FACTORS IN CANADA-UNITED STATES REAL INCOME DIFFERENCES

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This paper is a part of a larger study of economic growth in Canada, following the methods developed by Edward Denison in his book *The Sources of Economic Growth in the United States* and the publication *Why Growth Rates Differ*. The new material in this paper relates to Canada and the Canadian/U.S. comparison, while the material on Northwest Europe is drawn from the Brookings study.

The present paper sets out the results to date on the differences in real output per employed person between Canada and the United States for one year, 1960. At this stage in our research the results indicate that the level of real output per employed person in Canada was about 20 per cent lower than in the United States in that year. On the basis of historical output data, it would appear that this margin of difference in Canadian/U.S. product levels has persisted throughout the present century.

The central part of this paper examines the significance of differences in factor inputs in Canada and the United States and their contribution to the difference in income. The level of inputs per employed person in Canada accounts for only about 2 percentage points of the income difference between Canada and the United States. These results indicate that the overwhelming part of the difference in output per employed person between the two countries reflects the differences in output in relation to total factor inputs, rather than the magnitude of other factor inputs used in combination with labour.

This result is consistent with earlier studies by Denison and others which have indicated the crucial importance of output in relation to total factor inputs, both in output growth over time and intercountry comparisons of output level.

The body of the paper can give only brief attention to the numerous conceptual and statistical questions that arise in such a wide-ranging study, and the authors do not pretend to have tackled, let alone resolved, all of the wide range of problems related to this study. Nor do they claim any high degree of precision for the results, especially in the light of the statistical limitations of the basic data.

Introduction

This paper follows the methods developed by Edward F. Denison in his studies of economic growth. His first study was concerned with the sources of economic growth over time in the United States.[1] This involved a separation of the contribution of factor inputs—labour, capital and land—and the growth in output in relation to factor inputs. As well as developing the framework, methodology and data, he applied them to the question of how the rate of growth in the United States could be increased in the future, and to the projection of the future rate of growth in total output.

In his latest study,[2] he extends essentially the same framework of analysis to

1. Edward F. Denison, *The Sources of Economic Growth and the Alternatives Before Us* (New York: Committee for Economic Development, January 1962), Supplementary Paper No. 13.

2. Edward F. Denison assisted by Jean-Pierre Poullier, *Why Growth Rates Differ: Postwar Experience in Nine Western Countries* (Washington: The Brookings Institution, 1967), and Edward F. Denison, "Sources of Postwar Growth in Nine Western Countries", *American Economic Review*, May 1967, pp. 325–332. The authors are indebted to Dr. Denison and J. P. Poullier for advice and assistance over several years in the work of which this report is one part.

eight European countries for part of the post-war period (1950 to 1962). A major aim of this study was to see if European experience was consistent with the earlier U.S. study, and if the United States could learn anything for policy purposes from the high rate of growth in total factor productivity in post-war Europe. As part of this process he had to measure and analyze the contributions of labour, education, capital, natural resources, interindustry shifts, differences in demand strength, the effects of economies of scale, the reduction of trade barriers, etc. Many of these areas are known to be crucial to economic growth. Denison developed a model which permits many of these forces to be put into a quantitative and consistent framework of factor inputs and output in relation to factor inputs, and so provide a sense of perspective on individual items.

Although the study and its appendices are full of tables, sources, statistical limitations, etc., it is not just of interest to statistical experts. Although this was not the primary emphasis of the book, there are a wide range of topics related to policy analysis and conclusions, e.g., the role of demand variations (especially in the United States in the early 1960's), the contribution of investment and capital, the scope for interindustry shifts in individual European countries, the effects of international trade barriers and their reduction, differences in advances in knowledge in various countries, differences in manufacturing productivity within individual European countries. It contains comments on potential growth for a number of major countries, especially on labour force growth and education trends. The book provides many new insights, and merits careful study by economists and statisticians in governments, international agencies, and universities.

One of the important new features in the recent volume is the application of the earlier framework to an analysis of the factors in intercountry differences of real income. It is to this particular part of the Brookings study that this paper relates, concentrating on the development of the Canadian material. In all essential respects the paper follows the methods pioneered and developed by Denison.

In the application of the Denison framework to intercountry differences in real output per worker, essentially four steps are involved. Basic factual information on income differences must be prepared, and this is an area in national income work that has had much less attention than the time series data for individual countries. Information on the main factor inputs—labour, capital, and land—must be assembled and intercountry relatives prepared as the second step. Thirdly, the application of income share weights to the individual factor input relatives gives a measure of the contributions of all the factor inputs to the real income differences. Finally, the residual, i.e., the contribution of output in relation to factor inputs, is also broken down into a number of elements—economies of scale, allocation of resources to farming and self-employment, international trade barriers, fluctuations in demand and agricultural production, and advances in knowledge. Only the first three of these steps are covered in this paper.

One of the important areas of interest at the Economic Council of Canada is the study of economic growth in the past, as a basis of appraising potential growth in the future. This implies a concern for the possibilities of increasing the rate of growth and achieving a more efficient allocation of resources in Canada

by methods that are consistent with other broad goals on prices, balance of payments, etc. The close proximity of, and economic relations with, the larger and affluent country to the south make comparisons with the United States essential in many areas of Canadian study. The studies in this area, together with some econometric analysis of production relations in process at the Economic Council, are undertaken with a view to increasing understanding and facilitating decision-making by governments, business, etc. The interest in the Denison approach is in its possible relevance and usefulness for the main areas of concern in the work of the Economic Council.

It is recognized that there are many questions about the process of economic growth that are neither raised nor resolved in this brief study; it was not the purpose of this paper to get into such a broad area.

The statistical results presented in this paper have been revised and reworked in several stages, but the authors do not claim any high degree of precision for the results. Small differences are not statistically significant. They are being used to provide orders of magnitude and a broad and consistent framework of analysis for studies planned and under way.

Real National Product per Employed Person

The real output comparison involved the estimation of net national income on a comparable basis and with depreciation valued at replacement cost, and of price differences between Canada and the United States. In order to standardize for differences in the size of the economies, the data are put on a per-person-employed basis.

1. *National income estimates*: In explaining why net national income is used in the analysis of growth, the Brookings study states:

> The decision to analyze net rather than gross national product is the most important. Net product measures the amount a nation consumes plus the addition it makes to its capital stock. Stated in another way, it is the amount of its output that a nation could consume without changing its stock of capital. Insofar as a large output is a proper goal of society and objective of policy, it is net product that measures the degree of success in achieving this goal. Gross product is larger by the value of capital consumption. There is no more reason to wish to maximize capital consumption—the quantity of capital goods used up in production—than there is to maximize the quantity of any other intermediate product used up in production. . . .[3]

The estimation of net national product involves the calculation of depreciation on capital facilities at replacement cost, so these estimates are intimately linked to the construction of estimates of capital stock. It should also be noted that the comparisons are made on a factor cost rather than a market price basis, following the widespread preference for factor cost measures for studies of resource allocation. The difference—indirect taxes (net of subsidies)—has been an important source of revenue in Canada historically, and has grown significantly

3. *Ibid.*, p. 14.

in importance over the last two decades. Other adjustments have been made to the official estimates for the sake of international comparability, to bring the Canadian estimates on the OECD or U.N. definitions. However, the effects of such adjustments are small; they reduce the Canadian estimates slightly, relative to the United States.

