occupations in these cells, it appeared that each contained a large proportion of nurses and/or teachers. Another cell involved community college training and technical occupations. The final cell involved business school and skilled white collar occupations.

Comparison of Coefficients

As for males, the West German association coefficient was higher than the Canadian, but not significantly so: the West German score was 1.165 (s.e. = .110) and the Canadian was 1.068 (s.e. = .079). But it must be remembered that there is clear differentiation among white collar workers in the Canadian data, and not in the West German. Equally clear differentiation might well move the West German coefficient upwards, although, if the standard error was not reduced, the coefficient would have to move up considerably for the difference between nations to be significant.

Comparison of Occupational Categories

The occupational coefficients for females in each nation are shown in Table 6.10. The two sets of coefficients show some now very familiar features, with professionals at the top, followed by semi-professionals, and with scores declining with skill level both for white collar and for blue collar workers. Between the two nations, $r = .930$.

There are some interesting variations, though.

Table 6.10

Occupational Coefficients for West German and Canadian Females

Occupational Category	West Germany	Canada
Professional	1.844 (.137)	2.567 (.141)
Semi-professional	1.459 (.060)	1.923 (.131)
Technical	.983 (.123)	.532 (.188)
Managers	.246 (.187)	1.016 (.127)
Supervisors	-.250 (.114)	-.210 (.119)
Clerical, Sales and Service		
Skilled	.369 (.209)	.533 (.059)
Semi-skilled	-.016 (.197)	-.195 (.070)
Unskilled	-1.453 (.155)	-.433 (.103)
Crafts, Trades and Manual		
Skilled	-.809 (.144)	-.975 (.128)
Semi-skilled	-1.368 (.202)	-1.175 (.130)
Unskilled	-1.740 (.235)	-1.235 (.099)
Farmers and Farm Labourers	-1.064 (.260)	-1.237 (.174)

Ignoring differences which involve the Clerical-Sales-Service group and differences of borderline significance, a series of differences may be seen at the top of the listings. The Canadian score for professionals, at 2.567, is well above the West German at 1.844. The same is true for semi-professionals, where the Canadians score 1.923 and the West Germans 1.459. Managers too score higher in Canada, at 1.106, than in West Germany, where they come in at .246. All of these differences are significant at .01. Altogether, though, the two sets of coefficients are enough alike that they pose no problems for interpreting the educational coefficients.

Comparison of Educational Categories

These are shown for West Germany and Canada, respectively, in Tables 6.11 and 6.12. The West Germans show a pattern much like that seen earlier for males: using the categories present in both tables, r = .955. Those with no vocational training are almost two-thirds of a standard deviation below those with Main school plus apprenticeship. Clear distinctions are also found at the other end of the scale. The occupational advantage of university training, with a coefficient of 2.606, is close to a full standard deviation over Technical and Vocational College, with a coefficient of 1.648. Those with Technical and Vocational College in turn are more than 1.25 standard deviations above those with entrance requirements for tertiary training.

Table 6.11

Educational Coefficients for West German Females

Educational Category	Coefficient	S. E.
No vocational training	-1.069	.148
Main school plus apprenticeship	-.408	.056
Main school plus vocational school	.066	.139
Real school plus apprenticeship	.116	.080
Real school plus vocational school	.568	.130
Vocational practicum	.196	.100
Technical Institute (Master Craftsman, Technologist)	.373	.214
Entry requirements for tertiary training	.403	.143
Technical and Vocational College	1.648	.146
University	2.606	.085

Table 6.12

Educational Coefficients for Canadian Females,

For Comparison With West German Females

Educational Category	Coefficient	S. E.
Elementary incomplete	-1.835	.145
Elementary complete	-1.263	.084
Secondary, vocational		
partial	-.409	.060
complete	.486	.117
Secondary, academic		
partial	-.431	.086
complete	.384	.055
Secondary, stream uncertain		
partial	.387	.048
complete	.545	.195
Less than complete secondary plus apprenticeship	-.497	.128
Complete secondary plus apprenticeship	.434	.155
Business or trade school	.374	.020
Community college	1.035	.123
Nurse's or Teacher's Training	.765	.096
University Diploma	1.132	.094
Some University	1.024	.135
B.A.	1.774	.128
Graduate or professional degree	2.164	.115

Canadian females also show patterns much like those seen earlier for males. Those with incomplete elementary school, at -1.835, are well below those who have completed elementary training at -1.235. For each of the tracks, the occupational edge those who have completed high school hold over those who have not is more than three quarters of a standard deviation. This difference exists as well for those who have completed apprenticeships: those who have not completed high school score -.497, against .434 for those who have. At the upper end of the scale, a sharp jump appears again for those with the B.A., who score three quarters of a standard deviation higher than those with partial university. Those with graduate or professional degrees score almost half a standard deviation higher at 2.164, compared to 1.774.

Examining the Hypotheses

Since the patterns of coefficients are much alike for males and females, the results on the hypotheses are much alike. West German females have an insignificantly higher c, 1.165 against 1.068 for the Canadians. (It was noted, however, that the West German coefficient could have been held down by a lack of clear differentiation among white collar occupations.) The effect of having been in the Real school rather than the Main school is more positive than the effect of having been in an academic rather than a vocational stream. If the scores for those who attended the Main school are subtracted from the scores for those who attended the Real school the following figures result:

for those with apprenticeships	.524	(s.e. = .099)
for those with vocational school	.634	(s.e. = .153)

While these differences are smaller than those shown for men, they remain much larger than those for Canadian women. If the scores for those who were in the vocational track are subtracted from the scores for those in the academic track, the resulting figures are:

for those with partial secondary	-.021	(s.e. = .104)
for those with complete secondary	-.102	(s.e. = .152)

Neither figure is great and both are negative. Comparing the West German and Canadian figures, in all four combinations the West German figure is significantly larger, at the .025 level or beyond. The hypothesis about the relative occupational advantage of the Real school over the Main, compared to the difference between streams in Canada, is thus supported.

Females do differ from males in the relative standing of West German and Canadian degrees. While, for males the Canadian coefficient for graduate and professional degrees was slightly, and insignificantly, higher than the German, for females the Canadian coefficient was significantly lower, at 2.164, than the West German, at 2.606 ($p<.01$).

Comparing Sub-populations

As was true for males, sub-population differences create no complexities for the analysis. Age differences were not significant for either nation. For the West Germans, the difference between a model in which coefficients for those 25-44 were constrained to equal the coefficients for those 45-65 and a model in which coefficients were free to vary was 36.77 with 17 df. G yields $p>.10$. For Canadians the same test provides an L^2 of 50.58 with 27 df, and again G yields $p>.10$. Dividing the Canadian sample into francophones, immigrants and others, the difference between the constrained and unconstrained models is 166.227 with 54 df. Once again, $p>.10$.

Comparing the Sexes in West Germany

As has been shown, the hypotheses received the same reception for the two sexes. But as has also been shown, there are differences in the marginal distributions in the West German sample. To see whether any differences between the two, apart from the marginals, were significant a model was fitted in which the two were constrained to have the same coefficients and compared with another model in which coefficients were free to vary. In these models, the sexes retained the cell blocking used in the models fitted to them independently. The L^2 for the difference was 88.20 with 19 df. G yielded $p<.001$. On this account the sexes were Deming adjusted to each other's marginals. As it happened, only a quite poor fit could be obtained for the adjusted female table, so attention will be restricted to the adjusted male table. After adjustment it was necessary to block the same two cells blocked for the females, but not the cells which had only been blocked for males when using the unadjusted data. With these cells blocked, the fit was acceptable.[5] (L^2 (97 df) = 262.85; L^2/N = .072)

While there were changes in the association, row and column coefficients, most were quite minor. Here comment will be reserved for one which bears upon the hypotheses. After adjustment differences between the Main school and the Real school looked much more like those that had originally been found for females. The differences were:

for those with apprenticeships	.634
for those with vocational school	.664

In magnitude these figures are much closer to the female figures (.524 and .624) than to the unadjusted male figures (1.050 and 1.167). It appears as though the relatively greater effect of school type for males is essentially the result of differing marginal distributions. It is unfortunate that this cannot be confirmed by an adjustment of female to male marginals.

It was possible to adjust the two nations to each other's occupational marginals, but the adjustment created no very interesting effects on the association or education coefficients, so the results will not be focussed on here.

Summary and Discussion

This chapter's results have been much in keeping with the hypotheses. No significant difference was found between the nations, for either males or females, in the strength of the association coefficient, although the results for females were clouded by coding problems. For both males and females, the Real school offered more advantage over the Main school than the Canadian academic track offered over the vocational. In West Germany, school type remained important even though respondents had later completed an apprenticeship or vocational school training. This confirms the usefulness of Turner's notions of sponsorship in a situation where the effects of school type might have been overshadowed by later vocational training.

No complexities were added to the analysis by sub-population differences: those checked were either statistically insignificant or small in relation to the sample size.

On the methodological side, this chapter pointed up the difficulties that may arise when cells which must be blocked contain large proportions of a sample. It also pointed up the difficulties in placing West German females into skill levels, given the number of secretarial-clerical categories in the International Standard Classification of Occupations. As have earlier chapters, it provided a reminder that Deming adjustment between groups is not always workable. But, to look on the more positive side, the methodology has been able to provide useful results in the face of problems which had not arisen in earlier chapters.

Notes to Chapter Six

1. The data do not distinguish specific apprenticeships, and if they did it would be impossible, for want of numbers, to analyze them separately.

2. These figures differ from those given for the English comparison because here immigrants who came to Canada after the age of 16 have been included in the sample. As there is no Canadian equivalent to guest workers, no attempt has been made to adjust the Canadian sample to match the West German one in this respect.

3. In the category involving semi-professional occupations, 18 respondents out of 31 were nurses or teachers. In the Technical category respondents often were in occupations for which training has been provided in community colleges and the other institutions included with them. Examples include draughtsmen and computer programmers. Categories involving skilled blue collar workers include many occupations for which training has been traditionally provided through apprenticeship, including carpenters, electricians and industrial mechanics.

4. This comparison is based on a model in which the cell combining skilled blue collar work with completed vocational high school has been blocked. If a decision had been made not to block this cell, accepting a worse fit in order to compare the two forms of completed high school without the

qualification that a cell had been blocked for one and not the other, the outcome would have differed only slightly: the vocational stream would have exceeded the academic by .180 instead of .078.

5. L^2 has been preferred to X^2 here because X^2 is inflated by a series of cells with small expected values. $X^2 = 509.52$. As argued in Chapter Three, L^2 appears to be preferable for such situations.

CHAPTER SEVEN

THE CANADIAN SITUATION

This chapter attempts to bring together some key features of what can be learned about Canada from the forms of analysis employed here. First, it examines the Canadian data with fuller models than have been used above. It touches briefly on the adequacy of the Canadian code schemes for the purposes of the study. Finally, it reviews what has been learned about Canada from the pairwise comparisons.

The reader may well have noticed that the coefficients obtained when the Canadian data were coded in different ways sometimes varied considerably. The association coefficient, for example, went from .966 for Canadian males categorized for comparison with the U. S. to 1.156 for Canadian males categorized for comparison with West Germany. Some variation is to be expected, but its presence does raise the question of how the Canadian data would appear if fuller sets of categories were used, breaking the sample down as finely as reasonably possible. If coefficients change with the coding scheme, it is desirable to know their values when as much use is made of the data as possible. This chapter will present the results of a breakdown which, for males, uses one more occupational category and twelve more educational categories than have been used above and which, for females, uses three more educational categories.

Educational and Occupational Distributions

The marginal distributions for occupation differ only in minor ways from those seen above. As the new educational codes create different sets of missing cases from the codes used above, the occupational distributions of those in the labour force are slightly altered. They are presented in Tables 7.1 and 7.2. As in their basic features they are familiar from earlier chapters, only one feature of the tables will be commented upon here. Table 7.1 divides farmers and farm labourers, who have earlier been grouped. It may be seen that 4.8 per cent of the Canadian male sample consists of farmers and 1.5 per cent of farm labourers.

The educational distributions require some comment. Table 7.3 presents the marginals for males. The data have been presented to one more decimal place than usual because of the number of small categories. The table provides finer data than presented earlier on those with vocational and academic secondary training. It may be seen than those with vocational schooling are more likely at all grade levels to have gone on to an apprenticeship. For those with vocational schooling the ratios of those with apprenticeships to those without are:

Table 7.1

Occupational Distribution of Canadian Males, in Percentages

Occupational Category	Percentage
Professional	8.7
Semi-professional	4.5
Technical	1.9
Managers	4.7
Supervisors	7.5
Foremen	7.7
Clerical, Sales and Service	
Skilled	4.2
Semi-skilled	6.1
Unskilled	2.0
Crafts, Trades and Manual	
Skilled	19.0
Semi-skilled	11.2
Unskilled	13.6
Farmers	4.8
Farm Labourers	1.5
Total	100.1
N	12680

Table 7.2

Occupational Distribution of Canadian

Females, in Percentages

Occupational Category	Percentage
Professional	4.9
Semi-professional	13.4
Technical	1.8
Managers	2.6
Supervisors	6.8
Clerical, Sales and Service	
Skilled	21.1
Semi-skilled	23.0
Unskilled	7.1
Crafts, Trades and Manual	
Skilled	1.9
Semi-skilled	9.3
Unskilled	7.1
Farmers and Farm Labourers	1.1
Total	100.1
N	4700

Table 7.3

Educational Distribution for Canadian Males, in Percentages

Educational Category	Percentage
Elementary incomplete	11.92
plus apprenticeship	1.40
Elementary complete	14.02
plus apprenticeship	3.15
Secondary, vocational	
Grade 9 or 10	1.02
plus apprenticeship	.52
Grade 11	1.45
plus apprenticeship	.67
Secondary complete	2.64
plus apprenticeship	1.97
Secondary, academic	
Grade 9	2.70
plus apprenticeship	.94
Grade 10	4.65
plus apprenticeship	1.41
Grade 11	4.79
plus apprenticeship	1.48
Secondary complete	6.85
plus apprenticeship	2.62
Some business or trade school	1.81
plus apprenticeship	1.10
With complete secondary	.78
plus apprenticeship	.61
Complete business or trade school	2.51
plus apprenticeship	3.99
With complete secondary	.94
plus apprenticeship	.84
Some community college	.93
With complete secondary	1.15
Complete community college	.91
With complete secondary	1.44
Nurses' or Teachers' Training	.52
University Diploma	2.17
Some University	5.35
B.A.	5.36
Graduate or professional degree	5.40
Total	100.01
N	12680

for those with Grade 9 or 10	1 : 1.96
for those with Grade 11	1 : 2.16
for those with secondary complete	1 : 1.34

For those with academic schooling the ratios are:

for those with Grade 9	1 : 2.87
for those with Grade 10	1 : 3.30
for those with Grade 11	1 : 3.24
for those with secondary complete	1 : 2.61

The lowest ratio for those with academic schooling (1 : 2.61) is well above the highest for those with vocational (1 : 2.16).

