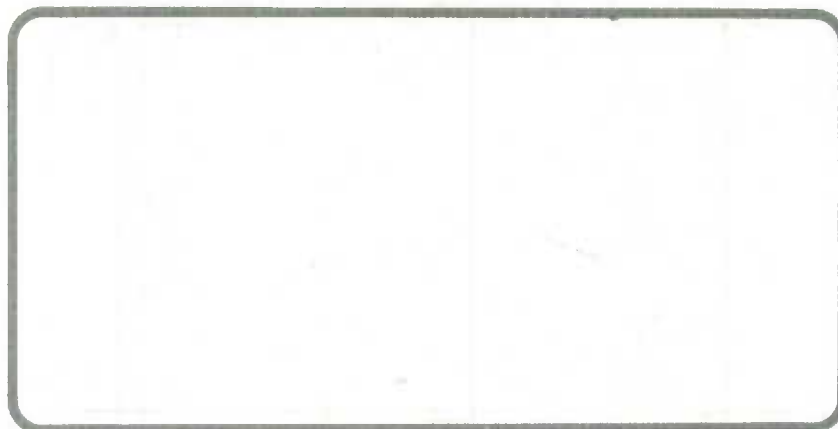




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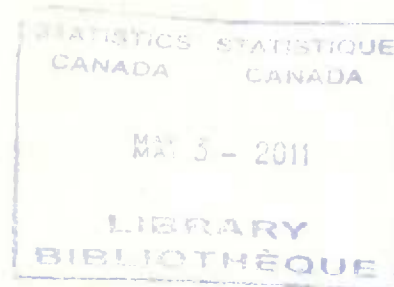


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**THE EXPANDING MIDDLE:
Some Canadian Evidence
on the Deskillling Debate***

by

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No. 9



Carleton University
and
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Abstract

This study addresses recent debates over trends in class structure that have emerged from the deskilling debate. The general conclusion I draw from an analysis of both census and survey data is that actual patterns and trends in the skill distribution of jobs are more complex than either the "deskilling" or "upgrading" theses would indicate. During the sixties and seventies the skill content of the labour force grew at an accelerating rate as a result of the expansion of "new middle class" professional, technical and managerial occupations. Patterns within working class occupations are more ambiguous: estimates based on the census distribution of occupations ranked by skill indicate a monotonic pattern of upgrading while survey results for the early eighties suggest a split or dual labour market for job skills.

In the past, changes in the skill distribution were a result of a shift in employment from the production of goods to the production of services. Future changes, however, will occur largely within the service sector simply because that is where most jobs are now located. Canada's service economy, like the American, is marked by a distinctly bifurcated skill distribution. Comparative studies, however, indicate this is a contingent rather than a necessary feature of a post-industrial economy, a result of political as well as market forces.

Key Words: skills, deskilling, social class, service economy.

The Expanding Middle:

Some Canadian Evidence on the Deskillinq Debate

Since the mid-seventies, the debate over trends in the skill distribution of jobs has emerged in two contexts. The first, and most well known, followed publication of Harry Braverman's Labor and Monopoly Capital (1974). More recently, it has surfaced in discussions of deindustrialization and the "declining middle", a debate initiated by Barry Bluestone and Bennett Harrison's The Deindustrialization of America (1982), popularized by Bob Kuttner in The Atlantic Monthly (1983), and has now made its way into Canada (Shifrin, 1986; Steed, 1986; Economic Council of Canada, 1987)

Contrary to prevailing wisdom (Kerr et al. 1960; Bell, 1973), Braverman argued that, under capitalism, employers introduce patterns of work organization and technological innovation in ways that rob workers of their skills. The reason for this is what economists refer to as the incomplete character of labour contracts. Employers buy labour for a specified time period, but of an unspecified intensity and content (Lewchuck 1985:33). The solution is deskilling: management appropriates the knowledge of workers to gain control over the labour process and the effort bargain. As a result, conception and execution in the labour process are separated giving modern economies their characteristic structure -- a small elite of managers and knowledge workers standing over a mass of unskilled and semi-skilled labourers. The new mass occupations of unskilled and semiskilled workers in manufacturing, sales, service and clerical jobs, according to Braverman, made up at least two thirds of the American labour force in 1970.

The issues raised by Braverman go well beyond concerns with the organization of work. As Panitch (1978) observes, Braverman's study was not just a book on the labour process. Its central purpose was to identify the class structure of the advanced capitalist economies. His critique, like Porter's (1965), was directed at the view that, with the decline of agriculture and the expansion of white collar work, the shape of modern economies could be described in terms of a large middle mass of skilled, mental workers resting on a small and shrinking working class of blue-collar manual workers. Instead, modern economies should be thought of as constructed on a base of both new and old "mass occupations" of unskilled and "semi-skilled" proletarians -- workers with nothing to sell but raw labour power. He was challenging claims concerning the composition of the working class on the one hand and the size, importance and likely evolution of the "new middle class", on the other. His conclusions concerning the new middle class were that its size had been exaggerated, its future expansion was intrinsically self-limiting, and that it too would slowly be subject to internal proletarianization. Moreover, the growth of new middle class professional and managerial occupations had come at the expense of the working class, i.e. by the appropriation of their skills and the erosion of craft autonomy.

It is useful to divide Braverman's thesis into two parts since in this paper I address only one of his claims. The first concerns the pattern of development that led up to the present period, his claim that the current "Taylorized" organization of production was preceded by a labour process in which most work was performed by skilled craftworkers.¹ The second concerns where things will go from here, the likely pattern of development as we move

into a "post-industrial" economy. My purpose in this paper is to evaluate the latter claims and, here, Braverman can be contrasted to Daniel Bell's (1973) classic statement on these matters.

For Bell (1973:127ff.), the prototypical worker of the post-industrial period is the professional who provides the services -- health, educational, recreational and social -- and the technical knowledge that define a post-industrial economy. Braverman thinks otherwise. Anticipating the deindustrialization theorists, he argues that the main result of the sectoral shift into services is expansion of the new mass occupations of unskilled clerical, sales and service workers. The usual bias of capital towards low skill, low wage industries is exacerbated by the availability of surplus labour generated by the increasing productivity of machine-based industries (Braverman, 1974:384) and previously untapped sources of paid labour such as women.

The deindustrialization theorists carry Braverman's account a step further but the concern is with wages not skills. The imagery invoked is not the replacement of skilled by unskilled workers but the replacement of well paid, unskilled, industrial workers by poorly paid, unskilled, service workers (Kuttner, 1983:61). Like Braverman, however, they conclude that the direction of change is toward the unskilled sectors of the service economy. The shift from goods to services does not mean our children will become knowledge workers; the more likely prospect is a job in a fast-food outlet.

In this paper I address these claims with an analysis of changes in the skill distribution of jobs in the Canadian economy between 1961 and 1981 with estimates based on the census distribution of occupations ranked by skill

level. I also compare these findings with self-reported skill requirements from the Canadian Class Structure Survey (Black and Myles, 1986) conducted in the winter of 1982-83. In general, the results support Braverman's conclusions concerning the shape of the skill distribution but not about trends. During this twenty year period, skilled jobs expanded at an accelerating rate. A significant part of this upgrading was a result of growth in new middle class professional and managerial occupations but there is no evidence that this occurred at the expense of (i.e. by deskilling) the working class.

Survey results based on self-reports do indicate a "polarized" skill distribution but not of the sort anticipated by Braverman. Rather than dividing managers and professionals from the "new mass occupations", the cleavage created by the skill distribution is within the working class. Neither Braverman's nor Bell's imagery of the emergent skill distribution describe this pattern adequately. A more appropriate model to guide future research, I argue, is found in the split or dual labour market metaphor of the segmentation theorists.