The output data on a per-employed-person basis are shown in Table 1 for 1960, the basic year used for this paper.

TABLE I

CANADA/UNITED STATES OUTPUT PER PERSON EMPLOYED IN NATIONAL CURRENCIES, 1960
(U.S. = 100)

	Official	Adjusted
Gross National Product at market prices	82	81
Gross National Product at factor cost	79	78
Net National Income	75	73

It is apparent that a number of elements contribute to the widening of the income per worker gap in the official GNP at market prices (82) to the adjusted Net National Income (at 73). The largest single difference reflects the larger share of depreciation in GNP (both at replacement and historic cost) in Canada than in the United States, but indirect taxes (less subsidies) are also a larger share of GNP in Canada than in the United States. The adjustments for international comparability are small, as both the U.S. and Canadian official estimates are fairly close to the standard concepts.

2. *Canada-United States Price Differences*: This calculation is one of the most difficult ones, but it is also crucial. The earlier work by Gilbert *et al.* indicated a tremendous disparity in price and quantity relatives for specific items, both within Europe and between individual European countries and the United States. This meant that there could be significant differences in the intercountry comparisons of price and real product depending on which country's weights were used.

Time and staff resources have not permitted Canada-U.S. price and real output comparisons with the depth of the earlier OEEC pioneering studies. The material used in this study is based on Canada-U.S. price relatives for 1965 and Canadian weights. For the consumer area, a special study was undertaken by the Dominion Bureau of Statistics. Canadian price data were matched with data in the U.S. Bureau of Labor Statistics. For some items that were included in the Canadian consumer price index but not in the comparable U.S. specifications, special pricing in selected U.S. cities was done by DBS staff. A write-up of this consumer price study with all the problems and qualifications is available from DBS.[4] The balance of the price comparisons for other GNP categories was done at the Economic Council of Canada, with the advice and assistance of

4. Prices Division, *Comparative Consumer Price Levels in the United States and Canada* (Ottawa: DBS, mimeo., 1967).

DBS staff, and on the basis of a number of interviews with Canadian companies which were familiar with construction or machinery prices in both countries. The 1965 data were extrapolated back to 1960 using related price indices for major components of the national accounts for the two countries.

The results for GNE and some of the main expenditure components are shown in Table 2. Machinery and equipment and consumer durables are clearly much more expensive in Canada than in the United States. To some degree this reflects the effects of the Canadian tariff, and the manufacturers' sales tax (with rates of 11 and 13 per cent at the manufacturers' level in 1960 and 1965 respectively), and a general tendency for manufactured goods costs and prices to be higher in Canada.[5] On the other hand, prices of services, food and construction are less expensive in Canada than in the United States, reflecting primarily the lower level of wages in Canada. For doctors, dentists and hospital costs, the prices are significantly less in Canada than in the United States.

TABLE 2

CANADA/UNITED STATES PRICES FOR MAJOR COMPONENTS OF GROSS NATIONAL EXPENDITURE[a]
(U.S. = 100; National Currencies)

	1960	1965
Consumers expenditure	96.1	97.7
Food	90.6	92.9
Nondurables, other	102.9	104.5
Durables	121.6	119.5
Services	89.9	91.3
Government expenditure	82.5	87.1
Current	80.9	86.7
Capital	88.2	88.5
Housing	87.6	93.9
Non-residential construction	86.3	94.1
Machinery and equipment	111.7	125.6
GNE at market price[b]	93.0	97.0

[a]See Table in Technical Appendix by E. C. West.
[b]Canadian quantity weights by major expenditure components.

It is apparent that prices of most items increased more in Canada than in the United States between 1960 and 1965. This reflects the greater degree of economic vigour in Canada than in the United States over this period and changes in taxes in Canada. In 1960, Canada had the highest level of unemployment and the greatest gap between actual and potential output of any industrialized country during the post-war period. Since then, demand has increased significantly and price increases have become more widespread; devaluation in 1962 put further upward pressure on domestic prices, especially after much of the 1960 slack had been taken up.

5. For additional evidence see D. J. Daly, B. A. Keys and E. J. Spence, *Scale and Specialization in Canadian Manufacturing*, Staff Study, The Economic Council of Canada (Ottawa: The Queen's Printer, forthcoming in 1968).

Relative Canada/U.S. real output per person in 1960 is derived from the 1960 net national income relatives in current dollars in Table 1 and the GNE price relatives (Table 2). The result is 79, or a level of output per worker in Canada 21 per cent below the U.S. level.

Canadian quantity weights were used for Table 2. The use of U.S. instead of Canadian weights for 1965 would raise the Canadian price relative some 2 percentage points—almost to parity with the United States. This is a much smaller difference than was obtained in the U.S.-European comparisons of real product and purchasing power. The larger U.S.-European difference probably reflects both greater differences in prices and quantities between these other countries and the United States than for the Canada-U.S. comparison, and the much finer level of detail used in the earlier studies.

The results of the comparison are shown in Table 3, along with the results for Northwest Europe.[6] As is apparent in the table, Canada's level of real income per person employed is intermediate between the United States and Northwest Europe. With U.S. price weights, Canada is about half way, but with national price weights, the level of output per person employed in Northwest Europe is further depressed.

TABLE 3

COMPARISON OF REAL INCOME, 1960
(U.S. = 100)

	Based on U.S. price weights				Based on 'national' price weights			
	Total	Per Capita	Per Labour Force	Per Person Employed	Total	Per Capita	Per Labour Force	Per Person Employed
United States*	100	100	100	100	100	100	100	100
Canada	6.9	70	78	79	6.7	68	75	77
Northwest Europe*	70.1	69	62	59	54.6	54	48	46

*See Denison and Poullier, *op. cit.*, Table 2-4, p. 22.

Canada has a lower proportion of its population in the labour force than any other developed country, and Northwest Europe accordingly has a much higher proportion of the population both employed and in the labour force than North America. With U.S. price weights, the table suggests that Northwest Europe has a level of national income per capita roughly equal to Canada. This is hard to accept on the basis of either personal observation or other information reflecting comparative living standards, but we have been unable to clarify the statistics and their implications any further at this stage.

6. The figures for Northwest Europe are from Denison and Poullier, *op. cit.*, and are included here for comparative purposes with the kind permission of Dr. Denison. Northwest Europe in this comparison includes Belgium, Denmark, France, Germany, Netherlands, Norway and the United Kingdom, but excludes Italy. This study also contains the results for each individual country.

This section of the paper has summarized the main pieces of evidence bearing on the relative levels of output per employed person in the United States and Canada. The balance of the paper will examine the degree to which the composition of the labour force and the quantity of other factors of production in the two countries can throw light on this difference.