Another feature of the data which has not appeared earlier is its distinctions between those who have partial and complete business or trade school and between those who have partial and complete community college. Most of those who had attended either type of program had finished it: completion rates were 64.1 per cent for business or trade school and 53.0 per cent for community college. Within the categories created by these distinctions a further distinction is made between those who have complete secondary schooling and those who do not.

Among those who had been to business or trade school, 26.4 per cent had complete secondary training, compared to 58.5 per cent of those who had been to community college. But although they had not usually completed high school, those with business or trade school training had usually done an apprenticeship: 51.1 per cent had completed them.

The breakdown for females in Table 7.4 presents less new data. Those with apprenticeships cannot be broken down as finely because only 4.0 per cent have taken them. Nor can those with partial secondary in a vocational stream, who make up 1.7 per cent of the sample. It has been possible to distinguish those with incomplete business or trade school and those with incomplete community college. Among those who attended business or trade school, 70.6 per cent completed it. Among those who went to community college, 53.1 per cent completed the program. Within the two categories for business and trade school, those with complete secondary education have been identified. As was true for males, they are in a minority: among those who had been to such schools, only 19.6 per cent had completed high school.

Model Fitting

Because so many education categories involving apprenticeships have been used, model fitting for males requires more cell blocking than has been used earlier. As for the comparison with West Germany, it is necessary to block cells crossing the semi-professions with nurse's or teacher's training, and crossing technical occupations with community college. While it is not strictly necessary to block all the cells crossing skilled blue collar work and apprenticeships, since some of them are small enough that they cause no great

Table 7.4

Educational Distribution for Canadian Females, in Percentages

Educational Category	Percentage
Elementary incomplete	6.7
Elementary complete	12.5
Secondary, vocational	
partial	1.7
complete	3.5
Secondary, academic	
Grade 9	2.6
Grade 10	5.4
Grade 11	5.3
complete	12.4
Apprenticeships	3.7
Some business or trade school	4.8
With complete secondary	1.3
Complete business or trade school	11.2
With complete secondary	2.5
Some community college	1.5
Complete community college	1.7
Nurse's or Teacher's Training	7.8
University Diploma	3.2
Some University	4.6
B.A.	5.0
Graduate or professional degree	2.7
Total	100.1
N	4700

departure from a good fit, even the smaller cells show substantial proportional differences between the observed and expected values if they are not blocked. Since this is so, and it is more straightforward conceptually simply to block all the cells involving skilled blue collar work and apprenticeships, this has been done. With fifteen cells blocked, $X^2 = 997.82$. While G indicates that this is significant, the critical value is not far below at 990.81. Blocking cells reduces L^2 from 1392.10 to 1003.10. ($p<.001$) At this level it lies 88.1 per cent below its independence value of 8415.48. $L^2/N = .079$.

Blocking cells involving apprenticeship removes a good number of cases, 20.7 per cent of the sample. It must thus be borne in mind that the coefficients presented represent a model which requires supplementation in the form of cell coefficients if it is to fit all of the data well.

Fitting for females is somewhat simpler. Six cells require blocking, involving the same combinations of education and occupation which were blocked for the comparison with West Germany. One is a nuisance cell crossing professional occupations with complete elementary education. Semi-professional occupations, when crossed with nurse's or teacher's training, university diplomas or partial degrees create cells too heavy to be well fitted without blocking. The same is true for the combination of business or trade school with skilled white collar occupations. With these cells blocked, $L^2 = 555.48$.

G indicates that this is significant, but the critical value is not a great distance below at 540.28. Blocking cells reduces L^2 by 368.05. (p<.001) At its value for the accepted model, it has declined by 85.8 per cent from its independence value of 3907.30.

Comparison of Coefficients

The association coefficients for males and females are similar to those seen above for the West German comparison. For males the coefficient is 1.189 (s.e. = .026), and for females it is 1.066 (s.e. = .055). The difference between the two is not significant.

Comparison of Occupational Categories

The occupation coefficients fall into familiar patterns. Table 7.5 provides the scores for males. As usual the professionals are at the top, followed by the semi-professionals. Skilled white collar workers, as usual, are above the semi-skilled, and for blue collar workers, scores decline regularly with skill levels. The distinction between farmers and farm labourers, not been presented before, shows the farmers a bit higher at -.834, compared to -1.078.

The coefficients for females also fall into familiar patterns, as shown in Table 7.6. Professionals are at the top, followed by semi-professionals. Scores decline regularly with skill level for the Clerical-Sales-Service group and for the

Table 7.5

Occupational Coefficients for Canadian Males

Occupational Category	Coefficient	Standard Error
Professional	2.156	.064
Semi-professional	1.430	.074
Technical	.641	.108
Managers	1.143	.046
Supervisors	.142	.056
Foremen	-.196	.038
Clerical, Sales and Service		
Skilled	.570	.042
Semi-skilled	-.154	.060
Unskilled	.062	.083
Crafts, Trades and Manual		
Skilled	-.548	.042
Semi-skilled	-.804	.055
Unskilled	-1.057	.049
Farmers	-.834	.035
Farm Labourers	-1.078	.082

Table 7.6

Occupational Coefficients for Canadian Females

Occupational Category	Coefficient	Standard Error
Professional	2.425	.115
Semi-professional	1.969	.146
Technical	.508	.205
Managers	1.000	.213
Supervisors	-.188	.122
Clerical, Sales and Service		
Skilled	.560	.057
Semi-skilled	-.213	.088
Unskilled	-.412	.081
Crafts, Trades and Manual		
Skilled	-.960	.115
Semi-skilled	-1.207	.107
Unskilled	-1.261	.065
Farmers and Farm Labourers	-1.220	.161

Crafts-Trades-Manual group.

Comparison of Educational Categories - Male

The education coefficients for males are shown in Table 7.7. The extended series of scores for apprenticeships allows some comparisons which could not be made above. Note that they are based on those who are not in skilled blue collar work, because those who are in such positions are in cells which have been blocked. Here we move beyond the obvious finding that those with apprenticeships are often found in such occupations to consider the outcome for those who are not. If the coefficients for those with apprenticeships are subtracted from the coefficients for those without them, the figures for various levels of education are as follows:

elementary incomplete	.752
elementary complete	.474
vocational secondary	
Grade 9 or 10	.083
Grade 11	.293
secondary complete	.080
academic secondary	
Grade 9	.574
Grade 10	.253
Grade 11	.043
secondary complete	.030
some business or trade school	.086
with secondary complete	.008
complete business or trade school	-.103
with secondary complete	-.263

As in the more limited West German comparison, the

Table 7.7

Educational Coefficients for Canadian Males

Educational Category	Coefficient	S. E.
Elementary incomplete	-1.477	.052
plus apprenticeship	-.721	.157
Elementary complete	-.939	.044
plus apprenticeship	-.465	.061
Secondary, vocational		
Grade 9 or 10	-.017	.141
plus apprenticeship	.066	.134
Grade 11	.020	.062
plus apprenticeship	.313	.104
Secondary complete	.266	.059
plus apprenticeship	.346	.123
Secondary, academic		
Grade 9	-.688	.125
plus apprenticeship	-.114	.082
Grade 10	-.369	.076
plus apprenticeship	-.116	.051
Grade 11	-.126	.045
plus apprenticeship	-.083	.136
Secondary complete	.310	.047
plus apprenticeship	.340	.064
Some business or trade school	.152	.034
plus apprenticeship	.066	.100
With complete secondary	.483	.109
plus apprenticeship	.491	.272
Complete business or trade school	.263	.037
plus apprenticeship	.160	.061
With complete secondary	.465	.074
plus apprenticeship	.202	.129
Some community college	.346	.065
With complete secondary	.451	.075
Complete community college	.482	.146
With complete secondary	.803	.052
Nurse's or Teacher's Training	.742	.126
University Diploma	.952	.040
Some University	.909	.040
B. A.	1.633	.056
Graduate or professional degree	2.231	.093

greatest advantage of those with apprenticeships over those without appears for those with incomplete elementary training, where the difference in the coefficients is .752. Those with elementary complete or Grade 9 in an academic program also show quite large differences, at .474 and at .574. For those with complete secondary training or with some business or trade school the differences are below .100. For those with complete business or trade school, the difference becomes negative, that is, those with apprenticeships score lower than those without. In a broad way the benefits of apprenticeship are inversely related to the scores those without apprenticeship received: r = -.907.

A second point worth noting in the table is that among those who have completed business or trade school or community college those with a complete secondary education have an occupational advantage over those without. If the coefficients for those with complete secondary are subtracted from the coefficients for those without it, the following are the results:

some business or trade school	.331
plus apprenticeship	.425
business or trade school complete	.202
plus apprenticeship	.042
some community college	.105
community college complete	.321

Another comparison of scores can be made to reexamine the differences between those with academic and vocational secondary training, for those who have not gone beyond high school. Unfortunately, Grades 9 and 10 have had to be combined for the vocational stream. If the combined grades are compared with both Grade 9 and Grade 10 of the academic stream, and the vocational scores are subtracted from the academic, the following figures result:

for Grade 9	-.671	
plus apprenticeship	-.058	
for Grade 10	-.352	
plus apprenticeship	-.060	
for Grade 11	-.106	(s.e. = .071)
plus apprenticeship	-.250	(s.e. = .153)
secondary complete	.054	(s.e. = .039)
plus apprenticeship	-.006	(s.e. = .095)

The figures for Grades 9 and 10, of course, should not be taken too literally. As the differences shown reflect classification differences, no standard errors for these grade levels are shown. For Grades 10 and 11, the differences shown, like those from models fitted in earlier chapters, are quite small or favour the vocational stream. For Grade 11 and for complete secondary, for which standard errors are shown, none of the differences are statistically significant.

Comparison of Educational Categories - Female

The education coefficients for females may be dealt with more quickly, as the education code is much simpler. The coefficients are shown in Table 7.8. Some comment should be made on the coefficients for categories not shown in the West German comparison. The scores rise regularly with grade level in the academic stream, from -.743 for Grade 9 to .361 for Grade 12. Note that the figures for Grade 10 (-.367) and for Grade 11 (-.279), like that for Grade 9, are below that for a partial vocational program, at .011. Significance tests are not strictly appropriate here, since the differences between categories reflect classification differences, and so will not be reported, but note that even when the academic stream has the advantage that everyone has gone as far as Grade 11 and the vocational contains those with Grades 9 to 11, the academic scores lower by .290. When secondary school has been completed, the scores still slightly favour the vocational stream, at .470 over the academic at .361, but the difference is not significant (s.e. = .108).

Not much can be made of the differences between those who had and had not completed high school among those who attended business or trade school, because of the high standard errors for high school graduates, but as for males those with complete high school do have higher scores. In other respects the education coefficients are much like those seen earlier.

Table 7.8

Educational Coefficients for Canadian Females

Educational Category	Coefficient	S. E.
Elementary incomplete	-1.838	.080
Elementary complete	-1.233	.106
Secondary, vocational		
partial	.011	.088
complete	.470	.118
Secondary, academic		
Grade 9	-.743	.186
Grade 10	-.367	.142
Grade 11	-.279	.097
complete	.361	.047
Apprenticeships	-.114	.120
Some business or trade school	.309	.070
With complete secondary	.390	.270
Complete business or trade school	.225	.060
With complete secondary	.834	.220
Some community college	.620	.226
Complete community college	1.021	.118
Nurse's or Teacher's Training	.717	.121
University Diploma	1.083	.108
Some University	.993	.141
B.A.	1.782	.075
Graduate or professional degree	2.159	.176

Sub-population Differences

As in earlier chapters, the models tested have been checked for sub-population differences, and as before these have proved to be small or insignificant. Unfortunately, for these comparisons it was necessary to compare tables using only 25 education categories for males and 15 for females.[1] For males, 7 cells were blocked including the cells blocked before which did not involve apprenticeships, and the cells which involved apprenticeships after the collapsing of categories. For females 4 cells were blocked in checking the effects of age and 5 in checking for differences among francophones in Quebec, immigrants and others.[2] For the females, neither comparison of sub-populations showed significant differences. Comparing a model with sub-group coefficients constrained to be equal with one in which they were free to vary, the difference for age groups was 38.30 (24 df). G yielded $p>.10$. The difference for francophones in Quebec, immigrants and others was 109.18 (48 df), and G again yielded $p>.10$. For males, the difference for francophones in Quebec, immigrants and others was 203.54 with 72 df and G, once again, yielded $p>.10$. The only comparison that proved significant was the age comparison, between those 25 to 44 and those 45 to 65, for males. Here the difference was 95.22 with 34 df. With a sample of 12680, a difference of this order seemed likely to represent rather subtle variation in the coefficients. The association coefficients for the younger and the older groups respectively were 1.007 and 1.010. The correlation of the occupation coefficients stood at .973. For the education coefficients it was .955. Younger and older males gave similar results in terms of the standing of university training and the differences between high school streams. Thus, while a study of sub-population differences would find the coefficients for older and younger groups of interest, for the purposes of this study the details of the coefficients may be passed by.

