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The Service Industries in Canada,

1946–66

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INTRODUCTION

THE subject of this volume reflects the increasing concern being felt over the paradox demonstrated in the growing importance of the service industries and the simultaneous existence of glaring gaps in our theoretical and empirical knowledge of this sector. Although the trends that have shaped the present industrial structures of the developed economies of the world are both long-standing and, in certain superficial respects, even obvious, their measurement and systematic analysis is a comparatively recent phenomenon.[1] The inventory of published work which has slowly accumulated owes much to the National Bureau of Economic Research's series during the 1950's on production, employment, and productivity in American industry. The contributions by Barger and Stigler,[2] for instance, may be noted as direct antecedents of the Bureau's current program of research aimed specifically toward the service industries.[8]

[1] Colin Clark's *The Conditions of Economic Progress,* 1st edition, London, 1940, is generally recognized as the first empirical study of comprehensive scope.

[2] Harold Barger, *The Transportation Industries, 1889–1946: A Study of Output, Employment, and Productivity,* New York, NBER, 1951, and *Distribution's Place in the American Economy since 1869,* Princeton for NBER, 1955; George J. Stigler, *Trends in Employment in the Service Industries,* Princeton for NBER, 1956.

[8] In the context of this paper, specific mention may be made of Victor R. Fuchs' *Productivity Trends in the Goods and Service Sectors, 1929–61: A Preliminary Sur-*

Canadian data on the industrial distribution of national product and the labor force have been used in comparative international studies of the structural changes accompanying economic growth,[4] but the record of indigenous research is a meager one. Some studies parallel to the NBER series exist in the background studies prepared a decade ago for the Royal Commission on Canada's Economic Prospects and in its own assessment of "the probable economic development of Canada and the problems to which such development appears likely to give rise." [5] Special mention may be made of the study by Hood and Scott, who, with sectoral projections of employment, productivity, and output, and the historical analysis underlying them, clearly established the growing importance of the service industries in Canada and tentatively estimated the measure of their potential contribution to the key growth variables.

, Despite the clear indication thus provided of pressing research needs in the area of services, there has been since that time only fragmentary reporting of their role in the structural evolution of the Canadian economy; certainly there have been no basic studies to identify, measure, and explain the factors which might be at work in it. The objectives of this paper are: first, to repair the purely descriptive aspects of this deficiency with up-to-date and, to some extent, new statistical material; and, second, to make a start on the analytical task by testing Fuchs' major findings at the aggregate level against these data. Two other "country" papers [6] have already drawn on the Fuchs-Denison methodology. Some Canadian evidence should there-

vey, Occasional Paper 89, New York, NBER, 1964, and *The Growing Importance of the Service Industries*, Occasional Paper 96, New York, NBER, 1965. Other studies, both completed and in progress, are listed in *Contributions to Economic Knowledge Through Research*, 47th Annual Report, New York, NBER, June 1967.

4 See, for example, Simon Kuznets, "Quantitative Aspects of the Economic Growth of Nations, II, Industrial Distribution of National Product and Labor Force," *Economic Development and Cultural Change*, Supplement to vol. V, No. 4, July 1957, and *Modern Economic Growth: Rate, Structure and Spread*, New Haven and London, 1966.

5 Bank of Montreal, *The Service Industries;* J.-C. Lessard, *Transportation in Canada;* W. C. Hood and Anthony Scott, *Output, Labour and Capital in the Canadian Economy; Final Report;* Ottawa, 1956–57.

6 B. M. Deakin and K. D. George, "Productivity Trends in the Service Industries, 1948–63," *London and Cambridge Economic Bulletin*, No. 53, March 1965; J. A. Dowie, "Productivity Growth in Goods and Services: Australia, U.S.A., U.K.," *The Economic Record*, December 1966.

fore be helpful in broadening the international perspective. From a purely domestic point of view, a survey of the service industries as a whole and their interrelations with other major sectors of the economy has been shown by Fuchs to be a necessary preliminary to more detailed studies.

Comparisons between Canada and the United States can hardly be avoided but, because of the aggregative nature of the data used for both countries and the attendant simplifications of methodology, the scope for useful conclusions is somewhat limited. It might, for instance, seem that the service sector in Canada has developed along lines similar to that of the United States, but not to the same extent, so that historical experience in the United States could provide some basis for anticipating the future course of events in Canada. In fact, any rigorous comparative study would require not only a much more detailed analysis of the basic economic statistics of what Stigler has graphically called "the promiscuous ensemble of the service industries" [7] but also the assembly of a very wide range of supplementary information. For although the parallel growth of the Canadian and U.S. economies suggests certain common developments (such as the spread of education, better medical services, and the growth of government functions), there must be considered against this the many influences (geographic, political, cultural, and social as well as purely economic) that qualify this broad picture of similarity and interdependence. As Stigler put it:

. . . those forces which we have found to be directly related to employment in the service industries are not in general perfectly, or indeed always highly, correlated with rising real income or any other index of economic development. We must therefore expect to find large national differences in the roles and rate of growth of the service industries: as between two countries with equal real incomes, the service industries will be larger . . . the greater the urbanization, the higher the level of education, the lower the degree of inequality of income distribution, the larger the relative numbers of children and aged in the population and so forth.[8]

One obstacle to comparisons between the Canadian findings of this paper and those of Fuchs arises from the difference in sector defini-

[7] *Op. cit.,* p. 166.
[8] *Op. cit.,* pp. 165–166.

tions. Those used here follow the classification system presently in use by the Dominion Bureau of Statistics for its measures of real output by industry of origin,[9] which treats transportation, storage, and communication as service industries. The goods sector thus comprises: agriculture; forestry, fishing, and trapping; mining, quarrying, and oil wells; manufacturing; construction; and public utility operations. The service sector comprises transportation, storage, and communication; trade; finance, insurance, and real estate; community, recreation, business and personal services; and public administration and defense. This definition underlies most analytical usage in Canada and was, in particular, adopted as the basis for the official measures of productivity change in the goods and service sectors, although in this case service is actually restricted to the commercial service industries.[10] Hood and Scott also treated transportation, storage, and communication as a service industry, but within a more detailed framework, in which the goods sector was divided into agriculture, resource industries, primary and secondary manufacturing, and construction.

The analysis of productivity differentials between the goods and service sectors that is central to this paper is primarily based on the DBS measures, which have been privately extended to include the noncommercial industries. For full sector comparisons, the definitions used here differ from Fuchs' only as noted. For a modified goods sector analogous to Fuchs' "goods*," the official productivity data for the nonagricultural goods industries were used, and to approximate "service*," those for the commercial service industries were used.

In the analysis of long-term trends in the industrial distribution of the labor force, the supporting tabular material shows data for the Fuchs, as well as the Canadian, definition of the service sector.

Two other points of a technical nature should also be made. First, while many of the primary statistical series of DBS now reflect the 1960 Standard Industrial Classification, derived aggregates such as industry distributions of current and constant dollar gross domestic

[9] See DBS Catalogue No. 61-505, *Indexes of Real Domestic Product by Industry of Origin, 1935–61,* Ottawa, 1963; and DBS Catalogue No. 61-005, *Annual Supplement to the Monthly Index of Industrial Production,* Ottawa, annual.

[10] DBS Catalogue No. 14-201, *Aggregate Productivity Trends,* Ottawa, 1967. The noncommercial exclusions comprise public administration and defense, education, hospitals, religion, other community services not elsewhere classified, and domestic service.

product are still generally being compiled on the 1948 basis. Hence, the Census and Labor Force Survey data of Tables 1 and 3, respectively, are the only exceptions to the consistent use of the old classification basis. It may be noted, incidentally, that the new classification favors the service sector slightly at the expense of goods since one of its more important effects is the transfer of establishments primarily engaged in repair work from manufacturing to retail trade and various other service industries.

The second point concerns the comparability of the current and constant dollar distributions of GDP. With the major exception of their labor income component, which is assembled from establishment data, current dollar distributions are classified on a company basis, while the constant dollar distributions are wholly on an establishment basis. Classification differences between the two series reflect the extensive degree of vertical integration between the resource industries and manufacturing and, to a certain extent, trade. They are quite important in industries such as forestry and mining, but the distorting effect on a "goods" and "service" comparison is probably not significant.

HISTORICAL LABOR FORCE TRENDS

As implied in the introductory comments, a major task of this paper must be to establish the extent to which Canadian experience confirms Fuchs' findings for the United States: that employment has been rising at an appreciably faster rate in the service industries than in the goods industries since 1929 and, in particular, that "virtually all of the net growth of employment in the United States in the postwar period has occurred in the service sector." [11] For this purpose, decennial census distributions by industry of the experienced labor force [12] from 1931 forward have mainly been used, together with some adjusted U.S. Census data for 1950 and 1960.

The Bank of Montreal's analysis of changes in the industrial struc-

[11] *The Growing Importance of the Service Industries*, p. 1.

[12] Census industry and occupation data before 1951 were based on the "gainfully employed" concept rather than the "labor force" concept. This may affect comparability over time in the industries where part-time female labor is important. For an explanation of the difference between these concepts, see Dominion Bureau of Statistics, *Ninth Census of Canada, 1951, Report No. SP-8, Occupation and Industry Trends in Canada*, Ottawa, 1954.

ture of the Canadian and United States economies, which extended
back to 1881, will first be briefly recalled. Despite the technical diffi-
culties of such an extended comparison, an unmistakably clear outline
emerges of a radical transformation during this period.

In Canada in 1881 less than one in five persons in the labour force was
employed within the service industries, including transportation and public
utilities, while one-half of the labour force was engaged in the primary indus-
tries of agriculture, forestry and fishing. Manufacturing accounted for one
person in eight.

There has been a gradual shift over the intervening years so that in 1951
nearly half of the labour force was in the service industries and agriculture
accounted for only one person in five, almost a complete reversal of the posi-
tions in 1881. Manufacturing employed one person in five instead of one
person in eight while the construction group has lost ground. . . .

This rising trend, important though it has been, has still not carried the
service industries to the relatively important position they have attained in
the United States. Similar employment shifts have occurred in the U.S., . . .
but service industries occupied nearly 52% of the U.S. labour force in 1950
in comparison with 45% in Canada, a figure reached by the U.S. some 20
years ago. In the U.S. the proportion employed in agriculture in the 1880's
was the same as in Canada, viz. 50%, but by the early 1950's had fallen to
12%—much lower than the 19% in Canada.[18]

This broad picture can be brought up to date and given further
precision by a consideration of Tables 1 to 5 below. Table 1 shows
that, on the basis of the Fuchs definition, the service sector grew by
143 per cent between 1931 and 1961, thus increasing its share of the
experienced labor force from 31 to 46 per cent, while the broader
definition allowed for a slightly smaller increase of 131 per cent and a
change in share from 39 to 54 per cent.

The United States data of Table 2 are, of course, both conceptually
and statistically different from those on which Fuchs based the state-
ment that "we are the first nation in the history of the world in
which more than half of the employed population is not involved
in the production of food, clothing, houses, automobiles, and other
tangible goods." [14] Fuchs' data are also more up to date. However,

[18] Bank of Montreal, *op. cit.*, p. 4.