Income Shares of Labour and Capital

Denison's work on growth has used the long-established threefold distinction of productive factors between labour, capital, and land, with further detail of components of these prime factors. Labour input is disaggregated into age and sex categories, along with a number of education levels. Capital takes account of housing, non-residential structures and equipment, inventories, and foreign investment. The contribution of land includes measures for non-residential sites, agricultural land and mineral resources. This paper follows Denison in using the distribution of national income as weights to compare the differences in level in 1960.

As we have noted earlier, the conceptual and methodological framework of this analysis is taken directly from the Denison growth studies. Following the publication of his first study there were comments and questions concerning the use of income share weights for factor inputs. The arguments against this procedure do not seem necessarily telling or relevant, particularly for international comparisons. A very large and important part of the analysis relates to the derivation of relative factor inputs which can of course stand alone. Many of the exciting policy-oriented implications of the analysis stem from these comparisons. If however the inputs are to be used in an aggregative or production function analysis, some weighting system for the individual inputs is required. Some of the literature seems to indicate a rejection of the marginal productivity theory but does not go far in suggesting alternatives. There may well be a more appropriate framework and we all await its exposition, but in the meanwhile shall go on applying the framework at hand.

In so far as the degree of competition or lack of it affects the Canadian-U.S. comparison, the limited evidence available on the degree of monopoly in Canada and the United States suggests less-effective competition in the financial and manufacturing sectors in Canada.[7] A difference in the degree of monopoly and effective competition between the two countries could result in a different relationship between factor inputs and output in the two countries. It is not clear, however, that differences in the degree of monopoly have had a large impact on the distribution of income between the main factors of production.

7. Canadian manufacturing production is highly concentrated in a small number of large firms in many of the major manufacturing industries, with a fairly high effective tariff rate which limits import competition. See Gideon Rosenbluth, *Concentration in Canadian Manufacturing Industries* (Princeton: Princeton University Press, 1957), on concentration; Daly, *et al.*, *op. cit.*, on some aspects on the tariff; and Royal Commission on Banking and Finance, *Report* (Ottawa: The Queen's Printer, 1964), especially Chapters 6, 18 and 19, on appraisal of the degree of competition in the Canadian financial system and proposals to make competition more effective.

The distribution of national income is set out in the accompanying table; these data provide the basis for combining the various factor inputs. It is based on official national accounts detail of statistics—employee remuneration, house rents, profits and noncorporate income including farm income and net factor income from abroad. The return to labour includes an estimate of the value of the labour input of entreprenеurs and unpaid workers in unincorporated business, including farms.[8] Non-residential property income is disaggregated on the basis of the relative value of assets, i.e., non-residential land, structures and equipment, and inventories.

TABLE 4

DISTRIBUTION OF NET NATIONAL INCOME, 1960–62
(Average of annual percentage)

	United States*	Canada	Northwest Europe*
NET NATIONAL INCOME	100.0	100.0	100.0
Labour income	79.9	78.1	76.5
Dwellings	4.2	4.8	2.4
Property income from abroad	0.7	−2.0	0.4
Other property income	15.2	19.1	20.7
Non-residential land	2.5	2.9	3.5
Non-residential structures and equipment	10.2	12.8	13.4
Inventories	2.5	3.4	3.8

*See Denison and Poullier, *op. cit.*, Table 4–1, p. 38.

The share distribution of national income is similar for the United States, Canada and Northwest Europe, and at this level of detail, differences in weights for the various factor inputs are quite small. Alternative distributions for the individual items of capital in relation to net income make only moderate differences in such intercountry comparisons since the labour income share invariably dominates the income distribution. This is quite a different picture from the intercountry comparisons of price and real output in the initial part of this paper, where weight differences between countries were shown to be quite important.

DIFFERENCES IN LABOUR INPUTS

In view of the dominant importance of labour as a factor of production, some consideration will be given to possible differences in the composition or quality of labour in Canada and the United States. Over the next few pages, the

8. Our estimate for Canada of the share of noncorporate income attributable to proprietors and unpaid workers was 58 per cent for 1960. This is somewhat lower than the 63 per cent for the United States in the early 1950's. In the light of the small and diminishing share of unincorporated business, the precise accuracy of the estimate of labour's share of income in the noncorporate sector does not have a crucial bearing on these calculations. For example, a 5 percentage point difference on either side of the above 58 per cent figure would make a difference in the labour share of total national income of only about 0.6 per cent.

differences arising from hours worked, age-sex composition and education will be examined but the available evidence indicates that these differences are largely offsetting and no net over-all effect emerges.

In general, average hours worked in Canada in 1960 were about one hour longer than in the United States, but hours worked are appreciably shorter in North America than in Europe. These differences can be seen in Table 5, which relates to weekly hours for all nonagricultural civilians at work.

TABLE 5

AVERAGE WEEKLY HOURS WORKED, 1960

United States*	40.6
Canada	41.6
Northwest Europe*	45.4

*See Denison and Poullier, *op. cit.*, Table 6–1, p. 55.

The composition of the labour force can affect the "quality" of the working population. In all countries younger workers and females receive a lower income than adult males. As compared with other countries, in 1960 the proportion of women employed and in the labour force in Canada was still very low, both in relation to total employment (see Table 6) and as a proportion of the number of women of working age.

TABLE 6

EMPLOYMENT BY SEX, AGE AND MILITARY STATUS, 1960
(Per cent distribution)

	United States*	Canada	Northwest Europe*
Total employment	100.0	100.0	100.0
Civilians			
Males	64.3	71.8	63.5
under 20	4.2	4.9	5.4
20 to 64	56.9	63.9	55.6
65 and over	3.2	3.0	2.5
Females	32.1	26.2	34.1
under 20	3.0	4.0	5.1
20 to 64	27.8	21.6	27.8
65 and over	1.3	0.6	1.2
Military	3.6	2.0	2.4

*See Denison and Poullier, *op. cit.*, Table 7–1, p. 71.

If the shares of man-hours by age and sex are weighted by the corresponding U.S. income weights from *Why Growth Rates Differ*, the resulting country relatives are as shown in the accompanying table. It is apparent that the composition of the Canadian labour force with fewer women is more favourable to output

than the United States, while the composition of employment in Northwest Europe is unfavourable to almost the same extent.

TABLE 7

AGE AND SEX RELATIVES, 1960
(U.S. = 100)

United States*	100.0
Canada	102.6
Northwest Europe*	97.5

*See Denison and Poullier, *op. cit.*, Table 7–5, p. 75.

A recent study on the levels of education in Canada and the United States has indicated a significantly lower level in Canada that has persisted for many decades.[9] The Bertram study used data on education for males aged 25 to 64, while the estimates in this paper have been extended to females and younger and older workers but at a lower level of detail. The level of education, based on years, of the 1960 labour force in Canada was significantly below the U.S. level, and very similar to the level in Northwest Europe.

TABLE 8

EDUCATION RELATIVES, 1960

United States*	100.0
Canada	93.3
Northwest Europe*	92.7

*See Denison and Poullier, *op. cit.*, Table 8–7, p. 91.