Comparing the Sexes

As has been done for the U. S. and West Germany, the sexes have been compared within a single model. Males were collapsed into the 20 education and 12 occupation categories used above for females, and constrained and unconstrained models were compared. In the test, the six cells blocked above for the female table were blocked, and for males three were blocked: the two which had been blocked above and which did not involve apprenticeships, and the one remaining cell which combined apprenticeship with skilled blue collar work. For the comparison L^2 was 170.82 with 29 df. G gave p>.10. It seems, then, that if the categories used for males and not females are neglected, and a number of cells are blocked, the remaining differences are basically matters of marginal distribution.

Stability of Coefficients Across Models

Examining the Canadian data with more elaborate education codes than were used in earlier chapters, as well as allowing some new findings to emerge, has provided support for earlier results on the hypotheses. Consider the stability of scores for university training across education codes. If the models used here and in the West German comparison are modified so that a single coefficient is obtained for university training, then the scores for the various models, for males, are:

for comparison with the U. S.	2.074
for comparison with England	2.205
for comparison with West Germany	2.029
from the fuller model	1.969

While there is some variability here, the scores used for comparison with the U. S. or England could be interchanged with any of the others without affecting the results of the hypotheses tested. If the scores for the B.A. and for other degrees from the West German comparison and the fuller model are considered, the comparison turns out similarly:

B.A. (for West German comparison)	1.673
B.A. (from the fuller model)	1.633
other degrees (for West German comparison)	2.313
other degrees (from the fuller model)	2.233

These results, along with the finding that the relative standing of vocational and academic streams is consistent, are evidence of the robustness of the results on the hypotheses across coding changes.

Unfortunately the comparison for females can only go part way because of a methodological problem. If the B.A. and other degrees are collapsed in the model used for comparison with West Germany or in the fuller model, with the intent of comparing the single coefficient with that obtained from the U. S. comparison, it is impossible to block the three cells involving the semi-professions with nurse's or teacher's training, university diplomas and partial degrees without obtaining very odd results. Although there are no clear rules as to when it will occur, sometimes when several cells are blocked in the same region of a table the coefficients obtained in fitting the table become quite odd. In the present instance secondary education, for example, appears as more valuable than university education and other equally uninterpretable results arise. Here the precise results will not be presented, but an illustration of the effects of such a perverse model will be given in the following chapter.

It is possible, of course, to compare the results from the fuller model with the results from the West German comparison:

B.A. (for West German comparison)	1.774
B.A. (for fuller model)	1.782
other degrees (for West German comparison)	2.164
other degrees (for fuller model)	2.155

Clearly these coefficients could be interchanged without any alterations in the conclusions drawn.

The differences among models that bear on the hypotheses thus are essentially in the association coefficients. For males, these have been:

for comparison with the U. S.	.966
for comparison with England	1.116
for comparison with West Germany	1.156
from the fuller model	1.189

For females, they have been:

for comparison with the U. S.	.926
for comparison with West Germany	1.068
from the fuller model	1.066

The main difference seen here is that in moving from the U. S. comparison the coefficients move up substantially. More elaborate models used for males produce gradual increases. This does not occur for females in moving from the West German comparison to the fuller model, presumably because the fuller model did not contain many more distinctions.

The differences observed emphasize the problem, in comparative studies, of attempting to ensure that the codes used for the two nations are picking up comparable distinctions within the nations involved. In comparing Canada and the U. S. it was necessary to work without codes for post-secondary non-university training and without codes for apprenticeship. As it is clear that the association coefficient for Canada rises when these are included, it seems reasonable to suspect that something similar would happen with the U. S. Whether the finding of no significant difference between the association coefficients would be upheld if codes incorporating these distinctions were available for the U. S. must remain uncertain.

Usefulness of the Canadian Codes

While the problem in this instance has been with the U. S. codes, the study has pointed up some of the limitations of the Canadian codes. It has been pointed out above that Canadian males in the Unskilled Clerical-Sales-Service category obtain higher education scores than those in the Semi-skilled category, and that there is reason to suspect, although not to conclude, that this results from the misplacement of two unit groups. It was noted in Chapter Four that the differentiation among Canadians with one to three years of university might be sharper if it was not necessary to estimate the number of years completed. Another limitation which has occurred to the writer throughout the analysis is that the data do not make it possible to distinguish those who have teacher training as well as university training. It is true in general that those with university training and other training cannot be distinguished, but teachers in this situation are a large group, particularly among women. At the time of the study some provinces treated the combination of a B.A. with teacher training as the equivalent of a B.Ed., so that many of those with a B.A. in the code scheme had the practical equivalent of a professional degree, but could not be identified as having it. Then too some of the cells blocked for Canadian females in comparison with West Germany or in the fuller models combined partial university, or university diplomas with semi-professional occupations. It appears quite likely that one reason these cells were heavy was the presence of respondents with elementary teaching credentials to which the code scheme is blind.

But in the larger scheme of the study these have been relatively minor difficulties. The Canadian educational codes are more elaborate than those available for the U. S., which lacks information on vocational preparation, or those for West Germany, which do not distinguish partially completed programs or years of education completed. As was shown above, the presence of vocational training in the codes provides for a clearer view of the strength of association between education and occupation. The availability of codes for vocational preparation appears to be particularly important in examining the link between education and occupation for males.

CANADA IN COMPARATIVE CONTEXT

Although the comparison between Canada and the U. S. was restricted by the limitations of the codes, it was nonetheless possible to demonstrate some clear differences between two nations which in previous comparative work had usually appeared to be very much alike. Even when differences in the marginals were dealt with by Deming adjustment, differences between the nations appeared. Those with middle level qualifications appeared to be more favourably situated in Canada than in the U. S. It was suggested that perhaps in a situation in which far fewer workers with university training were available Canadian employers had come to take those with lower credentials more seriously than American managers do.

When the marginals were not controlled for, Canadians appeared to do better than Americans with secondary or tertiary education. Because this pattern broke down with Deming adjustment, it was suggested in Chapter Four that the pattern was what might be expected on the basis that in Canada those with higher education were relatively few and hence faced relatively little competition. It appears then that, although the father-son mobility table for the two nations has shown few differences, apart from the effects of the later transition from agriculture in Canada (Goyder, 1985), one of the basic links between the occupations of fathers and those of their children operates differently in the two nations.

Since Canada and England have not previously been involved in a pairwise study, there was less reason to think that the two nations might turn out to be alike. In fact, the differences hypothesized were found. While English selective secondary schools conferred a clear advantage over non-selective schools for those who had no additional training, in Canada there was little difference between the academic and the vocational track. The relative advantage of a degree in England was clearly greater than in Canada. Deming adjusting one nation to the other's occupational marginals reduced the difference, but it remained clearly present. These results had been hypothesized on the premise that Canada is less a sponsorship society than England.

Another difference between the nations lies in the higher association coefficient found for Canada. It was shown in Chapter Five that the difference arose partially because of differing occupational marginals, and partially because of the much greater differentiation in the lower half of the educational distribution in Canada. This result underscores the importance, in the Canadian system, of differentiation among those who have not completed secondary school. As was shown in comparison with the U. S., the Canadian data show only minor differences in occupational outcomes for one, two and three years of university. In fact, starting from the models used in Chapter Four it was possible to collapse those with partial university into a single category with only slight changes in other coefficients in the model. It was at lower levels that clear differentiation appeared.

The results from the West German comparison reinforce some of those from the English. Although the education codes used were different, once again a sponsorship nation showed clear differences between types of school and Canada showed little difference between high school streams. The West German data indicated that a strong sponsorship society can maintain a relatively high position for its university-level personnel even though the proportion with university level training is relatively high. As shown in Chapter Six, if we think of German degrees as equivalent to Canadian graduate and professional degrees, then West German males have obtained a similar coefficient with a larger proportion of people trained to a comparable level, and West German females have obtained a higher coefficient.

The results from the three comparisons are consistent with the notion that Canada is not a sponsorship society in the mold of the European nations, but that it is not as extreme a contest society as the U. S. High school track means little in Canada, while school type has been seen to be of considerable importance in England and West Germany. University training receives a lower score for Canadian than for English males, and higher scores for Canadian males or females than for their American counterparts. Not only those with degrees, but those with partial university or with secondary training received higher scores in Canada than in the U. S. Thus the fundamental placement of the nation, on which many of the hypotheses of the study were based, has been supported by the data.

Notes to Chapter Seven

1. Eight of the ten categories lost by collapsing involve apprenticeship and some other form of training.

a. those with incomplete vocational high school and an apprenticeship were grouped with others who had an incomplete vocational high school.

b. those with apprenticeships and Grade 9, 10 or 11 in an academic stream were placed in a single category.

c. those with partial business or trade school and an apprenticeship were grouped with others who had partial business or trade school. As these respondents had been divided into those who had completed high school and those who had not, two categories were lost.

d. those who had an apprenticeship, complete secondary school, and business or trade school were grouped with those who had similar training otherwise, but had not done an apprenticeship.

e. those who had an apprenticeship and a community college diploma were grouped with those who had a diploma but not an apprenticeship. As those who had completed community college were divided into those who had completed high school and those who had not, two categories were eliminated.

Two categories not involving apprenticeship were lost. Those with nurse's or teacher's training were placed with those who had completed an academic secondary program but who had gone no farther. Those who had incomplete vocational high school, who had been placed in two categories depending on their grade level, were collapsed into a single category.

2. Five categories were eliminated by:
    a. placing those with an academic Grade 9 with those who had incomplete vocational secondary training.
    b. placing those with partial community college training with those who had partial business or trade school. Since these respondents had been divided into those who had complete secondary training and those who did not, two categories were eliminated.
    c. placing those with a complete community college program into the same category with those who had completed business or trade school and who had completed secondary school.
    d. placing those with graduate and professional degrees in the same category with B.A.s.

CHAPTER EIGHT

SUMMARY AND DISCUSSION

This chapter reviews the findings of the study. In turn it discusses the results obtained from testing the hypotheses, unanticipated findings about the Canadian case, and the methodological experience of the study.

TESTS OF HYPOTHESES

Hypotheses Derived From Turner

In Chapter One a series of hypotheses was set out, largely derived from Turner's (1960) classic distinction between sponsored and contest mobility. Although Turner's concepts were presented in 1960, no multi-national study of their utility in understanding the link between education and occupation has appeared in the literature. It was suggested that those with degrees would have higher relative standing in England than in Canada, and in Canada than in the U. S. It was also suggested that those who had been to selective schools in the European nations would have a greater edge over those who had been to non-selective schools than Canadians who had been through academic high school programs would have over those who had been through vocational programs.

The hypotheses derived from Turner have fared well. Not only those with university degrees but also those with credentials down as far as Grade 10, for males, or even down to Grade 8, for females, scored significantly lower in the U. S. than in Canada. (These results are consistent with what could have been predicted on the premise that over-education has occurred in the U. S.) English males with degrees scored well above Canadians, and while in England those who had been to selective schools scored well above those who had not, in Canada there was little difference between those who had been through the academic and vocational streams: in fact, if high school was not completed, those with a vocational background scored higher. In comparing Canada and West Germany, it was shown that for both sexes the Real school conferred clear advantages over the Main school. In Canada the vocational program was, if anything, slightly advantageous, except for those with complete secondary schooling and no trade training. Altogether, these results are consistent with the notion that Canada is less a sponsorship nation than the European nations studied, but more of one than the United States.

Another hypothesis, less directly related to Turner's views, but arrived at through considering them, held that distinctions among those with partially completed secondary or university training would be more sharply graded in the U. S. than in Canada. This was suggested on the grounds that in a strongly contest system there ought to be more people with partially completed programs for employers to consider, so that employers would become more sensitive to their qualifications, and on the grounds that in a contest society employers could not rely on differences between schools as a very useful screening device. At the university level this view could be tested, and was supported by the data for males. For females the coefficients were broadly consistent with the hypothesis, but high standard errors prevented clear conclusions.

Limitations of Turner's Analysis

While the hypotheses derived from Turner have generally fared well, some limitations of his analysis have had to be pointed out. It was noted that in England there has been a major route into the professions, not mentioned by Turner, which has not involved the universities. It can also be noted that although Turner suggested that the sheer increase in the number of university graduates under a strong contest system could lead to the devaluation of the degree he did not point out that a largely sponsorship system could also send large numbers through university. West Germany, which in other respects appears to be a sponsorship society has sent about as high a proportion of its labour force through university as has Canada. If West German degrees are treated as more like Canadian graduate and professional degrees than like the Canadian B.A., then West Germany has outdone Canada. In spite of this, the coefficients for West German degrees are at about the same level as those for Canadian graduate and professional degrees, for males, and at a higher level for females. It appears that a strong sponsorship system can maintain the standing of degrees even when their (approximate) academic counterparts in another country are less common.

While Turner was of course aware that particular training programs may be linked directly to particular occupations - he mentions the Catholic priesthood as an illustration of sponsorship in the midst of the generally contest oriented American society - his analysis did not deal with ways in which different forms of education exert their influence. It has appeared in this research that attention to general academic training can very helpfully be supplemented by attention to vocational preparation. While comparative studies of nations cannot work at the level of occupations, it has been shown that there is advantage to looking at the effects of at least those forms of vocational training which involve relatively large numbers of people. Attention to vocational training has made it possible to identify combinations of training and employment which were more common than predicted under the basic R x C model. Codes for vocational training have also been shown to influence the apparent strengh of association between education and occupation. As shown above, in the Canadian case using a code which represents vocational training as finely as the data allow increases the apparent association between education and occupation for males by almost twenty per cent. In the English case those with Level B and C qualifications and with craft/trade training were placed in the category of their highest academic training, and those with some O-Levels were then subdivided into three categories, for those who had passed one or two, three or four, and five or more. This recategorization reduced the association coefficient by about fourteen per cent (from .828 to .716). (For earlier results on the importance of occupational training in England see Kerckhoff, et al., 1982.) In the West German case, where under seven per cent of the male sample and under twenty per cent of females have no vocational training, its omission could not be seriously considered.