Data and Measurement Issues

One of Braverman's major contributions was to persuade a wide spectrum of social science opinion that conventional indicators of skill were seriously flawed (Allen, 1986; Porter, 1979). Traditionally, two sorts of evidence have been used as indicators of upgrading -- changes in the educational qualifications of the labour force and changes in occupational composition. With respect to the first, Braverman identified the fallacy of equating the possession of human capital with its use (Spenner, 1983: 827) -- the debate is

about the characteristics of jobs not their incumbents -- and pointed to a growing body of evidence that questioned the relation between educational credentials and the way jobs are performed.

The second type of evidence from which upgrading has been inferred is change in occupational composition using what Spenner (1983: 828) calls the nonmeasurement strategy for studying job skills. Quite simply, an underlying skill distribution is imputed to broad occupational groups (white collar, blue collar) and conclusions are drawn accordingly. As Allen (1986:94) observes, traditional evidence from occupational data has tended to reflect "the middle-class conceit that white collar work is better than blue-collar work whereas factory work is better than farm work." Braverman undermined this conceit by pointing out that the majority of jobs -- including white collar jobs -- could be mastered in a maximum of two to twelve weeks compared to the years of training required by traditional craft occupations.²

The skill measures for this study reflect these concerns. The core of the analysis rests on distributions in which occupations are ranked on the basis of training time and skill requirements. The indicators are from the worker trait data used in compiling the Canadian Classification and Dictionary of Occupations or CCDO (Canada, 1971).³ Designed as a tool for employment counselling, the CCDO provides scores of the skills and training required for several thousand different occupational titles and refer to requirements of positions rather than to attributes of incumbents.⁴

The data are samples from the 1961, 1971 and 1981 censuses for which detailed occupation (four digit) and industry (three digit) codes based on the 1971 standard were available for all three periods. The 1961 data are a

special sample of approximately 134,000 observations recoded to the 1971 standard as part of a special project conducted by Statistics Canada in the 1970s. In the 1981 census, all observations were coded to both the 1981 and 1971 standards. The recoded 1961 sample was a representative sample of the experienced labour force in Canada's ten provinces. The 1971 and 1981 samples were drawn from the same universe following the same method used to construct Statistics Canada's public use samples.⁹

I exclude the agricultural labour force from the analysis for three reasons. First, the significance of the decline of agriculture is no longer a matter of dispute: farming, especially modern farming, is skilled work and its decline represents a loss of skilled jobs to the Canadian economy. Secondly, the deskilling that has occurred through the decline of agriculture is not theoretically pertinent to the debates raised here. Braverman's theory is not about all labour but about the labour employed by capital and most farmers are self-employed (see also footnote 10). Finally, the decline of the farm population has little bearing on any critical understanding of the contemporary Canadian work force since as an historical process it is now exhausted.

The worker trait data include measures of 41 different job characteristics. I have selected two of these for analysis here plus two factor estimates from Hunter and Manley's (1986) analysis of the full set of scores. The two measures taken directly from the CCDO are the scales of General Educational Development (GED) and Specific Vocational Preparation (SVP). The GED ranks occupations on a 6 point scale on the basis of general reasoning, mathematical and language requirements. The associated verbal

descriptions describe a hierarchy of task requirements from the very simple (level 1 -- apply common sense understanding to carry out simple one- or two-step instructions) to the very complex (level 6 -- apply principles of scientific thinking to a wide range of intellectual and practical problems). The descriptions for levels 4 and higher correspond to what would generally be considered as "skilled" work. The SVP scale ranks jobs in terms of job-specific training time requirements ranging from "a short demonstration" to 10 years or more.⁶ The scalar values for these measures are presented as an appendix.

The two factor scores are Hunter and Manley's (1986) estimates of "cognitive complexity" (the extent to which jobs require verbal, quantitative and related skills) and "routine activity" (the degree to which a job involves a small number of tasks performed repeatedly). For the purpose of tabular presentation, the 486 job titles were ordered from the low to high on the factor scores and then divided into five groups with an equal number of titles in each group (quintiles). Level 1, then, represents the bottom 20 percent of all occupational titles and level 5 the top 20 percent.

I use all four measures since conceptually and empirically they capture different dimensions of skill. The Hunter and Manley scores have the advantage of greater reliability and analogous measures have been shown to be important predictors of personality characteristics and political and social attitudes (Kohn and Schooler, 1983). To interpret trends, however, I emphasize the GED and SVP scales, particularly the latter. Both have the advantage that the meaning of the scalar values are known (see Appendix A). The SVP scale has two additional advantages. First, it is the most sensitive to the criticisms

directed by Braverman against the usual occupational categories. Indeed, it is the criterion he uses (Braverman, 1974: chapter 20) to distinguish the new mass occupations from traditional craft occupations. Secondly, I am able to approximate the SVP measure with independent data based on self-reports from the Canadian Class Structure Survey conducted in Canada's ten provinces in the winter of 1982-83.⁷ Among other things, the survey included a large set of self-report questions on job skills that allow approximation of the SVP scale. In the analysis, I report two different versions of self-reported SVP. The first (the unadjusted measure) is based on responses to a question asking respondents about on-the-job training now required for their work. The second adjusts the first measure to take account of the formal educational component of the SVP scale. For reasons taken up in the footnote where the survey questions are also described, the former may be considered a low estimate and the latter a high estimate of the proportion of skilled jobs in the economy.⁸ The survey self-reports allow an independent assessment of the patterns observed with the worker trait data.

General Trends

The distributions in Table 1 confirm Braverman's claims about the shape of the skill distribution. Occupations that could be learned in less than a year still accounted for almost two thirds of all jobs in 1981 and "skilled" occupations on the GED scale (level 4 or higher) represented less than a third of all jobs. The survey data examined later indicate the worker trait data may provide a low estimate of the number of skilled jobs but sustain the conclusion that the majority of jobs still have modest training or skill requirements.⁹

TABLE 1: Change in the Skill Distribution of Jobs, Experienced Non-agricultural Labour Force, Canada, 1961-1981

1. Specific Vocational Preparation	< 30 Days	1-3 Months	3-6 Months	6-12 Months	1-2 Years	> 2 Years	Total
1961	20.6	21.8	15.0	14.9	11.1	17.6	100%
1971	18.2	19.8	16.6	14.7	11.2	19.9	100%
1981	12.0	17.2	17.8	18.9	11.1	23.1	100%
2. General Education Development ^a	1	2	3	4	5-6		Total
1961	8.0	31.7	35.6	16.6	8.2		100%
1971	7.6	26.9	37.2	18.9	9.4		100%
1981	6.1	21.3	40.9	20.1	11.5		100%
3. Cognitive Complexity ^a	1	2	3	4	5		Total
1961	22.6	15.1	32.8	15.6	12.9		100%
1971	19.9	14.2	32.6	15.8	17.4		100%
1981	16.9	13.7	28.9	19.5	21.0		100%
4. Routine Activity ^a	1	2	3	4	5		Total
1961	28.1	19.3	23.8	15.7	13.6		100%
1971	24.5	19.4	24.6	16.5	15.1		100%
1981	17.4	19.2	28.4	17.8	17.2		100%

^a Skill measures are ordered from low to high.

In contrast, Braverman's claims about emergent trends are not supported. All four indicators show a monotonic increase in skill levels over time. And rather than slowing down, there was more upgrading during the seventies than during the sixties. These underlying trends were similar for both men and women (Table 2). Young workers (Table 3) were the exception. They shared in the skill growth of the sixties but not the seventies despite rising educational credentials.¹⁰

At this level of analysis, the deskilling thesis clearly does not do very well. However, any fair assessment of Braverman must do more than examine general trends. Ultimately what is at issue is not the trend line but the structure and processes underlying it. In the following sections I examine two of these. First, I consider Braverman's discussion of the occupational shifts that underlie changes in the skill distribution. Second, I take up the debate over the expected consequences of the transition to a post-industrial economy.