[14] *The Growing Importance of the Service Industries*, p. 1. The series used was
"Number of Persons Engaged in Production," published by the Office of Business
Economics of the Department of Commerce. It excludes unpaid family workers and
converts part-time employees to full-time equivalents.

TABLE 1

Census Distributions of the Experienced Labor Force by Industry, Canada, 1931-61
(thousands of persons)

Industry	1931 [a]		1941 [b]		1951		1961	
	Number	Percentage of Total	Number	Percentage of Total	Number	Percentage of Total	Number	Percentage of Total
Trade	421	10.7	496	11.0	746	14.1	991	15.3
Finance, insurance, and real estate	92	2.3	90	2.0	144	2.7	229	3.5
Public administration and defense	95	2.4	431	9.6	301	5.7	480	7.4
Community, recreation, business and personal services	608	15.5	685	15.2	791	15.0	1,261	19.5
Service industries, total—Fuchs definition	1,216	31.0	1,701	37.8	1,982	37.6	2,960	45.8
Transportation, storage, and communication	297	7.6	288	6.4	450	8.5	531	8.2
Service industries, total	1,513	38.6	1,989	44.2	2,432	46.1	3,491	54.1
Agriculture	1,124	28.7	1,074	23.9	824	15.6	641	9.9
Forestry, fishing, and trapping	98	2.5	144	3.2	180	3.4	143	2.2
Mining, quarrying, and oil wells	72	1.8	93	2.1	104	2.0	120	1.9
Manufacturing	671	17.1	906	20.1	1,302	24.7	1,405	21.8
Construction	250	6.4	220	4.9	319	6.0	430	6.7
Electric, gas, and water utilities	25	0.6	26	0.6	49	0.9	70	1.1
Goods industries, total	2,240	57.1	2,463	54.8	2,778	52.7	2,809	43.5
Industry unspecified or undefined	169	4.3	46	1.0	67	1.3	158	2.4
Total employed, all industries	3,922	100.0	4,498	100.0	5,277	100.0	6,458	100.0

NOTE: Figures may not add due to rounding.

SOURCE: *1961 Census of Canada, Bulletin SL-1. Labour Force*—DBS Catalogue No. 94-551, *1941 Census of Canada, Bulletin SL-1. Labour Force*—Occupation and Industry Trends, Ottawa, 1966, Table 12; 1931 data—*Ninth Census of Canada, 1951, Report No. SP-8, Occupation and Industry Trends in Canada*, Ottawa, 1954, Tables 10 and 11.

ᵃ For rough conformity with the later figures, which reflect the 1960 Standard Industrial Classification, those of 1931 were adjusted as follows: post office transferred from public administration and defense to transportation, storage, and communication; auto repairs, watch and jewelry repairs transferred from manufacturing to trade; boot and shoe repairs, blacksmithing transferred from manufacturing to community, recreation, business, and personal services; dairies transferred from retail trade to manufacturing.

ᵇ Persons in active service on June 2, 1941, who were excluded from the published 1941 figures, have been included here.

TABLE 2

Census Distributions of the Experienced Labor Force by Industry,
United States, 1950 and 1960

(thousands of persons)

Industry (Canadian Designation)	1950		1960	
	Num-ber	Percent-age of Total	Num-ber	Percent-age of Total
Trade	9,788	16.2	10,960	15.7
Finance, insurance, and real estate	1,954	3.2	2,749	3.9
Public administration and defense	3,267	5.4	4,619	6.6
Community, recreation, business and personal services	11,524	19.1	15,429	22.1
Service industries, total — Fuchs definition	26,533	44.0	33,757	48.4
Transportation, storage, and communication	4,267	7.1	4,284	6.1
Service industries, total	30,800	51.1	38,041	54.6
Agriculture	7,048	11.7	4,415	6.3
Forestry, fishing, and trapping	133	0.2	104	0.1
Mining, quarrying, and oil wells	970	1.6	714	1.0
Manufacturing	15,307	25.4	18,536	26.6
Construction	3,764	6.2	4,302	6.2
Electric, gas, and water utilities	692	1.1	765	1.1
Goods industries, total	27,914	46.3	28,836	41.4
Industry not reported	1,543	2.6	2,847	4.1
Total employed, all industries	60,256	100.0	69,723	100.0

NOTE: Figures may not add due to rounding.

SOURCE: U.S. Bureau of the Census, *Census of Population: 1960*, Volume I — Characteristics of the Population, Part 1 — U.S. Summary, Washington, D.C., 1964, Tables 83 and 210. Civilian labor force distributions of Table 210 rearranged to conform with 1960 Canadian S.I.C. as far as permitted by the 149 category level of classification, and Armed Forces added (Table 83). Principal internal changes to Table 210 were: postal service transferred from public administration and defense to transportation, storage, and communication; sanitary services from electric, gas, and water utilities to public administration and defense; eating and drinking places from trade to community, recreation, business and personal services; and automobile repair service and garages from community, recreation, business and personal services to trade.

the fact that the 1960 distribution identifies only 48 per cent of the labor force with his definition of the service sector (although 55 per cent in the broader definition) is not nearly so remarkable as the very close correspondence between these percentages and those which result from the proximate Canadian data. What emerges here is that the lag in the relative development of the Canadian service sector, which Tables 1 and 2 show as still being quite important at the beginning of the 1950's, was substantially eliminated in a single decade.

A more detailed examination of the changing growth rates which gave rise to this phenomenon is facilitated by a rough updating of the data of Table 1. For this purpose, monthly estimates of the industrial distribution of the employed portion of the civilian labor force, adjusted for armed forces employment, must be used. It will be seen that the two alternative tabulations for 1961, provided by Tables 1 and 3, differ not only in absolute numbers but also in their percentage distribution between the various industries. The use of slightly different reference dates is part of the explanation, but more important are the sampling variability of the monthly labor force survey estimates and the differences in the form of questions used—particularly with respect to agricultural employment. Also, the data of Table 3 refer only to the employed portion of the labor force and there was a high rate of unemployment in mid-1961. Even discounting the greater sampling variability at the industry level, these data cannot be used to approximate labor force growth by industry because of the different over-all rates of unemployment between the two periods and the lack of published data on its detailed incidence.

These objections are less important for comparisons at the sector and total levels, and the data of Table 3 can therefore be taken as a fairly reliable indication that the accelerated development of the service industries during the 1950's has not carried through as strongly to the present time. Nevertheless, the percentage of the employed labor force classified in Fuchs' service sector in mid-1966 leaves no doubt that Canada's formal qualifications for admission to the hitherto exclusive club of "service economies" must by now be firmly established!

A somewhat sharper picture of the differential growth of the goods and service sectors in Canada emerges from Table 4, which is essen-

TABLE 3

Distributions of the Employed Labor Force by Industry,
Canada, 1961 and 1966
(thousands of persons)

	1961		1966	
Industry	Num-ber	Percent-age of Total	Num-ber	Percent-age of Total
Trade	1,012	16.1	1,172	16.0
Finance, insurance, and real estate	242	3.9	301	4.1
Public administration and defense	500	8.0	540	7.4
Community, recreation, business and per-sonal services	1,190	19.0	1,631	22.3
Service industries, total — Fuchs defini-tion	2,944	46.9	3,644	49.7
Transportation, storage, and communication	502	8.0	538	7.3
Service industries, total	3,446	54.9	4,182	57.1
Agriculture	723	11.5	583	8.0
Forestry, fishing, and trapping	105	1.7	110	1.5
Mining, quarrying, and oil wells	76	1.2	122	1.7
Manufacturing	1,453	23.1	1,737	23.7
Construction	406	6.5	516	7.0
Electric, gas, and water utilities	70	1.1	75	1.0
Goods industries, total	2,833	45.1	3,143	42.9
Total employed, all industries	6,279	100.0	7,325	100.0
Unemployed [a]	410		238	
Total labor force	6,689		7,563	

NOTE: Figures may not add due to rounding.

SOURCE: Dominion Bureau of Statistics, Special Surveys Division, *Special Tables 1 and 3(c)*, supplementing DBS Catalogue No. 71-001, *The Labour Force,* Ottawa, monthly. 1961 data were calculated as the average of the employed civilian labor force estimates by industry for the survey weeks of May 20, 1961 and June 17, 1961 for rough conformity with Census of Population reference data. A similar procedure was followed in 1966 using the survey weeks of May 21, 1966 and June 18, 1966. Annual averages of Armed Forces employment were added to the civilian labor force data in both years.

[a] Unemployed were 6.1 per cent of the total labor force in 1961 and 3.1 per cent in 1966.

TABLE 4

Average Annual Rates of Growth of the Experienced Labor Force
by Industry, Canada, 1931–66, and United States 1950–60

Industry	Canada			United States
	1931–61	1951–61	1961–66 [a]	1950–60
Trade	2.9	2.9	n.a.	1.1
Finance, insurance, and real estate	3.1	4.7	n.a.	3.5
Public administration and defense	5.5	4.8	n.a.	3.5
Community, recreation, business and personal services	2.5	4.8	n.a.	3.0
Service industries, total – Fuchs definition	3.0	4.1	3.7	2.4
Transportation, storage, and communication	2.0	1.7	n.a.	0.0
Service industries, total	2.8	3.7	3.3	2.1
Agriculture	−1.9	−2.5	n.a.	−4.6
Forestry, fishing, and trapping	1.2	−2.3	n.a.	−2.4
Mining, quarrying, and oil wells	1.7	1.4	n.a.	−3.0
Manufacturing	2.5	0.8	n.a.	1.9
Construction	1.8	3.0	n.a.	1.3
Electric, gas, and water utilities	3.5	3.6	n.a.	1.0
Goods industries, total	0.8	0.1	1.5	0.3
Total employed, all industries	1.7	2.0	2.5	1.5

SOURCE: Tables 1, 2, and 3.

n.a. = not applicable.

[a] 1961–66 growth rates are based on the data of Table 3, with the unemployed being prorated between sectors according to the percentage distribution in each year of the employed labor force. If, as seems probable, this procedure overstates the actual number of unemployed in services and understates the number in goods in both years, the growth rates in services and goods will be respectively understated and overstated because of the higher over-all rate of unemployment in 1961.

tially a comparison of average annual rates of growth by industry and sector between 1931 and 1961 with those of the 1951–61 subperiod. Separate growth rates for the two earlier decades as well might have added to the usefulness of the table in some respects, but for the purpose of sector comparisons, the disproportionate importance of public administration and defense in 1941 would have been a dis-

torting influence. Corresponding U.S. growth rates between 1950 and 1960 are also included, as well as some rough estimates at the sector and total levels for 1961–66, the derivation of which is described in the table.