While Turner did not state that sponsorship societies are always efficient, he did point out that if the right numbers are selected for advancement, then the specialized training given to those destined for an elite would be efficiently used. He did not point out that a system could be efficient at one level and not at others, depending on the numbers it put through particular forms of training. It appears that, at least partially because of lack of distinctions at the lowest level in its educational system, England, Turner's classic sponsorship society, translates educational experience into occupational position less efficiently overall than Canada does: the English association coefficient, at .828, is well below Canada's 1.116. The difference can be partly accounted for by the occupational marginals, but after adjusting the marginals, it shrinks again when the differentiation in the lower half of the Canadian educational distribution is removed by collapsing.

As the specific coefficients vary somewhat from one educational coding scheme to another, a comparison was made in Chapter Seven, to see whether the relative standing of university training across nations would have been changed if coefficients obtained from one coding scheme were interchanged with those from another. In every case in which such an interchange could be made it was of trivial effect.

Similarity of Association Coefficients

Along with hypotheses derived from Turner, tests were made of the hypothesis that association coefficients would be alike. This was in keeping with the suggestion of Featherman, et al. (1975) that mobility processes in Western industrial societies are essentially alike. While this hypotheses has been tested in various studies, this represents its first test in a multi-national examination of the occupation by education table. Only England differed significantly from Canada, but the difference was not a small one. The English association coefficient was .828, compared to the Canadian figure of 1.116. ($p<.001$) It was possible to largely account for these differences in structural terms. When Canadian occupational marginals were adjusted to the proportions of the English marginals, the Canadian association coefficient declined to 1.006. When a further adjustment was made after grouping all cases with Grade 10 or less the coefficient dropped further to .878. It was suggested that differences in occupational structure and the concentration of English respondents in the educational category with the lowest standing largely accounted for the difference in association.

It could be argued, in defense of the suggestion by Featherman, _et al._, that differences in association coefficients which result from varying marginals ought not to count as evidence against it. Such differences do not reflect differing mobility processes, only the structure within which they operate differs. While there is merit in this argument, it does not deal with the apparent importance of the lack of differentiation at the bottom of the English system. For those who are in a large undifferentiated category, mobility processes must be somewhat different from those experienced by members of a group which is equally large but which is differentiated by grade level, as it is in Canada. It may be concluded that there is at least some relevant evidence in opposition to the null hypothesis here.

Sub-population Differences

The hypothesis testing was simplified by the small size of most sub-population differences. For each nation tests were done to see whether there were important differences between those under 45 and those 45-65. In the American case the analysis was done both for the full sample and for non-blacks, to see whether important differences would arise. For Canada it was necessary to test for differences on a linguistic-nativity variable which distinguished francophones in Quebec, immigrants and others, for each comparison and for the fuller Canadian models. As previous multi-national studies of mobility processes have not examined sub-populations in this way, it was of some interest to discover that differences were not great. In every case they were statistically non-significant, or sufficiently small that for the purposes of this study they could be passed by.

The limits of the tests must be borne in mind, however. The tests used in comparing sub-populations have worked with many degrees of freedom, so that it is possible that real differences on some coefficients have been obscured by low level variation on others. As pointed out in Chapter One, because of sample sizes and the complexity of the occupational and educational codes, no strong test of the possibility that recent cohorts have had different experiences than those before them could be done. Perhaps more detailed studies will turn up sub-group differences. But for the more general purposes of this study sub-population variations have been of no great importance.

A Comment on Convergence

In a study of change in educational systems, Inkeles and Sirowy (1983) concluded that national systems have tended to converge on a wide range of characteristics. In a summary table they indicated that of twenty-one characteristics which have been studied longitudinally, eighteen have shown convergence. But of their three exceptions, two are related to aspects of education examined here. One is the degree of selectivity in the school system, which they measure by the extent to which children are required to repeat years. They argue

> We may reasonably expect considerable variation in national performance regarding selectivity, which would yield divergence or at least sustained diversity rather than convergence. Barr illustrates this sort of persistence of cultural tradition by pointing out that the relatively high repetition rates characteristic of France, Belgium and Portugal are visible in their former colonies, whereas the former colonies of countries with low repetition rates tend to have the lower rates characteristic of their former colonial rulers' home countries. This cultural legacy, once it is embedded, appears to be quite resistant to change. (p. 314)

Using repetition rates for the first grade as a measure of selectivity and the coefficient of variation as an indicator of convergence or divergence, they conclude that the evidence points to divergence between 1965 and 1979, for rich countries as well as poor.

On another characteristic closely related to this research, they find mixed evidence. The proportion enrolled in vocational secondary programs showed divergence between 1955 and 1975. Although there was a general lowering of the proportion enrolled, the nation to nation variation increased. Inkeles and Sirowy point out, however, that there have been changes in the policy governing vocational programs, in terms of raising the age of selection and making it easier to transfer to other programs, that have brought nations closer together.

However the balance of evidence should be assessed on this question, it is clear that this study has been working in an area in which national differences have shown considerable persistence. West Germany has retained three types of secondary school. Although England has moved to comprehensive secondary schools in its state system, the private system remains strong, and within the state comprehensive schools, as noted above, there has often been clear early separation of students. Although it is impossible to assess the general extent of convergence from four nations, their continuing differences, together with those shown by Inkeles and Sirowy, are consistent with the suggestion that the degree of selectiveness and the tendency to divide students of differing perceived ability at a relatively early age are facets of education in which national traditions tend to be very influential.

It may be speculated that one reason for persistence of national differences is that distinctions between school types, or between grade levels in a system in which school type is not very important, tend to be used as methods of selection by employers. It has been shown above that, for those without tertiary training, school type influences occupation in England and West Germany. In Canada, where high school track has made little difference, coefficients have risen steadily with number of grades completed. In the U. S. coefficients have risen both with number of grades completed and with number of years of university completed. Thus, if these nations were to move toward a common method of selecting (or not selecting) students at an early age, employers (in at least some of them) would have to change their methods of hiring, with whatever difficulties of adjustment this would involve for them or for job seekers. Such considerations could well weigh heavily with policy makers who might wish to contemplate changes in their systems of education.

Unanticipated Findings in the Canadian Data

From the tests of the hypotheses, Canada appears as a nation lying between the European sponsorship societies and the classic contest society in the U. S. It appears that the association between education and occupation in Canada is not unusual, although it is apparently higher than that in England.

In comparisons with England and West Germany it was not possible to Deming adjust Canada to the educational marginals of the other nations, but it could be done for comparison with the United States, albeit more satisfactorily for males than for females. From the adjustments there came evidence that those in the middle of the educational range may be viewed more favourably by Canadian employers than American. It was suggested that this could result from the relatively smaller Canadian supply of workers with advanced education. It could also be suggested, since in Canada those with one to three years of university but no degree showed small differences, whereas in the U. S. differences were clearly present, that perhaps as the university educated increase in number employers learn to use university credentials more discriminatingly.

A difference between the sexes in Canada lies in the effect of including occupational training in the definition of education. Earlier work by Boyd (1982) has suggested that the effect of education on occupational standing is greater for women than for men. But Gaskill (1982) and Boyd (1986) have raised the question of whether this is only because secondary schools provide much vocationally relevant experience for the white collar jobs women concentrate in but do not do so for men, who therefore enter trade schools and apprenticeships in greater proportions. In fact, when such occupationally relevant training is included, the sexes' relative standings on the association coefficient do shift. In the U. S. comparison the use of such categories was minimal, extending only to using nurse's or teacher's training in the female case. With this category to give females an 'unfair' advantage their coefficient was .925 and that of men was .966. (In fact if the extra category is not used for women, their coefficient goes up slightly, but the model does not fit as well.) In the West German comparison, where much more occupational training was included in the codes, the coefficient for Canadian women was 1.068, against 1.156 for men. Finally when the fuller models were used, the male coefficient edged up to 1.189 and the female held steady at 1.066. It appears that as the categories for occupational training are expanded the male coefficient moves upward in relation to the female.

METHODOLOGICAL FINDINGS

Stability of Occupational Coefficients

It has been possible to interpret the education and association coefficients without being greatly concerned about different orderings of the occupational categories. Rs for the coefficients between nations have never gone below .916. As coefficients for several nations have not been compared in the previous literature, the correlations presented in the text will be reviewed and a few others will be added:

U. S. males and Canadian males	.938
U. S. females and Canadian females	.950
U. S. males and Canadian females	.931
U. S. females and Canadian males	.961
English males and Canadian males	.930
English males and West German males	.979
West German males and Canadian males	.916
West German females and Canadian females	.936

The list does not exhaust the possible combinations of nations by sex, because the occupational categories used have not always been the same. Except for U. S. females, who have been correlated with other groups by omitting the score for farmers and farm labourers, a group too small to be analyzed among U. S. females, the correlations have been presented only when the categories have matched. In any case it is clear that there are massive similarities in the category scores. The rs are of about the same order as those presented by Treiman (1977) in arguing that the social standing of occupations is essentially alike across Western societies. Given the findings of Treiman and given the evidence presented in Chapter Two that the PPM system captures much of the social standing dimension, perhaps it should not be surprising that there are strong similarities here. But they have been arrived at without direct reference to the social standing of occupations within the categories. They thus provide support for the notion that occupations are vertically arranged in largely similar ways in Western societies, in this case vertically arranged in terms of the education of those who hold them rather than in terms of social standing. The pattern of strong similarities also suggests that the choice of the Pineo-Porter-McRoberts system as a base for comparison was a happy one.

Limitations of the Row by Column Model

Although the analysis proceeded smoothly in this respect, a few difficulties were encountered. As the study was viewed, in part, as a test of the usefulness of the Row by Column model in dealing with large occupation-by-education tables, the limitations encountered must be discussed. One limitation in working with occupation by education tables is the need for large samples. Educational systems are complex and hence must be represented by many categories. While under complex sampling standard errors are not a simple function of sample size, the smaller samples in this study did tend to yield higher standard errors. The two smallest samples used, although they did not have a great many educational categories, still produced the largest standard errors. These samples, for U. S. females and West German females, included, respectively, 1755 and 1834 cases. The U. S. sample, for its eight educational categories, had a mean standard error of .131. The West German sample, for its ten educational categories, had a mean standard error of .124. Since the samples used were usually considerably larger than these, and the categories it was necessary to compare were not usually among those with the larger standard errors for their samples, sampling fluctuation did not often cause difficulties. But in trying to compare the coefficients for those with one, two and three years of university for Canadian and American females the standard errors prevented conclusions from being drawn from coefficients that were patterned as predicted.

As has become clear on several occasions, sometimes one table cannot be satisfactorily adjusted to the marginals of another, because the strong magnification of cells in adjustment creates so many poorly fitting cells that the model does not fit well overall. It was suggested that it is just when Deming adjustment is most desirable because marginals differ most greatly that the R x C model is most vulnerable to this problem. This problem limits the ability to see what differences remain between tables when differences in the marginals are taken into account.

A further difficulty arose, in Chapter Four, when trying to compare a model with subgroups constrained to have the same coefficients with an unconstrained model. Under the unconstrained model a few cells were given very low fitted values and thus expanded L^2 in a way which made it difficult to be certain that the test for differences between two models was delivering meaningful results.

Yet another problem was mentioned in Chapter Seven where it was pointed out that sometimes blocking a set of cells will create odd changes in the coefficients. This seems to occur on rather unpredictable occasions, so that a general policy of blocking cells sparingly, and of examining shifts in the coefficients as cells are blocked, seems to have much to recommend it. But as the problem has not been illustrated above, or elsewhere in the literature, an example will be given here. Table 8.1 shows the coefficients for Canadian females, categorized for comparison with U. S. females, with the four cells involving professional and semi-professional occupations and the educational categories Up to Grade 7 and Grade 8 blocked. As usual professionals have the highest score among the occupational categories, then the semi-professionals. Then the usual pattern breaks. Note, in particular, that the Crafts-Trades-Manual grouping and the Farmers and Farm Labourers now have higher scores than the Clerical-Sales-Service grouping.

Among the educational categories the usual pattern is present only for those with education up to grade 8. Among those with grade 9, 10 and 11 scores hold at about the same level, well above the other categories in the table. To round out the unusual results, the association coefficient, at 3.573 is about three times as high as any reported in the study.

This example was selected, from over fifty created by

Table 8.1

Coefficients for Canadian Females, Categorized for Comparison With U. S. Females, With Four Corner Cells Blocked

Occupational Category	Coefficient
Professions	2.215
Semi-professions	1.924
Technical	-.564
Managers and supervisors	-.462
Clerical-Sales-Service	
Skilled	-.632
Semi-skilled	-.498
Unskilled	-.429
Crafts-Trades-Manual	
Skilled	-.384
Semi-skilled	-.293
Unskilled	-.310
Farmers and farm labourers	-.299
Educational Categories	
Up to Grade 7	-2.565
Grade 8	-1.399
Grade 9	.618
Grade 10	.619
Grade 11	.630
Secondary complete	.449
Nurses' or Teachers' training	.165
1 year university	.271
2 years university	.248
3 years university	.236
Degree(s) complete	.132
Association coefficient	3.573

the writer to examine the effects of blocking cells in particular patterns, because it is perhaps the most striking. But, although it is extreme, it does make the point that if several contiguous cells are to be blocked it is wise to examine the coefficients to see whether abrupt changes take place along the way. While this difficulty has only arisen once in the present study, and not in a crucial context, it could arise in situations in which, for substantive reasons, it was very desirable to block a set of cells which, taken together, create odd changes. Although this limitation has not been commented on in the literature, it has the potential to be troublesome to those who wish to do research on education and occupation, and who would like to explore the effects of specific vocational preparation thoroughly.