Occupation and Skill

Skill change can occur in two ways (Spenner, 1983: 826): through changes in the work content of occupations and through compositional shifts in the distribution of occupations. The skill mix in hospitals, for example, can be altered by changing the work done by nurses (a change in content), by changing the ratio of nurses to nurse assistants (a change in composition) or both. Moreover, the effects of one may offset those of the other. Engineers, for example, may be deskilled relative to some point in the past but their enormous growth and high skill levels relative to other occupations has

TABLE 2: Change in the Skill Distribution of Jobs, Women, Experienced Non-agricultural Labour Force, Canada, 1961-1981

	< 30 Days	1-3 Months	3-6 Months	6-12 Months	1-2 Years	> 2 Years	Total
1. Specific Vocational Preparation							
1961	33.1	16.1	13.8	13.1	10.3	13.6	100%
1971	23.3	17.4	20.9	15.4	9.8	14.2	100%
1981	13.0	15.2	23.8	21.2	9.7	17.0	100%
2. General Education Development ^a	1	2	3	4	5-6		Total
1961	3.9	36.8	35.4	20.1	3.8		100%
1971	4.5	27.3	45.2	18.6	4.4		100%
1981	3.9	17.7	51.3	20.2	6.9		100%
3. Cognitive Complexity ^a	1	2	3	4	5		Total
1961	26.6	7.0	34.5	18.9	13.1		100%
1971	21.1	7.6	38.5	19.7	13.2		100%
1981	17.3	7.4	33.1	24.7	17.5		100%
4. Routine Activity ^a	1	2	3	4	5		Total
1961	40.5	13.2	22.3	16.7	7.3		100%
1971	29.2	19.6	27.4	15.9	7.5		100%
1981	18.2	19.7	34.4	17.7	10.1		100%

^a Skill measures are ordered from low to high.

TABLE 3: Change in the Skill Distribution of Jobs, Young Workers (Age 15-29) in the Experienced Non-agricultural Labour Force, Canada, 1961-1981

	< 30 Days	1-3 Months	3-6 Months	6-12 Months	1-2 Years	> 2 Years	Total
1. Specific Vocational Preparation							
1961	26.7	25.2	14.0	14.4	9.6	10.2	100%
1971	21.9	21.0	18.2	14.4	11.0	13.3	100%
1981	15.0	19.9	21.2	20.2	9.9	13.8	100%
2. General Education Development ^a	1	2	3	4	5-6		Total
1961	9.4	37.5	36.4	13.0	3.5		100%
1971	8.8	29.5	40.1	16.2	5.4		100%
1981	7.4	26.4	45.6	14.7	6.2		100%
3. Cognitive Complexity ^a	1	2	3	4			Total
1961	29.2	14.4	33.5	13.5	9.3		100%
1971	23.6	13.1	34.5	15.2	13.5		100%
1981	22.8	13.8	31.6	18.5	13.6		100%
4. Routine Activity ^a	1	2	3	4	5		Total
1961	37.3	18.8	24.5	13.1	6.3		100%
1971	28.8	21.1	25.7	15.5	8.8		100%
1981	21.9	22.7	31.1	15.3	9.0		100%

^a Skill measures are ordered from low to high.

resulted in a net increase in skill levels for the economy as a whole. Indeed, as Wolff and Howell (1986: 4) suggest, deskilling in work content may well result in compositional upgrading: as the skill requirements of jobs decline (a change in content) it becomes feasible to phase them out altogether (a change in composition).

Part of the observed change in skill distributions is the result of the changes in occupational composition shown in Table 4.¹¹ Over the twenty year period, there was significant expansion of the share of professional-managerial occupations, more modest expansion of mass white collar occupations and a decline in the share of blue collar occupations.¹² These patterns are important since Braverman did not deny that professional and managerial jobs would expand. Rather, he argued that the growth of the new middle class of managers and professionals occurs at the expense of (i.e. by deskilling) the working class.¹³ The new middle class expands by appropriating the knowledge and skills of traditional craftworkers thus rendering them redundant.

Braverman (1974:403-409) goes further and argues that in the long run there is a tendency to proletarianize the intermediate strata as well. This begins to occur as soon as the size of these professional and management occupations is large enough to warrant application of the forms of rationalization previously applied to craftworkers. An extensive literature on the "crisis" of the new middle class suggests the recession of the seventies exacerbated this trend.¹⁴

TABLE 4: Changes in Occupational Composition, Experienced Non-agricultural Labour Force, 1961-1981^a

Occupation	1961	1971	1981
PROFESSIONAL AND TECHNICAL			
1. Professional	7.5	8.3	8.5
2. Semi-professional and Technical	4.2	6.2	7.9
ADMINISTRATION			
3. Managers	3.0	4.2	6.7
4. Supervisors	9.7	9.4	8.2
MASS OCCUPATIONS			
5. White Collar	29.3	31.5	31.6
6. Blue Collar	46.3	40.4	37.1
TOTAL	100%	100%	100%

^a Classification based on Pineo, Porter and McRoberts (1977).

TABLE 5: Changes in the Skill Distribution of Jobs by Occupations, Experienced Non-agricultural Labour Force, 1961-1981^a

A: Administrators						
	< 1 Year	1-2 Years	2-4 Years	> 4 Years		Total
1. Specific Vocational Preparation						
1961	1.0	20.4	72.9	5.7		100%
1971	2.0	20.0	64.8	13.1		100%
1981	2.7	15.4	54.4	27.4		100%
2. General Education Development ^b	1-2	3	4	5	6	Total
1961	0.1	8.2	55.3	34.8	1.6	100%
1971	0.0	7.2	53.4	35.8	3.5	100%
1981	0.0	7.4	49.4	40.1	3.0	100%
3. Cognitive Complexity ^b	1-2	3	4	5		Total
1961	0.1	22.7	32.6	44.7		100%
1971	0.0	18.9	30.4	50.7		100%
1981	0.0	15.4	27.0	57.6		100%
4. Routine Activity ^b	1-2	3	4	5		Total
1961	0.1	0.4	31.8	67.8		100%
1971	0.0	0.2	29.8	70.0		100%
1981	0.0	0.2	26.2	73.5		100%
B: Professional-Technical Workers						
	< 1 Year	1-2 Years	2-4 Years	> 4 Years		Total
1. Specific Vocational Preparation						
1961	3.2	34.0	39.4	23.4		100%
1971	3.2	33.6	44.9	18.4		100%
1981	3.8	30.0	47.7	18.5		100%
2. General Education Development ^b	1-2	3	4	5	6	Total
1961	0.4	9.7	59.6	19.3	11.0	100%
1971	0.4	7.8	63.8	19.6	8.3	100%
1981	0.5	8.2	60.2	23.5	8.0	100%
3. Cognitive Complexity ^b	1-2	3	4	5		Total
1961	0.3	2.7	27.3	69.8		100%
1971	0.2	2.7	25.7	71.4		100%
1981	0.3	3.2	21.2	75.3		100%
4. Routine Activity ^b	1-2	3	4	5		Total
1961	0.0	3.4	57.7	39.0		100%
1971	0.0	3.5	58.3	38.2		100%
1981	0.0	3.9	58.2	37.9		100%

TABLE 5: Changes in the Skill Distribution of Jobs by Occupations, Experienced Non-agricultural Labour Force, 1961-1981^a (concl.)