It is equally significant that a number of the individual European countries have a highly concentrated distribution at the legal school-leaving ages, while Canada and the United States have a greater variation around the median distribution. The extent of variation in years of education can be seen for three countries in Table 9.

In commenting on this in the context of the comparison of the distribution of education completed between United States and Europe, the Brookings volume comments on the significance of this dispersion:

> *The quality indexes based on United States weights may not take the American advantage in dispersion sufficiently into account, and their use may lead to some understatement of the difference between United States and European national incomes that is attributable to the education of the labor force.*
>
> The diversity of educational backgrounds among Americans must be an advantage in that it provides broad opportunity to match the education of workers

9. Economic Council of Canada, *Second Annual Review* (Ottawa: The Queen's Printer, 1965), Chapter 4, and Gordon W. Bertram, *The Contribution of Education to Economic Growth*, Staff Study No. 12, The Economic Council of Canada (Ottawa: The Queen's Printer, 1966).

with education requirements for specific types of work. The uniformity in education level of the great bulk of European workers may imply that individuals in the occupations least in need of educational background have more education than contributes much to job performance. It almost surely implies that in the more demanding occupations the European countries must often make do with workers having much less education than would be advantageous, or else they must be content with fewer workers in these occupations. As between two distributions of the labor force by amount of education that yield the same quality index, there is reason to think that, within limits, the distribution with the greater dispersion is the more conducive to a large national income.[10]

TABLE 9

DISTRIBUTION OF THE MALE LABOUR FORCE BY YEARS OF EDUCATION[a]
(Per cent)

Years	United States	Canada	United Kingdom
0–4	7.1	7.5	0.4
5–7	12.1	20.8	4.8
8	17.2	17.6	27.2
9	6.3	11.1	45.1
10	7.3	12.0	8.4
11	6.0	6.6	7.3
12	26.2	8.7	2.5
13–15	8.3	10.1	2.2
16+	9.5	5.6	2.1

[a]U.S. for 1957 and U.K. for 1951 from Denison and Poullier, *op. cit.*, Table 8–1, p. 80; Canada for 1961 from Bertram, *op. cit.*, pp. 20–21.

In summary, the effect of hours worked and the age-sex composition of the labour force is favourable to higher incomes per worker in Canada than in the United States, but the effect of the lower level of education is unfavourable. The combined and completely offsetting labour quality calculation is shown in the middle column of Table 10. (The much larger differences in labour input per capita reflect lower participation rates in Canada than in the United States and Northwest Europe and differences in the share of the population of labour force age.)

TABLE 10

LABOUR INPUT, INCLUDING QUALITY EFFECTS, 1960
(U.S. = 100)

	Total	Per Person Employed	Per Capita
United States*	100.0	100.0	100.0
Canada	8.8	100.0	88.8
Northwest Europe*	115.3	97.7	114.2

*See Denison and Poullier, *op. cit.*, Table 9–2, p. 115.

10. Denison and Poullier, *op. cit.*, pp. 105–6.

Differences in Other Inputs

This section covers the contribution of total real capital and the rental contribution of land and resources to income differences. Many studies of the role of capital in the growth process—both theoretical and empirical in orientation—are confined to fixed business capital in structures and equipment. The framework developed by Denison provides a wider focus on the whole range of investment alternatives, including dwellings, non-resident investment and inventories.

1. *Income from Net Foreign Lending*: The Denison analysis is tied to a measure of national, not domestic, income and product. As a result, the contribution of foreign capital—measured by income remitted on foreign investment —is added to income arising from domestic factors of lending countries and deleted from that of borrowing countries. Canada and Norway are the only two countries (of the ten) for whom a continuing capital inflow, or the use of foreign resources, is significant.

TABLE 11

Net Property Income from (to) Abroad per Person Employed, 1960

	Net Property Income from (to) Abroad	Contribution to Difference from U.S. Net National Income	
	(U.S. = 100)	(Percentage points in income gap)	(Per cent of income gap)
United States*	100	—	—
Canada	−241	2.0	9.2
Northwest Europe*	27	0.4	1.0

*See Denison and Poullier, *op. cit.*, Table 11–5, p. 132.

Canada had a large net payment per employed person in 1960, and about 2 percentage points or nine per cent of the difference in national income is explained in this way. It might, however, be noted that the level of fixed capital stock and its contribution to growth would probably also have been less in the absence of past borrowing.

2. *Dwellings*: Housing is not an important factor in the income difference between Canada and the United States, but is an important factor for Northwest Europe. The estimates are shown in Table 12.

TABLE 12

Income from Dwellings per Person Employed, 1960

	National Income from Dwellings	Contribution to Difference from U.S. Net National Income	
	(U.S. = 100)	(Percentage points in income gap)	(Per cent of income gap)
United States*	100	—	—
Canada	94	0.2	1.0
Northwest Europe*	54	1.9	4.6

*See Denison and Poullier, *op. cit.*, Table 11–3, p. 129.

3. *Inventories*: We are concerned here with the level of inventory holdings which represent an important allocation of real resources to production. There are difficult measurement problems in estimating total inventories, especially for international comparisons, and these are even more acute for intercountry comparisons of real income levels than for comparisons of growth experience. The differences in inventories per person employed and their contribution to income differences (the share allocation is noted below) are set out in Table 13.

TABLE 13

ENTERPRISE INVENTORIES PER PERSON EMPLOYED, 1960

	Inventories (U.S. = 100)	Contribution to Difference from U.S. Net National Income (Percentage points in income gap)
United States*	100	—
Canada[a]	116	−0.4
Northwest Europe*	66	0.8

*See Denison and Poullier, *op. cit.*, Table 13–4, p. 177.

[a]It might be noted that the real price adjustment for inventories is based on the total GNP price comparison for Canada and the United States.

4. *Non-Residential Structures and Equipment*: Denison derives the contribution of non-residential fixed capital to growth, based on an allocation of the return to total non-residential domestic capital among structures and equipment, inventories and land on the basis of asset values. The income share associated with this component was 10 per cent in the United States and 13 per cent for both Canada and Northwest Europe (Table 4). Thus, the income share of non-residential business capital is the largest of the capital inputs, and is in marked contrast to labour's share, which is many times larger.

Table 14 contains the results of a comparison of the gross capital stocks between Canada and the United States. Special attention should be given to the appreciably lower level of equipment in Canada, especially in the important "other" sector (apart from agriculture and manufacturing). This emphasis is also supported by a calculation of post-war cumulated non-residential fixed investment which showed the Canadian share of equipment to be low, and the share of construction very high, compared to most other countries. It is the equipment category which is given special emphasis in growth theories emphasizing new technology. On the other hand, the levels of construction are as large as, or larger than, in the United States in each category. In total, the level of gross capital stock per person employed is slightly lower in Canada than in the United States.

This would contribute to a level of net national income per person employed 0.4 per cent lower in Canada than in the United States.

The usual uncertainties of investment and capital stock measures multiply to an almost intolerable degree in the wider international comparison of levels of investment and capital stock, and their contribution to income differences.