To round out the picture of difficulties encountered, one will be mentioned which came up not in the study itself but in analyses of artificial data conducted beforehand. Initially an 8 x 8 table with a 50 in each diagonal cell and a 0 in every other cell was fitted. The row and column coefficients were perfectly ordered, moving along the rows and columns, and perfectly symmetric.

Then the table was complicated by placing 5s along the minor diagonal. Although the R x C model is not designed to deal with patterns of this kind, it was possible for the table to be fitted very well. (L^2 = 16.01, with 36 df; L^2/N = .036) But the secondary pattern was dealt with by adjusting the coefficients for the rows and columns as shown below:

Rows	Columns
1.150	1.106
-.666	-.569
-1.445	-1.578
.240	.266
.630	.610
-1.136	-1.118
-.293	-.209
1.520	1.492

The coefficients suggest not that there are two things happening in the table, but that the rows and columns are out of order. It seems then that in using the R x C model it is wise to satisfy oneself that the table is of the form to which the R x C model is adapted. If it is not, the model may fit anyway, but include misleading coefficients.

Row by Column Modelling and Canonical Analysis

Of course any method has its limitations and in the larger scheme of the study these were not of foremost importance. It has, after all, been possible to obtain meaningful tests of the hypotheses and to generate other interesting findings, as reviewed above. It is also true that the R x C method has fitted tables more parsimoniously than would have been possible through canonical analysis, its predecessor as a method to obtain scores for ordered categories. As the previous literature contains no comparisons of how the two techniques work out in practice, Table 8.2 shows the fits for the basic tables used in this study under the R x C model and under canonical analysis. For the former the values given are those obtained without blocking cells. For the latter two fits are shown, one which takes account of the effects of the first pair of canonical variables and one which takes into account the effects of the first and second pairs.

Canadian males and females enter the table more than once, in each instance based on the categories used for comparison with the nation with which they are paired in the table. The fits for canonical analysis are represented by X^2, since there is a direct link, by formula, between the canonical variables and the value of X^2. The fit for the R x C model is represented by L^2, since it is the measure minimized by the estimation procedure used in R x C modelling. As argued in Chapter Three, there are tables for which the X^2 value is not an appropriate measure of fit. Except in these instances, where very low fitted values for a small number of cells create an inflated X^2, the results of using it instead of L^2 are essentially the same, as the reader may verify be examining the X^2 values presented in earlier chapters.

In every case the value of X^2, based on the effects of the first pair of canonical variables is more than twice the value of L^2 from the R x C model. In the case of West German females the difference is well over a factor of four: the two values are 221.63 and 1030.52. Even if the second pair of

Table 8.2

Fits Resulting From R x C Modelling and Canonical Analysis

Sample	R x C	C.A.(1)*	C.A.(2)**
U. S. Males	90.59	216.93	82.64
Canadian Males	256.96	1360.40	246.91
U. S. Females	151.23	312.36	105.22
Canadian Females	497.39	1496.32	699.47
English Males	598.68	1663.06	938.05
Canadian Males	591.02	1959.35	776.69
West German Males	446.77	1324.03	628.25
Canadian Males	1053.48	3049.93	1500.23
West German Females	221.63	1030.52	358.35
Canadian Females	885.18	2402.58	1249.77
Canadian Males***	1392.10	3410.65	1814.90
Canadian Females***	923.50	2478.62	1284.57

* X^2 remaining after taking out one pair of canonical variables

** X^2 remaining after taking out two pairs of canonical variables

*** Using the fuller Canadian model.

canonical variables is allowed to exert its influence, the resulting X^2 is still usually above the L^2 for the R x C model. The exceptions are the tables for U. S. males, U. S. females and Canadian males categorized for comparison with U. S. males. For these three tables the differences between the R x C results and the canonical results are smaller than for the other nine tables, where the R x C fit remains better.

Thus, in most instances the R x C model provides a more satisfying fit with about half as many coefficients. It has been seen above that where the R x C model needs to be improved upon it is often possible to achieve a satisfactory fit by blocking a relatively small number of cells. Under the canonical approach further improvements can be made only by adding an additional pair of variables, each with as many coefficients as there are categories in the variable. The R x C model, in this respect, shows a great advantage in parsimony. It is parsimonious as well in providing a single measure of the overall strength of association. Had canonical analysis been employed, at least two measures would have had to be used, one for each pair of canonical variables. (While an overall measure of association can be obtained (Beck, 1973) it cannot be interpreted as showing how much one set of scores rises as another set rises.)

Then too, since the cell blocking procedure has ordinarily involved cells which combine a particular set of occupations with a form of education to which they provide entry, the improvements in fit have usually been readily interpretable. If improvements are achieved, on the other hand, by adding many new coefficients, interpretation is liable to be more difficult.

Though the R x C model has shown many advantages, without Fay's jackknifed test for goodness of fit its use would have proved more difficult. Blocking cells can affect the coefficients of a model, sometimes quite strongly, so that blocking must be considered carefully. In the absence of Fay's tests, it would often have been tempting to block more cells than were actually blocked, as X^2 and L^2 values were often well above the critical values given by standard X^2 tables. Fay's tests have provided reassurance that X^2 or L^2 values well above these levels could have arisen by chance, and have thus made it easier to refrain from blocking cells. While earlier writers using ANOAS or log-linear modelling have often accepted models whose fit was comparable to the fit of the models accepted here, they have had to do so with less statistical backing.

Some Contributions of the R x C Approach

Taken together the R x C model and jackknifing have enabled tests to be made of a series of hypotheses that would have been much more difficult to treat without them. As pointed out in Chapter Two, it would have been very difficult to work with measures of the social standing of occupations as the dependent variable, and yet it was desirable to use a method which could pick up the ordered quality of occupations. R x C models have met this need, demonstrated that the strength of association between education and occupation differs between England and Canada, and provided a more detailed view of the relative standing of educational categories than has previously been available.

They have also, through the need for cell blocking, shown that the relationship between education and occupation involves not only a general tendency for higher forms of education to be associated with more education-demanding occupations, but also points of concentrated association, where particular forms of education are strongly linked with particular sets of occupations. The particular points of concentration vary from nation to nation, but wherever the education code has included vocationally specific training they have been found. And yet they would have been difficult to define through methods used earlier.

The Strategy of Pairwise Comparison

The value of the R x C approach has been dependent on a strategy of pairwise comparisons. The alternate strategy of comparing several nations simultaneously would have required education codes to be reduced to a common denominator, which would have had to be the (estimated) number of years completed, plus a code for university degrees. Had this been done, nothing would have been learned about selective and non-selective schooling, about the effects of vocational education, or about apprenticeships. If R x C modelling had been nonetheless used, and cells had had to be blocked it would have been harder to interpret the cells in question because the education code would have omitted vocational training.

Yet the pairwise strategy carried the risk that the coefficients for Canada might fluctuate widely from one categorization of its education system to another. While some fluctuation was to be expected, great fluctuation would have presented considerable difficulties in defining Canada's place in terms of Turner's concepts, or in terms of the hypothesis that in Western nations the strength of association between education and occupation is much the same. Thus it was fortunate to discover that the score for university education and the differences between academic and vocational streams were quite stable from one classification scheme to another. The most notable change in the coefficients was the increase in the association coefficient from the comparison with the U. S. to other comparisons. This change and the related absence of categories for vocational schooling in the U. S. codes have required some circumspection in drawing conclusions about the strength of association between education and occupation in the U. S. and about the relative strength of association in the two countries. But this is clearly a limitation of the U. S. data rather than of the R x C model or of the strategy of pairwise comparison.

The effectiveness of these techniques in this research provides some reason for (at least cautious) optimism that they may be useful in handling other social mobility data. The occupation by education tables studied here are only one set of a series of possible tables for analysis. Sample sizes will permit tables from some other nations to be examined. It would be possible to extend the analysis by examining the link between parental occupation and education, or, with some collapsing of categories, to use partial ANOAS (Clogg, 1982b; Pannekoek, 1986) to examine the effects of parents' occupations on those of their children net of their effect on the children's education. The writer has conceived the present study as the first step in a series of such analyses. The results suggest that further steps may be fruitful.

APPENDIX A

CLASSIFICATION OF OCCUPATIONAL UNIT GROUPS

CLASSIFICATION OF AMERICAN UNIT GROUPS INTO CMS CATEGORIES

Professional

1,2,4,5,10,11,12,14,15,20,21,23,24,26,30,31,32,33,34,35,36,42,
43,44,45,51,52,53,54,61,62,63,64,65,71,72,74,86,91,92,93,94,96,
100,102,103,104,105,110,111,112,113,114,115,116,120,121,122,
123,124,125,126,130,131,132,133,134,135,140,141,142,144,174

Semi-professional

73,75,76,90,95,101,143,145,163,170,175,181,182,183,184,185,
190,191,192,194

Technical

13,55,56,203,205,212,213,215,222,223,225,235,240,802

Managers and Supervisors

13,55,56,201,202,203,205,210,211,212,213,215,216,220,221,222,
221,223,224,225,226,230,231,233,235,240,245,312,802

Skilled Clerical-Sales-Service

22,82,152,193,260,261,265,270,271,281,282,285,301,305,326,341,
342,363,370,371,384,924,931

Semi-skilled Clerical-Sales-Service

84,262,280,283,284,303,310,311,313,315,320,321,323,330,343,
345,350,355,360,362,372,374,375,376,381,382,285,390,391,394,
395,425,636,910,912,915,921,923,926,935,944,945

Unskilled Clerical-Sales-Service

264,266,314,325,331,332,333,334,344,361,364,383,901,902,903,
911,913,914,916,922,925,932,933,934,940,941,942,943

Skilled Crafts-Trades-Manual

25,403,404,405,410,411,413,414,415,416,421,422,423,430,431,
433,434,435,441,442,443,445,446,450,452,453,454,455,456,461,
462,471,472,473,474,475,480,481,485,486,491,502,503,504,505,
506,510,511,514,515,516,520,521,522,523,525,530,531,533,534,
535,536,540,545,546,550,551,552,554,560,561,562,571,572,575,
613,536,650,651,652,653,662,680,712,713,821,961,963,964,965

Semi-skilled Crafts-Trades-Manual

180,401,402,412,424,436,440,444,470,482,483,484,492,495,501,
512,542,543,563,580,590,601,602,603,605,610,612,614,615,620,
621,622,624,625,626,631,633,640,641,644,645,656,660,663,664,
665,666,670,671,672,673,674,681,690,692,694,695,706,710

Unskilled Crafts-Trades-Manual

392,420,604,611,623,630,634,642,643,661,701,703,704,705,711,
714,715,740,750,751,752,753,754,755,760,761,762,763,764,770,
780,785,962

Farmers and Farm Labourers

801,822,823,824

CLASSIFICATION OF ENGLISH UNIT GROUPS INTO CMS CATEGORIES

Professional

181,182,184,186,192,195,196,197,198,201,202,203,204,205,209,
211,212,213,214,217

Semi-professional

117,183,185,187,188,189,193,206,207,208,215

Technical

126,191,219,220

Managers

115,173,174,175,176,177,178,179,180,190,199,200,210,216

Supervisors

123,138,142,143,147,154,156,157,159,171

Foremen

306 - plus those in the Crafts-Trades-Manual categories designated by the supplementary code for supervisors.

Skilled Clerical-Sales-Service

141,148,149,150,194,218

Semi-skilled Clerical-Sales-Service

78,127,136,139,140,144,155,160,162,164,167,172

Unskilled Clerical-Sales-Service

129,130,131,132,145,146,158,161,163,165,166,168,170

Skilled Crafts-Trades-Manual

7,11,14,15,18,19,20,21,22,24,25,26,27,30,32,33,34,35,36,37,38,
40,41,42,45,46,49,50,51,52,53,55,56,57,58,74,79,85,86,87,88,
91,93,94,95,96,101,102,105,118,128,151,152,221,222

Semi-skilled Crafts-Trades-Manual

1,6,8,9,10,12,13,16,17,23,28,29,39,43,44,47,48,54,59,60,61,62,

63,64,65,66,67,68,69,70,71,72,73,75,76,77,80,81,82,83,84,89,
90,92,99,100,103,104,116,119,120,124,125,135,169

Unskilled Crafts-Trades-Manual

129,130,131,132,145,146,158,161,163,165,166,168,170

Farmers and Farm Workers

2,3,4,5

CLASSIFICATION OF ISCO UNIT GROUPS INTO CMS CATEGORIES

Professional

2,11,12,13,14,21,22,23,24,25,26,27,29,31,51,52,53,61,63,65,67,
69,81,82,83,90,110,121,122,129,131,132,135,139,141,191,192,193

Semi-professionals

71,62,64,66,68,71,75,76,79,133,134,149,151,159,161,162,163,
171,172,173,195

Technical

33,34,35,36,37,38,39,43,54,77,84,861

Managers

28,42,174,194,201,202,211,212,219,310,351,400,422

Supervisors

300,352,359,410,421,500,510,520

Managers

600,700

Skilled Clerical-Sales-Service

32,73,139,175,179,199,341,342,431,432,441,442,443,591,592

Semi-skilled Clerical-Sales-Service

72,74,321,322,331,339,342,380,391,392,393,394,399,451,531,532,
570,599

Unskilled Clerical-Sales-Service

370,395,452,490,540,560

Skilled Crafts-Trades-Manual

360,581,582,72,722,723,724,725,726,727,791,792,811,819,820,
831,832,833,839,842,843,844,849,854,855,856,857,871,872,873,
874,880,893,902,921,922,923,924,925,926,941,951,952,954,957,
961,969,983,984