Over the entire period from 1931 to 1961, the average rate of growth of the total experienced labor force was 1.7 per cent per annum, with services (our definition) and goods increasing at markedly different rates of 2.8 per cent and 0.8 per cent, respectively. Between 1951 and 1961, the over-all rate of growth was somewhat higher, at 2.0 per cent, and the disparity between the sectoral rates enormously greater. During this decade then, there can be no doubt that Canadian experience parallels Fuchs' finding that the service sector absorbed virtually all of the net postwar growth of employment in the United States. However, the data for 1961–66 suggest that there has been in recent years a distinct moderation of this accelerated development of services and a return to something like the longer-term trend. Of the increase in total employment of 1,046 thousands during this period, shown by Table 3, the goods sector accounted for approximately 30 per cent, in contrast with a corresponding percentage for 1951–61 of less than 3 per cent, as calculated from the labor force distributions of Table 1.

The decline in the relative importance of the goods sector between 1931 and 1961 is virtually all accounted for by agriculture, whose share in the experienced labor force fell from 28.7 to 9.9 per cent. It was also the only industry in which the labor force declined in absolute terms over the period as a whole, although the combination of forestry, fishing, and trapping experienced a significant decline between 1951 and 1961. Actually, as may be seen from Table 1, the nonagricultural goods industries gained slightly in relative importance by 1961, their successive percentage of the total labor force at the decennial intervals being 28.4, 30.9, 37.1, and 33.6. Within this particular aggregate, the dominant component of manufacturing also experienced a moderate over-all gain in relative importance—from 17.1 to 21.8 per cent—with the residual industries holding more or less constant.

United States experience between 1950 and 1960 was broadly con-

sistent with this general pattern. The decline in the percentage share of the experienced labor force classified to the goods sector was almost wholly matched by a corresponding decline in agriculture, leaving the relative importance of goods industries less agriculture virtually unchanged at 35.1 per cent. While manufacturing in Canada lost some ground during the 1950's, there was a small increase in its relative importance in the United States.

The contribution that agricultural shifts made to the changing industrial distribution of the North American labor force was thus an extremely important one. It is illustrated in Table 5, which adds the decrease in agriculture to the increase in the total experienced labor force and distributes this amount between the service and goods sectors and a residual category of unclassified changes. What emerges on the source side of the equation for Canada is the record of a substantial contribution of shifts from agriculture to the growth of the nonagricultural labor force since 1931. In recent years, this has been somewhat lower than the average for the 1931–61 period although, as may be seen from Table 1, the latter figure conceals important variations in agriculture's contribution during the 1931–41 and 1941–51 decades. Shifts from agriculture played an even greater part in the growth of the nonagricultural labor force of the United States between 1950 and 1960, and the data used in the Bank of Montreal study [15] indicate that, in contrast to the situation in Canada, the relative contribution of agriculture was very similar in the two preceding decades.

The disposition of these increases in the Canadian nonagricultural labor force shows a roughly two to one relationship between the service and goods shares over the entire period from 1931 to 1961, with the service sector increasing its share considerably during the 1950's and then reverting more recently to the long-term average pattern. In the United States during the 1950's, the service sector accounted for an appreciably lower share of the increase in the nonagricultural labor force than in Canada, although comparisons are difficult because of the magnitude of the "industry unspecified or undefined" category in both countries. Rough calculations with the Bank of Montreal

[15] Bank of Montreal, *op. cit.*, Table I, pp. 5–6. These data actually combine agriculture with forestry and fishing, but the latter industries comprise only a small proportion of the total.

TABLE 5

Changes in the Experienced Labor Force and Its Disposition between Sectors, Canada, 1931–66, and United States, 1950–60

(thousands of persons)

Source and Disposition of Change	Canada						United States 1950–60	
	1931–61		1951–61		1961–66 [a]			
	Number	Percentage of Total	Number	Percentage of Total	Number	Percentage of Total	Number	Percentage of Total
Increase in total experienced labor force	2,536	84.0	1,181	86.6	1,046	88.2	9,467	78.2
Decrease in agriculture	483	16.0	183	13.4	140	11.8	2,633	21.8
Increase in nonagricultural labor force	3,019	100.0	1,364	100.0	1,186	100.0	12,100	100.0
Net increase in service sector	1,978	65.5	1,059	77.6	736	62.1	7,241	59.8
Net increase in nonagricultural goods sector	1,052	34.8	214	15.7	450	37.9	3,555	29.4
Increase or decrease (−) in "industry unspecified or undefined" [b]	−11	−0.3	91	6.7	n.r.	n.r.	1,304	10.8

SOURCE: Tables 1–3.

n.r. = not relevant.

[a] 1961–66 data cover employed labor force only

[b] "Industry unspecified or undefined" may include some persons identified with agriculture.

data,[16] however, indicate that the thirty year average shares of services and nonagricultural goods in the increase of the nonagricultural labor force were, at approximately 62 and 32 per cent, quite close to the corresponding figures for Canada.

Before concluding this general review of historical trends in the industrial composition of the Canadian labor force, two points relating to the future sources of growth in the nonagricultural labor force will be briefly touched upon. The first is the extent to which shifts out of agricultural labor might continue to make a significant contribution. Table 1 shows that, although agriculture's percentage of the total experienced labor force decreased in each of the three decades covered, the absolute decline was not important until some time after 1941. This can probably be explained, first of all, by the diminished employment opportunities outside of agriculture during the depression years and, secondly, by the emphasis on agricultural production during World War II. Average annual rates of decrease during the 1941–51 and 1951–61 periods were, at 2.6 and 2.5 per cent, respectively, virtually identical, while the data of Table 3, in spite of their dubious value for growth rate calculations, suggest a marked increase since 1961 in this rate of decline. These trends are in keeping with the almost universal tendency among industrially advanced countries for progressively greater agricultural outputs to be produced with a declining labor force as the result of farm mechanization and related technological developments as well as changes in the organization of agricultural production.

Given the very large decline in the absolute number of persons engaged in agriculture which has already taken place since 1941— something in the order of 50 per cent according to the figures of Tables 1 and 3, the intuitive reaction is that the scope for further absolute decreases might be somewhat limited. However, some calculations in a study prepared for the first annual review of the Economic Council of Canada,[17] based in part on the assumption of a continuation in the trend towards the decreasing relative importance of

[16] *Ibid.* Public utilities were included with transportation and classified in the service sector, but their relative importance was slight.

[17] John Dawson, *Changes in Agriculture to 1970,* Staff Study No. 11 prepared for the Economic Council of Canada, Ottawa, 1965, pp. 23–24.

marginal farms,[18] estimated that an annual decrease in the agricultural labor force of about 2.3 per cent per annum could occur between 1963 and 1970. The rough data of Table 3 suggest that this rate had been considerably exceeded up to 1966, and the most recent projections of potential employment by the Council show a revision of the estimated rate of decline in agriculture to 3.1 per cent per annum.[19]

The second point concerns the future rate of growth of the total labor force. The average rate of increase from 1951 to 1966 was, according to the figures used here, approximately 2.2 per cent per annum. Again drawing upon the projections of the Economic Council of Canada, an annual average percentage increase of 3.2 between 1965 and 1970 is anticipated.[20] This rate of growth is as high as almost any ever attained in Canada's history and is far in excess of the recent and current growth rates in the labor forces of other industrial countries.

The potential disposition of this large and continuing influx of new workers will be importantly determined by the incidence among them of the basic demographic characteristics (age, sex, and education), for which Fuchs has shown there are marked differences between sectors in the United States. Some historical Canadian evidence on the industrial distribution of these characteristics is considered later in the paper. At this point, it may be noted that, on an over-all basis, rising female participation rates are expected by the Economic Council of Canada to make the female component of future labor force growth particularly large. Out of the projected 1.2 million additions from 1965 to 1970, it is estimated that some 620,000 will be females. An equally significant prospect is the anticipated large upsurge in the labor force of males under 25, which is expected to be 250,000 during the same period.

18 Defined, for this purpose, as those with annual sales of less than $2,500 per farm.

19 Economic Council of Canada, *Fourth Annual Review, The Canadian Economy from the 1960's to the 1970's,* Ottawa, September 1967, Table 4-1.

20 *Ibid.,* Table 3-12 and related discussion.

REASONS FOR THE RELATIVE GROWTH OF SERVICE EMPLOYMENT—
THE INCOME ELASTICITY HYPOTHESIS

Before considering possible explanations for the long-standing and persistent tendency toward the relative growth of service employment, the relevant data for 1946 to 1966, the period of main concern in this paper, may be briefly summarized. Table 6 shows the changing relative importance of the goods and service industries as illustrated by the three variables of employment,[21] production in current dollars, and real or constant dollar output. On the basis of full sector definitions, the relative proportions of employment accounted for by goods and services were virtually reversed between 1946 and 1966, with goods declining from 58.8 to 42.0 per cent and services increasing from 41.2 to 58.0 per cent. This reflects the marked differential in the growth rates of employment in the two sectors, which were 0.3 and 3.8 per cent per annum for goods and services, respectively. There were parallel, though much less pronounced, shifts in current dollar production during the same period. The share of the service sector in the value of gross domestic product increased from 48.8 to 53.7 per cent as the result of a growth rate 1.0 per cent higher than in the goods sector.

Within the commercial nonagricultural economy, employment also grew faster in services than in goods. The disparity between the two growth rates was smaller than in the full sector comparison, however, and this resulted in a more moderate increase in the service sector's share of employment, from 46.0 to 52.2 per cent. This mainly reflects the exclusion of agriculture from the comparison, since employment in the commercial service sector grew only slightly more slowly than in the full service sector. There was also an increase in service's share of current dollar production, from 49.6 to 51.4 per cent, which, as in the case of the full sector comparison, was a good deal smaller than the corresponding gain in employment.

A completely different picture emerges when changes in the share of real output and sector growth rates are considered. Within the total economy, the service sector's share of real output *decreased* from

21 From this point forward, the employment series mainly used is that underlying the official DBS productivity estimates, as noted in Table 6. See also the next section of this paper for a brief resumé of its derivation.

TABLE 6

Per Cent of Employment, Value of Production, and Real Output
in the Goods and Service Sectors, and the Growth Rates
by Sector, Canada, 1946 and 1966

	Percentage of Total		Growth Rate (per cent per annum)
	1946	1966	1946–66
Total economy			
Goods sector			
Employment	58.8	42.0	0.3
Value of GDP	51.2	46.3	7.5
Real output	52.1	56.2	5.1
Service sector			
Employment	41.2	58.0	3.8
Value of GDP	48.8	53.7	8.5
Real output	47.9	43.8	4.3
Commercial nonagricultural economy			
Nonagricultural goods sector			
Employment	54.0	47.8	2.2
Value of GDP	50.4	48.6	8.2
Real output	50.8	57.2	5.8
Commercial service sector			
Employment	46.0	52.2	3.4
Value of GDP	49.6	51.4	8.6
Real output	49.2	42.8	4.5

NOTE: All measures shown here are based on data classified according to the 1948 SIC. Additional estimation was necessary to derive all three sets of figures for the commercial service sector. It is technically incorrect to use real output data for share analysis since the per cent distribution in any year will depend upon the weights used. The use of any set of fixed weights, however, ensures that the differential between the sector growth rates is carried through, to a greater or lesser degree, into the sector shares. All growth rates were calculated by compounding between initial and terminal years. While acceptable for the purposes of this table, where the emphasis is on *differential* rates of growth between sectors, tests have shown that this procedure frequently overstates—and sometimes importantly—the results derived by least squares of logarithms method over this period.