Denison's approach to this problem is to use as a proxy for real capital (net) stock, cumulative investment data converted using Gilbert's real investment price comparisons (adjusted to exclude government investment).

The levels of capital inputs in Northwest Europe, based on estimates of cumulative investment per employed person, are less than half of the U.S. level. This contributes a difference of 5.6 percentage points to the difference in national income per person employed between the United States and Northwest Europe. Clearly, the levels of capital stock are significantly lower in Europe than in North America.

TABLE 14

GROSS COMMERCIAL[a] CAPITAL STOCK PER PERSON EMPLOYED, CANADA AND UNITED STATES, 1960

	Canada/United States (U.S. = 100)	
	$ Parity	U.S. $[b]
Agriculture		
Construction	153.3	160.1
Equipment	108.2	103.9
Manufacturing		
Construction	131.1	142.4
Equipment	110.8	98.9
Other		
Construction	83.4	101.7
Equipment	69.1	61.1
Total Commercial Sector		
Construction	94.0	110.3
Equipment	86.0	77.4
Total	90.6	96.3

[a]Commercial stocks exclude all institutions and general government; U.S. figures are based on Office of Business Economics private capital stock estimates adjusted to include public enterprises and exclude institutions.

[b]Deflated using estimated 1960 Canada/U.S. price relatives.

5. *Land and Natural Resources*: It should be emphasized that what is being measured here is the contribution of land and natural resources to the *rental* portion of national income. It does *not* include the income generated in natural resource industries which accrues to labour, profits or the government, so does not measure a *total* contribution of Canadian resources to income differences.

The income to land in this sense is assumed to fall into three parts—business sites, farmland and mineral lands. The weights of the three components are 73, 17 and 10 respectively, based on relative U.S. earnings. Building land is

assumed to be equally available in all countries, and thereby contributes nothing to income differences. Agricultural land in total and per person employed varies widely among countries. The available data indicate a substantially higher level of agricultural land and mineral resources per employed person in North America than in Northwest Europe, with the level in Canada being substantially higher than in the United States. However, when the weight for these two categories is only about one fourth of the land income share, and less than one per cent of national income, its measured contribution can only be small in relation to the total income differences. The results are summarized in Table 15.

TABLE 15

LAND AND MINERAL RESOURCES, 1960

	Land Input per Person Employed (U.S. = 100)				Contribution to Difference from U.S. Net National Income per Person Employed
	Non-Residential Sites	Agricultural Land	Mineral Resources	Total	(Percentage points in income gap)
United States*	100	100	100	100	—
Canada	100	199	171	124	−0.6
Northwest Europe*	100	16	26	78	0.5

*See Denison and Poullier, *op. cit.*, Table 14–3, p. 185.

SUMMARY OF INPUTS AND OUTPUT IN RELATION TO TOTAL FACTOR INPUTS

The three previous sections have discussed the differences in individual labour and other inputs between Canada and the United States, and discussed the weights used to combine the separate factors into a measure of total factor inputs. This section will bring together the separate inputs and develop the overwhelming importance of output in relation to total factor inputs as the central element in the Canada-United States income difference.

Table 16 summarizes the measures of factor inputs. Total inputs per person employed are almost the same in the two countries—2 per cent lower in Canada than in the United States. On the other hand, output per unit of input is 17 per cent lower in Canada.

As most of the differences in individual inputs have already been covered, only brief comments will be made here. Differences in the measured aspects of labour quality are negligible, with the lower level of education in Canada fully offsetting the longer hours worked and the larger proportion of adult males in the labour force. The larger supply of agricultural land and mineral resources in Canada is quite marked. However, the heavy weight for nonagricultural site

land (which is assumed to be equally available in all countries) reduces the Canadian relative for land and resource inputs to only 24 per cent above the U.S., while the relative for Northwest Europe is 22 per cent below. The quantity of non-residential construction and inventories is also higher on a per-employed-person basis in Canada than in the United States. On the other hand, the level of machinery and equipment per employed person is significantly lower, and of dwellings is also somewhat less. The adjustment for international assets is large in Canada, reflecting the extent of international ownership and indebtedness. In total, the index of capital stock per employed person in Canada is about 15 per cent below the United States, while Northwest Europe is about 50 per cent lower.

TABLE 16

FACTORS AFFECTING INCOME LEVEL, 1960
(U.S. = 100)

	United States*	Canada	Northwest Europe*
Net national income per person employed	100	78.8	59.0
Total input per person employed	100	98.0	89.2
Labour quality	100	100.0	98.3
Hours	100	103.8	106.3
Age-sex composition	100	102.2	98.1
Education	100	94.3	94.3
Capital	100	85.2	49.4
Dwellings	100	94.5	54.0
International assets	100	−241.2	26.7
Non-residential structures and equipment	100	96.3	44.9
Inventories	100	116.0	66.3
Land	100	124.0	78.3
Output per unit of input	100	83.0	66.2

*See Denison and Poullier, *op. cit.*, Table 15–6, p. 197.

The next table shows the contribution of each factor. Table 17 uses the distribution of income as a measure of the *contribution* of differences in factor inputs to differences in total output. The factor contribution is therefore a function of the income shares summarized in Table 4, and the indices of factors in Table 16. Of a difference of 21 percentage points, less than 2 points are attributable to factor inputs and about 20 percentage points are attributable to differences in output in relation to input. Although Table 16 shows that some individual factors, e.g., land, inventories, international assets, etc., are moderately different from the United States, the weights for these items in net national income are sufficiently small that they do not play a large role in explaining the

difference in output per worker. The contrasts between Canada and the United States on the one hand, and Northwest Europe on the other, are more pronounced. The difference in factor inputs per employed person between Northwest Europe and the United States amounts to 11 percentage points, largely reflecting lower stocks of capital in all forms per employed person.

One could summarize the contrast between Canada, the United States and Northwest Europe by saying that Canada has a level of factor inputs per employed person almost the same as the United States, but a level of output in relation to inputs that is somewhat closer to Europe than the United States.

TABLE 17

CONTRIBUTIONS TO DIFFERENCE FROM U.S. NATIONAL INCOME PER PERSON EMPLOYED, 1960
(Percentage points)

	United States*	Canada	Northwest Europe*
National income	100.0	78.8	59.0
Difference from the United States	—	21.2	41.0
Due to:			
Factor inputs	—	1.5	11.3
Labour quality	—	— .1	1.1
Hours	—	— 2.7	— 3.9
Age-sex composition	—	— 1.6	1.2
Education	—	4.2	3.8
Capital	—	2.2	9.7
Dwellings	—	.2	1.9
Property income from abroad	—	2.0	.4
Non-residential structures and equipment	—	.4	6.6
Inventories	—	— .4	.8
Land	—	— .5	.5
Output per unit of input	—	19.7	29.7

*See Denison and Poullier, *op. cit.*, Table 15–8, p. 199.

The relative importance of some of the major factors contributing to the difference from the U.S. level of output per employed person is indicated by the data in Table 18. More than 90 per cent of the Canadian difference is associated with differences in output in relation to input, while less than one tenth reflects differences in factor inputs per employed person. For Northwest Europe, more than one fourth of the difference reflects factor inputs. The marked difference in output in relation to input for Northwest Europe compared to the United States is reflected in about 70 per cent of the total.