Semi-skilled Crafts-Trades-Manual

1,180,631,632,711,712,713,728,729,731,732,733,734,741,742,743, 744,745,749,751,752,753,754,755,756,759,761,771,772,773,774, 775,776,777,778,779,781,782,783,789,793,794,795,796,799,801, 803,812,834,835,841,851,852,853,859,862,891,892,894,895,899, 901,910,927,929,931,939,942,943,949,953,955,956,959,972,973, 974,979.982,989

Unskilled Crafts-Trades-Manual

551,552,589,641,649,762,802,959,971,981.985,986,989,999

Farmers and Farm Workers

611,612,621,622,623,624,625,626,627,628,629

APPENDIX B

SUPPLEMENTARY TABLES OF COEFFICIENTS

Table B.1

Coefficients for All U. S. Males and for Non-black Males

Occupational Category	All Males	Non-black Males
Professions	2.288	2.235
Semi-professions	.670	.732
Technical	.577	.551
Managers and Supervisors	.541	.495
Clerical, Sales and Service		
Skilled	.718	.675
Semi-skilled	.168	.179
Unskilled	-.554	-.511
Crafts, Trades and Manual		
Skilled	-.601	-.678
Semi-skilled	-.767	-.824
Unskilled	-.967	-.975
Farmers and Farm Labourers	-.865	-.714
Educational Category		
Up to Grade 7	-1.767	-1.629
Grade 8 or 9	-1.080	-1.117
Grade 10 or 11	-.869	-.959
High school complete	-.467	-.549
1 year university	.038	-.022
2 years university	.458	.418
3 years university	.545	.519
Degree(s) complete	1.547	1.535
Association Coefficient	1.056	1.026

Table B.2

Coefficients for All U. S. Females

And for Non-black Females

Occupational Category	All Females	Non-black Females
Professional	2.136	2.145
Semi-professional	.972	.936
Technical	.753	.716
Managers and Supervisors	.425	.395
Clerical, Sales and Service		
Skilled	.084	.038
Semi-skilled	-.216	-.257
Unskilled	-.892	-.800
Crafts, Trades and Manual		
Skilled	-.710	-.879
Semi-skilled	-1.357	-1.421
Unskilled	-1.457	-1.438
Educational Category		
Up to Grade 7	-1.915	-2.007
Grade 8 or 9	-1.684	-1.804
Grade 10 or 11	-1.151	-1.132
High school complete	-.349	-.353
1 year university	.251	.224
2 years university	.357	.403
3 years university	.815	.819
Degree(s) completed	1.638	1.598
Association Coefficient	1.016	1.018

Table B.3

Coefficients for U. S. Males, From the Study Sample And From the GSS Sample, 1972-1983*

Occupational Category	Study Sample	Full GSS Sample
Professional	2.286	2.214
Semi-professional	.670	.834
Technical	.577	.567
Managers and Supervisors	.541	.607
Clerical, Sales and Service		
Skilled	.718	.697
Semi-skilled	.168	.146
Unskilled	-.554	-.723
Crafts, Trades and Manual		
Skilled	-.601	-.592
Semi-skilled	-.767	-.755
Unskilled	-.967	-1.023
Farmers and Farm Labourers	-.865	-1.009
Educational Category		
Up to Grade 7	-1.767	-1.700
Grade 8 or 9	-1.080	-1.213
Grade 10 or 11	-.869	-.875
Secondary complete	-.467	-.437
1 year university	.038	.098
2 years university	.458	.428
3 years university	.545	.560
Degree(s) complete	1.547	1.533
Association Coefficient	1.056	1.040

* Includes the basic adult population sample, but not the black oversample.

Table B.4

Coefficients for U. S. Females, From the Study Sample And From the GSS Sample, 1972-1983*

Occupational Category	Study Sample	Full GSS Sample
Professional	2.136	2.176
Semi-professional	.972	.994
Technical	.753	.548
Managers and Supervisors	.425	.413
Clerical, Sales and Service		
Skilled	.084	.083
Semi-skilled	-.216	-.256
Unskilled	-.892	-.852
Crafts, Trades and Manual		
Skilled	-.710	-.790
Semi-skilled	-1.357	-1.376
Unskilled	-1.457	-1.313
Educational Category		
Up to Grade 7	-1.915	-2.081
Grade 8 or 9	-1.648	-1.691
Grade 10 or 11	-1.151	-1.242
Secondary complete	-.349	-.288
1 year university	.251	.101
2 years university	.357	.437
3 years university	.815	.814
Degree(s) complete	1.638	1.617
Association Coefficient	1.016	1.019

* Includes the basic adult population sample, but not the black oversample.

Table B.5

Occupational Coefficients for Canadian Males, Unadjusted and Adjusted to U. S. Marginals

Occupational Category	Unadjusted	Adjusted
Professions	2.116	2.207
Semi-professions	1.424	1.275
Technical	.758	.502
Managers and Supervisors	.727	.743
Clerical, Sales and Service		
Skilled	.614	.213
Semi-skilled	-.144	-.224
Unskilled	.168	-.205
Crafts, Trades and Manual		
Skilled	-.450	-.547
Semi-skilled	-.859	-.825
Unskilled	-1.187	-1.015
Farmers and Farm Labourers	-.983	-.709

Table B.6

Occupational Coefficients for Canadian Females, Unadjusted and Adjusted to U. S. Marginals

Occupational Category	Unadjusted	Adjusted
Professions	2.454	2.490
Semi-professions	1.777	.874
Technical	.418	.239
Managers and Supervisors	-.093	.153
Clerical, Sales and Service		
Skilled	.298	-.152
Semi-skilled	-.271	-.442
Unskilled	-.485	-.473
Crafts, Trades and Manual		
Skilled	-1.029	-1.001
Semi-skilled	-1.343	-.893
Unskilled	-1.291	-.956

Table B.7

Occupational Coefficients For West German and Canadian Females With Skilled and Semi-skilled Clerical-Sales-Service Categories Collapsed

Occupational Category	West Germany	Canada
Professional	1.955	2.114
Semi-Professional	1.534	1.608
Technical	1.054	.457
Managers	.162	.866
Supervisors	-.361	-.347
Clerical-Sales-Service		
Skilled and Semi-skilled	-.069	-.011
Unskilled	-1.429	-.596
Crafts-Trades-Manual		
Skilled	-.891	-1.176
Semi-skilled	-.978	-1.398
Unskilled	-1.722	-1.472
Farmers and Farm Labourers	-1.163	-1.471

Table B.8

Educational Coefficients for West German Females With Skilled And Semi-skilled Clerical-Sales-Service Categories Collapsed

Educational Category	Coefficient
No vocational Training	-1.213
Main school plus apprenticeship	-.329
Main school plus vocational school	.038
Real school plus apprenticeship	.247
Real school plus vocational school	.705
Vocational practicum	.329
Technical Institute (Master Craftsman, Technologist)	.532
Entry requirements for tertiary training	.559
Technical and Vocational College	1.701
University	2.463

Table B.9

Educational Coefficients for Canadian Females, With Skilled And Semi-skilled Clerical-Sales-Service Categories Collapsed

Educational Category	Coefficient
Elementary incomplete	-1.888
Elementary complete	-1.359
Secondary, vocational	
partial	-.305
complete	.218
Secondary, academic	
partial	-.549
complete	.222
Secondary, stream uncertain	
partial	.198
complete	.374
Less than complete secondary plus apprenticeship	-.143
Complete secondary plus apprenticeship	.359
Business or trade school	.270
Community college	.981
Nurse's or Teacher's training	.611
University diploma	1.203
Some university	.890
B.A.	1.935
Graduate or professional degree	2.415

Table B.10

Standard Errors for U. S. Males, Using the Stratified Jackknife and Balanced Half Sample Replication

Occupational Category	Stratified Jackknife	Balanced Half Samples
Professions	.089	.101
Semi-professions	.138	.140
Technical	.108	.114
Managers and Supervisors	.081	.082
Clerical, Sales and Service		
Skilled	.094	.093
Semi-skilled	.089	.092
Unskilled	.196	.194
Crafts, Trades and Manual		
Skilled	.076	.077
Semi-skilled	.102	.106
Unskilled	.102	.113
Farmers and Farm Labourers	.234	.236
Educational Category		
Up to Grade 7	.226	.238
Grade 8 or 9	.228	.229
Grade 10 or 11	.151	.161
Secondary complete	.084	.089
1 year university	.122	.118
2 years university	.078	.084
3 years university	.109	.105
Degree(s)	.105	.118
Association Coefficient	.100	.130

Table B.11

Standard Errors for U. S. Females, Using the Stratified Jackknife and Balanced Half Sample Replication

Occupational Category	Stratified Jackknife	Balanced Half Samples
Professions	.146	.134
Semi-professions	.103	.100
Technical	.162	.175
Managers and Supervisors	.113	.104
Clerical, Sales and Service		
Skilled	.083	.080
Semi-skilled	.070	.074
Unskilled	.114	.120
Crafts, Trades and Manual		
Skilled	.260	.260
Semi-skilled	.134	.137
Unskilled	.163	.158
Educational Category		
Up to Grade 7	.178	.192
Grade 8 or 9	.173	.176
Grade 10 or 11	.134	.140
Grade 12	.116	.122
One year university	.108	.103
Two years university	.107	.106
Three years university	.103	.108
Degree(s)	.124	.121
Association Coefficient	.083	.100

APPENDIX C

BASIC DATA TABLES

Table C.1

Basic Table for U. S. Males

	Pro	Semi	Tech	Mana Sup	Sk CSS	Sk CTM	SSk CSS	SSk CTM	Unsk CSS	Unsk CTM	F+FL	Total
Up to Grade 7	0	1	1	4	0	25	6	36	13	42	13	141
Grade 8 or 9	0	2	1	18	1	57	7	38	4	46	15	189
Grade 10 or 11	0	2	1	15	1	60	16	42	10	37	4	188
Secondary complete	7	6	17	100	18	268	59	156	32	116	29	808
1 year university	2	3	9	28	7	40	12	18	6	17	4	146
2 years university	12	8	13	54	15	36	30	24	7	20	6	225
3 years university	8	7	4	20	7	22	18	7	7	7	0	107
Degree(s) complete	237	17	23	139	30	17	36	15	6	9	6	535
Total	266	46	69	378	79	525	184	336	85	294	77	2339

Abbreviations

Pro	Professional
Semi	Semi-professional
Tech	Technical
ManaSup	Managers and Supervisors
Sk CSS	Skilled Clerical-Sales-Service
Sk CTM	Skilled Crafts-Trades-Manual
SSk CSS	Semi-skilled Clerical-Sales-Service
SSk CTM	Semi-skilled Crafts-Trades-Manual
Unsk CSS	Unskilled Clerical-Sales-Service
Unsk CTM	Unskilled Crafts-Trades-Manual
F+FL	Farmers and Farm Labourers

Table C.2

Basic Table for U. S. Females

	Pro	Semi	Tech	Mana Sup	Sk CSS	Sk CTM	SSk CSS	SSk CTM	Unsk CSS	Unsk CTM	Total
Up to Grade 7	0	0	0	0	0	4	11	13	10	5	43
Grade 8 or 9	2	1	1	4	2	5	19	32	17	8	91
Grade 10 or 11	1	3	3	13	6	8	60	39	41	20	194
Secondary complete	10	24	10	71	84	13	308	80	93	27	720
1 year university	9	5	4	16	14	3	77	4	10	1	143
2 years university	8	9	6	25	22	4	51	9	8	0	142
3 years university	7	24	3	11	8	0	22	2	3	2	82
Degree(s) complete	167	40	16	46	15	5	42	1	8	0	340
Total	204	106	43	186	151	42	590	180	190	63	1755

Abbreviations

Pro	Professional
Semi	Semi-professional
Tech	Technical
ManaSup	Managers and Supervisors
Sk CSS	Skilled Clerical-Sales-Service
Sk CTM	Skilled Crafts-Trades-Manual
SSk CSS	Semi-skilled Clerical-Sales-Service
SSk CTM	Semi-skilled Crafts-Trades-Manual
Unsk CSS	Unskilled Clerical-Sales-Service
Unsk CTM	Unskilled Crafts-Trades-Manual

Table C.3

Basic Table for Canadian Males,

For Comparison With U. S. Males

	Pro	Semi	Tech	Mana Sup	Sk CSS	Sk CTM	SSk CSS	SSk CTM	Unsk CSS	Unsk CTM	F+FL	Total
Up to Grade 7	3	11	8	5	13	60	75	60	17	35	2	1889
Grade 8	9	4	5	100	20	451	91	206	21	277	155	1339
Grade 9	12	8	18	134	23	390	107	158	20	186	82	1138
Grade 10	23	24	17	216	68	506	109	174	35	195	86	1453
Grade 11	30	31	20	151	50	276	67	108	23	107	49	912
Secondary complete	181	198	97	554	231	769	188	226	95	188	111	2838
1 year university	34	22	10	104	12	29	13	9	7	4	4	248
2 years university	16	23	1	47	21	27	19	3	3	7	9	176
3 years university	44	34	16	55	24	33	11	9	7	7	1	241
Degree(s) complete	726	203	25	296	34	36	15	10	4	9	9	1367
Total	1078	558	217	1762	496	3077	695	1263	232	1515	506	11601

Abbreviations

Pro	Professional
Semi	Semi-professional
Tech	Technical
ManaSup	Managers and Supervisors
Sk CSS	Skilled Clerical-Sales-Service
Sk CTM	Skilled Crafts-Trades-Manual
SSk CSS	Semi-skilled Clerical-Sales-Service
SSk CTM	Semi-skilled Crafts-Trades-Manual
Unsk CSS	Unskilled Clerical-Sales-Service
Unsk CTM	Unskilled Crafts-Trades-Manual
F+FL	Farmers and Farm Labourers