C: <u>White Collar Workers</u>							
	< 30 Days	1-3 Months	3-6 Months	6-12 Months	1-2 Years	> 2 Years	Total
1. Specific Vocational Preparation							
1961	30.4	21.9	25.2	18.5	3.53	0.5	100%
1971	23.3	20.2	33.4	19.9	3.02	0.2	100%
1981	9.9	15.9	38.0	31.9	5.25	0.1	100%
2. General Education Development ^b	1	2	3	4	5-6		Total
1961	0.4	36.6	55.7	7.4	0.0		100%
1971	0.3	28.7	64.9	6.1	0.0		100%
1981	0.2	14.6	77.3	7.9	0.0		100%
3. Cognitive Complexity ^b	1	2	3	4	5		Total
1961	13.8	8.5	57.3	19.7	0.7		100%
1971	11.4	9.5	59.0	19.8	0.4		100%
1981	10.1	7.4	49.7	32.4	0.4		100%
4. Routine Activity ^b	1	2	3	4	5		Total
1961	35.1	24.4	33.2	7.3	0.0		100%
1971	28.3	27.2	38.5	6.0	0.0		100%
1981	14.0	26.1	52.3	7.6	0.0		100%
D: <u>Blue Collar Workers</u>							
	< 30 Days	1-3 Months	3-6 Months	6-12 Months	1-2 Years	> 2 Years	Total
1. Specific Vocational Preparation							
1961	25.2	33.2	13.9	19.8	7.4	0.6	100%
1971	26.0	32.2	14.6	19.4	6.4	0.6	100%
1981	23.6	33.8	14.6	21.0	6.5	0.6	100%
2. General Education Development ^b	1	2	3	4	5-6		Total
1961	17.0	45.1	36.9	1.0	0.0		100%
1971	18.6	44.1	36.2	1.1	0.0		100%
1981	16.5	45.0	37.5	1.1	0.0		100%
3. Cognitive Complexity ^b	1	2	3	4	5-6		Total
1961	40.1	27.0	27.5	5.5	0.0		100%
1971	40.3	27.8	27.6	4.3	0.0		100%
1981	37.1	30.6	27.8	4.5	0.0		100%
4. Routine Activity ^b	1	2	3	4	5		Total
1961	38.3	26.1	29.4	6.1	0.2		100%
1971	38.5	26.7	29.6	5.1	0.2		100%
1981	34.9	29.5	30.0	5.3	0.2		100%

^a Occupational classification based on Pineo, Porter, McRoberts (1977).

^b Skill measures are ordered from low to high.

The implication of all this is that the upgrading observed in Table 1 may well be the result of compositional shifts in the occupational structure (more managers, professionals and technical workers) that conceal the deskilling that has gone on within these broad categories.¹⁵ Inspection of the underlying skill by occupation distributions in Table 5 provides only modest support for these claims. There has been no change in the skill composition of blue collar jobs and substantial upgrading of white collar jobs. There was also a significant shift from lower to higher levels of administrative work. Only among professional and technical workers is there some indication of "deskilling" and then only during the sixties.

In sum, there is little evidence that the new middle class has expanded at the expense of (i.e. by deskilling) the working class. Nor is there evidence of an ongoing decline within the middle class. To the contrary, the expansion of new middle class jobs, especially higher level managerial jobs, accelerated in the seventies. The implication would seem to be that Bell and the post-industrialists provide a more useful starting point for understanding emergent trends in class structure than Braverman and the deindustrialization theorists. In the following section I consider whether this is the case.

Bell, Braverman and the Post-Industrialism Thesis

Bell (1973:126-127) and Braverman (1974:425) agree in broad terms about the skill content and class structure of industrial societies. For both, the basic feature of an industrial economy is the polarization of skills between a small elite of managers and engineers, on the one hand, and a mass of unskilled and semi-skilled machine operatives on the other.¹⁶ The source of contention concerns where things are likely to go from here. The debate can be

put in perspective by considering the 1961 skill differences by industry summarized in Table 6 with Lieberman's (1976) index of net difference.¹⁷ A negative value indicates that the skill level in an industry is lower than that in the economy as a whole; a positive value indicates an industry with a high skill mix.¹⁸

Two features of the industrial skill mix stand out. First, the "industrial" sector of the economy has few skilled jobs. Second, the implications of the shift to a service economy are ambiguous because of the bifurcated character of the service sector. On the one hand, there are the highly skilled social services (the "welfare state" industries) and business services (the "information economy") and, on the other, the unskilled services associated with wholesale and retail trade and consumer services (where the fast food industry is located). Bell is betting expansion will occur in the former set of industries; Braverman and the deindustrialization theorists anticipate expansion in the latter.

The changes in industrial composition summarized in Table 7 indicate that both were correct but that Bell was closer to the mark than Braverman. Wholesale and retail trade, the largest employer of unskilled service workers, was relatively stagnant during this period (Picot, 1986a).¹⁹ Consumer services (and especially accommodation and food services), the least skilled sector of the economy, did expand but modestly. In contrast, both social and business services, the most skilled sectors of the service economy, increased

TABLE 6: Relative Skill Levels by Industry as Measured by the Index of Net Difference¹, Experienced Non-agricultural Labour Force, 1961

	Relative Skill Level			
	Specific Vocational Preparation	General Education Development	Cognitive Complexity	Routine Activity
1. Industrial Sector				
- Extractive	-.17	-.35	-.40	-.31
- Manufacturing	-.11	-.16	-.19	-.10
- Construction	.04	-.18	-.15	-.01
- Transport, Communication, Utilities	.02	.07	-.05	-.03
Total Industrial	-.06	-.13	-.17	-.09
2. Service Sector				
- Trade	-.05	.05	.15	-.03
- Business Services	.29	.34	.41	.27
- Social Services	.37	.39	.37	.37
- Consumer Services	-.26	-.15	-.27	-.22
- Public Administration	.12	.07	.22	.19
Total Services	.06	.12	.16	.08

¹ Calculated relative to the marginal distribution for the entire non-agricultural labour force.

TABLE 7: Changes in the Composition of the Experienced Non-agricultural Labour Force by Industry, Canada, 1961-1981

	Share of Labour Force (%)		
	1961	1971	1981
1. Industrial Sector			
- Extractive	4.3	3.1	3.1
- Manufacturing	25.3	22.8	20.1
- Construction	7.8	6.8	6.7
- Transport, Communication, Utilities	10.6	8.8	8.4
Total Industrial	47.9	41.5	38.2
2. Service Sector			
- Trade	18.3	17.6	18.1
- Business Services	6.2	7.9	10.2
- Social Services	9.9	15.1	15.1
- Consumer Services	9.6	9.8	10.7
- Public Administration	8.0	8.2	7.8
Total Services	52.1	58.5	61.8

their shares significantly, the former during the sixties and the latter during the seventies.