SOURCE: Employment data—Worksheets underlying index numbers of employment published in DBS Catalogue No. 14-201, *Aggregate Productivity Trends*, Ottawa, 1967, supplemented by data for the noncommercial industries from the DBS Special Surveys Division, as noted in Table 3; Gross Domestic Product data—DBS Catalogue No. 13-502, *National Accounts, Income and Expenditure, 1926–56*, Ottawa, 1958, and DBS Catalogue No. 13-201, *National Accounts, Income and Expenditure*, Ottawa, annual; Real output data—DBS Catalogue No. 61-505, *Indexes of Real Domestic Product by Industry of Origin, 1935–61*, Ottawa, 1963, and DBS Catalogue No. 61-005, *Annual Supplement to the Monthly Index of Industrial Production*, Ottawa, May 1967.

47.9 to 43.8 per cent, and the commercial service sector lost even more ground within the commercial nonagricultural economy with a decrease from 49.2 to 42.8 per cent. The corresponding growth rate differentials (service minus goods) were −0.8 and −1.3 per cent per annum.

When these figures are considered in relation to the current dollar data, it is evident that there was in Canada a very marked rise in service prices relative to those of goods during the postwar period. Furthermore, as Table 7 shows, sector differentials in the rate of growth of the implicit price deflator between current and constant dollar output are not affected by changes in the sector definition used. Prices in the industries excluded from the restricted sector comparisons, namely agriculture and noncommercial services, must therefore have risen at about the same rate as those in the nonagricultural goods and commercial service industries, respectively.

Postwar United States experience appears to have been quite different. As in Canada, the implicit price deflator for the service sector as a whole grew faster than that for total goods, although the differential was only two-thirds of the corresponding Canadian figure. However, the implicit price deflator for the excluded goods industries, namely agriculture, forestry and fisheries, and government enterprise, apparently declined, while that for real estate, households and institutions, and general government combined seems to have grown at an appreciably faster rate than in the remainder of the service sector. Consequently, for sector comparisons other than goods and service, differentials in the rate of growth of the implicit price deflator were much smaller than in Canada and even, in the extreme case of goods* and service*, virtually nonexistent.

It is true, of course, that the United States data of Table 7 are based on different sector definitions than those underlying the Canadian data and relate to a shorter time period that excludes the sustained high growth of the 1960's. Questions can also be raised about the validity of some of the basic data and whether the distribution, direction, and magnitude of possible bias is similar for both countries. Taking the data at their face value, however, it is difficult to escape the conclusion that the rise in the price of services relative to goods during the postwar period, although common to both countries, has

TABLE 7

Rates of Growth of Employment, Value of Production, Real Output, and
Implicit Price Deflator, in the Goods and Service Sectors, with
Sector Differentials, Canada and United States

(per cent per annum)

Sector	Canada, 1946–66				United States, 1947–61			
	Employ-ment	GDP	Real Output	Implicit Price Deflator	Employ-ment	GDP	Real Output	Implicit Price Deflator
Goods	0.3	7.5	5.1	2.4	−0.1	5.0	2.9	2.1
Goods*	2.2	8.2	5.8	2.4	0.4	5.7	3.1	2.6
Service	3.8	8.5	4.3	4.2	2.3	6.7	3.4	3.3
Service*	3.4	8.6	4.5	4.1	1.9	5.8	3.0	2.8
Sector differential:								
Service − goods	3.5	1.0	−0.8	1.8	2.4	1.7	0.5	1.2
Service − goods*	1.6	0.3	−1.5	1.8	1.9	1.0	0.3	0.7
Service* − goods	3.1	1.1	−0.6	1.7	2.0	0.8	0.1	0.7
Service* − goods*	1.2	0.4	−1.3	1.7	1.5	0.1	−0.1	0.2

NOTE: Although Fuchs' terminology of goods* and service*
is applied here to the Canadian data, the sector definitions
underlying the latter are those outlined in the introduction and
used in Table 6 and elsewhere.

SOURCE: Canadian data – Table 6; U.S. data – Fuchs, *Productivity Trends in the Goods and Service Sectors, op. cit.,* Table A-2.

been greater and more pervasive in Canada than in the United States.

As will be shown below, this point has an important bearing on the first hypothesis considered by Fuchs as a possible explanation for the differential growth of employment in the two sectors, namely that the increase in the service sector's share of total employment may be due in some part to a higher income elasticity of demand for services than for goods. The essence of this hypothesis is that, as income per capita rises and a certain standard of goods consumption is achieved, further increments in income tend to be channeled in greater proportion toward spending on additional services rather than on additional goods. Of course, demand is affected by a great many factors other than income—changes in relative prices, quite obviously, as well as those in tastes and technology, and also institutional factors such as the distribution of income and the degree of urbanization. There can also be significant differences between the short-run and long-run effects of income and price changes since current consumption decisions are importantly influenced by past behavior as manifested in established habit patterns and stocks of durable goods.[22] Even relatively sophisticated econometric techniques cannot separate out more than a few of these numerous and interrelated effects simultaneously, so that inconsistencies between the results of different partial approaches can occur quite frequently. The best-known work in this area is based on consumer expenditure data only [23] and therefore cannot explain the quite different factors which determine expenditures in other important areas of final demand.

Fuchs' principal approach to the testing of the income elasticity hypothesis was therefore an indirect one. Notwithstanding the fact that many industries produce intermediate as well as final outputs, he argued that, if the rise in real income per capita between 1929 and 1963 had in fact resulted in a more elastic demand for services than for goods, it ought to be reflected in a more rapid rise in real output for the service sector relative to the goods sector. Accordingly, his conclusion that the income elasticity effect was not a major part of

[22] H. S. Houthakker and Lester D. Taylor, *Consumer Demand in the United States, 1929–1970,* Cambridge, Mass., 1966, pp. 8–9.

[23] See, for example, Kuznets, *Modern Economic Growth: Rate, Structure and Spread,* Table 5-10, and also Houthakker and Taylor, *op. cit.*

the explanation for the growth in the service sector's share of total employment rested heavily on the fact that differential rates of change of real output between the two sectors were very small relative to those for employment.

Fuchs used two alternative sets of differential rates of change of real output for comparison with those of employment on the assumption that distributions by sector of GDP in current dollars on the one hand, and those of constant dollar product on the other, are indicative of the limits of possible measurement biases in the growth of service output relative to that of goods.[24] The use of the former measure eliminates the effect of differential price change since prices are deemed to have changed at the same rate in both sectors. When constant dollar measures are used, allowance has to be made for the possibility of a shift to goods resulting from the price effect. Sector differentials (service minus goods) in the rate of growth of the implicit price deflator between 1929 and 1963 were positive but relatively small, so that the price effect did not appear to be of major importance.

United States data for the period 1947 to 1961, as summarized in Table 7, do not present such a uniform picture as those analyzed by Fuchs because of the marked disparity in the growth of both current and constant dollar output between those industries subtracted for the purpose of the restricted sector comparisons and their parent aggregates. If attention is confined to the core sectors of service* and goods*, however, it is quite clear from the relationship between the output and employment differentials that Fuchs' more broadly based conclusion about relative income elasticities is not invalidated by more recent experience.

In some respects, the postwar Canadian data seem easier to assess. Differentials between service and goods output based on the current dollar measure, in which the direction of probable bias is favorable to services, are uniformly small in relation to the employment differentials for all four comparisons. Again, the constant dollar output measures show that goods output increased faster than service output in each case. The data also indicate that agricultural output grew less rapidly than in the remaining goods industries, which, in conjunc-

24 Fuchs, *The Growing Importance of the Service Industries*, Table 6 and related discussion.

tion with the apparently negligible change in the implicit price deflator for agriculture, tends to confirm the generally accepted view that the income elasticity of demand for agricultural products is low.

However, the use of bracketing assumptions to assess the possible magnitude of relative changes in output as indicators of underlying income elasticities of demand depends, for its efficacy, on a fairly narrow spread between their limits, i.e., on moderate differentials between the rates of growth of the implicit price deflators for each sector. In the Canadian case, these differentials are so pervasively large that they put the assessment of the probable price effect, which runs counter to the income effect, outside the range of unsupported judgment.

A question which is perhaps more relevant in the present context, and to which the data used here can supply a much firmer answer, is whether the service industries in Canada face demand schedules that are more elastic in total than those for goods. A more rapid rise of real output in the service sector than in the goods sector would clearly indicate a stronger elasticity of response to the combined effect of changes in income, relative prices, the degree of urbanization, and other relevant factors mentioned earlier. That this has almost certainly not happened is evident from the sector differentials in the rate of growth of real output shown in Table 7, even when allowance is made for any reasonable margin of error in their calculation.

Some corroboration of this conclusion may be sought in an examination of the relative growth of rough end-use demand series for goods and services which can be developed by expanding national accounts distributions of personal expenditures on consumer goods and services to include other categories of final demand.[25] These are current dollar data which cannot be converted into real terms because of the inability to make a corresponding separation of the implicit price deflator for Gross National Expenditure into its goods and service components. Moreover, these classifications reflect the embodiment of service outputs in final demand for goods, and vice versa. Nevertheless, the comparison provides an interesting supplement to that based on output data, and what emerges, on the basis of compound

[25] For the source material of these calculations, see DBS Catalogue No. 13-502, *National Accounts, Income and Expenditure, 1926–56,* Ottawa, 1958, and DBS Catalogue No. 13-201, *National Accounts, Income and Expenditure,* Ottawa, Annual, Tables 1, 2, 19, 47, and 55.

rates between terminal years, is that the average rate of growth of "Demand for Canadian Services," at 8.7 per cent, was slightly higher than that of "Demand for Canadian Goods," at 8.1 per cent, between 1946 and 1966. Bearing in mind, however, the marked differential between the implicit price deflator for GDP goods and GDP services, it seems almost certain that the rate of growth of final demand for Canadian services in real terms—as the result of income elasticity and all other influences—was lower than that for goods.

In summary then, it can be said that, while the data considered here do not permit any firm conclusions about sector differentials in income elasticity as such, the sharply differing rates of employment growth between the goods and service sectors in Canada during the postwar years cannot be explained by differences in the rates of growth of sector outputs or of final demand for their products. Indeed, even after allowance for the imperfections of many of the underlying statistics, the evidence clearly suggests that output grew faster in the goods than in the service sector, even though goods employment grew more slowly. The explanation must therefore lie in the differential rate of growth of output per person employed, and this in turn raises a fresh set of questions as to what factors might have been responsible for the differing productivity performance of the two sectors.