The central importance of the difference in output in relation to inputs in explaining differences in output per employed person among major industrialized countries is clear from these figures and the analysis for individual countries in the study *Why Growth Rates Differ*.

TABLE 18

DISTRIBUTION OF CONTRIBUTIONS OF SELECTED FACTORS TO DIFFERENCE FROM U.S. NATIONAL INCOME PER PERSON EMPLOYED, 1960[a]
(Per cent of income gap)

	Canada	Northwest Europe
Factor inputs	7.1	27.6
Labour quality	− 0.5	2.7
Education	19.8	9.3
Hours, age and sex	−20.3	−6.5
Capital	10.4	23.7
Non-residential structures and equipment	1.9	16.1
Dwellings	0.9	4.6
Output per unit of input	92.9	72.4
Total income gap with U.S., net national income per person employed	100.0	100.0

[a]Estimated from Table 17.

INCOME DIFFERENCES OVER TIME

Tables and discussion in the central part of this paper have related to comparisons for 1960. This paper is an outgrowth of a larger study patterned on *Why Growth Rates Differ*, which reproduces for Canada the calculation of factor inputs in relation to growth and income differences and considers some of the relevant residual terms. The larger study includes in more detail the material presented here, together with other related information. It is planned to complete and publish the Canadian study on factor inputs in growth and income differences in 1968.

The work by Dorothy Walters for Canada permits comparisons between ten countries in Europe and North America from 1950 to 1962. For this period, Canada has undergone the *largest* increase in total factor inputs of any of the ten countries. At the same time, the increase in output in relation to total factor inputs has been the *smallest* of any of the ten countries (although not much lower than the United Kingdom and the United States).

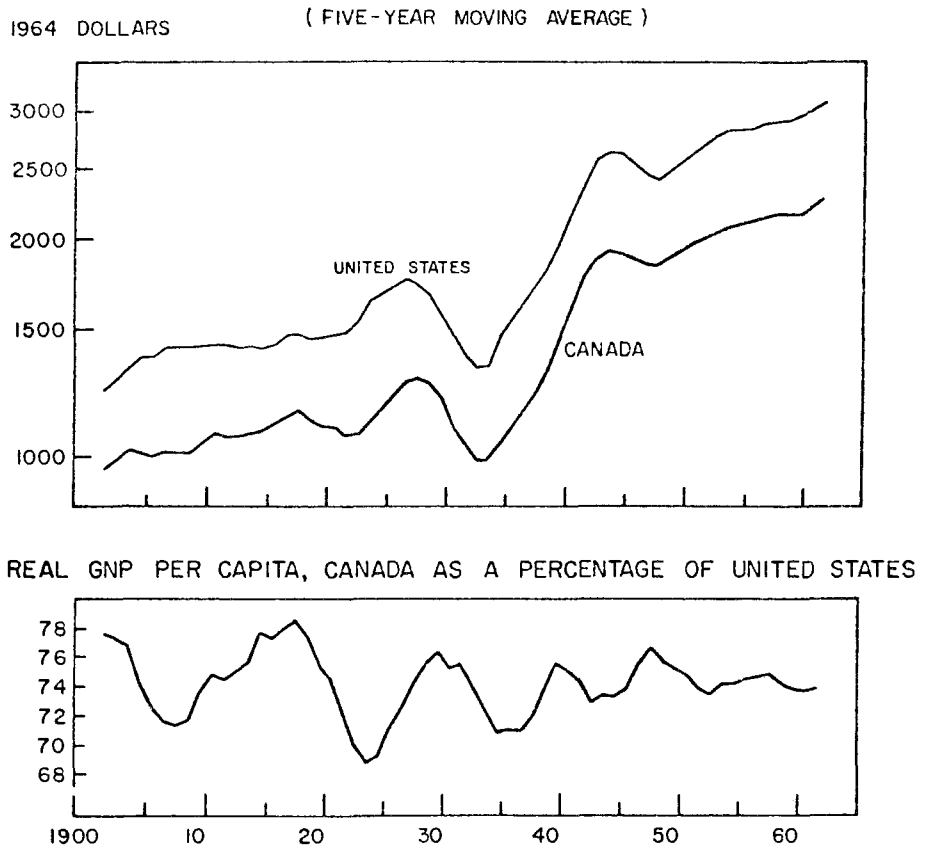
It is quite clear from this material that the lower level of output in relation to input in Canada than in the United States is not limited to the year 1960.

Some comparisons in the level of GNP per capita for Canada and the United States can be made for a much longer period.[11] Chart 1 presents some evidence for the past six decades. It is clear that a persistent gap in living standards has prevailed for a prolonged period. While the Chart relates to population and not to employment, and does not take account of other factor inputs, our analysis thus far supports the main general point that the appreciably lower level of output in relation to input in Canada has persisted for several generations.

11. Economic Council of Canada, *op. cit.*, p. 51.

Chart 1

Comparison of Real GNP Per Capita,
Canada and United States, 1900–1964



Note: Based on data in constant 1964 Canadian and United States dollars smoothed by five-year moving averages. The use of "real" in headings may be misleading. The Canadian and United States time series are in constant prices and therefore represent real changes over time, but the levels are in national dollars and have not been adjusted by the real Canada/U.S. exchange rate.

Source: *Historical Statistics of Canada*, M. C. Urquhart, ed., The Macmillan Company, Toronto, 1965. Dominion Bureau of Statistics, *National Accounts*, 1926–56, and various subsequent annuals. K. A. H. Buckley; unpublished estimates of real GNP, 1900–1925. U.S. Bureau of the Census, *Historical Statistics of the United States*, Washington, 1960. Department of Commerce, *Survey of Current Business*, August 1965. Department of Commerce, *U.S. Income and Output, 1958*. N. Potter and F. T. Christy, *Trends in Natural Resource Commodities*, John Hopkins, 1962.

Further Research

In terms of the material covered in this paper, the authors are nervous primarily about two areas in the data. For one thing, the material on prices and

real output comparisons between the United States and Canada could and should be extended to explore the effects of weight differences, additional data in the investment area, etc. In addition, there is a need for improved and extended capital stock data and for further exploration of the relationship of this stock to economic growth and income differences.

The research thus far really raises more questions than it answers. Why has the level of output in relation to input persistently stayed so much lower in Canada than in the United States? This is a central question for longer-term economic policy. In the Brookings study *Why Growth Rates Differ*, almost half of the volume is devoted to comparable questions for the United States and Europe. Much more attention is given to economies of scale, interindustry shifts and reductions in trade barriers than was given in Denison's earlier volume on United States economic growth. Work in these areas for Canada has only just begun, but is critically necessary.