On balance, then, we would expect changes in industrial composition to have an upgrading effect on skill levels. What of the trends within industries? Changes in skill levels within industries are summarized with the index of net difference in Table 8. A positive value indicates a rise in skill levels; a negative value indicates decline. There is evidence of deskilling within a few selected industries during the sixties but the changes were small and reversed by larger positive changes during the seventies. A similar pattern for this time period using very different measures of "deskilling" has also been found in the United States (Wright and Singelmann, 1982; Wright and Martin, 1987)

To summarize the relative contribution of changes in industrial composition and changes in skill composition within industries over this period, Table 9 presents the results of a "shift-share" analysis. Briefly, this method allocates the total change in skill levels to three components: (a) a component due to changes in industrial composition (the industry shift effect); (b) a component due to changes in the skill distribution within industries (the skill composition shift); and (c) the interaction of (a) and (b). The first component can be thought of as measuring what would have happened had there been a change in industrial composition but no change in the skill mix within industries and the second as what would have happened had there been no change in industrial composition and only the observed change in the skill mix within industries had occurred.²⁰ The results are calculated

TABLE 8: Change in Skill Level Within Industries, Index of Net Difference, Experienced Non-agricultural Labour Force, Canada, 1961-1

	Change in Skill Level, Index of Net Difference ¹							
	1961-1971				1971-1981			
	Specific Vocational Preparation	General Education Development	Cognitive Complexity	Routine Activity	Specific Vocational Preparation	General Education Development	Cognitive Complexity	Routine Activity
1. Industrial Sector								
- Extractive	.15	.16	.15	.14	.10	.12	.12	.10
- Manufacturing	.03	.02	.04	.03	.05	.03	.02	.04
- Construction	.04	.02	.04	.05	.07	.06	.00	.00
- Transport, Communication, Utilities	.03	.06	.05	.03	.06	.04	.05	.06
Total Industrial	.04	.04	.05	.03	.06	.05	.05	.06
2. Service Sector								
- Trade	.02	-.06	.00	.01	.22	.19	.14	.19
- Business Services	-.04	-.07	-.04	-.02	.00	.09	.07	.09
- Social Services	-.02	-.04	-.01	-.02	.04	.03	.04	.02
- Consumer Services	.03	-.08	.02	.03	.08	.07	.07	.07
- Public Administration	.02	.07	.02	-.01	.11	.11	.11	.11
Total Services	.04	.00	.02	.03	.10	.09	.08	.09

¹ Calculated between time periods within industries.

for the non-agricultural labour force using a detailed 42 industry classification (see Appendix B).

Despite the morass of numbers in Table 9, the conclusions are simple. First, there was modest upgrading of skills during the sixties and this was largely due to changes in industrial composition. In general, the industry shift effects are larger than the skill composition shifts during this decade. The more important conclusion, however, is that most of the change in skill levels occurred in the seventies and changes in industrial composition had little or nothing to do with these shifts. Virtually all of the change during the seventies was a result of the changing skill mix within industries. In sum, neither Bell nor Braverman provide a useful point of departure for understanding the shifts that occurred during this twenty year period. There is little of the deskilling anticipated by Braverman; and the upgrading observed was only marginally associated with the emergence of the service economy described by Bell.

The general conclusions to be drawn from these data are that the years from 1961 to 1981 were a period not only of continued but accelerated expansion of new middle class jobs; that this "upgrading" did not occur by deskilling the working class; and that prevailing accounts derived from theories of post-industrialism are little help in explaining these trends. I return to this issue in the conclusion. Before doing so, however, it is necessary to address an additional question concerning the validity of these measured trends. As we will see, this exercise adds an important modification of the results presented so far.

TABLE 9: Effects of Changing Industrial Composition on the Skill Distribution of Jobs, Experienced Non-agricultural Labour Force, Canada, 1961-1981

	1961-1971				1971-1981			
	Total Change	Industry Shift	Skill Composition Shift	Interaction	Total Change	Industry Shift	Skill Composition Shift	Interaction
1. Specific Vocational Preparation								
< 30 days	-2.41	-0.65	-1.30	-0.47	-6.23	0.06	-6.25	-0.04
1-3 months	-2.44	-1.76	-0.58	-0.10	-2.18	-0.05	-1.40	0.06
3-6 months	2.61	-0.33	2.79	0.15	1.18	-0.18	1.30	0.06
6-12 months	-0.20	-0.07	-0.07	-0.06	4.15	0.31	3.86	-0.02
1-2 years	0.14	1.23	-1.50	0.40	0.13	0.23	-0.32	-0.04
> 2 years	2.31	1.57	0.65	0.09	3.22	0.42	2.82	-0.02
2. General Educational Development								
1	-0.42	-0.16	-0.10	-0.15	-1.41	0.03	-1.47	0.03
2	-4.76	-2.38	-2.00	-0.38	-5.91	-0.08	-5.86	0.03
3	1.63	-0.37	1.95	0.05	3.90	0.20	3.72	-0.02
4	2.23	2.24	-0.45	0.44	1.21	0.42	0.80	-0.01
5/6	1.31	0.67	0.61	0.03	2.21	0.23	2.01	-0.04
3. Cognitive Complexity								
1	-2.73	-1.91	-0.49	-0.33	-2.02	-0.40	-2.35	-0.01
2	-0.84	-0.69	-0.03	-0.13	-0.93	-0.33	-0.64	0.04
3	0.00	-0.00	0.98	-0.10	-3.63	-0.23	-3.37	-0.03
4	0.26	1.36	-1.60	0.50	3.73	0.50	3.20	0.03
5	3.32	2.12	1.14	0.06	3.65	0.54	3.17	-0.06
4. Routine Activity								
1	-3.57	-1.75	-1.41	-0.41	-6.98	0.10	-6.72	0.06
2	.10	-0.72	1.00	-0.18	-0.49	0.56	-0.09	-0.03
3	.03	-0.32	1.07	0.09	3.93	0.03	3.87	0.03
4	.03	1.03	-1.52	0.53	1.41	-0.30	0.89	-0.03
5	1.00	0.97	0.07	-0.03	2.13	-0.32	2.05	-0.03

What Do the Worker Trait Scores Measure?

The conclusions so far rest on the premise that the worker trait data provide a valid measure of changes in the skill distribution of jobs over this twenty year period. We know, however, there are several sources of error in these measures (Cain and Treiman, 1981; Hunter and Manley, 1986; Spenner 1983). The most serious of these for present purposes, however, is the assumption of historical invariance within the 486 occupational titles from the 1971 census. Because of this assumption, there is strong reason to suspect that measured skill changes using these data are conservative, i.e. they underestimate both the upgrading and the deskilling that has taken place. The critical issue, however, is not the presence of measurement error but the bias it introduces. In this section I address this problem by comparing 1981 worker trait estimates with self-reported skill levels from the Canadian Class Structure Survey in 1982-83. The survey results indicate more polarization in the skill distribution of jobs than the worker trait estimates but not of the form anticipated by Braverman. The main cleavage is not between professional-managerial and all other workers but within the working class itself, a cleavage that cuts across both white collar and blue collar occupations.

The 1981 worker trait estimates of Specific Vocational Preparation and self-reported training time requirements before and after adjustment for educational training (see p. 8) are presented in Table 10. Irrespective of whether we consider the entire non-agricultural labour force or only wage and salary earners, the results are the same: the self-report distributions are considerably more polarized than the worker trait estimates. Approximately 40

TABLE 10: Self-Report and Worker Trait Estimates of Training Time Requirements

1. Experienced Non-agricultural Labour Force, Total

	1981 Worker Trait Estimates	Class Structure Survey*	
		Unadjusted	Adjusted
< 30 days	11.9	40.2	30.3
1-3 months	17.9	14.7	10.1
3-6 months	17.7	7.0	4.8
6-12 months	18.7	10.3	5.0
> 1 year	<u>34.1</u>	<u>27.8</u>	<u>49.8</u>
Total	100%	100%	100%

2. Experienced Non-agricultural Labour Force, Wage and Salary Earners

	1981 Worker Trait Estimates	Class Structure Survey*	
		Unadjusted	Adjusted
< 30 days	12.7	41.6	31.4
1-3 months	17.9	15.2	10.5
3-6 months	18.2	7.2	4.8
6-12 months	19.3	9.8	4.7
> 1 year	<u>31.9</u>	<u>26.2</u>	<u>48.6</u>
Total	100%	100%	100%

* Adjusted estimates include formal educational requirements; unadjusted estimated do not. See text for discussion.

percent of survey respondents said their jobs could be learned in less than a month. After adjusting for those who say some post-secondary education is required, the figure falls to approximately 30 percent but this contrasts with an estimate of only 12 percent in the worker trait data.²¹ In short, survey respondents report a very high percentage with no skill requirements whatsoever. But they also report a higher proportion of skilled jobs than is indicated by the worker trait estimates. After adjusting for educational requirements, the survey estimates show almost half the jobs in the labour force as requiring a year or more of training compared to an estimate of less than a third in the worker trait data.