REASONS FOR THE RELATIVE GROWTH OF SERVICE EMPLOYMENT— CHANGES IN PRODUCTIVITY

That output per person employed grew much faster in goods than in services, regardless of how the sectors are defined, is clear beyond doubt from the rough data of Table 8.

The evidence of the preceding section also indicates that this differential change of output per person employed is the principal explanation for the much more rapid rise of employment in the service sector between 1946 and 1966. This in itself, however, is not a particularly illuminating conclusion. The well-established character of the differential has most certainly had and will continue to have implications just beginning to be perceived, which go much further and deeper than the superficial effect on head-counts of employment.[26]

[26] See, for instance, Fuchs, *The Growing Importance of the Service Industries,* pp. 14–24, for a discussion of some of the economic implications.

TABLE 8

Average Annual Rates of Growth of Output per Person Employed,
Goods and Service Sectors, Canada, 1946–66
(per cent per annum)

Sector Definitions	Goods	Service	Differential (G − S)
Goods and service	4.8	0.5	4.3
Nonagricultural goods and service	3.6	0.5	3.1
Goods and commercial service	4.8	1.1	3.7
Nonagricultural goods and commercial service	3.6	1.1	2.5

SOURCE: Table 6.

The first step toward an understanding of how the structure and workings of the Canadian economy might be affected by this phenomenon must clearly be an attempt, however tentative, to disentangle some of the factors responsible for the slower growth of output per person employed in the service industries.

Fuchs' work suggests that at least four measurable factors have been involved in the U.S. situation. These are a more rapid decline in hours worked per man in the service industries, the differential effect of intrasector shifts in the relative importance of industries with different levels of productivity, a slower rise in the quality of the work force in the service industries, and a less rapid growth in the amount of capital employed per worker.

In this section, the procedures followed by Fuchs to estimate the effects of these factors [27] are retraced with Canadian data. As noted in the introduction, the analysis is essentially based on the official DBS measures of real output per person employed and per man-hour recently developed for the goods and service sectors of the commercial economy, which have been privately extended to include the noncommercial industries. The component data are shown in Table 9 together with certain other relevant input measures, to be discussed later in this section.

[27] The results of his calculations are summarized in Tables 2 to 4 in *Productivity Trends in the Goods and Service Sectors.*

TABLE 9

Rates of Growth of Output, Input, and Productivity,
Goods and Service Sectors, Canada, 1946–66
(per cent per annum)

	Goods	Nonagri-cultural Goods	Service	Commercial Service
Real output	4.67	5.33	4.24	4.28
Employment	−0.09	1.43	3.79	3.10
Man-hours	−0.73	1.04	3.06	2.39
Output per person employed	4.76	3.84	0.44	1.14
Output per man-hour	5.43	4.24	1.15	1.84
Labor income	6.74	6.85	8.67	8.49
GDP, current dollars	6.19	7.06	8.36	8.19

NOTE: All growth rates were calculated by the least squares of logarithms method. The productivity growth rates were derived from time series of output per unit of labor input rather than by subtraction of the growth rates of the components.

SOURCE: Output, employment, man-hours, and productivity growth rates – DBS Catalogue No. 14-201, *Aggregate Productivity Trends, 1946–66*, supplemented by private estimates from published sources for the noncommercial industries; growth rates of labor income and gross domestic product in current dollars calculated from published series in DBS Catalogue Nos. 13-502 and 13-201, *National Accounts, Income and Expenditure* with private adjustments for coverage in the case of the commercial service sector.

As well as reflecting more precise methods of calculation than have hitherto been used in the paper, the official productivity measures embody a number of refinements and developments on the labor input side.[28] There are two major sources of employment statistics for the commercial economy, the monthly household-based labor force survey and the monthly establishment-based employment survey. In view of their different basic purposes, they vary in coverage, concept, and methods, and neither is completely suitable in its published form for productivity measurement purposes. In order to overcome these difficulties, a composite series of persons employed was developed, using elements from these and certain supplementary sources. After the necessary conceptual and statistical adjustments, this provides a

[28] See also DBS Catalogue No. 14-501, *Indexes of Output per Person Employed and per Man-Hour in Canada, Commercial Nonagricultural Industries, 1947–63*, Ottawa, 1965.

TABLE 10

Explanation of Output Per Person Employed Differentials Between Goods and Service Sectors, Canada and United States

(per cent per annum)

	Canada, 1946–66				United States, 1947–61			
	Goods Minus Service	Goods Minus Comm. Service	Nonag. Goods Minus Service	Nonag. Goods Minus Comm. Service	Goods Minus Service	Goods Minus Service*	Goods* Minus Service	Goods* Minus Service*
Differentials in growth rate of output per person employed (goods minus service)	4.32	3.62	3.40	2.70	1.94	1.88	1.59	1.53
Accounted for by differentials in								
Rate of decrease of average hours worked	0.07	0.05	0.33	0.31	0.07	0.06	0.09	0.08
Effects of intrasector shifts	0.60	0.40	0.17	-0.03	0.40 [a]	0.26 [a]	0.14 [a]	0.00 [a]
Rate of growth of labor quality	2.08	1.57	0.31	-0.21	0.79	0.95	0.66	0.82
Rate of growth of capital input	-0.23	-0.24	0.49	0.47	-0.06	0.25	0.21	0.52
Leaving								
Unaccounted residual (errors, technological change, economies of scale, etc.)	1.80	1.84	2.10	2.16	0.74	0.36	0.49	0.11
Percentage of O/PE unexplained	42	51	62	80	38	19	31	7

NOTE: All calculations within sectors are by division of component growth rates plus 100 rather than by subtraction.

SOURCE: Canadian data—Table 9 and shift calculations referred to in text; U.S. data—Fuchs, *Productivity Trends in the Goods and Service Sectors, op. cit.,* Table A-2. Canadian sector definitions—see pp. (4 and 5); U.S. sector definitions—see *ibid.,* p. 3.

[a] Estimate, calculated from shift differentials reported by Fuchs for 1929–61 and Canadian data for 1946–66.

reasonably consistent match for the real output measures. Most of the employment data for paid workers originate from establishment surveys, while the labor force survey is the source of data relating to the self-employed and unpaid family workers.

The quantities to be explained, namely sector differentials in the growth rates of output per person employed in Canada between 1946 and 1966 for the various alternative comparisons of goods and services, are shown in Table 10, together with estimates for the specified explanatory variables. Roughly corresponding measures for the United States, covering the period 1947 to 1961, are also included for comparative purposes. Fuchs' analysis of the United States data between 1929 and 1961 did not cover the subperiods explicitly but, as he suggested, there are important differences between them, both in the magnitudes of the productivity differentials and the explanatory variables, so that the more recent experience is what is relevant here.

The largest Canadian differential in output per person emerges from a comparison of the full goods and service sectors. As Table 11 shows, the exclusion of the noncommercial industries appreciably raises the rate of growth of output per person employed in service

TABLE 11

Growth Rates of Output Per Person Employed, Goods and
Service Sectors, Canada and United States, 1946–66
(per cent per annum)

	Canada	United States
Goods	4.76	
Nonagricultural goods	3.84	
Service	0.44	
Commercial service	1.14	
Goods		3.03
Goods*		2.68
Service		1.09
Service*		1.15

NOTE: All calculations are by division of component growth rates plus 100.
SOURCE: Canadian data—Table 9; U.S. data—Fuchs, *Productivity Trends in the Goods and Service Sectors, op. cit.,* Table A-2.

and the exclusion of agriculture lowers it in goods, thereby reducing the differential in the modified sector comparisons. As the result of parallel though less pronounced influences, the relationship between the U.S. differentials shows a similar pattern. In absolute terms, however, the latter are much smaller than the corresponding Canadian measures, mainly because the rate of growth of output per person employed was higher in the Canadian than in the U.S. goods industries. For instance, as may be seen from Table 11, the 2.38 percentage points of difference between the two differentials for the full goods and service comparison are accounted for by differences of 1.73 between the goods components (Canada minus U.S.) and 0.65 between the service components (U.S. minus Canada).

There are considerable variations in the extent to which the output per person employed differentials can be accounted for by the explanatory variables, both internationally and within each country. The lowest Canadian percentage of unexplained differential is higher than the highest United States percentage. Again, the spread between these percentages is large for both the U.S. and Canadian data and runs in opposite directions, with the fully restricted goods and service comparison faring worst in the Canadian case but best in the U.S. Attention must now be turned to a detailed examination of the postwar behavior in Canada of these explanatory variables, whose differing importance in individual sector comparisons has produced the widely differing results just noted.

Differential Changes in Average Hours Worked

In assessing the contribution of this factor to the sector differentials in output per person employed, the different nature of the Canadian and U.S. employment data must be remembered. As indicated earlier,[29] Fuchs uses an employment series which excludes unpaid family workers and converts part-time employees to full-time equivalents. Thus, the most important influences on the differential rates of change of average hours worked in the United States, shown in Table 10, are presumably long-term changes in the workweek of full-time employees in the two sectors. The Canadian employment concept includes part-time workers, both paid and unpaid, so that any average hours worked

[29] See footnote 14.

measure reflects not only the trend of hours worked by full-time employees but also the effect of changes in the relative importance of part-time employees. Comparisons of the Canadian and U.S. sector differentials in average hours worked cannot therefore be particularly meaningful.

There is a striking difference in the size of the average hours worked differential between the sector comparisons based on total goods and those involving nonagricultural goods. This is due to the very large shift of employment out of agriculture between 1946 and 1966 and the fact that the level of average hours worked in agriculture was markedly higher than that in the nonagricultural goods industries during the whole of this period. As Table 9 shows, the combined effect of these two influences is to raise the rate of growth of man-hours more than that of employment when the transition is made from goods to nonagricultural goods, with the result that the rate of decrease of average hours worked is smaller in the latter sector than in the former.

The differentials in the rate of decrease of average hours worked for the two comparisons involving nonagricultural goods are therefore larger than those which are based on the full goods sector, but they must be interpreted with caution because of the part-time effect referred to above. Tests with the source data [30] of the average hours component of the man-hours used in the official productivity measures for the goods and service sectors between 1959 and 1966 indicate that, while the average hours worked by all persons employed in services declined appreciably relative to the corresponding nonagricultural goods measure (an annual growth rate of −0.76 per cent compared with −0.13 per cent), changes in the average hours worked by persons employed for thirty-five hours or more in each survey week were quite similar in both sectors (actually an increase of 0.27 per cent per annum in nonagricultural goods and of 0.21 per annum in services).

Thus the differentials of 0.33 and 0.31 per cent per annum shown in Table 10 can probably be attributed for the most part to a steady growth in the importance of part-time employment in the service industries during the postwar years. To the extent that this trend is likely to persist—and there is no evidence to suggest otherwise during

[30] Labor force distributions of employment by intervals of hours worked.

the foreseeable future [31]—such differentials will continue to provide an important part of the explanation for the disparity in output per person employed between the nonagricultural goods and service sectors.