Table C.4

Basic Table for Canadian Females, For Comparison With U. S. Females

	Pro	Semi	Tech	Mana Sup	Sk CSS	Sk CTM	SSk CSS	SSk CTM	Unsk CSS	Unsk CTM	F+FL	Total
Up to Grade 7	3	2	2	41	1-	19	73	43	42	1	14	449
Grade 8	4	9	6	37	34	10	87	70	34	61	12	364
Grade 9	0	7	9	35	76	14	151	57	32	36	4	421
Grade 10	3	14	7	71	167	18	176	50	57	38	6	607
Grade 11	5	6	6	56	134	6	144	18	32	31	6	444
Secondary complete	46	134	37	116	407	12	311	39	91	36	4	1233
Nurse's or Teacher's Training	10	246	2	11	46	1	32	11	6	2	1	368
1 year university	7	37	0	7	32	0	5	2	6	0	0	101
2 years university	3	20	0	7	11	0	5	0	2	0	0	48
3 years university	5	30	3	3	13	0	5	1	6	0	0	66
Degree(s) complete	136	121	8	35	20	0	23	7	1	5	0	356
Total	222	626	80	419	950	79	1017	398	309	310	47	4457

Abbreviations

Pro	Professional
Semi	Semi-professional
Tech	Technical
ManaSup	Managers and Supervisors
Sk CSS	Skilled Clerical-Sales-Service

Sk CTM	Skilled Crafts-Trades-Manual
SSk CSS	Semi-skilled Clerical-Sales-Service
SSk CTM	Semi-skilled Crafts-Trades-Manual
Unsk CSS	Unskilled Clerical-Sales-Service
Unsk CTM	Unskilled Crafts-Trades-Manual
F+FL	Farmers and Farm Labourers

Table C.5

Basic Table for English Males

	Pro	Semi	Tech	Mana	Sup	Fore	Sk CSS	Sk CTM	SSk CSS	SSk CTM	Unsk CSS	Unsk CTM	F+FL	Total
NSTLA	18	17	30	105	201	337	84	1317	486	940	246	822	242	4845
STLA	2	7	9	45	48	61	20	178	76	98	22	92	30	688
NSBLA	7	2	1	20	29	22	20	98	55	64	18	59	14	409
SBLA	15	10	13	52	49	27	36	67	72	49	12	35	28	465
NSTLA,CT	15	2	9	21	11	34	26	163	21	46	2	14	0	364
STLA,CT	10	3	3	21	3	20	9	48	9	8	0	1	1	136
NSBLA,CT	7	2	5	16	22	17	20	44	44	25	6	11	2	221
SBLA,CT	13	8	10	57	40	15	33	47	70	18	6	11	9	337
NS,OLEVL	11	0	5	8	2	2	9	25	5	7	1	1	0	76
S,OLEVL	11	4	8	17	6	12	12	22	9	7	2	2	6	118
17+	25	8	9	43	28	8	13	16	40	8	1	4	13	216
ALEVL	28	8	15	28	24	7	26	19	41	7	2	4	1	210
CQUALS	62	100	10	77	22	9	37	35	28	12	2	4	2	400
BQUALS	120	11	5	40	5	3	19	6	4	0	0	0	1	214
SOMEU	16	7	6	15	3	0	10	4	8	3	2	2	0	76
DEGREE	141	58	10	54	7	1	35	3	7	2	1	2	5	326
Total	501	247	148	619	500	575	409	2092	975	1294	323	1064	354	9101

Abbreviations for Occupational Categories

Pro	Professional
Semi	Semi-professional
Tech	Technical

Mana	Managers
Sup	Supervisors
Fore	Foremen
Sk CSS	Skilled Clerical-Sales-Service
Sk CTM	Skilled Crafts-Trades-Manual
SSk CSS	Semi-skilled Clerical-Sales-Service
SSk CTM	Semi-skilled Crafts-Trades-Manual
Unsk CSS	Unskilled Clerical-Sales-Service
Unsk CTM	Unskilled Crafts-Trades-Manual
F+FL	Farmers and Farm Labourers

Abbreviations for Educational Categories

NSTLA	Non-selective, to leaving age
STLA	Selective, to leaving age
NSBLA	Non-selective, beyond leaving age
SBLA	Selective, beyond leaving age
NSTLA,CT	Non-selective, to leaving age plus craft/trade certificate
STLA,CT	Selective, to leaving age plus craft/trade certificate
NSBLA,CT	Non-selective, beyond leaving age plus craft/trade certificate
SBLA,CT	Selective, beyond leaving age plus craft/trade certificate
NS,OLEVL	Non-selective, passed O-Levels
S,OLEVL	Selective, passed O-Levels
17+	Stayed to 17+, after O-Levels
ALEVL	Passed A-Levels
CQUAL	Level C Qualifications
BQUAL	Level B Qualifications
SOMEU	Some university
DEGREE	Degree(s) completed

Table C.6

Basic Table for Canadian Males

For Comparison With English Males

	Pro	Semi	Tech	Mana	Sup	Fore	Sk CSS	Sk CTM	SSk CSS	SSk CTM	Unsk CSS	Unsk CTM	F+FL	Total
ELINC	2	8	3	10	46	98	8	307	48	262	16	416	167	1391
ELCOM	3	1	16	32	82	124	19	324	107	222	21	375	199	1525
GR9A	0	1	1	2	4	13	0	22	5	8	0	12	7	75
GR9V	6	1	2	10	9	15	9	33	8	12	5	20	4	134
GR9UN	7	7	4	17	25	18	16	61	27	36	7	31	10	266
GR10A	2	5	8	13	50	54	7	136	50	99	18	121	66	629
GR10V	2	9	4	30	63	82	28	154	55	93	16	110	58	704
GR10UN	12	12	18	41	77	77	41	181	82	113	27	117	66	864
GR11A	2	2	2	8	13	12	10	33	15	14	0	13	3	127
GR11V	3	4	0	16	9	8	9	19	13	12	5	4	5	107
GR11UN	10	3	3	7	21	10	11	21	8	6	2	8	6	116
SECCOMA	17	28	20	31	34	42	22	114	24	42	13	35	20	442
SECCOMV	42	31	26	104	134	78	100	161	99	81	48	82	45	1031
SECCOMUN	13	17	7	30	25	11	30	53	18	28	18	15	7	272
BORTS	21	26	21	85	58	92	42	238	54	60	17	54	21	789
COMCOL	25	20	19	12	22	24	7	40	7	9	4	9	8	206
NORT	6	28	2	4	0	1	3	0	6	0	0	3	3	56
UDIP	33	26	4	37	21	12	20	11	7	9	2	3	17	202
PARTD	76	70	19	101	75	34	56	36	29	15	10	15	11	547
DEGREE	568	164	15	213	24	12	32	8	8	4	4	6	8	1066
Total	850	463	194	803	792	817	470	1952	670	1125	233	1449	731	10549

Abbreviations for Occupational Categories

Pro	Professional
Semi	Semi-professional
Tech	Technical
Mana	Managers
Sup	Supervisors
Fore	Foremen
Sk CSS	Skilled Clerical-Sales-Service
Sk CTM	Skilled Crafts-Trades-Manual
SSk CSS	Semi-skilled Clerical-Sales-Service
SSk CTM	Semi-skilled Crafts-Trades-Manual
Unsk CSS	Unskilled Clerical-Sales-Service
Unsk CTM	Unskilled Crafts-Trades-Manual
F+FL	Farmers and Farm Labourers

Abbreviations for Educational Categories

ELINC	Elementary incomplete
ELCOM	Elementary complete
GR9A	Grade 9, academic
GR9V	Grade 9, vocational
GR9UN	Grade 9, track uncertain
GR10A	Grade 10, academic
GR10V	Grade 10, vocational
GR10UN	Grade 10, track uncertain
GR11A	Grade 11, academic
GR11V	Grade 11, vocational
GR11UN	Grade 11, track uncertain
SECCOMA	Secondary complete, academic
SECCOMV	Secondary complete, vocational
SECCOMUN	Secondary complete, track uncertain
BORTS	Business or trade school
COMCOL	Community college
NORT	Nurse's or Teacher's training
UDIP	University diploma
PARTD	Degree partially complete
DEGREE	Degree(s) complete

Table C.7

Basic Table for West German Males

	Pro	Semi	Tech	Mana	Sup	Fore	Sk CSS	Sk CTM	SSk CSS	SSk CTM	Unsk CSS	Unsk CTM	F+FL	Total
NOVOCT	1	2	0	4	3	0	3	58	10	67	5	70	24	247
MSAPP	10	6	18	61	53	44	39	621	132	355	29	154	78	1598
RSAPP	14	9	8	73	37	7	41	43	97	25	0	8	9	371
MSFTVOC	2	4	1	7	5	4	2	54	7	35	5	8	7	141
RSFTVOC	7	6	4	19	3	3	6	8	19	4	0	2	1	82
VOCPRAC	1	4	4	10	5	2	10	8	7	6	0	1	2	60
MASTECH	13	7	48	27	12	41	20	119	23	61	1	4	8	384
ENTTECH	7	2	16	9	5	5	7	4	8	8	1	1	0	73
ENTUNI	17	2	4	22	8	2	11	3	12	5	0	3	2	91
VOCTECH	114	6	8	51	5	2	11	16	9	4	0	0	2	228
UNIVER	222	74	3	25	7	1	9	1	2	5	0	0	1	350
Total	408	122	114	308	143	111	159	935	324	575	41	251	134	3625

Abbreviations for Occupational Categories

Pro	Professional
Semi	Semi-professional
Tech	Technical
Mana	Managers
Sup	Supervisors
Fore	Foremen
Sk CSS	Skilled Clerical-Sales-Service
Sk CTM	Skilled Crafts-Trades-Manual
SSk CSS	Semi-skilled Clerical-Sales-Service
SSk CTM	Semi-skilled Crafts-Trades-Manual
Unsk CSS	Unskilled Clerical-Sales-Service
Unsk CTM	Unskilled Crafts-Trades-Manual
F+FL	Farmers and Farm Labourers

Abbreviations for Educational Categories

NOVOCT	No vocational training
MSAPP	Main school plus apprenticeship
RSAPP	Real school plus apprenticeship
MSFTVOC	Main school plus full time vocational school
RSFTVOC	Real school plus full time vocational school
VOCPRAC	Vocational practicum
MASTECH	Master craftsman or technologist
ENTTECH	Entrance requirements for Technical and Vocational College
ENTUNI	Entrance requirements for university
TECHVOC	Technical and Vocational College
UNIVER	University graduate

Table C.8

Basic Table for West German Females

	Pro	Semi	Tech	Mana	Sup	Sk CSS	Sk CTM	SSk CSS	SSk CTM	Unsk CSS	Unsk CTM	F+FL	Total
NOVOCT	1	6	1	13	27	4	22	90	64	28	87	21	364
MSAPP	8	23	1	54	43	14	28	352	50	24	35	16	648
RSAPP	5	19	5	45	19	6	6	182	1	1	4	6	299
MSFTVOC	1	17	2	3	1	1	1	22	5	3	5	2	63
RSFTVOC	7	30	2	10	4	3	0	30	2	0	4	0	92
VOCPRAC	0	8	1	3	1	2	0	25	2	1	0	0	43
MASTECH	7	9	7	2	8	0	5	17	2	0	0	2	59
ENTTER	6	11	2	8	8	0	1	14	2	0	2	0	54
VOCTECH	22	12	4	2	0	0	0	6	0	0	0	0	46
UNIVER	76	85	0	0	0	2	0	3	0	0	0	0	166
Total	133	220	25	140	111	32	63	741	128	57	137	47	1834

Abbreviations for Occupational Categories

Pro	Professional
Semi	Semi-professional
Tech	Technical
Mana	Managers
Sup	Supervisors
Sk CSS	Skilled Clerical-Sales-Service
Sk CTM	Skilled Crafts-Trades-Manual
SSk CSS	Semi-skilled Clerical-Sales-Service
SSk CTM	Semi-skilled Crafts-Trades-Manual
Unsk CSS	Unskilled Clerical-Sales-Service
Unsk CTM	Unskilled Crafts-Trades-Manual
F+FL	Farmers and Farm Labourers

Abbreviations for Educational Categories

NOVOCT	No vocational training
MSAPP	Main school plus apprenticeship
RSAPP	Real school plus apprenticeship
MSFTVOC	Main school plus full time vocational school
RSFTVOC	Real school plus full time vocational school
VOCPRAC	Vocational practicum
MASTECH	Master craftsman or technologist
ENTTER	Entrance requirements for Technical and Vocational College or for university
TECHVOC	Technical and Vocational College
UNIVER	University graduate

Table C.9

Basic Table for Canadian Males,

For Comparison With West German Males

	Pro	Semi	Tech	Mana	Sup	Fore	Sk CSS	Sk CTM	SSk CSS	SSk CTM	Unsk CSS	Unsk CTM	F+FL	Total
ELINC	1	9	3	7	52	83	8	28	46	16	14	85	72	1524
ELINC,TT	1	0	0	4	8	23	3	65	8	28	2	32	13	187
ELCOM	1	1	13	31	84	112	20	297	109	275	16	397	208	1564
ELCOM,TT	4	0	5	10	23	41	2	129	18	42	12	58	16	360
PSECV	12	7	7	17	25	33	22	71	39	56	9	54	22	374
PSECV,TT	4	2	4	15	15	22	7	60	5	10	2	22	3	171
PSECA	14	25	21	66	169	171	59	339	169	279	42	329	170	1853
PSECA,TT	5	5	10	24	34	56	19	177	38	77	21	45	26	537
PSECUN	12	9	3	17	30	21	27	43	28	21	3	26	11	251
PSECUN,TT	8	2	2	12	15	14	6	45	11	21	4	8	2	150
SCOMV	13	27	16	21	35	24	21	63	17	34	12	30	20	333
SCOMV,TT	12	7	5	17	8	30	10	109	10	23	3	11	5	250
SCOMA	34	28	18	84	126	52	95	103	88	66	38	94	40	866
SCOMA,TT	14	12	11	31	33	37	17	80	26	37	11	14	9	332
SCOMUN	11	8	7	19	15	12	23	28	15	21	15	11	7	192
SCOMUN,TT	7	10	0	13	13	8	13	41	6	10	3	4	0	128
BORTS	30	35	22	99	87	118	50	238	71	86	18	71	29	1044
COMCOL	36	36	29	19	27	34	16	52	8	11	4	13	10	295
NORT	7	31	2	4	0	4	3	1	6	0	0	4	4	66
UDIP	53	33	9	43	27	20	24	17	12	12	4	4	18	276
PARTD	96	83	27	120	89	47	58	46	42	21	16	18	14	677
BA	271	141	18	138	21	16	28	14	11	5	2	7	8	680
PROGRAD	455	59	7	122	16	3	6	3	4	5	2	2	1	685
Total	1101	570	239	933	952	981	537	2439	787	1456	253	1739	808	12795