Examination of the distributions by occupation (Table 11) sheds some light on the reason for these differences. According to the worker trait estimates, virtually all administrators, professionals and technical workers but almost no other occupations require a year or more of training. This pattern confirms Braverman's view of the skill distribution but the survey results indicate the people who hold these jobs do not agree. According to the incumbents of Braverman's new "mass occupations", these positions are both more skilled and less skilled than one would conclude from the worker trait estimates. Over 40 percent of both blue and white collar workers state that their jobs can be learned in less than a month but almost 30 percent also indicate their jobs require a year or more of training. What should we conclude?

Braverman predicted skill polarization would emerge between a small "new middle class" of administrative and technical workers whose future

TABLE 11: Self-Report and Worker Trait Estimates of Training Time by Occupation, Wage and Salary Earners

	Occupation			
	Administrators	Professional and Technical	White Collar	Blue Collar
1. 1981 Worker Trait Estimates				
< 30 days	0.0	0.0	9.9	24.9
1-3 months	0.0	0.3	16.0	33.0
3-6 months	0.1	1.2	37.8	14.5
6-12 months	3.2	2.5	32.2	20.5
> 1 year	<u>96.7</u>	<u>96.0</u>	<u>4.2</u>	<u>7.3</u>
Total	100%	100%	100%	100%
	Occupation			
	Administrators	Professional and Technical	White Collar	Blue Collar
2. Self-Report - Class Structure Survey				
< 30 days	11.3	2.8	43.8	44.6
1-3 months	7.1	1.1	14.2	13.5
3-6 months	2.0	1.3	6.4	6.1
6-12 months	3.2	0.9	5.6	6.7
> 1 year	<u>76.4</u>	<u>93.8</u>	<u>30.1</u>	<u>28.0</u>
Total	100%	100%	100%	100%

expansion was inherently self-limiting and a large working class of increasingly deskilled proletarians. The census indicates the first prediction was incorrect: new middle class occupations have expanded not declined. Together the administrative, professional and technical categories grew from 24 percent of the non-agricultural labour force in 1961 to 31 percent in 1981 and the survey data give no reason to question the conclusion from the worker trait estimates that this has resulted in upgrading.²²

However, the survey findings do give us reason to pause over the results indicating a monotonic increase in skill levels in the rest of the economy, i.e. among Braverman's "new mass occupations".²³ Instead of the homogeneous semi-skilled work force found with the worker trait estimates, the survey indicates a polarized skill distribution of skilled and unskilled workers. And contrary to much traditional and current sociological wisdom (Gagliani, 1981), this is not a cleavage captured by the distinction between white and blue collar workers. The implication is that neither Braverman's "mass occupations" (which imply a homogeneous and universal process of deskilling) nor Bell's "knowledge society" (which implies the reverse) provide appropriate metaphors to describe this pattern. Both, it would seem, should be replaced with the metaphors of the segmented labour market theorists (Averitt, 1968; Doeringer and Piore, 1971; Edwards, 1979): the pattern is that of a "split" or "dual" labour market for jobs skills.

Discussion

These results and similar studies of changes in occupation and class composition in both Canada (Melz, 1965; Foot and Melz, 1985; Picot, 1986b) and the United States (Singelmann and Tienda, 1983; Wright and Martin, 1987) show

that through the sixties, the relative increase in the number of "good jobs" in the economy was largely a result of changes in industrial composition. A major component of this was employment growth in the state sector -- public administration during the fifties and the health, social and educational services associated with the modern "welfare state" during the sixties (Picot, 1986a). By the seventies, however, this source of growth was exhausted. What accounts for the expansion of "good jobs" thereafter is a more speculative matter.

Foot and Melz (1985) suggest changes in relative wage differences and technological factors as explanations. Wright and Martin (1987) propose changes both in technology and in the international division of labour. An account that directly incorporates the major economic turning point of the seventies, the economic "crisis" that became manifest after 1973, is that of Bowles, Gordon and Weiskopf (1983). They argue that the expansion of non-production workers in the American economy formed part of the "Great Repression", a concerted effort by employers to regain control of the workplace lost in the preceding decade. This is a plausible interpretation because of the well-known historical bias of the American economy towards greater reliance on managerialist solutions to problems of productivity and technical change (Chandler and Deams, 1980; Lewchuck, 1985; Melman, 1951). In sum, a traditional response of North American management to economic crisis and productivity slowdown is to throw more management at the problem. This bias continues to be evident in the structure of the contemporary American economy and also in the Canadian, especially in those sectors dominated by American branch plants (Black and Myles, 1986). This interpretation is also

broadly consistent with trends in the Canadian economy during the seventies. During this period, the growth of managerial occupations accelerated while the reverse was true for professional occupations (Foot and Melz, 1985: 17).

None of the results presented here, however, should be construed as providing direct or indirect evidence for this conclusion. By itself, the evidence is ambiguous. More managers and professionals may mean a greater effort to gain control over the "shop floor"; it may also be the result of eliminating less skilled jobs and a shift to a more complex labour process.²⁴ Rather, my point is to underline the sort of explanation these data require and it is not one that can be deduced from general theory in the manner of Bell or Braverman. The "managerialist bias" identified by the economic historians was a distinctive feature of American capitalism, not of capitalism per se. Hence, it is a subject for historical-comparative analysis, not something to be mechanically deduced from the "logic of capitalism".

Whatever the explanation, it is clear that at this point in history traditional dichotomies based on the "goods" to "services" distinction are no longer adequate for anticipating or explaining emergent trends in the skill distribution of jobs or class structure. The main reason for this is that most of the labour force is now part of the service economy. As a result, future changes will take place largely within the service sector. Over the postwar period, the service economy has had three major growth centres: the state sector including social services and public administration, business services and consumer services. Each has had, and will continue to have, rather different effects in shaping both the supply of "good jobs" and the class structure.

The threat of the "hamburger economy" portrayed by Kuttner and the deindustrialization theorists is quite real. Food and accommodation services made the list of the ten fastest growing industries in all three decades between 1951 and 1981 (Picot, 1986a:21). The effects of this were outweighed by expansion of the high skill industries but were not without consequence: the growth of consumer services has helped to produce a bifurcated post-industrial labour market. Comparative evidence indicates this dual labour market for job skills is a contingent not a necessary feature of a post-industrial economy, however. Esping-Andersen (1987) has shown that the rapid expansion of what he calls the "food, fun and wine industries" is an American trend that is not replicated in either Sweden or Germany. But it is one that has spilled over into Canada.

There are a number of reasons for this including characteristics of the labour supply (a large number of young workers) and the demand for such services (a large number of single-person households). But labour politics and public policy also matter. In Sweden, wage policies that systematically put low wage employers out of business combined with the "crowding out" effects of a large welfare state create an inhospitable environment for low wage, unskilled service industries (Esping-Andersen, 1987). Conversely, policies that encourage "flexible" labour markets at the bottom of the wage structure and government "restraint" in providing public services will tend to have the opposite effect.²⁹

Public policy is also involved in shaping the social and political character of the new middle class. As we have seen, the new middle class formed in the fifties and sixties was largely a "public sector/welfare state"

middle class. In contrast, the seventies contributed to the relative growth of a "commercial" new middle class. This is most evident among its credentialed members (university graduates), the majority of whom have traditionally been employed in public administration and the social services, i.e. by the state. In 1971, over 60 percent of all graduates were employed in the public sector. By 1981, the figure had fallen to 54 percent and among young workers (age 15-29) the shift was even more striking -- from 60 to 45 percent.²⁶ This shift has been evident in a political culture increasingly hostile to "big government" and distrustful of the "welfare state" as a solution to social problems. The new middle class formed in the fifties and sixties (civil servants, teachers, social and health care workers) is the target of this distrust. The result -- government restraint in health, education and welfare -- is less indicative of a "crisis" of the new middle class, however, than the emergence of a new political fault line within it.