The Effects of Intrasector Shift Differentials

These were estimated for the Canadian data in the same manner as Fuchs'. Rates of change of output per person employed for each component industry within a particular sector were weighted by the average of their shares of output and the appropriate inputs in 1946 and 1966. Because of the conceptual ambiguity of such a cross-weighting technique, it seemed desirable to test whether the four standardization procedures would have yielded results of different sign if used separately. With minor exceptions, all the alternative fixed-weight measures of productivity growth, and therefore their averages within a sector, were lower than the corresponding growth rates inclusive of shift effects.

The individual sector shift effects were 0.58 per cent for goods, 0.15 per cent for nonagricultural goods, −0.02 per cent for service, and 0.18 per cent for commercial service, all on a per annum basis. The pure effect of the diminishing importance during the period in question of agriculture, where the level of output per person employed was lower than in most other goods industries, was thus 0.43 per cent per annum. This is the major component of the first two shift differentials shown in Table 10. For the comparison between the two restricted sectors, nonagricultural goods and commercial service, the two shift effects virtually neutralize each other, and the nonagricultural goods minus service differential is mostly accounted for by the modest shift effect within nonagricultural goods, since that within the full service sector was negligible.

No comparison can be made with the shift differentials for the United States which are shown in Table 10. These were estimated on the basis of Fuchs' calculations for goods minus service and goods*

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[31] On the contrary, given the greater opportunities for part-time employment which the service sector provides, and the attraction of such employment for female participants, the high proportion of females expected in the projected additions to the labor force by 1970 (see page 252) makes it possible that the trend will be even more pronounced.

minus service* for the period 1929–61 [32] in conjunction with the rela-
tionship between the four Canadian differentials for the postwar years,
and were only included for the purpose of calculating an approximate
measure of the unexplained residual in Table 10.

Differential Changes in Labor Quality

In order to compensate for the heterogeneous character of conven-
tional man-hours data, Fuchs used labor compensation as a standard-
ized measure of labor input. The crucial assumption here is that,

> if . . . the price of labor (adjusted for quality, effort, and so forth) changes
> at the same rate in all branches of the economy, then the change in total
> labor compensation in a particular industry relative to the change in the
> economy as a whole is equal to the change in labor input in that industry
> relative to the change in labor input for the economy as a whole.[33]

It then follows that relative quality changes between industries or
sectors can be inferred from differentials in the rates of change of
compensation per man-hour. On this basis, Fuchs established that
there had been a significantly faster growth of labor quality in the
goods as compared with the service industries for both the full and
restricted sectors over the entire period from 1929 to 1961, a conclu-
sion which the more recent U.S. experience also supports, as may be
seen from Table 10. He next discussed a number of other factors
which might have had some bearing on this differential, such as the
incidence of unionization, the effects of nonpecuniary advantages and
differential industry rates of growth, as well as the one which prob-
ably strikes closest to the central assumption, i.e., whether, given the
existence of sector differentials in educational attainment, there might
have been pronounced differences in wage trends for workers with
different amounts of formal schooling. In respect to the factors ex-
pressly considered, Fuchs was of the opinion that they did not seem
sufficiently important to invalidate the observed results.

He then went on to consider whether, on the basis of sector differ-

[32] See Fuchs, *Productivity Trends in the Goods and Service Sectors*, Table 4.
Differential shift effects were found to account for about one-fifth of the sector
differential in output per man in the full sector comparison—largely because of
agriculture, but were of negligible importance in the case of the modified sector
comparison.

[33] *Ibid.*, p. 8.

entials in labor force characteristics such as age, sex, color, and edu-
cation—variables that can be related to earnings [34]—there existed any
independent evidence which would verify his inferences about differ-
ential quality change. The details of this analysis will not be repeated
here, but the over-all thrust of the data considered was that there
had been a distinct tendency over the period in question for workers
in the goods sector to become progressively more concentrated in the
"high quality" groupings with respect to the characteristics examined.

The Canadian results shown in Table 10 are therefore surprising
if some parallel with those of the U.S. is looked for. The range of the
four alternative differentials in compensation per man-hour is ex-
tremely broad, with that for goods minus service looking perhaps too
good to be true while, at the other extreme, it is quite remarkable
that the rate of growth of labor quality which the indicator in ques-
tion represents should appear to be faster in commercial service than
in nonagricultural goods. However, as the preceding discussion on
differential changes in average hours worked will perhaps have sug-
gested, the disparity between the results of the comparisons based on
the full goods sector and those involving nonagricultural goods is
mostly accounted for on the man-hours side of the calculation. Aver-
age hours worked in agriculture are considerably higher than in non-
agricultural goods, and the very sharp decline of employment in that
industry over the period in question reduced the rate of growth of
man-hours from 1.04 per cent per annum in nonagricultural goods
to −0.73 per cent in the total goods sector.

Perhaps the most obvious comment on these results is that the qual-
ity of the basic data may simply not be adequate to support the calcu-
lation of meaningful second-order differences. For example, a 5 per
cent range of error in the growth rates of labor income and man-hours
would be sufficient to yield sector differentials in compensation per
man-hour as wide apart as 0.72 and −1.13 per cent in the case of non-
agricultural goods and commercial service, and an even greater lati-
tude could exist for any estimates including agriculture.

Before assigning a major share of the blame to data deficiencies,

[34] For some recent Canadian tabulations of earnings by sex, age, and selected
levels of schooling, see DBS Catalogue No. 91-510, *Earnings and Education*, by
J. R. Podoluk, Ottawa, 1965, Table 6.

TABLE 12

Alternative Estimates of the Differential Rates of Growth of Labor
Quality and Capital Input, Goods and Service Sectors,
Canada, 1946–66
(per cent per annum)

	Goods Minus Service	Goods Minus Commercial Service	Nonagri- cultural Goods Minus Service	Nonagri- cultural Goods Minus Commercial Service
Labor quality	1.30	0.93	0.49	0.12
Capital input	0.49	0.35	0.30	0.16

SOURCE: Table 9. Sector labor income measures have been modified by the inclusion
of accrued net income of farm operators from farm production and net income of non-
farm unincorporated business from DBS Catalogue Nos. 13-502 and 13-201, *National
Accounts, Income and Expenditure,* Table 24.

however, it should be pointed out that the compensation data used
in the numerators of the sectoral indicators of changes in labor qual-
ity analyzed here relate only to paid workers and are thus inconsist-
ent with the man-hour measures used in the denominator which cover
the self-employed as well. Fuchs acknowledged a similar problem [35]
but was apparently able to ignore it. Labor-type income of the self-
employed in Canada forms part of the national accounts categories
of "accrued net income of farm operators from farm production" and
"net income of nonfarm unincorporated business," and a very large
proportion of the latter originates in the service industries.

   There is, of course, no unique way of separating out such income,
and the procedure, followed in Table 12, of assuming that it accounts
for the entire amount reported under these headings may be just as
unsatisfactory as ignoring it altogether. It cannot even be claimed that
these two crude alternatives provide limiting values for the sector
differentials, since there are feasible combinations of the distribution
of self-employed labor income by industry and changes over time in

[35] *Productivity Trends in the Goods and Service Sectors,* p. 9.

its relative importance which could yield results falling outside such limits. However, the modified sector differentials of compensation per man-hour shown in the first row of Table 12 certainly look more reasonable, and labor-type income may very well be a sufficiently high and stable proportion of total unincorporated business income so that the assumption underlying the results of Table 12 is a better approximation of reality than that on which the Table 10 results are based. At any rate, there is scope for further investigation here and a more sophisticated attempt to calculate valid measures of labor compensation by sectors.

It may be noted incidentally that the procedure for modifying the sector differentials in compensation per man-hour just discussed also yields revised estimates of the differential rates of growth of capital input, since labor compensation is the denominator in the calculation of the latter measure. What the procedure amounts to in effect is a reallocation between the two explanatory variables of the differential growth of current dollar GDP per man-hour, so that the unexplained portion of the differential rate of growth of output per person employed remains unchanged. The revised estimates for the differential growth of capital input will be evaluated at a later stage in the paper.

The ambiguous nature of the results arrived at by the calculation of compensation per man-hour differentials from Canadian data underlines even more firmly than in the U.S. case the need for an independent assessment of the quality effect, as well as an investigation of the factors which might distort its reflection in unit compensation differentials.

Some impressions of the changing incidence by sector of what Fuchs has identified as "high quality" demographic characteristics can be derived fairly readily from decennial census and labor force survey sources. However, the association of these characteristics with earnings data by industry cannot at the present time be taken very far because of the limited cross-classifications which are readily available at this level. Given the appropriate detail, standardized measures of labor input by industry, based on earnings-weighted distributions of significant combinations of characteristics, could be prepared. This is a possibility that can perhaps be anticipated with more confidence than that of making allowance for the effects of other influences on earn-

TABLE 13

Civilian Labor Force Employment and Growth, by Sex,
Service and Goods Sectors, Canada, 1946–66

	Per Cent Distribution		Annual Growth Rate
	1946	1966	
Services			
Men	64.9	57.9	3.4
Women	35.1	42.1	4.9
Total	100.0	100.0	3.9
Goods			
Men	85.3	84.4	0.5
Women	14.7	15.6	0.9
Total	100.0	100.0	0.6
Total			
Men	77.3	69.7	1.6
Women	22.7	30.3	3.6
Total	100.0	100.0	2.2

NOTE: 1966 data adjusted to conform with the 1948 SIC. Growth rates compounded between terminal years.

SOURCE: DBS, Special Surveys Division, Special Table 3(c), supplementing DBS Catalogue No. 71-001, *The Labour Force*, Ottawa, monthly.

ing capacity, but both of them must be left open for further study and data development.

On the first point, a recent Canadian study [36] has shown that educational attainments among women in the general population are somewhat higher than among men for similar age groups, mainly because a higher proportion of females have completed high school. In 1965, the proportion of females 25 years of age and over with high school graduation was 18.5 per cent, while for males the proportion was a little less than 13 per cent. The increasing proportion of women in the labor force, particularly in the service sector, might therefore have been expected to raise the average educational, and thus the

[36] DBS Catalogue No. 71-505, Frank J. Whittingham, *Educational Attainment of the Canadian Population and Labour Force: 1960–1965*, Special Labour Force Studies No. 1, Ottawa, October 1966, p. 7 and Table 2.

quality, level of persons employed in the service industries. As Table 13 shows, about 42 per cent of employment in the service sector in 1966 was accounted for by women, compared with 35 per cent in 1946, and the growth rate of women in services has been close to 5 per cent per annum.

However, Census data suggest that the educational differential in favor of women has been diminishing. This is indicated by the figures of Table 14. Between 1951 and 1961, the educational status of males clearly rose faster than that of females. Indeed, the proportion of

TABLE 14

Per Cent Distribution of the Civilian Male and Female Labor Force by Years of Schooling, Canada, 1951 and 1961

	Per Cent Share	
Years of Schooling	1951	1961
Females		
0–4	3.0	3.6
5–8	31.0	26.3
9–12	52.7	51.6
13+	13.3	18.5
Total	100.0	100.0
Males		
0–4	8.3	7.1
5–8	46.7	37.3
9–12	35.6	40.1
13+	9.4	15.5
Total	100.0	100.0
Both sexes		
0–4	7.1	6.2
5–8	43.2	34.3
9–12	39.3	43.2
13+	10.3	16.3
Total	100.0	100.0

NOTE: 1951 concept—"number of years attended"; 1961 concept—"highest grade attended." 1951 Census includes 14 year olds.