Current thinking on the Canada-United States differences in output per employed person suggests the need to go below the national aggregates. Are the differences in output per employed person in the two countries similar in all sectors, or are there important exceptions? An initial study for a number of manufacturing industries suggests that the differences are even more pronounced in that sector than for the economy as a whole. The significantly lower levels of output per worker in individual industries are reflected in higher prices of manufactured products (see also Table 2 in this paper), even though average hourly earnings in Canadian manufacturing tend to be between 20 and 25 per cent lower than in the United States.[12] Additional work in trade, agriculture, and some other primary industries is planned to explore these questions further.

Thus far, the primary application of the distinction between factor inputs and output in relation to inputs has been in the areas of economic growth and real income differences. It is worth raising the relevance and possible application of this material to international trade and comparative advantage. The basic data on factor quantities and output in relation to inputs could be extended by data on factor prices to re-examine some of the important questions in international trade, including the applicability of the basic theorems of Ricardo and Hecksher-Ohlin.[13] In the light of the importance of international trade to Canada, this would be a fruitful field for research, and would open up significant new possibilities for building more bridges between the areas of growth and international trade, using the framework of analysis pioneered by Denison and his associates.

12. Daly, *et al.*, *op. cit.*

13. For a convenient recent summary, see J. Bhagwati, "The Pure Theory of International Trade", in *Surveys of Economic Theory*, Volume II (London: Macmillan, 1965).

TECHNICAL APPENDIX

REAL INCOME COMPARISON CANADA-UNITED STATES 1965 AND SELECTED YEARS BACK TO 1950*

BY E. C. WEST

To make a spatial comparison of real income between Canada and the United States for 1965, the approach was essentially that of the Gilbert and Kravis OEEC study for 1950.[1] However, because of the time constraint, their detailed method had to be rejected in favour of short-cut approximations. The technique was to make spatial price comparisons for as many GNE components as possible. In the case of consumption, this was done at a relatively fine level of detail;[2] however, for the remaining categories of output, reliance was on available statistics or interviews with companies to establish price differentials for broad categories. Given the price differentials for major categories of consumption, government purchases, structures, equipment, etc., over-all purchasing power equivalents and real income comparisons were obtained by weighting the relatives with GNE at market price components, of both the United States and Canada.

A relatively fine level of weighting was not attempted since, aside from consumption, the detailed price differentials were lacking for other components of output. The breakdown of output was therefore at a fairly aggregate level, i.e., five categories of consumption, seven of government and eight of investment. This was also the level used to extrapolate the results for 1965 back to 1960 and other years. Price and volume indicators for these years were largely developed from official data on prices and constant dollar expenditures for the two countries.[3]

The use of the two (United States and Canadian) national accounts weighting systems at this level of detail did not give significant differences in results; for 1965 the difference was 2 per cent for the purchasing power equivalent of total output. This is a very small difference compared to that found between the United States and other countries in the Gilbert studies. The largest difference in 1965 was 4 per cent for the purchasing power equivalent of the public and private investment sector where weighting differences were the greatest between the two countries.[4] Consumption showed only a small

*Acknowledgment should be made to the Dominion Bureau of Statistics for their contribution to this project. They made the spatial price comparisons for consumer expenditure (see footnote 2) and provided data in connection with the housing and highway estimates. They, as well as the Canadian Construction Association, co-operated in the listing of international builders used in connection with the non-residential building estimate.

1. Milton Gilbert and Irving B. Kravis, *An International Comparison of National Products and the Purchasing Power of Currencies* (Paris, OEEC, 1954).

2. See Prices Division, *Comparative Consumer Price Levels in the United States and Canada*, Ottawa, Dominion Bureau of Statistics, mimeo., 1967, available on request.

3. See Technical Appendix P 157, Milton Gilbert and Associates, *Comparative National Products and Price Levels*, OEEC, 1958, for extrapolating procedures.

4. A larger difference of 8 per cent for government goods purchases occurred in 1965 more as a result of the difficulty of making an allocation of Canadian government purchases between durable and nondurable comparable to that of the United States than because of a true weighting difference.

difference working at a four-category level of detail (food, durable, other nondurable and services). A further test was made as a check on the possibility that a larger difference would result with the use of a finer level of detail within consumption. The 35 spatial price relatives of consumption as published by DBS were reweighted with U.S. Consumer Price Index December 1957 value weights in order to make a comparison with the results of the same price relatives weighted with Canadian 1957 CPI value weights. The weighting systems were not significantly different and only a small difference in the aggregate price relatives occurred.

Procedures for developing the purchasing power equivalents for the categories given above will now be outlined. The Dominion Bureau of Statistics material on price differences within consumption had been aggregated according to the Canadian Consumer Price Index weighting system. The published price differentials were reaggregated using the same weights to give purchasing power equivalents for food, durables, nondurables and services excluding shelter. These spatial price relatives were then aggregated on the basis of the national accounts weights. Since a price relative for shelter was not included in the DBS consumer comparisons, the implicit purchasing power equivalent of the goods and services, excluding rent, was used for shelter.

For government, 1965 price differentials had to be established according to a durable, nondurable, service and structures breakdown of government expenditures on goods and services. These are the categories used by the United States for their published constant dollar estimates which are needed for the purposes of extrapolation to other years. The attempt was then made to arrange the Canadian deflated series according to the same classification. For durables, the price differential for 1965 was taken to be the average of the price ratios established for motor vehicles and other machinery and equipment purchases. For nondurables, the implicit purchasing power equivalent established in consumption for goods was used. For government services, the 1965 price ratio was derived from a comparison of the average income per worker for Canadian and U.S. federal employees. This showed Canadian earnings some 20 per cent below the American level. Except for highways, the price differentials developed for public structures, i.e., housing, non-residential building and engineering, were assumed to be identical to those developed for the business sector. On the other hand, data were available to derive the price differential for highway construction between Canada and the United States. The Dominion Bureau of Statistics, in conjunction with the U.S. Bureau of Public Roads, matched price data implicit in each country's highway price index. Price ratios were developed for three major components of highway construction, i.e., earth excavation, crushed gravel and bituminous paving, on the basis of seven comparisons of adjacent U.S. states and Canadian provinces. The three component ratios were subsequently combined to give an over-all price comparison. On this basis it was determined that highways were about 20 per cent cheaper to build in Canada than in the United States. This estimate has a number of statistical shortcomings. High variability between different years in the ratios for each component forced an averaging over a four-year period (1962–65). There were also problems of significant level differences between these four-year ratio

averages by area and between the final bituminous paving ratio and the crushed gravel ratio. The estimate is by and large considered weak and could possibly overstate the true price differential.

To establish price differentials for the business investment sector, reliance was predominantly on the interview technique. For construction, 16 international builders and associations were interviewed for their assessment of the price difference of identical structures built on both sides of the border. A number of different techniques were tried, including the Gilbert and Kravis "building operations method"—an aggregation of cost comparisons of 11 different building operations. Even though identical structures are rarely built, even in the same country, it was possible to obtain a few good comparisons; one, for instance, was a cost-per-square-foot estimate for an identical store built across Canada and the Northern United States. In other cases, it was not known how successful the respondent was in adjusting for quality differences in the buildings compared, but, aside from a few extremes, there was enough central tendency, combining the results from different methods, to arrive at a real exchange rate of parity for non-residential building. Given a Canada/U.S. price ratio of 100 for non-residential building and 80 for highways, an average of 90 was assumed to be applicable for engineering construction. Lacking information to establish the purchasing power equivalent for engineering independently, it was assumed that the estimate for this type of project must lie between the estimates for interior and exterior work.