Notes

1. Whether skilled labour in the U.S. has declined in the last century is a point of considerable dispute (Spenner, 1983; Form, 1987). Among economic historians, however, there does seem to be a consensus that American employers introduced industrial technology in a way that precluded the need for skilled labour (Lewchuck, 1986). Hence, the "deskilling thesis" may be thought of in terms of an opportunity foregone, i.e. not in terms of a decline of skilled jobs but as a missed opportunity to expand such jobs. This does not mean Braverman is correct, however. The same literature emphasizes that this was a feature of American capitalism rather than capitalism per se. Hence, it is a subject for historical-comparative analysis, not something to be deduced from the "logic of capitalism".

2. See especially Braverman's (1974: chapter 20) extended discussion of the way in which upgrading was inferred as a result of changes in the occupational classification used by the U.S. Bureau of the Census.

3. The CCDO classifications were adapted from the American Dictionary of Occupational Titles or DOT (United States, 1965) gathered through on-site observation of jobs by occupational analysts. For a discussion and history of the DOT see Cain and Treiman (1981). The measurement properties and problems associated with these measures are discussed extensively in Cain and Treiman (1981), Hunter and Manley (1986) and Spenner (1983). Less seems to be known about the procedures used to adapt the DOT to the Canadian context (Hunter and Manley, 1986).

4. Since neither the census nor most surveys attempt to code occupations to the 7 digit level required to take full advantage of this information, the analysis is based on average scores for the 486 occupational titles of the 1971 census (see Hunter and Manley, 1986 for details). I am grateful to Alf

Hunter for making these data available to me.

5. The 1971 public use sample frame uses a 1 percent sample yielding approximately 87,000 observations. For 1981, a 2 percent sample frame was available yielding approximately 213,000 observations.

6. This includes university or college training that is vocationally oriented but excludes liberal arts degrees. Training time in formal educational programs is weighted to be half of that acquired directly on the job.

7. For details see Black and Myles (1986). The sample was a multistage probability sample of Canada's ten provinces stratified by region and community size. Completed interviews were obtained in 76 percent of eligible households. Total sample size was 2577. Here I make use of a sub-sample of approximately 2039 observations selected to approximate the census "experienced labour force" definition.

8. Respondents were asked "how much on-the-job training, apprenticeship training or job experience is now normally required for people who do your type of work" and then asked to choose from a list corresponding to the SVP categories. The responses to this question were then adjusted to take into account the formal educational component of the SVP scale. The SVP counts one hour of specific vocational preparation for every two hours of vocationally oriented post-secondary education. The exception is a degree in the liberal arts for which no equivalency is given. We were able to approximate this criteria with a question asking respondents: "what level of formal schooling is now normally required for people who do your type of work?" The response categories were: (1) Grade school diploma or less; (2) Some high school; (3) Completed high school; (4) College/Vocational School; (5) University

Bachelor's Degree; (6) Master's Degree or higher. With this information the initial scores were adjusted so that all respondents who indicated that entry to their jobs required a post-secondary education (including college or vocational school) were imputed to require a year of specific vocational preparation or more. More detailed adjustments are possible with the data but these would exaggerate the precision in our measures. Because we could not distinguish liberal arts from other degrees, the adjusted scores probably overestimate skill requirements.

9. One reviewer commented that, because of measurement problems, conclusions about the shape of the skill distribution are less persuasive than conclusions about trends and should be downgraded in the presentation. While this observation is technically correct, I chose not to follow this advice in order to emphasize the fact that there is precious little evidence to support the view that most jobs are now skilled jobs and that Braverman was undoubtedly correct in drawing this to our attention.

10. The results presented here are for the entire non-agricultural labour force. Braverman's theory is not about all labour, however, but about the labour employed by capital. Accordingly, all of the analyses for 1971 and 1981 were done twice: for the total labour force and for wage and salary workers only. The conclusions of both analyses were identical. Unfortunately, the "class of worker" variable necessary to separate employees from employers and the self-employed was not included in the 1961 sample. The implications are minor, however, since most of the observed skill change occurred in the seventies.

11. In a strict sense, all of the change that is measured with the census data is the result of a compositional shift in the underlying 486

occupational titles. This does not obviate the value of the distinction, however, since here we are concerned with a particular set of compositional shifts raised by Braverman, namely the growth of professional-managerial occupations, on the one hand, and the new mass occupations on the other.

12. The occupational categories used here and elsewhere in the analysis are aggregations of the Pineo-Porter-McRoberts (1977) classification. The "Professional and technical" category aggregates their employed and self-employed professionals, semi-professionals and technicians (categories 1, 2, 4 and 5); the "administrative" category aggregates their high-level and middle management, supervisors and foremen (categories 3, 6, 8, and 9); the "white collar" category aggregates all clerical, sales and service workers (categories 9, 12 and 14); and the "blue collar" category aggregates crafts and trades and all manual workers (categories 10, 13 and 15).

13. Braverman did not argue that the total amount of science and technology that go into the labour process had declined. To the contrary, the average amount of scientific knowledge that goes into production increases dramatically over time. But as this occurs, the direct producers are deskilled while the numbers of managers and technical experts (engineers) increase. The "average" skill level may actually increase but as Braverman (1974:425) observes to take comfort from this fact:

...is to adopt the logic of the statistician who, with one foot in the fire and the other in ice water, will tell you that "on the average" he is perfectly comfortable. The mass of workers gain nothing from the fact that the decline in their command over the labour process is more than compensated for by the increasing command of managers and engineers.

14. For reviews see Abercrombie and Urry (1983), Black (1987) and Clegg,

Boreham and Dow (1986).

15. Throughout the text I equate professionals and managers with the "new middle class" and all other employees as "working class". We have been told frequently that "occupations are not classes" (Wright, 1980) and that it is inappropriate to use occupational categories designed to identify the technical division of labour to study the social division of labour. Any careful inspection of standard occupational codes and their definitions will indicate this is not the case. Virtually all of the categories of conventional class typologies can be identified by cross-classifying the two traditional variables of labour force analysis: occupation and class of worker. The problem is a technical one of measurement quality rather than conceptual or theoretical. What occupational data do not allow are the fine-grained analyses of social relations of authority and control that studies designed for this purpose permit.

16. Bell (1973:126-27), foreshadowing Braverman, writes:

Skills are broken down into simpler components and the artisan of the past is replaced by two new figures -- the engineer who is responsible for the layout and flow of work, and the semi-skilled worker, the human cog between machines -- until the technical ingenuity of the engineer creates a new machine and replaces him as well.

17. The index is designed to compare ordinal level frequency distributions and takes on values between -1.0 and +1.0. The formula for the index is: $ND_{xy} = \text{pr}(X > Y) - \text{pr}(Y > X)$. It can be interpreted as measuring the probability that a randomly selected individual from distribution X will have a higher or lower score on characteristic I than a randomly selected

individual from distribution Y and can be thought of as a statistical analogue of the index of dissimilarity for use with ordinal data.

18. The industry classification used here and elsewhere in the paper is described in Appendix B. It is a modification of a scheme widely used elsewhere (Singelmann, 1978; Picot, 1986a) to capture the transition from an "industrial" to a "post-industrial" economy. More importantly, it allows us to identify clearly the empirical basis for the contrary expectations about the consequences of this shift.