SOURCE: 1951 data—Dominion Bureau of Statistics, *Ninth Census of Canada, 1951, Vol. IV—Labour Force, Occupations and Industries,* Table 19. 1961 data—1961 Census, unpublished (available on request).

females with 9–12 years of schooling declined a little, while that of males with 13 or more years of schooling increased faster than the proportion of females in this category.

Thus, the evidence of Table 14 suggests that, in Canada, the quality of the male labor force, which currently accounts for some 85 per cent of total employment in the goods sector, has been rising faster than the quality of the female labor force, which is heavily concentrated in the service sector. The joint effect of shifts in the sectoral distribution of the two characteristics of education and sex comes out more directly in Table 15. The percentage of the total labor force in goods industries with 9 or more years of schooling rose from 37 per cent in 1951 to 47 per cent in 1961, while the corresponding percentage in the service industries, although much higher in both years, showed only a small increase. Changes between 1951 and 1961 for the nonagricultural goods and commercial service sectors were of the same general order, but the absolute levels of educational attainment were markedly different. The exclusion of agriculture increases the quality

TABLE 15

Education and Age Characteristics of the Labor Force,
Goods and Service Sectors, Canada, 1951 and 1961
(per cent of sector labor force)

	Goods	Service	Nonagri-cultural Goods	Commercial Service
1951				
Ages 25 to 64	72.2	71.3	73.0	71.2
9 years or more of schooling	36.7	64.0	42.0	59.2
1961				
Ages 25 to 64	77.8	74.8	78.9	75.2
9 years or more of schooling	46.9	69.4	51.2	65.4

NOTE: 1951 data roughly adjusted to conformity with the 1960 SIC. The conceptual difference of the schooling question noted in Table 14 applies here.
SOURCE: Same as Table 14.

of the goods labor force, while the exclusion from services of the non-commercial industries results in a decrease of average quality.

Table 15 also shows changes in the percentage of the labor force in both sectors falling into what is generally thought of as the higher quality age group. In summarizing his impressions of similar data, Fuchs comments that "the service-sector work force has been increasingly drawn from females, nonwhites, the young, and the old, . . ." [37] As far as age is concerned, this tendency was not pronounced in the United States in recent years; in Canada, the opposite was the case. The proportion of the sector labor force between the ages of 25 and 64 actually increased for both variants of the two sectors, although the increase was smaller in services than in goods.

Differences in the Rate of Growth of Capital Inputs

An extension of the assumption underlying Fuchs' estimates of relative changes between sectors in standardized labor inputs permits the derivation of a rough measure of that part of the differential change in output per person employed attributable to changes in the rate of growth of capital per person employed. Just as relative changes in labor compensation were used to estimate relative changes in quality-adjusted labor input, so, on the assumption that "the price of a composite unit of factor input (land, labor, and capital) has changed at the same rate in all branches of the economy," [38] relative changes in total factor input were equated with relative changes in total compensation, as measured by current dollar gross product. Thus, the differential rate of growth of capital per unit of labor input emerges residually by subtracting the differential in the growth of output per unit of total factor input from that of output per unit of labor input or, more simply, by calculating differentials in the rate of growth of total compensation per unit of labor compensation.

Table 10 suggests that, on the basis described, there was in Canada during the postwar years a faster rate of growth of capital inputs in nonagricultural goods than in services, but that when the goods sector is broadened to include agriculture, this differential is reversed. These results bear little obvious relationship to those for the United States

[37] *Productivity Trends in the Goods and Service Sectors,* p. 30 and Table 10.
[38] *Ibid.,* pp. 9–10.

where three comparisons out of four show capital inputs to have grown faster in goods than in services, the exception being goods minus service where there was a slight margin in favor of services.

The modification of the underlying labor compensation series along the lines indicated earlier produces the alternative Canadian differentials shown in the second row of Table 12. It is again difficult to assess whether these are more realistic than the original results of Table 10. To the extent that the revised labor quality differentials represent an improvement, then, given the validity of the underlying assumption that the price of a composite unit of factor input has changed at the same rates in all industries, there ought to be a parallel improvement in the indicators of the differential growth of capital inputs. One obvious point is that the alternative measures reverse the sign of the differential in the comparisons involving the full goods sector where there is no intuitive reason to suppose that the inclusion of agriculture would change the results so drastically from those of the comparisons based on nonagricultural goods.

A further difficulty of the Table 10 results is brought out in Table 16. This shows the components of the sector differentials which are seen to be largely derived as differences between negative values of the total compensation per unit of labor compensation measure. It is not, of course, a sine qua non that a positive sector differential be derived as a subtraction of positive quantities since, in a purely arithmetic sense, it can just as well represent a less rapid decline in capital input relative to labor as a more rapid increase. However, the former proposition is again intuitively difficult to accept and the alternative results shown in Table 12 have at least the merit of not depending upon such an interpretation.

As in the case of the labor quality differentials, some independent evidence must be sought and, for this purpose, differential changes in direct capital-labor ratios may be used. Official statistics of fixed capital stocks are not yet available for all industries in the economy,[39] but private estimates by Hood and Scott [40] permit rough estimates to be made of the differential changes in capital-labor ratios between the goods and service sectors up to 1955.

[39] See, however, DBS Catalogue Nos. 13-522 and 13-523, *Fixed Capital Flows and Stocks—Manufacturing, Canada, 1926–60*, Ottawa, August 1966.
[40] Hood and Scott, *op. cit.*, Table 6B3.

TABLE 16

Growth Rates of Total Compensation Per Unit of Labor
Compensation, Goods and Service Sectors,
Canada and United States
(per cent per annum)

| | Canada, 1946–66 | | United States, 1947–61 |
	Original	Revised	
Goods	−0.52	0.67	
Nonagricultural goods	0.20	0.48	
Service	−0.29	0.18	
Commercial service	−0.28	0.32	
Goods			−0.28
Goods*			−0.01
Service			−0.22
Service*			−0.53

NOTE: All calculations are by division of component growth rates plus 100.
SOURCE: Canadian data—same as Table 12; U.S. data—Fuchs, *Productivity Trends in the Goods and Service Sectors, op. cit.,* Table A-2.

Table 17 shows that the capital-labor ratio increased between 1946 and 1955 for each variant of the goods and service sectors and that the increases in goods were much greater than those in services. Furthermore, the measure for the full goods sector increased more than that for nonagricultural goods and there was a similar disparity between commercial service and the full service sector. These findings are more consistent with the revised than with the original growth rates of total compensation per unit of labor compensation (shown in Table 16) and thus, in spite of the shorter time period covered, tend to support the alternative estimates of the contribution of changes in relative capital-labor proportions to differential output per person employed in Table 12.

A rather oblique indication that the trend toward increasing capital intensity in the goods industries relative to services (indicated by Table 17) has continued to more recent times is provided by the growth of capital and repair expenditures in the goods and service

TABLE 17

Changes in the Net Stock of Capital and Employment,
Goods and Service Sectors, Canada, 1946–55

	1946	1955	Per Cent Change
Total goods			
Value of net stock of capital (in millions of 1949 dollars)	7,731.8	15,770.5	104.0
Index of persons employed (1949 = 100)	95.9	98.0	2.2
Capital-labor ratio	–	–	99.6
Nonagricultural goods			
Value of net stock of capital (in millions of 1949 dollars)	6,468.6	12,950.8	100.2
Index of persons employed (1949 = 100)	87.7	111.6	27.3
Capital-labor ratio	–	–	57.3
Service			
Value of net stock of capital (in millions of 1949 dollars)	11,925.8	18,203.0	52.6
Index of persons employed (1949 = 100)	92.0	130.4	41.8
Capital-labor ratio	–	–	10.8
Commercial service			
Value of net stock of capital (in millions of 1949 dollars)	5,654.9	8,968.3	58.6
Index of persons employed (1949 = 100)	86.0	117.0	36.0
Capital-labor ratio	–	–	16.6

Source: Capital stock data—Hood and Scott, *op. cit.*, Table 6B3; index numbers of persons employed—same as Table 6.

sectors relative to that of employment between 1955 and 1965. Rough calculations indicate that the proportions between the two were in the order of 26:1 and 6:1 for goods and nonagricultural goods, but only about 2:1 for both the service and commercial service sectors. Even allowing for the fact that these ratios have an upward bias because of the price inflation in the current dollar expenditure data used, they provide further support for the proposition that part of the ex-

planation for the lower rate of growth of output per person employed in the service industries is the fact that capital per person employed has risen more slowly than in the goods sector.

SUMMARY AND CONCLUSIONS

This paper has attempted, first of all, to delineate the broad changes which have taken place in the industrial distribution of the Canadian labor force since 1931. What has emerged quite unmistakably is the picture of a steady increase in the proportion accounted for by the service industries, the cumulative effect of which has been a virtual reversal of the relative importance of the goods and service industries as they stood at the beginning of the period. This shift gathered momentum in the 1950's and has continued with somewhat diminished force in more recent years. A striking fact about this increase in the relative importance of the service industries is that it was, in effect, achieved at the expense of agriculture, which lost ground steadily in relative terms and, since the Second World War, in an absolute sense as well.

Whether this shift of employment to the service sector will continue in the future and, if so, to what extent are questions to which no answers were attempted. It was noted, however, that a significant proportion of the new additions to the labor force during the next few years was expected to be distinguished by the kind of demographic characteristics which are becoming increasingly identified with employment in the service industries. Any systematic assessment of future employment trends must really start from the demand side, and the most promising approach would seem to be through an over-all projection exercise, based on an up-to-date input-output table, of the kind which has recently been attempted in the United States as part of the Federal Interagency Growth Study Project.[41]

In considering what might have been responsible for the relatively faster growth of employment in the service industries, it was concluded that the pure effect of a higher income elasticity of demand for services than for goods was difficult to identify, but that the total influence

[41] See *Manpower Report of the President and a Report on Manpower Requirements, Resources, Utilization, and Training by the United States Department of Labor*, transmitted to Congress, Washington, D.C., March 1966.

from the demand side could not have been a substantial factor. Rather, the main explanation lies in a much lower rate of increase of output per person employed in the service sector than in goods. The reasons for this difference are extremely difficult to quantify, but the evidence examined, both direct and indirect, suggests that all of the four factors explicitly considered by Fuchs have also been operative in Canada in varying degrees according to which particular sector comparison is made.