The interview technique did not prove feasible for residential construction since there are few companies in international house building. A couple of other approaches did not net any useful results, so that it was necessary to fall back on cost data for single detached dwelling units financed in the United States under the Federal Housing Administration and in Canada under National Housing Act loans provided by Central Mortgage and Housing Corporation. However, it was not possible to exclude the cost of the site. Cost-per-square-foot comparisons were made on the basis of eight U.S. cities and seven Canadian cities weighted by population. This estimate gave Canadian housing prices 6 per cent lower than in the United States.

Time and resources would not allow the pricing of some 150 items of producers' durable equipment as was done for the Gilbert and Kravis study. The international builders were therefore questioned as well on the price of machinery and equipment in Canada relative to the United States in order to supplement previous findings of other company interviews.[5] Invariably, the response was that Canadian machinery and equipment prices tended to meet the laid down cost in Canada of similar U.S. equipment. Depending on the item, prices in Canada could reach 40 per cent above the comparable U.S. item, reflecting 8 per cent exchange, 22 per cent duty and 11 per cent Canadian Federal Sales Tax. A figure of 30 per cent was chosen for other machinery and equipment in 1965 to approximate an average duty rate.

Agricultural machinery and vehicles were treated separately. There is an

5. See D. J. Daly, B. A. Keys and E. J. Spence, *Scale and Specialization in Canadian Manufacturing*, Staff Study for the Economic Council of Canada, Ottawa, Queen's Printer, forthcoming in 1968.

APPENDIX TABLE

CANADA/UNITED STATES PURCHASING POWER EQUIVALENTS WITH U.S. AND CANADIAN GNE WEIGHTS

	1950		1955		1960		1962		1965	
	Weighting		Weighting		Weighting		Weighting		Weighting	
	U.S.	Can.	U.S.	Can.	U.S.	Can.	U.S.	Can.	U.S.	Can.
Consumption	96.8	94.5	99.0	96.9	98.0	96.1	98.0	96.5	99.4	97.7
Goods	103.8	101.2	104.3	101.8	102.8	100.3	102.8	100.7	104.5	102.5
Services	82.8	82.4	89.6	89.0	90.6	89.9	91.0	90.4	91.8	91.3
Government	77.7	79.8	88.9	82.6	85.8	82.5	87.2	83.7	88.6	87.1
Goods	92.3	92.8	113.5	87.1	114.3	98.9	116.1	103.8	119.2	110.1
Services	70.1	70.1	75.5	75.5	73.5	73.5	75.9	75.9	77.6	77.6
Structures	87.4	86.7	92.7	92.6	87.3	86.1	83.1	80.9	89.9	85.4
Investment	91.3	89.1	96.6	94.1	98.3	94.6	101.1	96.1	108.1	105.4
Structures	78.2	80.3	86.4	86.4	88.3	86.7	89.2	87.9	95.2	94.0
Machinery and Equipment	107.3	106.3	113.0	112.5	112.8	111.8	117.4	116.6	126.6	125.6
Inventories	98.1	96.5	94.9	93.4	92.6	91.1	96.3	94.8	98.7	97.0
Net Exports	108.9	108.9	98.6	98.6	97.0	97.0	106.8	106.8	98.7	97.0
Gross National Expenditure	93.1	91.2	96.7	93.5	95.6	93.0	96.2	93.7	98.7	97.0

over-all consensus that farm machinery sells at the same price in the North American market irrespective of the Canada-U.S. border and that duty and Federal Sales Tax are not applicable on these items. Agricultural machinery and equipment would therefore be 8 per cent more expensive in Canada reflecting only the exchange rate. The extrapolation of these 1965 purchasing power equivalents for both agricultural and other machinery and equipment to other years resulted in estimates that, in most cases, agreed favourably with what would have been expected on known exchange and tax rates. Motor vehicles were given the same price differential as that established for private motor vehicles in consumer expenditures.

The remaining categories of output, inventories and net exports were given purchasing power equivalents the same as that implicit in all the items covered in output thus far. For inventories, extrapolation of the 1965 results to other years was on the basis of the U.S. and Canadian wholesale price index. The exchange rate was used as the conversion factor to obtain net exports for other years.

The following Table shows the results for various years for the purchasing power equivalent at the aggregate and major component level according to the two weighting systems. The intention is only to illustrate the results of weighting differences and extrapolation procedures, not to give credence to the magnitude of the detail. Some confidence can be placed on the results at the aggregate level, but it will be appreciated that considerably more research is needed at the detail level before estimates can be accepted as reliable.

Ce document fait partie d'une étude plus complète de la croissance économique au Canada, fondée sur les méthodes mises au point par Edward Denison dans ses ouvrages *The Sources of Economic Growth in the United States* et *Why Growth Rates Differ*. Les nouvelles données fournies dans ce document ont trait au Canada et à des comparaisons entre le Canada et les Etats-Unis, tandis que les données relatives au nord-ouest de l'Europe sont tirées de l'étude Brookings.

Le document présente les résultats obtenus jusqu'ici quant à l'écart de production réelle par personne employée entre le Canada et les Etats-Unis au cours d'une année en particulier, soit 1960. Au stade actuel de nos recherches, il nous faut conclure que, cette année-là, le volume de production réelle par personne employée a été d'environ 20 p. 100 plus faible au Canada qu'aux Etats-Unis. De plus, une comparaison rétrospective indique que cet écart est demeuré sensiblement le même depuis le début du siècle actuel.

La partie centrale du document est consacrée à une étude de l'importance des différences entre le Canada et les Etats-Unis pour ce qui est des éléments employés dans la production, ainsi que du rôle de ces différences dans l'écart de revenu. Le volume des éléments de production par personne employée au Canada ne représente que deux points, en pourcentage, de l'écart de revenu entre les deux pays. C'est donc dire que la disparité de production par personne employée résulte pour une très large part de différences de rendement de l'ensemble des éléments employés plutôt que du volume des facteurs employés en combinaison avec la main-d'œuvre.

Ces résultats sont conformes à ceux d'études antérieures de Denison et autres, qui ont souligné l'importance primordiale de la production par rapport à l'ensemble des éléments employés, tant pour la croissance de la production au cours des années que pour les comparaisons du chiffre de la production d'un pays à un autre.

Dans le corps de ce document, les auteurs ne peuvent qu'accorder une brève attention aux nombreuses questions d'ordre conceptuel et statistiques qui surgissent dans une étude de cette envergure, et ils ne prétendent pas avoir abordé, et encore moins résolu, toute la vaste gamme de problèmes connexes à cette étude. En raison, particulièrement, des limitations statistiques des données de base, ils ne prétendent pas non plus à un très haut degré de précision dans leurs résultats.