19. Indeed, for the economy as a whole the proportion of sales workers declined (Foot and Melz, 1985)

20. "Shift-share" analysis has appeared in a variety of forms and is basically an application of standardization techniques familiar to demographers. To estimate the "industry shift effect", for example, one poses the counterfactual question: What would have happened to the skill mix had there been no change in industry composition and only the skill mix within industries had changed? To answer the question standardization is used to hold the effects of industry change "constant" and produce the counterfactual estimate of what would have happened in the absence of the change in industry composition. The difference between the observed and the counterfactual estimates is the "industry shift effect". In a similar way, the skill composition shift is estimated by asking what would have happened had there been a change in industry composition but no change in the skill mix within industries. Interactions are large when there is a correlation between the two components, e.g. where the fastest growing industries are also those with the greatest change in their internal skill composition. When interactions are large relative to the main effects this also means that the results are

sensitive to the referent chosen for standardization, e.g. standardization of 1981 on 1971 data will produce different results and conclusions than when 1971 data is standardized on 1981 data. More generally it means that the summary measures of "effects" are potentially quite misleading. This is not the case with the results presented here. A readily available exposition of this method can be found in Wright and Singellman (1982).

21. The underlying numbers are even more dramatic. With the worker trait data I followed the practice of combining the lowest two categories (short demonstration, less than 30 days) because the numbers estimated to require a short demonstration were so small. In the survey, however, 18.5 percent of all wage salary workers reported jobs that required a "short demonstration only" even after adjustment for educational requirements.

22. If anything, the survey data indicate a larger "new middle class". Compare the results here to those in Black and Myles (1986).

23. Because the survey results represent a single point in time, they do not allow us to make any definitive statement about trends. Part or all of the difference between the worker trait and survey estimates may be an artifact of measurement strategy. The most we can say is that the survey findings reinforce the conclusion concerning the upgrading that results through the growth of professional, technical and managerial jobs but cast some doubt on the trends observed in the rest of the labour force.

24. A clear pattern of monotonic upgrading across all levels of the skill hierarchy as indicated by the worker trait estimates could be counted as *prima facie* evidence for the latter interpretation. The survey results, however, do not support this conclusion.

25. A Guaranteed Annual Income, for example, would subsidize not only

the working poor but also their employers encouraging the expansion of such jobs. In contrast, renewed growth of the "welfare state" industries in health, education and welfare would have the opposite effect.

26. On the change in employment patterns of university graduates see Picot (1983).

APPENDIX A

Rating Level of Specific Vocational Preparation and General Educational Development

1. Special Vocational Preparation

Level	Time
1	Short demonstration only.
2	Anything beyond short demonstration up to and including 30 days.
3	Over 30 days up to and including 3 months.
4	Over 3 months up to and including 6 months.
5	Over 6 months up to and including 1 year.
6	Over 1 years up to and including 2 years.
7	Over 2 years up to and including 4 years.
8	Over 4 years up to and including 10 years.
9	Over 10 years.

2. General Educational Development

Reasoning Development	Mathematical Development	Language Development
<p>Apply principles of logical or scientific thinking to a wide range of intellectual and practical problems. Deal with non-verbal symbolism (formulas, scientific equations, graphs, musical notes, etc.) in its most difficult phases. Deal with a variety of abstract and concrete variables. Apprehend the most abstruse classes of concepts.</p> <p>Apply principles of logical or scientific thinking to define problems, collect data, establish facts and draw valid conclusions. Interpret an extensive variety of technical instructions, in books, manuals, and mathematical or diagrammatic form. Deal with several abstract and concrete variables.</p> <p>Apply principles of rational systems to solve practical problems and deal with a variety of concrete variables in situations where only limited standardization exists. Examples of "principles of rational systems" are: Bookkeeping, internal combustion engines, electric wiring systems, house building, nursing, farm management, ship sailing. Interpret a variety of instructions furnished in written, oral, diagrammatic, or schedule form.</p>	<p>Apply knowledge of advanced mathematical and statistical techniques such as differential and integral calculus, factor analysis, and probability determination, or work with a wide variety of theoretical mathematical concepts and make original applications of mathematical procedures, as in empirical and differential equations.</p> <p>Perform ordinary arithmetic, algebraic and geometric procedures in standard, practical applications.</p>	<p>Comprehension and expression of a level to</p> <ul style="list-style-type: none"> - Report, write, or edit articles for such publications as newspapers, magazines, and technical or scientific journals. Prepare and draw up deeds, leases, wills, mortgages, and contracts. - Interview, counsel, or advise such people as students, clients, or patients, in such matters as welfare eligibility, vocational rehabilitation, mental hygiene or marital relations. - Evaluate engineering technical data to design buildings and bridges. <p>Comprehension and expression of a level to</p> <ul style="list-style-type: none"> - Transcribe dictation, make appointments for executive and handle his personal mail, interview and screen people wishing to speak to him, and write routine correspondence on own initiative. - Interview job applicants to determine work best suited for their abilities and experience, and contact employers to interest them in services of agency. - Interpret technical manuals as well as drawings and specifications, such as layouts, blueprints, and schematics.

Level	Reasoning Development	Mathematical Development	Language Development
3	Apply common sense understanding to carry out instructions furnished in written, oral, or diagrammatic form. Deal with problems involving several concrete variable in or from standardized situations.	Make arithmetic calculations involving fractions, decimals and percentages.	Comprehension and expression of a level to <ul style="list-style-type: none"> - File, post and mail such material as forms, cheques, receipts, and bills. - Copy data from one record to another, fill in report forms, and type all work from rough draft or corrected copy.
2	Apply common sense understanding to carry out detailed but uninvolved written or oral instructions. Deal with problems involving a few concrete variables in or from standardized situations.	Use arithmetic to add, subtract, multiply, and divide whole numbers.	<ul style="list-style-type: none"> - Interview members of household to obtain such information as age, occupation, and number of children, to be used as data for surveys, or economic studies. - Guide people on tours through historical or public buildings, describing such features as size, value, and points of interest.
1	Apply common sense understanding to carry out simple one- or two- step instructions. Deal with standardized situations with occasional or no variables in or from these situations encountered on the job.	Perform simple addition and subtraction, reading and copy of figures, or counting and recording.	Comprehension and expression of a level to <ul style="list-style-type: none"> - Learn job duties from oral instructions or demonstration. - Write identifying information, such as name and address of customer, weight, number, or type of product, on tags, or slips. - Request orally, or in writing, such supplies as linen, soap, or work materials.

Source: Canada, Canadian Classification and Dictionary of Occupations, Volume 1, Ottawa: Department of Manpower and Immigration, Pages 1161-62.

APPENDIX B
Industrial Classification

1. Industrial Sector

1.1 Extractive:

forestry; fishing, trapping; mines, oil gas

1.2 Manufacturing:

food, beverage; rubber, plastic; leather; textile; knitting; clothing; wood industries; furniture, fixture; paper; printing, publishing; primary metal; metal fabricating; machinery; transport equipment; electrical equipment; non-metallic miner.; petroleum, coal, gas; miscellaneous

1.3 Construction

1.4 Utilities, Transport and Communication:

utilities; transport, storage; communication

2. Service Sector

2.1 Trade

wholesale trade; retail trade; miscellaneous trade

2.2 Business Services

financial; insurance; insurance, real estate agents; miscellaneous business services

2.3 Social Services

education; health; welfare; miscellaneous, religious

2.4 Consumer Services

entertainment; personal; accommodation, food; miscellaneous services

2.5 Public Administration

federal; provincial; local, other

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