Thus, it is fairly certain that part of the differential in output per person employed is accounted for by a faster rate of decrease of average hours worked in services than in goods, although it will be recalled that this effect is mainly the result of a growth of part-time employment in services which has had no significant parallel in the goods sector. Shifts in the relative importance within sectors of industries having different levels of productivity appeared to be of about the same magnitude in both the nonagricultural goods and commercial service sectors and therefore contributed nothing to the explanation of the basic productivity differential. On the other hand, important shift differentials emerged when the goods sector including agriculture was compared with services.

The results obtained when assessing the importance of differential rates of change in labor quality and of physical capital per worker on the basis of Fuchs' proxy measures for total labor input and total factor input were somewhat ambiguous in nature, because of the difficulty of developing a valid measure for total labor input which embraces all classes of workers. However, the limited supplementary evidence which was considered suggested that Fuchs' general conclusions on these points were probably valid for postwar Canadian experience also, and it gave some support to the results derived by the direct method on the basis of the alternative measures of the growth of total labor input which were presented.

Some comments were made earlier on the adequacy of presently available data when used in the context of what appears to be a simple analytical framework, but which is in fact extremely rigorous in the demands which it makes on data. It may never be possible to distinguish clearly between the effects of deficiencies in the data and those of the methodology itself, but the air could clear somewhat with

a reworking of the relevant calculations when the forthcoming historical revisions to the Canadian national accounts and the next stage in the updating of the real domestic product measures are completed.[42] A similar reworking of the U.S. analysis, on the basis of comparable revisions of the source data which were recently completed,[43] should also be carried out. Canada-U.S. comparisons on a more consistent basis for sector definitions and time periods covered could then be an extremely useful way of looking more closely at the basic methodology which has not so far been subjected to much critical scrutiny.

During the next few years, further developments in the area of real output measures, labor statistics, and capital stock estimates are planned in Canada which will gradually improve the basis for analyzing differential productivity trends in the goods and service sectors. However, it is difficult to be optimistic about even long-term prospects in some of the more intractable areas of real output measurement in the service sector. It is often said that, because output in the non-commercial industries is measured by labor inputs, changes in output per person employed are zero by definition. In fact, because of the many diverse measures of labor input used on the output side which are not consistent with the labor force employment series generally used in the denominator, negative productivity change invariably results, as may be readily inferred from the difference between the service and commercial service measures of output per person employed shown in Table 9. It may be desirable in future analyses of differential productivity change to inpute some more realistic measure to this difficult sector of the economy. Even the assumption of zero productivity change would result in a significant narrowing of the goods minus service differential.

It is impossible to conclude this paper without some explicit acknowledgment of the debt which it owes to the work of Fuchs and those in whose steps he has followed. This has been little more than a rough exploration of the territory, but it might never even have

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[42] See comments in the May 1966 and May 1967 issues of DBS Catalogue No. 61-005, *Annual Supplement to the Monthly Index of Industrial Production.*

[43] See "The National Income and Product Accounts of the United States: Revised Estimates, 1929–64," *Survey of Current Business,* Vol. 45, No. 8 (August 1965); and "Revised Estimates of GNP by Major Industries," *Survey of Current Business,* Vol. 47, No. 4 (April 1967).

been initiated without the aid of the insights that he has provided into the factors underlying the major transformation taking place in the structure of the North American economy. As the National Bureau's program of productivity studies in the service industries progresses, it will undoubtedly provide similar inspiration for future work by Canadian researchers.

DISCUSSION
NESTOR E. TERLECKYJ, Bureau of the Budget

In his paper, Worton develops data on comparative trends in employment in the service and goods industries in Canada. He compares these trends with the developments in the United States. He then analyzes the differences in the growth rate between the service industries employment and employment in the goods industries by applying the analytical framework developed by Victor Fuchs. Worton tests the hypotheses of differential income elasticity for goods and services and of differential rates of productivity growth. My discussion follows this outline. At the end I have a few general observations regarding the framework of analysis.

EMPLOYMENT TRENDS

In his analysis of the employment trends, Worton finds that over the long period, service employment in Canada grew secularly more rapidly than employment in the goods industries. By placing the data of the two countries on a comparable basis, Worton is able to observe that in 1950 service employment in Canada still constituted a considerably lower proportion of the labor force than in the United States, and that since 1950 the shift in the labor force to services accelerated in Canada so that by 1960 the proportions of employment in the two countries engaged in the goods and in the service industries were not too different.

While presentation and analysis of employment trends are interesting in themselves, the central point is that employment in services grew faster than employment in goods. This finding does not depend on whether all goods and all service industries are being compared

or whether the comparison is limited to the private commercial services sector and the nonagricultural goods industries.

In addition to establishing the employment trends, Worton compares the trends in gross product. He finds that the undeflated value of gross product grew more rapidly in services than in goods, but that real product as measured [1] grew more rapidly in goods than in services.

DIFFERENTIAL INCOME ELASTICITY HYPOTHESIS

It is generally recognized as possible that employment grew more in service industries than in goods because the consumer demand for services is more income elastic than for goods and, since in the course of time incomes rose considerably, employment in the production of services grew more rapidly than that in goods. This hypothesis is in line with the generally held views of shifts from primary to secondary to tertiary industries. Worton tests this hypothesis by comparing the growth differential between goods and service industries output in current and deflated dollars. Since real output of goods grew more and since the excess growth of the undeflated service output was small, Worton rejects the income elasticity hypothesis.

My main criticism of this analysis concerns the limitations of the comparison of the relative changes over time as a test for the income elasticity hypothesis. A stronger test, though still within the scope of partial analysis, for the income elasticity hypothesis could be devised by bringing in cross-sectional data on income elasticity and, probably, by removing from the universe of comparison those services and goods not consumed in the household sector. Eventually, however, the differences in the employment trends should be analyzed in a more general framework including income elasticity, if significant, as one of the explanatory variables, and not necessarily, or not exclusively, in terms of goods vs. service industries.

DIFFERENTIAL PRODUCTIVITY CHANGE HYPOTHESIS

Worton compares growth in real output per person employed in the goods sector and in the service sector and comes out with substantial differences in favor of goods. Depending on the set of sector definitions

[1] The gross product trends are based on the prevailing concepts of measurement.

considered, this differential productivity growth is roughly between 2.5 and 4.5 per cent per annum. For the comparison of commercial services and nonagricultural goods, the difference is 2.7 per cent annually. The counterpart rate for the United States established by Victor Fuchs is 1.5 per cent.

Fuchs analyzed the reasons for this difference in the United States, and found that after allowance for hours of work per person, for intersector shifts, and for differential changes in labor quality and in capital per worker, virtually all of this difference can be explained. Worton applies the same methodology to the Canadian data and explains only 0.6 out of the total 2.7 per cent differential between the two sectors.

This is the most striking result of Worton's paper. The economic systems of the two countries are not too different, the effective R and D inputs may be comparable, and the education input is included. As far as I can tell, without undertaking exhaustive reviews, the nature of the data used for the two countries and the methodology are the same. Why then the difference? The unexplained residual is quite large. It amounts to more than 2 per cent per annum over a period of more than twenty years. The puzzle to me lies not so much in the fact that there is a residual not explained by the four factors used (one could invoke economies of scale and the differential rates of innovation) but that the differential is explained for the United States but not explained for Canada. I don't have any major critical points to raise about this part of the paper other than again suggesting a more unified analytic framework. Rather I call attention to the puzzle posed by Worton's results and to the opportunity it offers as a starting point for further research both into the substance of the matter, i.e., reasons for changes in productivity, and into the concepts underlying the existing measurements of output and input. With regard to the latter point, I would like to see whether comparable differentials for the United States and Canada would be obtained with output measured by indexes derived from physical units instead of the real dollar gross output. As to the substantive hypotheses, of course the possibilities are numerous. Two of the candidates are the differential operation of the economies of scale and the differential rates of technological change between goods and services in the two countries. I

doubt, however, that the economies of scale had much to do with the discrepancy. If anything, these would tend to make the residual greater since, a priori, the potential for economies of scale to become active was greater in Canada than in the United States. It may be, as Fabricant suggests, that the key to Worton's puzzle lies in the initial differences in the absolute levels of productivity in services and in goods in the two countries.

ANALYTICAL AND MEASUREMENT FRAMEWORK

In conclusion, I would like to make three brief points about the analytical and measurement framework in which Worton's analysis is embedded.

The first question deals with the physical units of services versus the constant dollar gross product. Based on the experience I had attempting to measure physical output of the public sector and of some private service industries, I tend to be quite optimistic about the development of production indexes for a large number of service industries that on the whole would be no worse than measures of the goods output and would certainly be better than measurement of output by cost.[2] It is possible that the quantitative results obtained by Worton, if based on physical output concepts, would be sufficiently different to qualitatively change their meaning.

My second point deals with substitution relationships of goods and services in consumption. From a consumer or, more broadly, from a welfare point of view, the relevant grouping of output is not so much by goods versus services but by the category of the consumer need that these outputs serve and thus by the degree of substitutability within the groups. Of course, many of the properties of goods and of services exchanged in the market are radically different, and the ability of goods to move in time and in space provides sufficient reason for some. of the basic distinctions being made for the purposes of economic analysis. However, a grouping of outputs by objective, rather than by the formal physical embodiment, can also lead to powerful analytical insights and important empirical conclusions. It is possible, for example, that the failure of the income elasticity hypothesis in Worton's

[2] For my earlier statement on this subject, see *1964 Proceedings of the American Statistical Association, The Business and Economic Statistics Section,* pp. 76–94.

paper is not so much a reflection of the shortcomings of a test as of raising the wrong question. The intermingling of goods and service alternatives serving the same consumer objectives may be sufficiently pervasive so that no over-all difference in their respective income elasticities can be observed. I would also like to refer to some very interesting work which has been done in recent years by the government of the United States in grouping various outputs of the public sector, both goods and services, under welfare oriented policy objectives, where, for example, under the heading of traffic safety such goods and services as seatbelts, training of drivers, and the ambulance service may be combined instead of being identified under their respective modes of operation, i.e., goods, training, and medical services.

Finally, I would like to make a point regarding practicalities of alternative forms of output measurement. This is essentially a question of the usefulness of an aggregate output index representing the total product as against a marginal product vector, i.e., marginal or incremental product disaggregated. The distinction is important from the point of view of choice, both consumer and public, and is relevant also in the context of Reder's paper and Klarman's discussion of it. The point I want to emphasize is that, from the policy viewpoint, it is the marginal product vector rather than an aggregate production index that is usually relevant. It may be more important to know the marginal product than the total product because only an incremental change at a time is feasible. Incremental formulation permits estimates of trade-offs on the margin between different program areas. A disaggregated vector is also a better decision vehicle than an aggregate index because in a choice-making or a policy context, an index form of measurement entails an unnecessary assumption of the welfare function of a quite restricted sort, i.e., a linear function with cardinal utility measured by the system of weight used in aggregation. As a practical matter, the problem of policy makers and analysts is not the difficulty of dealing with multidimensional baskets, but the problem of estimating the relevant functional relations, i.e., demand and production functions, the marginal products, and the transformation relations, with a reasonable degree of confidence.