Abbreviations for Occupational Categories

Pro	Professional
Semi	Semi-professional
Tech	Technical
Mana	Managers
Sup	Supervisors
Fore	Foremen
Sk CSS	Skilled Clerical-Sales-Service
Sk CTM	Skilled Crafts-Trades-Manual
SSk CSS	Semi-skilled Clerical-Sales-Service
SSk CTM	Semi-skilled Crafts-Trades-Manual
Unsk CSS	Unskilled Clerical-Sales-Service
Unsk CTM	Unskilled Crafts-Trades-Manual
F+FL	Farmers and Farm Labourers

Abbreviations for Educational Categories

ELINC	Elementary incomplete
ELINC,TT	Elementary incomplete, plus trade training
ELCOM	Elementary complete
ELCOM,TT	Elementary complete, plus trade training
PSECV	Partial secondary, vocational
PSECV,TT	Partial secondary, vocational, plus trade training
PSECA	Partial secondary, academic
PSECA,TT	Partial secondary, academic, plus trade training
PSECUN	Partial secondary, track uncertain
PSECUN,TT	Partial secondary, track uncertain, plus trade training
SCOMV	Secondary complete, vocational
SCOMV,TT	Secondary complete, vocational, plus trade training
SCOMA	Secondary complete, academic
SCOMA,TT	Secondary complete, academic, plus trade training
SCOMUN	Secondary complete, track uncertain
SCOMUN,TT	Secondary complete, track uncertain, plus trade training
BORTS	Business or trade school
COMCOL	Community college
NORT	Nurse's or Teacher's training
UDIP	University diploma
PARTD	Degree partially complete
BA	B.A.
PROGRAD	Professional or graduate degree (M.A., Ph.D.)

Table C.10

Basic Table for Canadian Females,

For Comparison With West German Females

	Pro	Semi	Tech	Mana	Sup	Sk CSS	Sk CTM	SSk CSS	SSk CTM	Unsk CSS	Unsk CTM	F+FL	Total
ELINC	0	2	1	4	26	3	14	45	106	27	82	12	322
ELCOM	6	3	8	5	35	20	24	125	129	60	94	16	525
PSECV	1	2	0	4	6	23	2	28	12	7	8	0	93
PSECA	5	11	7	10	60	90	18	287	93	76	75	14	746
PSECUN	2	3	1	5	26	69	0	55	4	10	5	0	180
PSEC,TT	0	5	5	2	16	19	7	35	26	12	17	2	146
SCOMV	3	5	5	4	9	74	3	37	1	14	9	1	165
SCOMA	15	17	4	23	40	193	8	189	24	44	22	2	581
SCOMUN	3	6	0	4	2	29	0	21	4	13	2	1	85
SCOM,TT	4	2	6	3	9	24	0	31	5	6	2	0	92
BORTS	10	25	13	6	64	300	7	148	20	41	7	3	644
COMCOL	4	14	14	6	5	21	1	6	2	5	0	1	79
NORT	10	246	2	6	4	46	1	32	11	6	2	1	367
UDIP	14	77	8	8	2	13	2	15	3	6	2	0	150
PARTD	15	91	3	3	13	57	0	19	3	13	0	0	217
BA	65	95	3	19	5	19	0	17	5	1	5	0	234
PROGRAD	71	26	5	8	4	1	0	8	2	0	0	0	125
Total	228	630	85	120	326	1001	87	1098	450	341	332	53	4751

Abbreviations for Occupational Categories

Pro	Professional
Semi	Semi-professional
Tech	Technical
Mana	Managers
Sup	Supervisors
Sk CSS	Skilled Clerical-Sales-Service
Sk CTM	Skilled Crafts-Trades-Manual
SSk CSS	Semi-skilled Clerical-Sales-Service
SSk CTM	Semi-skilled Crafts-Trades-Manual
Unsk CSS	Unskilled Clerical-Sales-Service
Unsk CTM	Unskilled Crafts-Trades-Manual
F+FL	Farmers and Farm Labourers

Abbreviations for Educational Categories

ELINC	Elementary incomplete
ELCOM	Elementary complete
PSECV	Partial secondary, vocational
PSECA	Partial secondary, academic
PSECUN	Partial secondary, track uncertain
PSEC,TT	Partial secondary, plus trade training
SCOMV	Secondary complete, vocational
SCOMA	Secondary complete, academic
SCOMUN	Secondary complete, track uncertain
SCOM,TT	Secondary complete, plus trade training
BORTS	Business or trade school
COMCOL	Community college
NORT	Nurse's or Teacher's training
UDIP	University diploma
PARTD	Degree partially complete
BA	B.A.
PROGRAD	Professional or graduate degree (M.A., Ph.D.)

Table C.11

Fuller Table for Canadian Males

	Pro	Semi	Tech	Mana	Sup	Fore	Sk CSS	Sk CTM	SSk CSS	SSk CTM	Unsk CSS	Unsk CTM	Farm	FLab	Total
A.	1	8	3	6	50	82	8	23	21	46	15	14	83	52	1512
B.	0	0	0	4	7	23	3	63	10	8	25	2	30	3	178
C.	2	3	13	35	98	130	21	349	174	125	310	22	435	61	1778
D.	2	2	5	10	21	46	4	148	18	20	45	12	64	2	399
E.	6	0	3	5	11	19	8	26	3	8	16	5	17	2	129
F.	0	1	1	8	4	10	1	25	1	3	2	0	10	0	66
G.	5	6	4	12	12	10	14	34	7	21	24	5	29	1	184
H.	4	0	3	7	12	8	6	27	0	1	7	2	8	0	85
I.	1	1	5	8	31	35	2	49	26	32	62	3	77	10	342
J.	1	1	3	5	12	6	0	42	7	12	15	7	5	3	119
K.	1	8	4	24	61	62	21	113	46	49	84	7	104	5	589
L.	2	1	2	7	11	28	9	51	5	11	26	10	13	3	179
M.	9	12	13	30	60	48	31	98	42	63	80	22	90	9	607
N.	2	2	4	12	12	18	6	65	4	12	26	4	20	1	188
O.	13	27	16	21	35	24	21	63	14	17	34	12	30	8	335
P.	12	7	5	17	8	30	10	109	5	10	23	3	11	0	250
Q.	34	28	18	84	126	52	95	103	35	88	66	38	94	7	868
R.	14	12	11	31	33	37	17	80	7	26	37	11	14	2	332
S.	8	6	2	12	28	21	26	46	6	26	15	3	30	0	229
T.	8	0	2	7	17	14	3	40	0	7	27	2	11	1	139
U.	9	2	3	15	8	3	9	11	5	7	14	7	6	0	99
V.	6	4	0	2	9	5	11	22	0	3	10	3	2	0	77
W.	16	11	2	38	33	22	16	68	9	38	29	4	31	1	318
X.	7	12	14	36	35	76	20	183	5	27	40	10	34	7	506
Y.	6	14	2	11	13	13	7	28	2	5	10	4	3	1	119
Z.	1	0	4	12	5	10	6	48	2	1	10	0	6	2	107
AA.	8	5	2	15	9	6	7	24	4	14	8	2	12	2	118
BB.	3	14	5	16	12	12	16	35	2	11	5	8	7	0	146
CC.	12	11	5	10	7	19	1	27	5	4	7	0	6	1	115
DD.	26	27	24	9	19	13	15	24	2	4	5	4	8	3	183
EE.	7	31	2	4	0	4	3	1	3	6	0	0	4	1	66
FF.	53	33	9	43	27	20	24	17	16	12	12	4	4	1	275
GG.	96	83	27	120	89	47	58	46	12	42	21	16	18	3	678
HH.	271	141	18	138	21	16	28	14	7	11	5	2	7	1	680
II.	455	59	7	122	16	3	6	3	1	4	5	2	2	0	685
TO.	1101	572	241	936	952	972	533	2405	607	774	1420	250	1725	193	12680

Abbreviations for Occupational Categories

Pro	Professional
Semi	Semi-professional
Tech	Technical
Mana	Managers
Sup	Supervisors
Fore	Foremen
Sk CSS	Skilled Clerical-Sales-Service
Sk CTM	Skilled Crafts-Trades-Manual
SSk CSS	Semi-skilled Clerical-Sales-Service
SSk CTM	Semi-skilled Crafts-Trades-Manual
Unsk CSS	Unskilled Clerical-Sales-Service
Unsk CTM	Unskilled Crafts-Trades-Manual
Farm	Farmers
FLab	Farm Labourers

Letter Designations for Educational Categories

A. Elementary incomplete
B. Elementary incomplete, plus apprenticeship
C. Elementary complete
D. Elementary complete, plus apprenticeship
E. Grade 9 or 10, vocational
F. Grade 9 or 10, vocational, plus apprenticeship
G. Grade 11, vocational
H. Grade 11, vocational, plus apprenticeship
I. Grade 9, academic
J. Grade 9, academic, plus apprenticeship
K. Grade 10, academic
L. Grade 10, academic, plus apprenticeship
M. Grade 11, academic
N. Grade 11, academic, plus apprenticeship
O. Secondary complete, vocational
P. Secondary complete, vocational, plus apprenticeship
Q. Secondary complete, academic
R. Secondary complete, academic, plus apprenticeship
S. Some business or trade school
T. Some business or trade school, plus apprenticeship
U. Some business or trade school, secondary complete
V. Some business or trade school, secondary complete, plus apprenticeship
W. Complete business or trade school
X. Complete business or trade school, plus apprenticeship
Y. Complete business or trade school, secondary complete
Z. Complete business or trade school, secondary complete, plus apprenticeship
AA. Some community college

BB. Some community college, secondary complete
CC. Complete community college
DD. Complete community college, secondary complete
EE. Nurse's or Teacher's training
FF. University diploma
GG. Partial degree
HH. B.A.
II. Professional or graduate degree (M.A., Ph.D.)
TO. Total

Table C.12

Fuller Table for Canadian Females,

	Pro	Semi	Tech	Mana	Sup	Sk CSS	Sk CTM	SSk CSS	SSk CTM	Unsk CSS	Unsk CTM	F+FL	Total
ELINC	0	2	1	4	24	3	14	45	106	24	82	12	317
ELCOM	4	5	8	5	40	15	25	144	145	66	111	18	586
PSECV	1	2	0	4	4	21	2	23	10	7	6	0	80
GR9A	0	0	3	3	6	10	5	44	23	14	13	2	123
GR10A	2	4	1	4	25	32	8	98	26	26	23	5	254
GR11A	2	2	3	2	21	38	5	110	16	22	25	4	250
SCOMV	3	5	5	4	9	74	3	37	1	14	9	1	165
SCOMA	15	17	4	23	40	193	8	189	24	44	22	2	581
APPS	4	5	11	5	14	32	7	51	27	12	17	1	172
SBORTS	4	5	0	3	26	77	0	62	6	19	6	1	224
SBORTS, SCOM	3	0	0	4	4	19	0	16	2	13	0	1	62
CBORTS	5	14	9	6	56	234	7	134	19	32	7	3	526
CBORTS, SCOM	5	11	4	0	8	65	0	15	1	9	0	0	118
SCOMCOL	1	9	1	3	8	22	0	18	3	2	2	1	70
COMCOL	4	14	14	6	5	21	1	6	2	5	0	1	79
NORT	10	246	2	6	4	46	1	32	11	6	2	1	367
UDIP	14	77	8	8	2	13	2	15	3	6	2	0	150
PARTD	15	91	3	3	13	57	0	19	3	13	0	0	217
BA	65	95	3	19	5	19	0	17	5	1	5	0	234
PROGRAD	71	26	5	8	4	1	0	8	2	0	0	0	125
Total	228	630	85	120	318	992	88	1083	436	335	332	53	4700

Abbreviations for Occupational Categories

Pro	Professional
Semi	Semi-professional
Tech	Technical
Mana	Managers
Sup	Supervisors
Sk CSS	Skilled Clerical-Sales-Service
Sk CTM	Skilled Crafts-Trades-Manual
SSk CSS	Semi-skilled Clerical-Sales-Service
SSk CTM	Semi-skilled Crafts-Trades-Manual
Unsk CSS	Unskilled Clerical-Sales-Service
Unsk CTM	Unskilled Crafts-Trades-Manual
F+FL	Farmers and Farm Labourers

Abbreviations for Educational Categories

ELINC	Elementary incomplete
ELCOM	Elementary complete
PSECV	Partial secondary, vocational
GR9A	Grade 9, academic
GR10A	Grade 10, academic
GR11A	Grade 11, academic
SCOMV	Secondary complete, vocational
SCOMA	Secondary complete, academic
APPS	Apprenticeships
SBORTS	Some business or trade school, secondary incomplete
SBORTS,SCOM	Some business or trade school, secondary complete
CBORTS	Complete business or trade school, secondary incomplete
CBORTS,SCOM	Complete business or trade school, secondary complete
SCOMCOL	Some community college
CCOMCOL	Complete community college
NORT	Nurse's or Teacher's training
UDIP	University diploma
PARTD	Degree partially complete
BA	B.A.
PROGRAD	Professional or graduate degree (M.A., Ph.D.)

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